Supply Chain Analysis of Frozen Pea Industry in Rudrapur

Project Report

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G. B. Pant University of Agriculture and Technology

PANTNAGAR-263145 (U.S. Nagar), Uttarakhand, India

By

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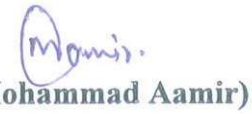
Place: Pantnagar



(Mohammad Aamir)

CERTIFICATE

We, the undersigned members of Project Advisory Committee of **Mohammad Aamir, Id No. 39715,** a candidate for the degree of **Master of Business Administration (Agribusiness)**, agree that the project report entitled **"Supply Chain Analysis of Frozen Pea Industry in Rudrapur"** may be submitted in partial fulfillment of the requirements of the degree.

(Ashutosh Singh)

Chairman

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Member

(Nirdesh Kumar Singh)

Member

EXECUTIVE SUMMARY

The study was conducted on the basis of a pilot study. This was carried out to understand the challenges faced by pea processing plants via Naini Frozen Foods, M/S Sharda Agri Foods, Grandeur Agro tech Ltd., KLA Foods operating in Rudrapur. The pilot survey revealed that Quality degradation due to various issues related to cold chain infrastructure, fragmentation, integration, transportation, market demand & information and packaging. The study was hence undertaken to analyze these problems and hence recommend appropriate remedial measures to overcome these problems to the needy group. In analyzing the supply chain of frozen pea a total of 160 respondents (such as farmers, pea processors, dealers, retailers and consumers) were interviewed via structured questionnaire on the basis of convenience sampling. Primary data was collected from the each players of supply chain. After proper analysis of collected data it was found that frozen pea processors do not have sufficient cold storages, pre-cooling facilities, refrigerated vehicles due to huge money required in managing supply chain as cold chain. Each stake holder: farmers, wholesalers, frozen pea manufacturers, retailers all work in silos which shows lack of integration among them. There was large no. of intermediaries which are fragmented the supply chain. The supply of frozen pea to most of retailers by the dealers or distributers was not on time due to not having enough refrigerated vehicles for their supply it leads to unavailability & quality degradation of frozen pea at the point of retail. On the other hand only 60.93% Farmers about post harvest management, 66.66% Farmers about quality seeds and 50.69% Farmers about processing & value addition were found to have good knowledge & awareness. All these issues in the supply chain are leading to maximum inefficiencies and resulting to losses and quality degradation of frozen pea. This is require immediate attention that can support in mitigating the identified challenges. For this development of cold chain infrastructure at the central area of major pea production belt, Cold storage facilities may be set up by private players or cooperatives societies, Cold chain can be set up in area where lack of road facilities is there, State government refrigerated transportation system can be set up for pea transport and Refrigerated vans can be initiated in rural areas by public private partnership. This will provide impetus to supply chain of frozen pea industry.

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1. INTRODUCTION

1.1 Background

India can become the food supplier of the world. It has the cultivable land, all the seasons for production of all varieties of fruits and vegetables, an agribusiness system that works although it needs to be vastly improved. The single most important problem facing the Indian agricultural industry is the highly inefficient supply chain. Because of lack of cold chain infrastructure and also a food processing industry about 20% of all foods produced in India are wasted. By building an efficient and effective supply chain using the state-of-the-art techniques it is possible to serve the population with value added food while simultaneously ensuring remunerative prices to the farmers. The surplus of cereals, fruits, vegetables, milk, fish, meat, and poultry can be processed as value added food products and marketed aggressively both locally and internationally. Investments in cold chain infrastructure, applied research in post harvest technologies, installation of food processing plants in various sectors and development of food retailing sector are mandatory for achieving gains in this sector. Strategic growth plans for achieving both national and international competitiveness of the food industry are essential. India has a huge opportunity to become a leading global food supplier if only it has the right marketing strategies and of course agile, adaptive and efficient supply chain. India has diversity in terms of its population with several religious groups with different food habits and culture. This diversity should be used to advantage to become the *Halal food hub*, the *Organic food hub*, the *Vegetarian food hub*, and the *Sea food hub* among others.

The food supply chain is complex with perishable goods and numerous small stake holders. In India, the infrastructure connecting these partners is very weak. Each stake holder: farmers, wholesalers, food manufacturers, retailers all work in silos. Also, demand forecasting is totally absent and the farmers try to push what they produce in to the market. Data integration, financial flow management, supply-demand matching, collaborative forecasting, information sharing, goods movement synchronization through efficient transport scheduling, are very well practiced in high technology industries with immense benefits. These best practices should find their way in to the food supply chains.

Figure 1.1 Flow of frozen peas supply chain

Cold chain is a logistic system that provides a series of facilities for maintaining ideal storage conditions for perishables from the point of origin to the point of consumption in the food supply chain. The chain needs to start at the farm level (e.g. harvest methods, pre-cooling) and cover up to the consumer level or at least to the retail level. A well organized cold chain reduces spoilage, retains the quality of the harvested products and guarantees a cost efficient delivery to the consumer given adequate attention for customer service.

The main feature of the chain is that if any of the links is missing or is weak, the whole system fails. The Cold chain logistics infrastructure generally consists of

1. Pre-cooling facilities
2. Cold Storages
3. Refrigerated Carriers
4. Packaging
5. Warehouse and Information Management systems
6. Traceability
7. Financial and Insurance Institutions

The temperature controlled supply chains or cold chains are a significant proportion of the retail food market. Fast foods, ready meals and frozen products have increased market share in recent years. There are several food temperature levels to suit different types of products. Frozen, cold chill, medium chill, and exotic chill are some of the frequently nomenclatures with identified temperature ranges. The range of temperatures is dependent on the products whether it is meat or ice cream or potatoes or bananas. Failure to maintain appropriate temperature regimes throughout the product life cycle may shorten the product life or adversely affect its fitness for consumption. Cold chain management involves maintaining appropriate temperature regime when the product travels from the farm in Himachal Pradesh to the consumer in London or New York City. That is why the logistics challenge is formidable in food chains, which is cost conscious industry. There are several governmental regulations in all countries and the

responsibility to maintain hygiene and standards falls on the food retailer or manufacturer. The recent developments in electronic tagging could be useful for monitoring the temperatures and also the shelf life of the product.

