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# Analysis of major factors inhibiting fish growers from undertaking decisions regarding value addition in national capital region of India

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**Abstract**
An analytical study to find out the inhibitors among the fish farmers to undertake processing in National Capital Region (NCR) of India was conducted from December 2014 to May 2015 in Karnal district of Haryana. A comprehensive list of fifty fish farmers was prepared in consultation with different agencies and organizations promoting fisheries activity. In order to identify different inhibitors and to measure their severity a Likert like scale was constructed. Reliability (Cornbach alpha coefficient of rating scale is 0.767) and validity of the scale constructed was tested with the help of selected fish farmers and experts. Data on severity of inhibitors were collected from randomly selected fish farmers analysed with non-parametric test like Kruskal-Wallis one-way ANOVA and Friedman's two - way ANOVA. Multiple pair wise comparisons using Nemenyi's procedure / Two-tailed test was also conducted in each dimension of inhibitors for finding significant difference among each factors and placing them in homogenous groups. The mean rank corresponding to infrastructure related inhibitors (42.65) is more and therefore it was the most important inhibiting factor among the fish farmers. It was followed by financial inhibitors with mean rank of 32.10. Least inhibiting factors for fish processing among fish growers were socio-psychological factors (Mean Rank 10.15). Unavailability of machineries in this place (6.20) has been identified as major factor among technical inhibitors. Unavailability of credits (Mean Rank 6.80) and lack of awareness about government support policies (Mean Rank 6.00) were found the major financial inhibitors. Most severe inhibitors under market related factors were lack of market intelligence and inability to find market for value added produce (lack of demand) were with highest mean ranks (6.05 and 5.85 respectively). This study results also revealed that lack of cold storage for keeping the raw products (Mean Rank 6.20) as the major infrastructure related inhibitor among fish farmers.

**Keywords:** Inhibitors, Fish farmers, Post-harvest decisions

## 1. Introduction
Sustainable livelihood development and food security are the major concern of today's agricultural and allied sector in India. Along with traditional way of crop cultivation, a holistic approach to utilise the untapped potentials of farming resources in farmer land is very important to attain the desired level of economic empowerment and security in food and nutrition. Fisheries and aquaculture is an important option for this (Thompson *et al.* 2011) [21]. Since, India is with a wide variety of climatic condition and more than ten per cent of the global biodiversity in terms of fish and shellfish species ranging from deep seas to lakes in the mountains are suitable to propagate in Indian land (Kumari and Patra, 2014) [10]. In India, the economic importance of fisheries sector is well recognised with its contribution of about 6.3 per cent of the global fish production, 1.1 per cent of the GDP and 5.15 per cent of the agricultural GDP (NFDB, 2015) [15]. The total fish production of 10.07 million metric tonnes presently has nearly 65 per cent contribution from the inland sector (NFDB, 2015) [15]. It is an area with huge potential for further development in Indian conditions, contributing employment for about fourteen million people (NFDB, 2015) [15]. Even though the fisheries sector is large enough to provide the huge employment generation in Indian condition, the economic benefit of the inland fish cultivation is very less in the processing sector (Cleaning, Grading, Packing, and value addition in the form of different products making). Value addition and post-harvest operation in this sector can make a huge difference in the economic benefits of the fish growers. Even if the fisheries sector is with huge potential for development in many directions, other than the southern part of India, fish value addition is still in its infancy stage

due to the less demand of the products in local conditions. Even though nutritional quality of dried and processed fish remains intact or sometimes retains higher quality standards compared to fresh fish (Faruque *et al*., 2012) [5], large volume of the fish produced in this country ( nearly 78%) is consumed in fresh form and a marginal portion (nearly 6%) of this fish grown is being processed in India (MPEDA, 2013) [14]. The present study is therefore, an endeavour with an aim to examine the inhibitors among fish growers to undergo processing of fish.

