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Constraint Analysis of Fish Processing in Peri Urban Areas of National Capital Region

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ABSTRACT

Reducing wastage of produces and increasing income of farmers are two important areas which invited more emphasis by any agrarian economy for its sustainability and development. In the changing scenario of life pattern and food habits people generally prefer, ready to take or ready to cook type of food products like milk, processed vegetables, fish and meat. In order to address these, value addition and processing plays a key role. Fish processing sector in India, especially fresh water aquaculture is an emerging area in this. In this study an attempt was done to know about the various constraints faced by the fish processors and their level of severity. Reliability and validity tested Likert like scale was used for this purpose. Significant differences of different dimensions of constraints were compared using Kruskal-Wallis one-way ANOVA (Chi-Square = 19.450, df = 3, $p < 0.05$). Each set of constraints contains sub categories and they were tested by using Friedman's two way ANOVA. Multiple pair wise comparisons using Nemenyi's procedure / Two-tailed test was also conducted to place them in homogenous groups. Infrastructure related constraints due to lack of cold chain management, storage facility etc. with mean rank 33.80 were identified as the major constraint to existing post-harvest management mechanism in fishery.

Keywords: Fish processing, peri urban, constraint, likert scale

Aquaculture is an area with lots of scope for development of alternative food network in urban and peri urban regions where the conventional agricultural functions are often replaced by non-agricultural or post-productive ones (Renting *et al.,* 2003; Luttik and van der Ploeg, 2004). It is a potential area to expand Indian export even. Supply chains in domestic fish marketing can be improved by enhancing private investment in value addition and transportation sectors (Sathiadhas *et al.,* 2011). But value addition and post harvest management in inland fisheries is not received much attention (Magawata *et al.,* 2014). There is a persistently high volume of post-harvest loss that removes significant quantities of fish from the market – up to 25 per cent in many developing countries (FAO, 2014). Fish farmers are not aware about the large economic scope of doing processing in a group basis. Even if some farmers are motivated to do the value addition of fish they have to overcome many hurdles while the process of creating value, time of accessing finance and finally marketing the finished products. On this background the present study was an attempt to find out various constraints faced by the fish processors and analyze the severity of them.

DATABASE AND METHODOLOGY

The present study was conducted in peri urban area of National Capital Region (NCR) of India. NCR which covers an area about 34,144 sq kms and comprised of four states Haryana, UP, Delhi and Rajasthan. It is an example of inter-state regional development planning. Among these states in NCR, Haryana ranks 2nd in the country in per unit

fish productivity with 5,800 kg/ha (Anonymous, 2015). Among the different districts of Haryana, Karnal is with more number of ponds and water sources for inland fisheries. This state is also with well connected market and institutional support for fisheries development. Karnal district of Haryana state selected purposively as the study area for present study. An exhaustive list of fish processors of Karnal was collected with the help of experts from Indian Council of Agricultural Research (ICAR) institutes like, Krishi Vigyan Kendra (KVK) of National Dairy research Institute (NDRI), Regional Station of Indian Agricultural Research Institute (IARI), Fisheries Department of Haryana state (FDH) and progressive/ contact fish farmers in the Karnal region. Among the selected farmers 40 were selected with the purpose of validating and checking reliability of the scale developed for identifying the constraints in post harvest management of fisheries and 10 fish processors were randomly selected for the constraints analysis. In order to cross check the information collected from the fish processors a detailed interview of intermediary people like retailers, wholesalers and different institutional members were also carried out.

The constraints were identified and severities of these identified constraints were measured with the help of a Likert like scale constructed for the study as per the methods suggested by Likert (1932). Under this scale constructs (which one can able to measure the magnitude), dimensions (the major four dimensions i) Infrastructure related Constraints ii) Market Related Constraints iii) Technical and capacity building related constraints iv) Financial Constraints) and items (these are the statements representing each dimension of construct under study) were identified and operationalised by consultation with the experts and scientists from Agricultural Extension, Agricultural Economics and Post Harvest Technology Divisions of IARI, review of literature studies and the field experience of team members. Selection of the items was in line with the criteria suggested by Edward (1969). Items were analyzed with the help of experts and a group of 40 respondents during the study. Selected items for the scale were primarily given to the respondents for ratings in 5 point continuum, starting from least sever (1) to most sever (5). On the basis of total score, upper and lower 25 per cent of the subjects were selected as a referent group (20 respondents) for calculating 't' value as they are explaining the maximum variability. Items or statements were selected on the basis of higher 't' value over a cutoff point of 1.75.