1.2 Process of pea procurement and processing as follows

The peas are first grown in field and harvested by farmers. Then the peas are sold in the mandi to the commission agents or directly to the companies. The commission agents take commission of 1% to 2% from the farmers and take commission of 3% from the industry. Now the peas are sold to the companies by commission agents. Then the peas are transported to the company where the peas to be selected are by arrival norms. Then the depoding of pea is done. Then the peas are washed to clean the impurities. Then the peas are blanched at a temperature of 90°C to 100°C for 3 to 5 minutes to retain the texture, colour and freshness of the peas. Then the peas are passed through instant quick freezer. Then the peas are packed and then stored at a temperature of -20°C. Then the peas are distributed to the retail outlets or institutions after passing through departure norms.

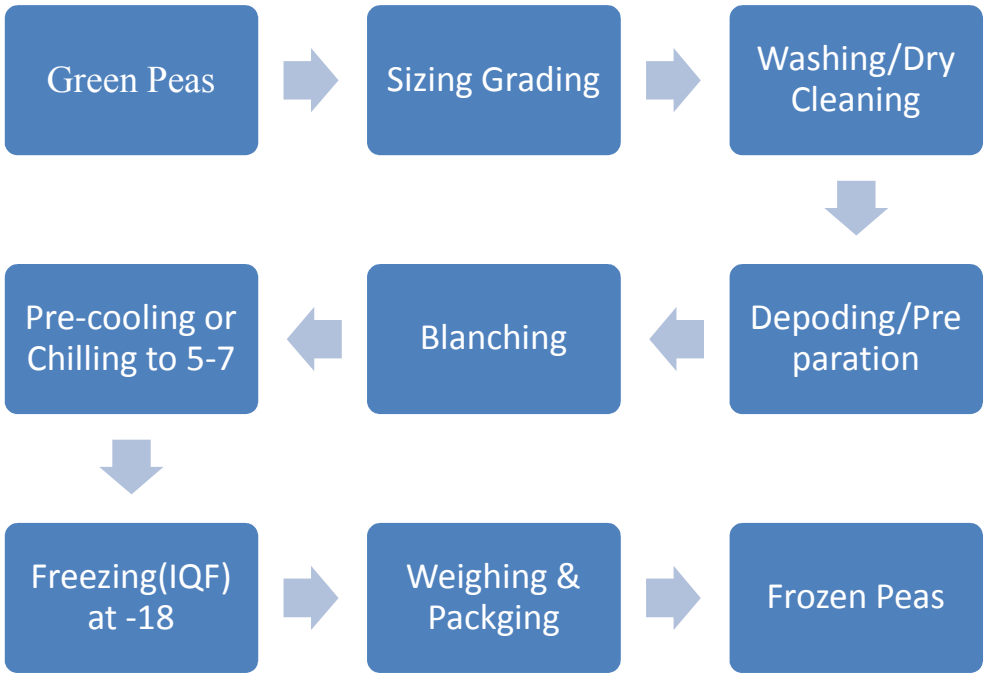

Figure 1.2 Process flow for quick freezing of green peas

1.2.1 Quality Norms: Final quality of produce depends on the following quality parameters from time of harvesting at farms, to procurement, processing and finally storage condition:

1) **Quality Norms at the time of procurement-**

- Insected pod- Not accepted more than 3%
- Mature (dryness)-15%
- Under developed –Not > 7%
- (These all three should not be more than 15%)
- Rotten Tip or blackish pod but seed not affected – accepted not > 20%
- Wastage – not > 3%
- Without seed – not > 7%
- (Wastage and without seed should not be more than 7%)

2) **Blanching Temperature:** Between 90°C -100°C for 3 to 5 min.
3) **Individually Quick Frozen (IQF):** At -18°C to -20°C.
4) **Quality Norms for finished product:**

- Blond peas (yellowish) - accepted not > 2%
- Blemish peas (stains) – not > 5%
- Serious Blemished peas (worm-eaten peas) – not > 0.5%
- Pea fragments – not > 12%

5) **Cold Storage Temperature:** -18°C

1.3 Supply chain management (SCM)

A supply chain management (SCM) consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only the manufacturer and supplier, but also transporters, warehouses, retailers and even customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, and finance and customer service. A supply chain is dynamic process and involves the constant flow of information, product, and funds between different stages. The customer is an integral part of the supply chain. In fact, the primary purpose of any supply chain is to satisfy customer needs and, in process, generate profit

for itself. The term supply chain conjures up images of product or supply moving from suppliers to manufacturers to distributors to retailers to customers along a chain. This is certainly part of the supply chain, but it is also important to visualize information, funds and product flows along both directions in the chain. The term supply chain also implies that only one player is involved at each stage. In reality, a manufacturer may receive material from several suppliers and then supply several distributors. Thus, most supply chains are actually networks. It may be more accurate to use the terms supply network or supply web to describe the structure of most supply chains.

1.3.1 The Objective of Supply Chain Management

The objective of any supply chain is to maximize the overall value generated. The value a supply chain generates is the difference between the final worth of the product to the customer and the effort the supply chain expands in filling the customer's request. For most commercially supply chains, value will be strongly correlated with supply chain profitability, the difference between the revenue generated from the customer and the overall cost across the supply chain. Supply chain profitability or surplus is the total profit to be shared across all supply chain stage and intermediaries. The higher the supply chain profitability, the more successful is the supply chain. Supply chain success should be measured in terms of supply chain profitability and not in terms of the profits at an individual stage. The goal of supply chain management includes:-

- To cut cost
- Increase profits
- Improve performance in relationships with customers and suppliers
- Develop value added services that gives a company a comparative edge.
- To reduce inventory as much as possible, compatible with retaining the ability to fulfil customer demand.
- To eliminate waste from the supply chain. Waste can be defined as any activity during the supply chain process that adds cost to the supply chain without adding value to the product or service.