## 2. Materials and Methods

Haryana with a recent origin in Fish farming, stands 2nd in the average annual fish production per unit area in the Country. The average annual fish production in the state is 6000 Kg (FDH, 2015) [6]. Karnal district of the Haryana state (Latitude - 28° 16' N and Longitude - 77° 05' E) is falling in the national capital region of India (Mapsofindia, 2015) [13] is the leadingdistrict in the state in fish farming (FDH, 2015) [6]. It is there for Karnal district of the Haryana was selected purposively to study the inhibiting factors among the fish farmers to go for value addition in fisheries. A comprehensive list of fish farmers of Karnal was collected with the help of ICAR institutes like Krishi Vigyan Kendra of National Dairy research Institute (NDRI), Regional Station of Indian Agricultural Research Institute (IARI), Fisheries Department, Haryana and progressive/ contact fish farmers in the Karnal region. Among the 50 selected farmers 40 were selected with the purpose of validating and checking reliability of the scale developed for identifying the inhibitors and remaining 10 respondents for the actual measurement of severity comparison of different identified inhibitors to go for processing or value addition of fish. Data collection and detailed study was conducted from December 2014 to May 2015.

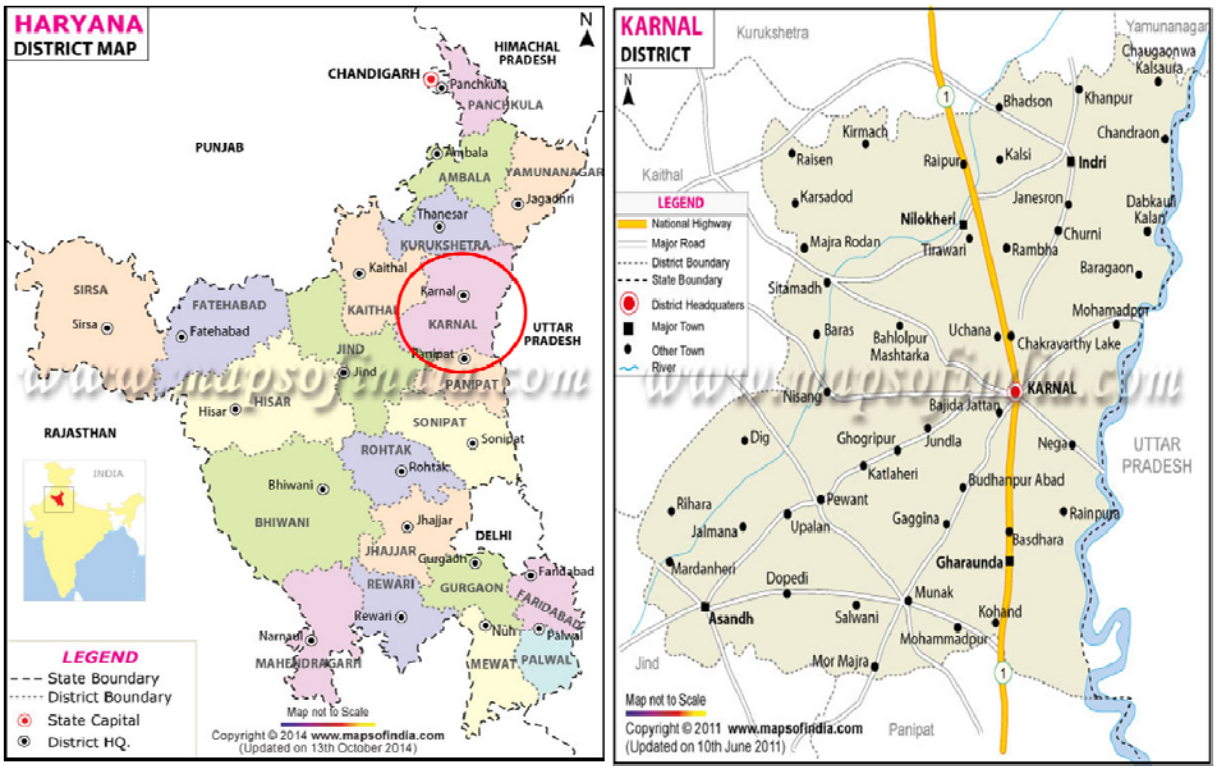


**Fig 1:** Map of study area, Karnal district of Haryana State in India (Mapsofindia, 2015) [13].

For the measurement of inhibitors among fish farmers to undertake post harvest management practices, a Likert like 5 point scale was developed, as per the methods suggested by Likert (1932) [11], which involve the following steps like, Defining the construct (which one can able to measure the magnitude. Here the construct was inhibiting factors among fish farmers), Identification and operationalization of dimensions under the construct (the major five dimensions identified under inhibitors i) Socio psychological inhibitors ii) Technical inhibitors iii) Financial inhibitors iv) Market related inhibitors and v) Infrastructure related inhibitors) and Collection, development and inspection of items (these are the statements representing each dimension of construct under study. Items were collected and developed based on review of literature, consultation with the experts from Agricultural Extension, Agricultural Economics and Post Harvest Technology Divisions of IARI and also based on the field experience of researcher. Selection of the items was in line with the criteria suggested by Edward (1969) [3]. 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). A reverse scoring pattern was adopted in negative statements. On the basis of total score, upper and lower 25 per cent of the subjects were selected as a referent group (20 fish famers) for calculating 't' value. Items or statements were selected on the basis of higher 't' value over a cut off point of 1.75.