$$t = \frac{\bar{x}_h - \bar{x}_1}{\sqrt{\frac{s_h^2}{n_h} + \frac{s_1^2}{n_1}}}$$

$\bar{x}_h$ = Mean score of given statement in upper (high Score) group

$\bar{x}_1$ = Mean score of given statement in low (low score) group

s_h^2 = The variance of the distribution of responses in high group

s_1^2 = The variance of the distribution of responses in low group

n_h = number of subjects in upper group

n_1 = number of subjects in low group

Final scale consists of four different dimensions and nine items under each dimension. Among the different ways of reliability testing, split half method with internal consistency test was used in the present study (Kerlinger, 1964). Coefficient of internal consistency (Spearman's rho) of this scale is 0.843. In order to avoid or nullify the problems associated with the grouping, Cornbach alpha coefficient (1951) has been used. Cornbach alpha coefficient of this rating scale is 0.927. Since the responses were in ordinal scale of measurement, different dimensions of constraints were compared using Kruskal-Wallis one-way ANOVA. Each set of constraints contains sub categories and they were tested by using Friedman's two way ANOVA. Validity of the scale was measured with juries' opinion method. Multiple pair wise comparisons using Nemenyi's procedure/Two-tailed test was also conducted under each dimension of constraints for finding significant difference among each factors and placing them in homogenous groups (Siegel and Castellan,1988).

Description of statistical methods used for data analysis in present study

Kruskal–Wallis one-way analysis of variance: It is used for comparing more than two samples that are independent, or not related. It is a non-parametric

method for testing whether samples derived from the same distribution. When the Kruskal-Wallis test leads to significant results, then at least one of the samples is different from the other samples. The test statistic (for large sample) is,

$$K = \frac{12}{N(N+1)} \sum_{i=1}^{g} n_i \left(\frac{\sum_{j=1}^{n_i} r_{ij}}{n_i} - \frac{N+1}{2} \right)^2$$

which follows a $\chi 2$ distribution with (g-1) degrees of freedom, where '*g*' is the number of groups 'n_i' is the number of observations in ith group, 'r_{ij}' is the rank (among all observations) of jth observation from group '*i*' and 'N' is the total number of observations across all groups.

Friedman's test for related samples: It is used for comparing more than two samples that are related. When the Friedman's test leads to significant results, then at least one of the samples is different from the other samples. The test statistic is given by,

$$Q = \frac{SS_k}{SS_e} \sim \chi^2_{(k-1)}$$

where '*k*' is the number of related groups,

$$SS_k = n \sum_{j=1}^{k} \left(\frac{\sum_{i=1}^{n} r_{ij}}{n} - \frac{\sum_{i=1}^{n} \sum_{j=1}^{k} r_{ij}}{nk} \right)^2 \quad \text{and,}$$

$$SS_e = \frac{1}{n(k-1)} \sum_{i=1}^{n} \sum_{j=1}^{k} \left(r_{ij} - \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} r_{ij}}{nk} \right)^2$$

and, 'r_{ij}' represents the rank of 'j^{th}' observation from group '*i*'.

RESULTS AND DISCUSSION

Data collected under four major dimensions of constraints (Technical and capacity building related constraints, Infrastructure related Constraints, Financial Constraints and Market Related Constraints**)** were analysed using Kruskal-Wallis one-way ANOVA. The test (Chi-Square = 19.450, df = 3, $p < 0.05$) revealed that, the different dimensions of constraints identified in the existing post harvest management mechanism of fresh water fisheries have a differential level of influence according to processors' perception.

Table 1: Major dimension of different constraints among fish processors (Kruskal-Wallis test and Multiple pair wise comparisons)

Sl. No.	Factors	Mean Rank	Groups**
1	Infrastructure related Constraints	33.80	A
2	Market Related Constraints	19.80	B
3	Technical and capacity building related constraints	15.70	B
4	Financial Constraints	12.80	B

***Mean ranks having same letters are not significantly different*

The mean rank corresponding to infrastructure related constraints (33.80) is more and hence it was the major constraint to existing post harvest management mechanism in fishery as per the fish processors perception (Table 1). Least affecting constraint was financial constraints (Mean Rank 12.80). From Table 1, Multiple comparison of these dimensions revealed that, infrastructure related constraints (since the letter grouping is different for it, as compared with other groups) have with a differential and most severe influence on the existing post harvest management mechanism of the inland fisheries sector in the study area. But even if the mean rank for the market related constraints, technical and capacity building related constraints and financial constraints are different, the letter grouping of multiple comparison analysis is same for all (B).