1.4 Government & Private sector initiatives

1.4.1 Government initiatives

The Government of India (GOI) has accorded high priority to the establishment of cold chains and encourages major initiatives in this sector.

- Foreign equity participation of 51% is permitted for cold chain projects.
- There is no restriction on import of cold storage equipment or establishing cold storages in India.
- National Horticulture Board (NHB) operates a capital investment subsidy scheme (CISS) which provides 25% (maximum Rs.50 lakhs) subsidies to the promoter.

Ministry of Agriculture launched a "Mission for Integrated Development of Horticulture" in 2014, under which cold-chain development is the thrust area, so that all other inputs in way of enhancing horticultural yields can have suitable recourse to reach gainful end-use. This Mission subsumes all previous major programmes for horticulture of the Department of Agriculture & Cooperation. Cold-chain is considered an important tool for farmers of perishable produce, to connect with markets and to realise meaningful productivity.

Ministry of Food Processing Industries (MoFPI), GoI is operating a "Scheme on cold chain, value addition and preservation infrastructure" dedicated for cold-chain in addition to other programs that develop processing units. Ministry of Commerce is operating a scheme to enhance exports, which includes necessary export oriented cold-chain components. All these centrally sponsored initiatives by the Government have contributed a great extent for the creation of new cold storage capacity and a few other components of cold-chain. Strategically, holistic development of integrated cold-chain holds the key for reducing post-harvest losses, ensuring uninterrupted supply and thereby minimizing food inflation.

A number of studies on cold-chain sector, were conducted earlier by different agencies to assess the infrastructure demand of this sector and the outcome of these studies is briefly discussed as under: According to a study conducted by National Stock Exchange Limited (NSEL) in December 2010, the country needed 61.13 million MT cold storage capacity against the then available 24.29 million MT. A gap of 36.83 million MT was evaluated. The assessment was made on the basis of peak season production of fruits & vegetables and their highest market arrival in a month. As per Emerson Climate Technologies, in 2013 report titled "The Food Wastage & Cold Storage Infrastructure Relationship in India" there were about 6,300 cold

storage facilities with an installed capacity of 30.11 million tons. The report carried forward the earlier assessment that India needs to double its cold storage space, to reach a total of 61.13 million tons of cold storage capacity in order to minimize food wastage. The Associated Chambers of Commerce and Industry of India (ASSOCHAM) in a study with TechSci Research, titled "Opportunities in Cold Chain-emerging Trends and Market Challenges", estimated the cold chain industry to register a compound annual growth rate of 25.8%, to reach a value of Rs.640 billion by 2017. The report referred to existing 30.11 million MT of cold storages in 2012, and of the need to create an additional 36.83 million MT in cold stores. The report states that the shift in demand towards horticulture products in India is expected to generate significant demand for temperature-controlled warehouses. The study also reported the concentration of cold stores in certain states as a failing. Recently in 2014, YES Bank conducted a study titled "Cold Chain-Opportunities in India". According to the report, the market share in cold-chain was divided into 88-90% with cold stores and 10-12% with refrigerated transport. This report also referred to the earlier assessment of 61 million metric tons required in form of cold storage and projected the need to create another 30.98 million tons nationwide in storage capacity.

1.4.2 Private sector initiatives

There are several private sector initiatives in the food processing and service sector. A number of companies are actively working on integrating the agriculture supply chain. Here we mention a few of them. These show the feasibility of operating efficient cold chains in the India scenario. They could be treated as pilots and other projects can be built emulating them. Here we consider the following cases

- Mcdonalds-India, a fast food service operator growing its own ingredients such as lettuce, potatoes, etc.
- Amul which is a highly successful cooperative dairy in Gujarat.
- E-choupals which is an ITC success story of procurement of produce from small farmers is an example of supply chain management Indian style.

There are other examples such as Bombay dabba walah which is an excellent example of six-sigma forward and reverse logistics delivery. Also, ITC, Mahindra and Rallis together are creating a network of service providers who offer information on weather and prices, credit, transport and assured demand.

1.5 Work Already Done

The review of literature is an essential part of any study. As such, some of the available literature in relation to the present study is listed below in brief.

Viswanadham (2007) stated that by building an efficient and effective supply chain using state of the art techniques it is possible to serve the population with value added food while simultaneously ensuring remunerative prices to the farmers. The surplus of cereals, fruits, vegetables, milk, fish, meat and poultry can be processed as value added food products and marketed aggressively both locally and internationally. Investments in cold chain infrastructure, applied research in post harvest technologies, installation of food processing plants in various sectors and development of food retailing sector are mandatory for achieving gains in this sector. Strategic growth plans for achieving both national and international competitiveness of the food industry are essential.

Simchi-Levi et al. (2008) defined supply chain management as a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system-wide costs while satisfying service level requirements.

Modi et al. (2009) stated in his study that the traditional supply chain model is followed in India with the share of around 95- 98% which involves large number of intermediaries who eat up all the share of about 75 percent of the total net margin accruing to the entire supply chain. The local traders/auctioneers and commission agents performs the function of aggregators who procure the Fruits & Vegetables from small landholding farmers on behalf of big traders and sell to Mandi. Some large landholding farmers used to sell their Fruits & Vegetables produce directly at the local Mandi (market place) without the help of any local agents. Usually, farmers preferred to sell their produce to local agents or trader rather than selling directly in Mandi.

Sidhu et al. (2010) in his study found that in India, more than 90 percent of the produce dispose through commission agents/wholesalers and a small proportion sell through retailers and directly to consumers. It involves large number of intermediaries i.e. agents (commission agents), auctioneers, wholesalers and traditional retailer apart from farmers and customers. The agents collect Fruits & Vegetables from the small farmers and sell to the big trader who then transports the commodity to the Mandi after processing or some value addition. The wholesaler buys Fruits & Vegetables from the Mandi through auction and then sells to the retailer which includes pavement shops, cart vendors, family run 'mom and pop' stores and roadside shops. Then these retailers sell the Fruits &Vegetables to the end consumers.