$$t = \frac{\bar{X}_h - \bar{X}_l}{\sqrt{\frac{s_h^2}{n_h} + \frac{s_l^2}{n_l}}}$$

$\bar{X}_h$ = Mean score of given statement in high group

$\overline{x}_l$ = Mean score of given statement in low group

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

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

$n_h$ = number of subjects in high group

$n_l$ = number of subjects in low group

Reliability of the present scale was estimated in internal consistency or split half method. It helps to assess the homogeneity of items in scale. In this method items were split in to two equal groups and find the inter correlation between two. For testing reliability of the scale, total of 40 set of responses were taken in to consideration. Coefficient of internal consistency (Spearman's rho) of this scale is 0.720. In order to avoid or nullify the problems associated with the grouping, Cornbach alpha coefficient (1951) [2] has been used. Cornbach alpha coefficient of this rating scale is 0.767. Validity of the scale was measured with juries' opinion method.

Face to face interview was carried out to know about the general conditions of fish farming in that area and selected fish farmers were asked to rate the different inhibitors on developed scale. Data collected were analysed with the help of SPSS 20 software and Excel Stat software to draw valid conclusion. Non parametric test were used to analyse the significance of different inhibitors. Five major categories of inhibitors were compared using Kruskal-Wallis one-way ANOVA (Siegel and Castellan, 1988) [20], a non-parametric method for testing whether samples originate from the same distribution. It is used for comparing more than two samples that are independent, or not related. The parametric equivalence of the Kruskal-Wallis test is the one-way analysis of variance (ANOVA). The factual null hypothesis is that the populations from which the samples originate have the same median. 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 $i^{th}$ group, $r_{ij}$ is the rank (among all observations) of $j^{th}$ observation from group $i$ and $N$ is the total number of observations across all groups.

Each set of inhibitors contains sub categories and they were tested by using Friedman's two way analysis of variance (Siegel and Castellan, 1988) [20], a non-parametric statistical test for testing whether samples originate from the same distribution. 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, $SS_k = n\sum_{j=1}^{k}\left( \frac{\sum_{i=1}^{n} r_{ij}}{n} - \frac{\sum_{i=1}^{n}\sum_{j=1}^{k} r_{ij}}{nk} \right)^2$ and $SS_e = \frac{1}{n(k-1)}\sum_{i=1}^{n}\sum_{j=1}^{k}\left( r_{ij} - \frac{\sum_{i=1}^{n}\sum_{j=1}^{k} r_{ij}}{nk} \right)^2$, $r_{ij}$ represents the rank of $j^{th}$ observation from group $i$.

Multiple pair wise comparisons using Nemenyi's procedure/Two-tailed test was also conducted in each dimension of inhibitors for finding significant difference among each factors and placing them in homogenous groups (Siegel and Castellan, 1988) [20]. After the severity measurement of inhibitors a detailed discussion about different component of inhibitors were carried out and systematically recorded.

## 3. Results

### Major factors inhibiting fish farmers from processing of fish

Five different dimensions of major inhibiting factors identified (socio-psychological factors, technical factors, financial factors, marketing related factors and infrastructure related factors) were rated by the fish farmers. Kruskal-Wallis one-way ANOVA test (Chi-Square=31.868, df=4, $p$<0.05) revealed that the level of influence of different inhibitors were differed significantly.