This indicates the similarity (on par) in severity of these constraints, if considered in a wider area. Many of the previous studies revealed that fish processing industry have to overcome a series of constraints for its full scale development in present scenario. There are physical losses while processing, because fish cannot be stored, additional losses because processing waste is not converted to edible byproducts and reduction of nutritional quality caused by damage during storage and processing (FAO, 2014). Further analysis of the each category of

the constraints was conducted using the Friedman's two way ANOVA test.

Table 2: Severity comparison of different components of technical and capacity building related constraints among fish processors (Friedman's test and Multiple pair wise comparisons)

Sl. No.	Factors	Mean Rank	Groups**
1	Low cohesion in groups	8.45	A
2	Lack of knowledge about trading options (future and forward)	6.75	A B
3	Non availability of suitable and improved machineries for processing	6.65	A B
4	High cost involved in purchase of suitable machineries	6.30	A B C
5	Lack of training programmes	4.65	B C D
6	Inadequate technical capacity	4.55	B C D
7	Lack of proper knowledge about harvesting time	2.60	C D
8	Lack of motivation	2.55	C D
9	Lack of feedback/ success stories in media	2.50	D

***Mean ranks having same letters are not significantly different*

Among selected nine diverse technical and capacity building constraints (Chi-Square = 55.210, df = 8, $p < 0.05$) low cohesion in groups (Mean Rank 8.45) has been identified as most severe one (Table 2). Since fish processing and marketing needs huge investment in terms of cold storage facilities, transportation and waste disposal, one processor could not able to do all these things by himself and there is a need of group approach in finance, sharing of facilities and even group marketing. The group movement in the study area is not in a fully fledged form. Because of these things fish processors perceived that low cohesion in groups as a major constraint. It was followed by lack of knowledge about trading options (Mean Rank 6.75) and non availability of improved machineries for processing (Mean Rank 6.65). Even if NDRI- KVK and Haryana State Department of Fisheries were conducting training on fish farming, there was a persistent lack of training on value addition and market led fishery. Respondents were able to fetch good profit due to the high demand and their skill in production but the market oriented value addition skills were lagging behind. Due to these reasons processors marked lack of training programmes (Mean Rank 4.65) and inadequate technical capacity (Mean Rank 4.55) as moderately sever constraints under technical and capacity building constraint group. Whereas lack of feedback/ success stories in media and lack of motivation (Mean Ranks 2.50 and 2.55 respectively) were identified as the least severe constraints (Table 2). Multiple pair wise comparison of these technical and capacity building related constraints have shown four different grouping patterns. But many of them are showing the similar effect when considered under lager area or population. From these letter grouping (Table 2) it is well evident that, low cohesion in groups (A) was identified as most sever and differentially influencing constraints among all others.

Table 3: Severity comparison of different components of infrastructure related constraints among fish processors (Friedman's test and Multiple pair wise comparisons)

Sl. No.	Factors	Mean Rank	Groups**
1	Lack of cold chain management	8.35	A
2	Lack of marketing yards/ places	7.90	A
3	Poor infrastructure for storage	7.40	A
4	Non availability of suitable machineries in local places	5.95	A B
5	Non availability of skilled labour	5.30	A B
6	Lack of proper grading facilities	2.80	B
7	Lack of proper packaging facilities	2.80	B
8	Lack of regular supply of power and electricity	2.25	B
9	Lack of proper roads and transportation	2.25	B

***Mean ranks having same letters are not significantly different*

As per the Friedman's test statistic (Chi-Square = 72.162, df = 8, $p < 0.05$) infrastructure related

constraints among the fish processors varied significantly. Most important infrastructure related constraints identified was lack of cold chain management with mean rank of 8.35. Processors were storing their products by using old age methods like ice boxes and refrigerators. Holding facility and keeping capacity of these methods were very poor in the study area. Lack of marketing yards/ places (Mean Rank 7.90) and poor infrastructure for storage (Mean Rank 7.40) were other severe constraints in study area. There was no government regulated markets for fisheries in Karnal. Even the market place for fish marketing was owned by private people only. Processors or producers whoever was selling their products in this place need to pay huge amount as rent along with electricity and other convenience charges. Fish market in Karnal has been found in a bad condition.