Veena et al. (2011) confirmed in his study that Fruits &Vegetables are also rich source of vitamins, minerals, proteins, and carbohydrates etc. which are essential in human nutrition. These are referred to as protective foods and assumed great importance as nutritional security of the people. As the population is increasing, the demand for such food is also increasing. To meet such demand and provide a food in proper quality and nutrition, Supply chain plays a very vital role in this sector and becomes even more important because of perishability nature and very short shelf life. It not only helps to cut costs, but also adds to maintain and improve the quality of produce delivered, which are perishable in nature.

1.6 Problem Statement

A pilot study was conducted to understand the challenges faced by pea processing plants via Naini Frozen Foods, M/S Sharda Agri Foods, Grandeur Agro tech Ltd., KLA Foods operating in Rudrapur. The pilot survey revealed that Quality degradation due to lack of cold chain facilities, inadequate capacity of cold chain, lack of cold chain network, Huge amount of losses during transportation from the farmers' field to mandi or the pea processing unit, Lack of forward and backward integration in supply chain, Improper loading and unloading by labors, Poor packaging material used by the farmers resulting in damage to the crop.

The study is hence undertaken to analyze these problems and hence recommend appropriate remedial measures to overcome these problems to the needy group.

1.7 Objectives of Study

1. To study the supply chain gaps in pea processing industry in terms of cold chain infrastructure, fragmentation issues, integration issues, transportation issues, market demand & information issues and packaging issues.
2. To determine the farmers' knowledge and awareness about post-harvest technologies, quality seeds and processing & value addition.
3. To suggest mitigation strategies for identified challenges in supply chain of pea processing industry.

2. INDUSTRY DESCRIPTION

2.1 Naini Frozen Foods

Incorporated in the year 2005, Naini Frozen Foods is engaged in manufacturing Frozen Peas and an impeccable range of Frozen Vegetables and Ice Cubes for Industrial use. Under the able and efficient guidance of Mentors Mr. Dinesh Shukla & Mr. Ashish Shukla, Naini Frozen Foods, has carved a niche for itself and has become one of the leading manufacturers and suppliers of frozen peas & vegetables in the industry. Their vast industrial experience has helped in garnering a strong presence in the market. The company is well equipped with modernized manufacturing facilities and equipment using state-of-the art technology comprising of Individually Quick Freezing (IQF). Freezing line is equipped with 2000 Kg/per hour IQF Tunnel. The plant is spread in more than 1, 20,000 Sq. ft Area, which is situated Rudrapur near Industrial Area SIDCUL, Pantnagar, in Uttarakhand State of India. We are registered with various government nodal agencies & Ministry of Food Processing, New Delhi, India.

In addition to this & to meet the existing world standards in terms of hygiene & quality, the company has applied for IS0 9000 certification. We employ quality inspectors who thoroughly check the entire range of products at every level from procuring to final dispatch. Due to the high quality of our products, we have garnered a very good reputation in the industry and regularly adding on a huge client base every year.

2.2 M/S Sharda Agri Foods

M/S Sharda Agri Foods (P) Limited was set up in the year 2009 under Companies Act 1956, in the city of Rudrapur, Uttarakhand. They are prime Manufacturer, Supplier & Service Provider of a broad gamut of Frozen Products. Under the expert guidance of Mr. Vishnu Bansal (Director) & Mr. Pradeep Agarwal (Director), having experience of three decades in this domain, the company markets & sells Frozen products under its registered Brand Name SAFPL & SHARDA respectively. As our products have very good demand outside India, we are in the processes of making business strategies and searching right business partner to deal with for exporting our product in the countries where there is huge demand. About Infrastructure they are backed by rock steady infrastructure, which helps in delivering high quality Frozen Products to the clients. The highlights of infrastructure are: 1. Factory premises is situated on NH-74 (Khatima- Panipat)

and it is well-connected with rail & road Transport to any part of the country. And it is about 28 & 15 km away from the Integrated Industrial Area of Pantnagar & Sitarganj respectively. Total area in which factory is established is around 3.5 acre which is surrounded by lush green agriculture fields, 2. Machinery, Plant is a Mixture of Imported & Indigenous Machinery, 3. Production Capacity include IQF –2MT P/H, Normal cold - 4400 MT, Storage IQF cold –3600 MT storage approx and Grading - 3 MT P/H Capacity.

2.3 Grandeur Agrotech

Grandeur Agrotech (P) Ltd. is India's leading company in processed fruits and vegetable. The company is managed by the well established entrepreneurs of North India. The processing unit of company is established at an ideal location of Uttarakhand. It is situated in Tarai region surrounded by the hills of Kumaun. The plant is in the most fertile part of india. The processing unit is established at SIDUL in a Rudrapur which is the nearest point from Rudrapur Mandi. It takes hardly 15 minutes to approach site. The Kasganj belt is also at short distance. This unit of GRANDEUR AGROTECH (P) Ltd. at in Rudrapur is having I.Q.F facility of 1.5 MT per hour. The storage capacity is about 1200 M.T. Digital temperature display adds to the transparency of their service. Covered structure and roof, which facilitates easy loading and unloading of goods under extreme climatic conditions. Sufficient floor space area facilitates easy movements. There are doors with proper locking systems and sufficient light points along with uninterrupted electricity supply. Frozen fruits and vegetable products are manufactured under strict quality control and hygienic condition in their factory. Staff of company is managed by highly qualified professionals of repute. Technical staff highly trained of years experience in the field supervises all processing work. Presently company is engages in processing varieties of fruits and vegetables through I.Q.F. (Individual Quick Freezing) technique, maintaining its all nutritional values, natural taste and colour.