**Table 1:** Major Dimensions of different inhibiting factors among fish farmers based on mean ranks as per Kruskal-Wallis test

| Sl. No. | Factors | Mean Rank | Groups** | |
|---|---|---|---|---|
| 1. | Infrastructure related inhibitors | 42.70 | A | |
| 2. | Financial inhibitors | 32.10 | A | |
| 3. | Marketing related inhibitors | 26.60 | A | B |
| 4. | Technical inhibitors | 16.00 | | B |
| 5. | Socio- psychological inhibitors | 10.20 | | B |

**Mean ranks having same letters are not significantly different

The mean rank corresponding to Infrastructure related inhibitors (42.65) is more and therefore it was the most important inhibiting factor among the fish farmers. It was followed by financial inhibitors with mean rank of 32.10. Least inhibiting factors for fish processing among fish growers were socio-psychological factors (Mean Rank 10.15). Whereas marketing related inhibitors and technical inhibitors were identified as moderately severe inhibitors for capacity to undertake processing of fish by the producers (Mean Rank 26.60 and 16.00 respectively). Since letter grouping of multiple comparisons of the different dimensions of inhibitors were same for infrastructure related inhibitors, financial inhibitors and marketing related inhibitors, even if the mean rank are different, the effective severity of these were on par. Also it can be inferred from the results that technical and socio-psychological inhibitors were differed very significantly from financial and infrastructure related inhibitors among the fish farmers which prevent them to proceed with processing of fish because of two different letter grouping.

Further examination of the each group of the inhibitors was done using the Friedman's test. From the test statistic value and its significance, it was clear that each component in each category differed in producers view.

**Table 2:** Severity comparison of different socio- psychological inhibitors among fish farmers based on mean ranks as per Friedman's test

| Sl. No. | Factors | Mean Rank | Groups** | | |
|---|---|---|---|---|---|
| 1. | Lack of proper direction | 6.50 | A | | |
| 2. | Negative attitude of the society | 5.65 | A | B | |
| 3. | Lack of education | 3.85 | A | B | C |
| 4. | Lack of urge for social status | 3.60 | | B | C |
| 5. | Lack of independence in decision making | 3.15 | | B | C |
| 6. | Lack of internal locus of control | 2.65 | | | C |
| 7. | Lack of tolerance for ambiguity | 2.60 | | | C |

**Mean ranks having same letters are not significantly different

Friedman's test statistic for socio – psychological inhibitors is Chi-Square=34.150, df=6, $p<0.05$. This indicated the significantly different level of influence of different components under socio – psychological inhibitors among the fish growers. Lack of proper research in the needed direction was identified as most sever inhibitor among the fish growers to undertake post harvest management and value addition (Table 2). According to the farmers' opinion, extension persons and research scientists were concentrating only to resource rich farmers and their direction was to increase the productivity of cultivated fish among those identified eminent farmers only. Development system in the whole country is neglecting the marginal and small inland fish farmers and concerns of these farmers were not taken to consideration. Negative attitude of the society with mean rank 5.65 has been identified as the second most severe inhibitor among socio psychological factors. This is because of less popularity of fish products among people in northern India and their misconception of bad effect of fish on human health, while taking fish as food in summer season. Lack of education (Mean Rank 3.85) was also identified as a severe inhibitor among fish growers whereas; lack of tolerance for ambiguity (Mean Rank 2.60) and lack of locus of control (Mean Rank 2.65) were accepted as least severe inhibitor to fish growers. Multiple comparisons of different components of socio – psychological inhibitors revealed that three distinct grouping of components were present in it according to their mean rank (with different letter grouping). Lack of proper direction is identified as most severe and different from others in magnitude and effect of severity. Whereas, negative attitude of the society and lack of education were identified with equal severity effect on fish farmers to inhibit them to take the processing decision of fish. Similarly, lack of education, lack of urge for social status and lack of independence in decision making were identified as on par with respect to the severity among the socio – psychological inhibitors.

**Table 3:** Severity comparison of different technical inhibitors among fish farmers based on mean ranks as per Friedman's test

| Sl. No. | Factors | Mean Rank | Groups** | | | |
|---|---|---|---|---|---|---|
| 1. | Unavailability of machineries in local place | 6.20 | A | | | |
| 2. | Unavailability of suitable processing technologies | 5.35 | A | B | | |
| 3. | Lack of knowledge about processing activities | 4.75 | A | B | C | |
| 4. | High cost of processing activities | 4.65 | A | B | C | |
| 5. | Lack of skilled labour | 2.95 | | B | C | D |
| 6. | Lack of knowledge about processing standards | 2.30 | | | C | D |
| 7. | Unavailability of raw materials year round | 1.80 | | | | D |