Table 4: Severity comparison of different components of financial constraints among fish processors (Friedman's test and Multiple pair wise comparisons)

Sl. No.	Factors	Mean Rank	Groups**
1	High rate of interest for credits	8.20	A
2	Lack of finance	8.10	A
3	High cost of skilled labour	7.25	A B
4	Lack of awareness about government support policies	5.30	A B C
5	Lack of price policy by the government	4.10	B C
6	Lack of awareness about credit availability	3.80	B C
7	Long payback period for investment	2.95	C
8	Lack of banking facilities near by	2.65	C
9	Distress sale of produce due to need of immediate liquid cash	2.65	C

***Mean ranks having same letters are not significantly different*

There were no any waste disposal facilities, proper sanitation and even any drinking water facilities. Lack of proper grading and packing facilities identified as less severe and clubbed together with mean rank of 2.80. Lack of Power and electricity and lack of proper roads and transportation (Mean Rank 2.25) were recognized as least severe constraints among fish processors under infrastructure related constraint category. From the mean ranks and the results of Multiple comparison analysis it is well clear that, lack of cold chain management, lack of marketing yards/ places and poor infrastructure for storage were the most sever constraints related with infrastructure and their severity effects were on par (A), if considered in a lager extent (Since the letter grouping is similar for both and differed from others).

The results presented in the Table 4 (Chi-Square = 65.828, df = 8, $p < 0.05$) indicated that the severity of different components of financial constraints were differed significantly and high rate of interest for credits (Mean Rank 8.20) and lack of finance (Mean Rank 8.10) were identified by the fish processors as most severe financial constraint. Based on their response it was inferred that even if nationalized banks were present in the study area, they were not willing to give loan for fish farming and farm level value addition. Processors could get loan for big processing plant but not for small scale one. However at individual level one cannot able to meet the huge capital for starting value addition in fish. Because of these reasons they were depending on local money lenders to borrow money. The interest rates fixed by these money lenders were very high and processors need to bear additional burden to repay the loan. High cost of skilled labour and lack of awareness about government support policies were moderately severe constraint faced by the fish processors (Mean Ranks 7.25 and 5.30 respectively).

Distress sale of produce due to need of immediate liquid cash, lack of banking facilities nearby (nested together with mean rank 2.65) and high payback period in investment (Mean Rank 2.95) were the least severe financial related constraints among fish processors (Table 4). The study area is in peri urban region and with good connectivity and banking facility. Many of the major commercial banks were having branches and operating units in the study area. Since fish is a perishable, high value commodity farmers were harvesting it on demand basis and the processed products are with high keeping quality and shelf life, distress sale of the fish is thing rarely happening in the study area. Letter grouping of multiple comparison also revealed the similar result. High rate of interest

for credits and lack of finance were identified and grouped together with same letter group (A) which showing the highest severity among other factors.

Table 5: Severity comparison of different components of market related constraints among fish processors (Friedman's test and Multiple pair wise comparisons)

Sl. No.	Factors	Mean Rank	Groups**
1	Inability to find market for value added produce	7.90	A
2	Lack of appropriate marketing channel	7.70	A
3	Large numbers of middlemen	7.20	A B
4	Lack of market intelligent and market facility	6.65	A B C
5	Less knowledge about marketing strategies	3.75	B C D
6	Difficulties of contract enforcement with dealers	3.30	C D
7	Produce has low market value due to poor appearance	3.10	C D
8	Inability to meet standards as prescribed	2.75	D
9	Price risk and uncertainty (Market value vary widely between the time of harvest and the time of local shortage)	2.65	D

***Mean ranks having same letters are not significantly different*

As per Friedman's test statistic (Chi-Square = 61.860, df = 8, $p < 0.05$.) market related constraints have a differential level of influence among fish processors. Inability to find market for value added produce with mean rank 7.90 was the major constraint under market related one. In local and distant markets, other than the big super markets like Reliance, Shopping Malls etc. fresh and alive fish had found in more demand than ready to cook (cut cleaned and packed fish) or ready to eat type fish products (fish balls, fish fingers, fish chips etc).

Since the actual markets for the processed fish (ready to cook) were in large metropolitan cities and local processors were not able to supply the products to all place by themselves lack of appropriate marketing channel (Mean Rank 7.70) and large numbers of middlemen (Mean Rank 7.20) were identified by the processors as major two market related constraints. Price risk and uncertainty with mean rank 2.65 (Table 5) was the least severe constraint identified among market factors. There has been noticed consistently high price and profit for fish products in the study area based on processors opinion. Multiple comparison analysis revealed that lack of market for the value added products and lack of appropriate marketing channels for the produces were highest in magnitude and effect of severity as they grouped together and not on par with other items (Table 5). Presence of large numbers of middlemen, lack of market intelligence and less knowledge regarding the marketing strategies were identified as on par with severity effect.