2.4 KLA India Public Limited

KLA India Food Ltd (KLA) was established in the year of 2006 by Mr. Ashok Agrawal. Presently, Mr. Utsav Agrawal and Mr. Lakshya Agrawal are the main share holder and directors in the company. KLA's activities comprise trading of rice and processing of frozen vegetables as Frozen Pea, Frozen Sweet Corn, and Frozen mix vegetable. The company's frozen foods

processing unit is located at Rudrapur (Uttarakhand) with a freezing capacity of 2 MT per hour. Rice contributed to about 80% of the company total operating revenue in FY15. The company markets its various products under the brand name 'KLA'. KLA have one of the most advanced rice making facilities in India. Our system of quality control built into each and every step of manufacturing, milling, weighing and packing operations are fully automatic. We have masters who know the complex rice milling process of delicate basmati rice. The manufacturing unit Param Exim Ltd is ISO & HACCP (Hazard Analysis at Critical Control Points) certified. This certification itself ensures processing of rice is free from any hazard which may be harmful to human being. The working atmosphere is quite hygienic and free from dust. Kota stone on the floor and tiles on the walls help to improve the quality of working place. We have team of experts who have rich experience of iron ore.

Memberships & Affiliations

- IS 343:2000 HACCP certified
- Member of APEDA (Agriculture and Processed Food Products Export Development Authority), Government of India
- Member of FIEO (Federation of Indian Export Organizations), Government of India
- Member of AIREA (All India Rice Exporter Association)
- Member of CII (Confederation of Indian Industries)
- KLA is in regular interaction with GB Pant University of Agriculture & Technology for betterment of agriculture, post harvest and marketing.

Awards and Achievements

- Honorable Shri Kamal Nath, Cabinet Minister, Commerce & Industry, Govt. of India presenting APEDA Export Award on Dt. 30th May 2008.
- Honorable. Shri Kamal Nath, Cabinate Minister, Commerce & Industries Presenting Apeda Export award on 30th April 2007.
- Honorable Governor S. S. Barnala, Tamil Nadu presenting Uttarakhand Rattan Award to Mr. Arun Agarwal on Dt. 15th April 2007.
- Honorable Sh. M. V. Rajsekharan, Minister of State, Planning presenting Udhyog Rattan Award on Dt. 25th July 2006.

3. METHODOLOGY

To fulfill the objectives of this study following methodology was adopted during the study.

3.1 Research Design

The descriptive research design was used for the study to know the gap in supply chain of Pea, which includes the survey and fact finding enquiries.

3.2 Collection of Data

Both primary and secondary data were collected to accomplish this study.

Secondary Data: The secondary data would be collected from websites and company brochures, books, journals etc.

Primary Data: Primary data was obtained from farmers (pea growers), pea processors, dealers and retailers and consumers with the help of questionnaire.

3.3 Area of Study

The area of study chosen for the study was Rudrapur.

3.4 Sampling plan

3.4.1 Universe

All the farmers (pea growers), commission agents, pea processors, dealers, retailers and consumers of frozen peas.

3.4.2. Sampling Unit

Sampling units consist of farmers (pea growers), pea processors, dealers, retailers and consumers of frozen peas.

3.4.3 Sampling Technique

Convenience sampling method was used for the selection of pea growers, pea processors, dealers, retailers and consumers of frozen peas.

3.4.4 Sample Size

A total of 160 respondents were interviewed via structured questionnaire on the basis of convenience sampling.

Farmers - 24

Pea Processors - 4

Dealers - 8

Retailers - 24

Consumers - 100

3.4.5 Research Instrument

Interviews with farmers (pea growers), Pea processors, dealers, retailers and consumers with the help of structured questionnaire.

3.4.6 Analysis of Data

Proper statistical and mathematical techniques were used for the analysis of data. The project was carried out to accomplish the stated objectives of the study with the help of various graphs and charts will be taken.

3.4.7 Duration of Study

The survey was conducted for a span of two months i.e. 11thMarch to 11th May, 2016.

3.4.8 Limitation of Study

1. The study was confined to a selected group of respondents in a particular region (Rudrapur) and it may not equally apply to the general responses of other market of the country.
2. Persuading the respondents to answer the questionnaire was not an easy task.

4. RESULTS

This chapter contains the analysis of primary and secondary data. Findings and analysis of each objective has been discussed separately.

4.1 Analysis of the supply chain gaps in frozen pea processing industry in terms of various issues

4.1.1 Analysis of cold chain infrastructure issues in the supply chain

Table 4.1 shows that there are various issues related to cold chain in Rudrapur, such as lack of cold chain facilities, inadequate capacity of cold chain, lack of cold chain network. This creates some problem to significant problem in frozen pea supply chain. Due to this concern it has become difficult for the farmers, pea processors and wholesalers to do their business effectively and get proper remuneration for their produce.

Table 4.1 Status of cold chain infrastructure problem by the chosen frozen pea processors

Such as cold storage & warehousing facilities, cooling shed, pre-cooling, cold chain capacities	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods				✓	
M/S Sharda Agri Foods			✓		
Grandeur Agro tech Ltd.				✓	
KLA Foods			✓		

4.1.2 Analysis of Fragmentation issues in the supply chain

Table 4.2 shows that one of the main issues in the supply chain of pea processing industry in Rudrapur is the large number of local trader and intermediaries who eat all the share of farmer's income. The whole supply chain in Rudrapur is dominated by local traders. This makes supply chain more fragmented.

Table 4.2 Status of Fragmentation problem by the chosen frozen pea processors

Such as Large number of intermediaries, farmers have greater reliance on intermediaries, large number of local agents and commission agents	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods				✓	
M/S Sharda Agri Foods				✓	
Grandeur Agro tech Ltd.				✓	
KLA Foods				✓	

4.1.3 Analysis of Integration issues in the supply chain of frozen pea

Table 4.3 shows that Linkage and integration between the various players in the supply chain plays a very important role to make the whole supply chain effective and profitable. But in the supply chain of pea processing industry in Rudrapur there is a lack of forward and backward integration between the farmers and the other partners.