**Mean ranks having same letters are not significantly different

Based on Friedman's ANOVA statistic (Chi-Square = 40.608, df = 6, $p<0.05$) it was inferred that technical inhibitors showed a significant difference of influence. Mean rank corresponding to unavailability of machineries in their place (6.20) is greater than all other components; hence it has been identified as major factor among technical inhibitors. Unavailability of processing technologies and lack of knowledge about processing activities were ranked as moderately severe inhibitors. Fish growers perceived unavailability of raw materials year round (Mean Rank 1.80) and lack of knowledge about processing standards (Mean Rank 2.30) are two least severe inhibitors under this category. Since these factors were identified with different letter grouping and with overlapping of groups, it can be inferred from the results that even if the mean ranks for the different components are different the actual effects are somewhat on par. Unavailability of machineries in local place was the most severe and distinguished constraint whereas unavailability of raw materials year round was the least severe inhibitors among the fish farmers to undertake processing of fish.

**Table 4:** Severity comparison of different financial inhibitors among fish farmers based on mean ranks as per Friedman's test

| Sl. No. | Factors | Mean Rank | Groups** | | | |
|---|---|---|---|---|---|---|
| 1. | Unavailability of credits | 6.80 | A | | | |
| 2. | Lack of awareness about government support policies | 6.00 | A | B | | |
| 3. | High initial investment | 5.00 | A | B | C | |
| 4. | Lack of price policy by the government | 3.55 | | B | C | D |
| 5. | High cost of raw materials | 2.35 | | | C | D |
| 6. | Long payback period for investment | 2.30 | | | C | D |
| 7. | Lack of awareness about credit availability | 2.00 | | | | D |

**Mean ranks having same letters are not significantly different

It is well evident that (From Friedman's ANOVA statistic Chi-Square=54.372, df=6, $p<0.05$, and Table 4) unavailability of credits (Mean Rank 6.80) and lack of awareness about government support policies (Mean Rank 6.00) were bearing highest mean rank and hence those were the major inhibitors. Lack of awareness about credit availability (Mean Rank 2.00) and long payback period in investment (Mean Rank 2.30) were identified as the least severe inhibitors under financial factors.

Even if, high initial investment rate (Mean Rank 5.00) and lack of price policy by the government (Mean Rank 3.55) were with different mean rank but the letter grouping indicated the similar effect in a large area.

**Table 5:** Severity comparison of different marketing related inhibitors among fish farmers based on mean ranks as per Friedman's test

| Sl. No. | Factors | Mean Rank | Groups** | | |
|---|---|---|---|---|---|
| 1. | Lack of market intelligence | 6.05 | A | | |
| 2. | Inability to find market for value added produce (lack of demand) | 5.85 | A | | |
| 3. | Lack of appropriate marketing channel | 4.45 | A | B | |
| 4. | Lack of market facilities in local place | 4.40 | A | B | |
| 5. | Large number of middle man in marketing of value added products | 3.85 | A | B | C |
| 6. | Price risk and uncertainty | 1.85 | | B | C |
| 7. | Distress sale of produce due to need of immediate liquid cash | 1.55 | | | C |

**Mean ranks having same letters are not significantly different

Test for difference analysis (Friedman's ANOVA statistic, Chi-Square=43.933, df=6, $p<0.05$) for market related inhibitors showed that there was a significant difference in influence of various components. From Table 5 it is well apparent that mean rank corresponding to lack of market intelligence and inability to find market for value added produce (lack of demand) were with highest mean ranks (6.05 and 5.85 respectively), and these were identified as most severe inhibitors under market related factors. Lack of appropriate marketing channel, lack of market facilities in their place and large number of middlemen in marketing of value added products were identified as moderately severe inhibiting factors among the fish producers to undertake the processing of fish. Whereas Price risk and uncertainty (Mean Rank 1.85) and distress sale of produce due to need of immediate liquid cash (Mean Rank 1.55) has been identified as least severe inhibitors among fish growers to take decisions about post harvest management and value addition of raw fish.