The findings of present study were consistent with the findings of Alam *et al.* (2010) in which major constraints of fish marketing and processing reported as constraints related to infrastructure, plant management and institutional management aspect. In the infrastructural constrains, lack of modern, hygienic fish landing centers; shortage of adequate ice-plants with sufficient capacity, cold and freezer storage; lack of handling and preservation facilities etc are the most severe. Similar results were reported by Jaji *et al.* (2014). Study by Pandey and De (2015) on fish farmers' perceived constraints in transfer of aquaculture technology in Bishnupur district of Manipur showed that lack of visits, lack of farmer friendly literature, lack of training and capacity building, inadequate financial support, poor implementation of schemes, high wages and labour cost as some of the constraints present in fish processing sector. Fish farmers generally lack organization, leadership and political support. Fishery enhancement requires investments for producing fish seed or procuring seed from hatcheries, and fisher communities also need money to lease fishing rights and buy their gear. Thus finance is also a constraint for them (Kaju Nath, 2015). Another study by Alam and Thomson (2001) revealed that, low financial capacities, resource limitations, poor implementation of fisheries laws, the limited spread of fish farming and processing technology and ineffective extension practices are the different constraints in the fisheries sector. These studty results were in consistant with the findings of the present study.

CONCLUSION

The present study highlighted the importance of market accessibility, market intelligence and timely accessibility of sufficient decision supporting data to manage and market the fish products. Since market intelligence and guaranteed market were identified as two important components promoting the post harvest decisions, it needs to be taken care of for making fisheries sector as a profit reaping entity. The success of fishery as an entreprice depends on the capacity of the community to coordinate and implement the practice all together. Collective marketing and group financing are the other two areas to overcome the constraints present in the fisheries processing sector. Central or state governments need to create sufficient infrastructure for processing and storage to address the infrastructure related problems present in the fisheries sector.

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REFERENCES

Alam, Md, F. and Thomson, K.J. 2001. Current constraints and future possibilities for Bangladesh fisheries. *Food Policy* **26**: 297-313.

Alam, M.J., Yasmin, R. and Rahman, A. 2010. A study on fish marketing system in Swarighat, Dhaka, Bangladesh. *Nat. Sci.,* **8**(12): 96-103.

Cornbach, L.J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika* **16**(3): 297-334.

Anonymous. 2015. Economic survey Haryana 2014-15. http://web1.hry.nic.in/budget/Esurvey.pdf. Cited 31 Mar 2015.

Edwards, A.L. 1969. Techniques of attitude scale construction. Vakils, Feffer and Simons Private LTD; New York.

FAO. 2014. Global Initiative on Food Loss and Waste Reduction. http://www.fao.org/3/a-i4068e.pdf. Cited 31 Mar 2015

Jaji, M.F., Adegbuyi, B. and Morufat Adedoyin Yusuf-Oshoala. 2014. Assessment of constraints of women in fish processing and accessibility to extension activities in Lagos state, Nigeria, Oida. *Int. J. Sustainable Dev.,* **7**(5): 61-70.

Kaju Nath. 2015. Production and market efficiency for inland fisheries in North East India: The empirical study of Lohit and Lower Subansiri districts of Arunachal Pradesh. *Int. J. Fish. Aq. St.,* **2**(5): 39-45.

Kerlinger, F.N. 1964. Foundations of behavioural research. New Delhi: Surjeet publications.

Likert, R.A. 1932. Technique for the measurement of attitudes. *Arch. Psychology,* **140**: 1-55.

Luttik, J. and van der Ploeg, B. 2004. Functions of agriculture in urban society in the Netherlands. In: Brouwer F (ed) Sustaining Agriculture and the Rural Economy: Governance, Policy and Multifunctionality, Edward Elgar, Cheltenham 204-222.

Magawata, I., Yakubu, A.A. and Kabir, I.2014. Fish processing methods: A case study of Argungu Local Government Area, Kebbi state, Nigeria. *World J Fish & Marine Sci.,* **6**(6): 509-515.

Pandey, D.K. and De, H.K. 2015. Entrepreneurial behaviour of tribal fish farmers in Tripura, north-east India. *Indian. J. Fish,* **62**(1): 149-152.

Renting, H., Marsden, T.K. and Banks, J. 2003. Understanding alternative food networks: exploring the role of short food supply chains in rural development. *Environ. Plan. A* **35**(3): 393-412.

Sathiadhas, R., Narayanakumar, R. and Aswathy, N. 2011. Efficiency of domestic marine fish marketing in India - a macro analysis. *Indian. J. Fish,* **58**(4): 125-131.

Siegel, S. and Castellan, N.J. 1988. Nonparametric Statistics for the Behavioral Sciences: (2nd Edn.), USA: Mcgraw-Hill international.