Table 4.3 Status of Integration problem by the chosen frozen pea processors

Such as Backward-Forward integration, linkages between industry, government and institution, Poor linkage in the marketing channel	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods				✓	
M/S Sharda Agri Foods				✓	
Grandeur Agro tech Ltd.				✓	
KLA Foods			✓		

4.1.4 Analysis of Transportation issues in the frozen pea supply chain

Table 4.4 shows that Transportation related challenges are very high in the Rudrapur because of unavailability of well transportation mode, high cost of transportation, lack of temperature controlled vehicle for the movement of goods. Due to this transportation become serious problem in whole supply chain.

Table 4.4 Status of Transportation problem by the chosen frozen pea processors

Such as refrigerated vehicles, Efficient and cost saving transportation for the movement,	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					✓
M/S Sharda Agri Foods					✓
Grandeur Agro tech Ltd.					✓
KLA Foods					✓

4.1.5 Analysis of Market Demand and Information issues in the frozen pea supply chain

Table 4.5 shows that in Rudrapur, there is some problem that farmers have lack of information regarding the prices in the market, demand, food processing units etc. that leads to poor realization of prices, high amount of losses, late delivery of goods in the market place.

Table 4.5 Status of Market Demand and Information problem by the chosen frozen pea processors

Such as market information to the farmers such as prices, flow of the product, food processing unit etc, knowledge about the demand in the market, timely information	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods			✓		
M/S Sharda Agri Foods			✓		

Grandeur Agro tech Ltd.			✓		
KLA Foods			✓		

4.1.6 Analysis of Packaging issues in the frozen pea supply chain

Table 4.6 shows that Packaging is very important for pea as they are highly perishable goods and it needs proper packaging for the handling of pea fresh produce. Without proper packaging it is very difficult to maintain their shelf life. Cost is very important factor for this issue. High cost of packaging material makes difficult for the farmers to do proper packaging of their goods.

Table 4.6 Status of Packaging problem by the chosen frozen pea processors

Such as High cost of packaging material, Unavailability of packaging material	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					✓
M/S Sharda Agri Foods			✓		
Grandeur Agro tech Ltd.				✓	
KLA Foods				✓	

4.1.7 Analysis of factor consider most important by dealer in frozen pea selling

Exhibit 4.1 shows most important factor to sell frozen pea is quality or brand than price, availability and any other factor by the dealer. Quality is most important parameter considered while selling frozen peas.

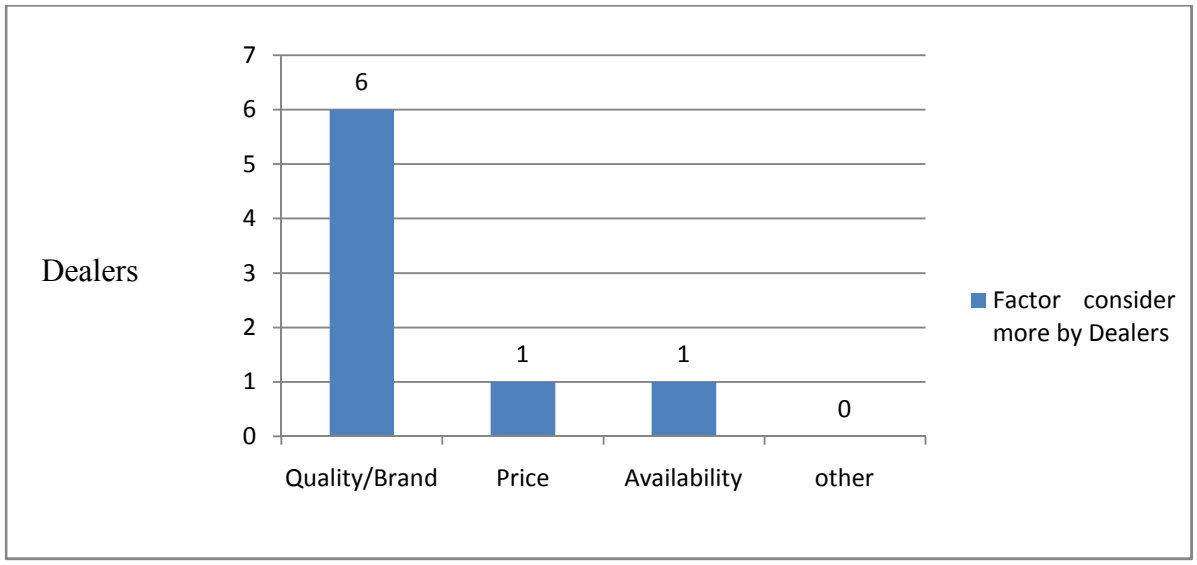

Exhibit 4.1 Factor considered most important by Dealer in selling frozen pea

4.1.8 Dealer perception about installed capacity of cold storages and no. of refrigerated trucks or reefer vans in frozen peas supply

Exhibit 4.2 clearly showing that all dealer perception are that installed capacity of cold storages and no. of refrigerated trucks or reefer vans in frozen peas supply are not sufficient to serve the need of consumer.