**Table 6:** Severity comparison of different infrastructure related inhibitors among fish farmers based on mean ranks as per Friedman's test

| Sl. No. | Factors | Mean Rank | Groups** | |
|---|---|---|---|---|
| 1. | Lack of cold storage for keeping the raw products | 6.20 | A | |
| 2. | Lack of proper waste utilization /recycling facility | 5.90 | A | |
| 3. | Lack of storage facilities by own / in locality | 5.30 | A | |
| 4. | High cost involved as Mandi charges | 4.40 | A | B |
| 5. | Lack of regular supply of electricity | 2.30 | | B |
| 6. | Lack of good transportation facility | 2.10 | | B |
| 7. | Lack of space and building for processing | 1.90 | | B |

**Mean ranks having same letters are not significantly different

Friedman's test statistics showed that infrastructure related inhibitors showed a significant difference of influence among fish growers (Chi-Square=50.333, df=6, $p<0.05$). They identified lack of cold storage for keeping the raw products (Mean Rank 6.20) as the major infrastructure related inhibitor among them. This was followed by lack of proper waste utilization /recycling facility and lack of storage facilities by own / in locality (Mean Rank 5.90 and 5.30 respectively). Since, Karnal is a District with well connected roads within and to NCR, lack of good transportation facility was identified as one of the least relentless inhibitor.

## 4. Discussions

Pandey *et al.* (2014) [16] have reported that technological, economic/financial, administrative, social, infrastructural and extension related inhibitors are major constraints faced by the fish farmers. Ferdoushi *et al.* (2015) [7] and Rokeya *et al.* (1997) [18] have reported that several problems were found associated with marketing of fish, include lack of capital, higher transportation cost, storage problem, lower market demand and higher loan interest rate etc. Certain other problems in fish marketing and processing include highly perishable and bulkiness of material, high cost of storage and transportation, no guarantee of quality and quantity of commodity, low demand elasticity and high price spread (Ravindranath, 2008) [17]. Similar results were also reported by Jaji *et al.* (2014) [9]. The findings of present study were consistent with the findings of Alam *et al.* (2010) [1] 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; illiteracy, ignorance, lack of awareness and poor socio-economic condition of the fisher men; shortage of adequate ice-plants with sufficient capacity, cold and freezer storage; lack of handling and preservation facilities etc are the most severe. According to Sadiq *et al.* (2015) [19] high cost of feeds, lack of modern technologies, lastly mortality of fish and lastly poor storage facilities were the major problems perceived by the fish farmers. Fish marketing in India is mainly handled by the private sector. As a result, there are a large number of mediators in the marketing channels, especially in the freshwater fish sub-sector; thus reducing the share of fishermen/aquaculturists in consumer rupee, and contributing to the high retail prices (Ganesh Kumar *et al.* 2010) [8]. These fears of reducing profit also make the fish farmers to keep away from the processing of fish. Lack of infrastructure, lack of access to credit and limited education and no access to technology are other inhibitors among the fish farmers to undertake the processing activities. Some of the studies also revealed that physical losses because fish cannot be stored, additional losses when processing waste is not converted to edible by products and reduction of nutritional quality, caused by damage during storage and processing are other severe inhibitors among the fish growers to undergo processing (FAO, 2014) [4]. According to Mahmud *et al.* (2015) [12] most of the fishermen were facing various problems during fishing and marketing their goods in the local market like extortion by the local extortionist, insufficient credit facility, lack of marketing facilities, lack of knowledge of fishing and processing, lack of appropriate machinery etc.

## 5. Conclusion and suggestions

Fisheries sector in India is a highly potential area for providing livelihood sustainability to fish growers with its diverse and rich species resources and scope of value addition. Even if these conducive factors are present the processing sector in Indian fisheries not emerged as a revolutionary area. From the

present study, it can be concluded that infrastructure related inhibitors, financial inhibitors and marketing related inhibitors are the major inhibiting factors among the inland fish growers of Karnal district of India, which prevent them from processing of fish. Even though the study area is near to the National Capital Region of the country, farmers are facing the problems like lack of cold storage facilities, lack of waste utilization facility, lack of storage facilities after processing of the products, lack of credits for doing fish processing and lack of proper market intelligence.

The present study highlighted the importance of market intelligence and timely accessibility of sufficient decision supporting data to manage and market the products. Since the fish processing is very capital intensive, a single farmer may not be able to bear the entire financial burden. In order to overcome these difficulties, collective processing and collective marketing need to be promoted. Central government or sate government need to take initiatives to create market infrastructure, store houses and cold chain management in public Mandi or elsewhere. Besides giving all the technical and infrastructure facilities, it is also very much important to motivate the producers to become a processor or entrepreneur by giving the case studies and examples of people who gained by a small decision to do processing instead of selling it in raw form.

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