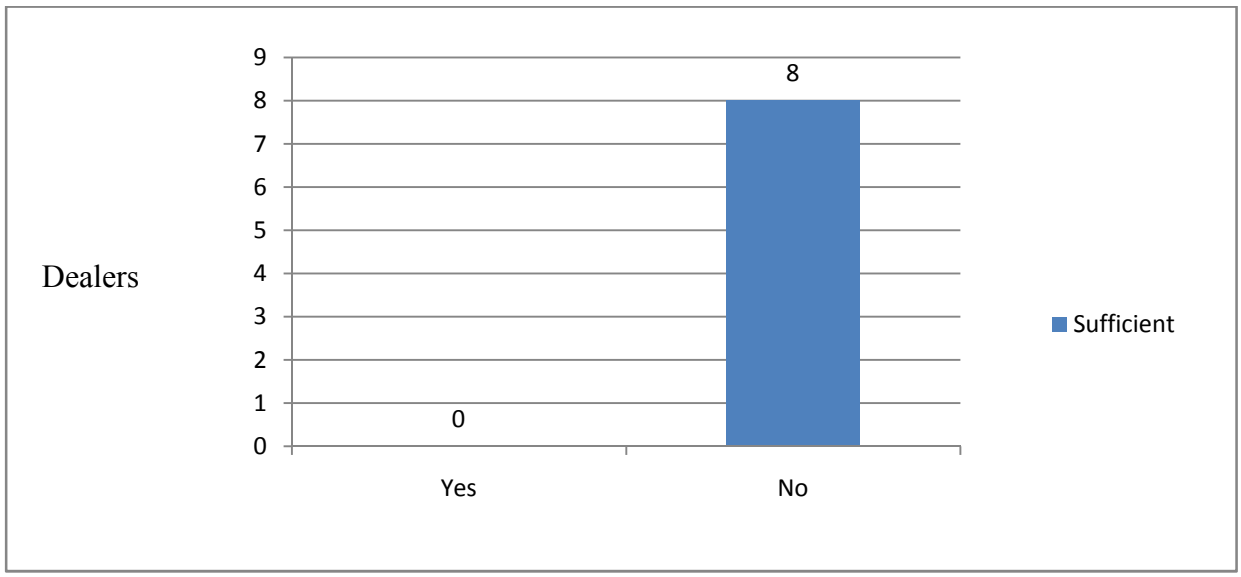

Exhibit 4.2 Dealer perception about installed capacity of cold storages and no. of refrigerated trucks or reefer vans

4.1.9 Priorities of attributes that retailer seeks into frozen pea

This study was done to find out the priorities of attributes that retailer seeks into a Frozen pea Brand. The data for various attribute have been tabulated in the table below It was found that margin was the important criteria for selling Frozen pea, demand was the second most important criteria, and brand name of the products was ranked third. Whereas replacement of damaged products the least important criteria for selling Frozen pea.

Table 4.7 Attributes that retailer seeks into frozen pea

Criteria	Distribution of respondents (N=24)
	Respondent
Margin	15
Demand	6
Brand name	3
Replacement	0

4.1.10 Analysis of Factors which needs to improve

Exhibit 4.3 shows that 37.5 per cent of retailers says it's not prompt supply, 25 per cent of retailers says need of enhanced cold storage capacity, 20.83 per cent of its quality consideration, 0.083 per cent of its availability, 0.041 per cent distributor behavior and relationship weight age the least important here.

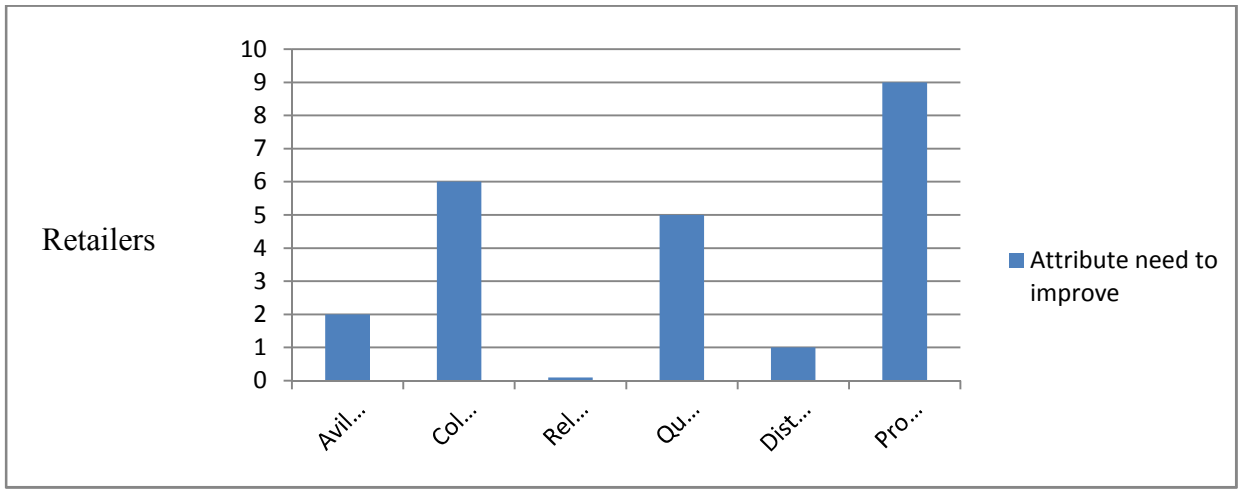

Exhibit 4.3 Factors which needs to improve at retail

4.1.11 Frozen pea consumer purpose of buying frozen pea

Exhibit 4.4 represents different criteria of purpose to buy frozen pea by the consumers. In this 66% respondent restaurant & hotel purpose, 24% Hostel purpose, 15% House purpose, 5% occasionally purpose and other purpose were founded very little importance.

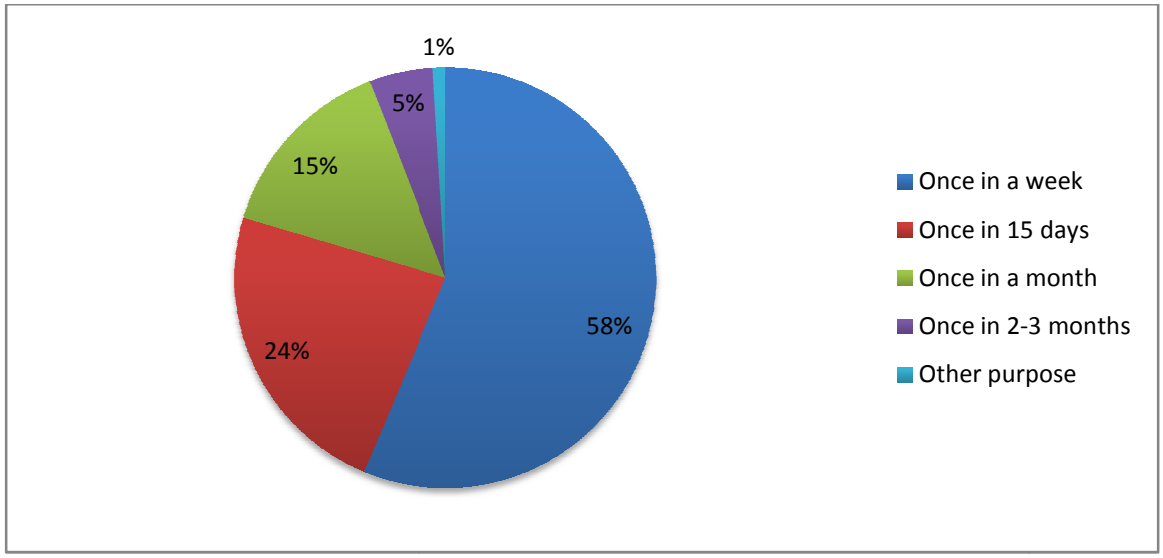

Exhibit 4.4 The purpose of buying frozen pea

4.1.12 Frozen pea consumer Frequency to visit pea retail store

Exhibit 4.5 clearly shows that 58% respondent visits once in a week that more frequently than 30% once in 15 days, 10% once in a month respondents in a frozen pea retail store. Most of consumer visit more in a short time interval so availability of frozen pea in retail very necessary.

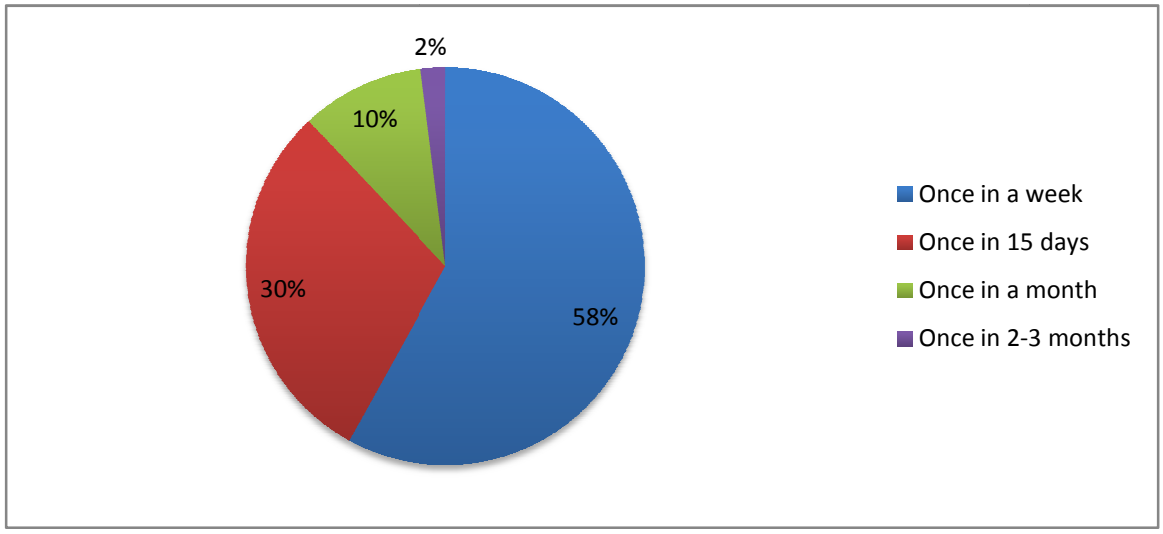

Exhibit 4.5 Frequency to visit pea retail store

4.1.13 Frozen pea consumer source of information

Exhibit 4.6 clearly shows that 98% respondent informed by the friends/others than any other source of information except 2% social media/internet. Most of consumer visit to a frozen pea retail through the information of friends or other mean as a source of information.

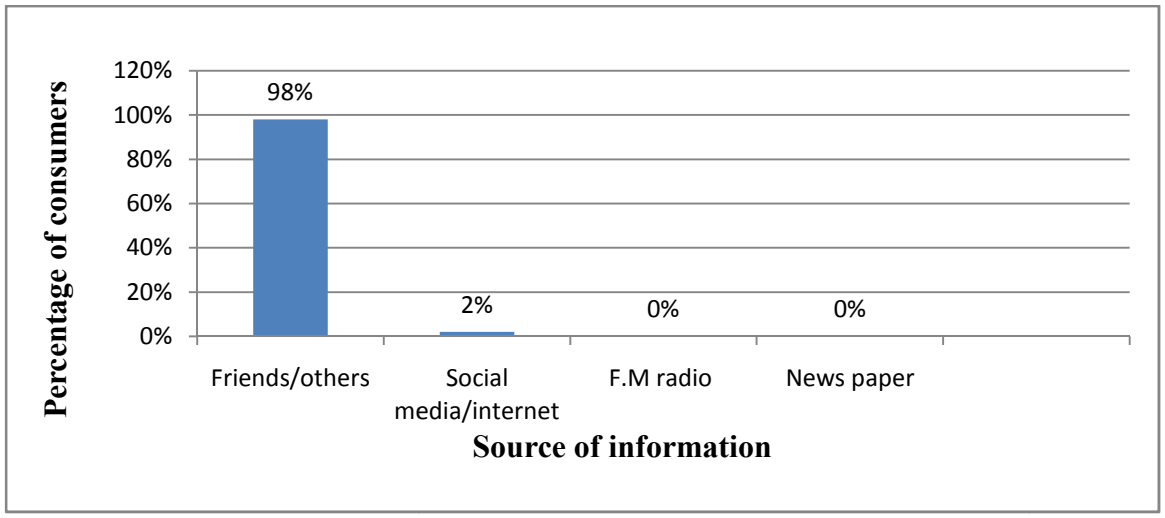

Exhibit 4.6 Source of information makes consumers to visit a frozen pea retail store

4.1.14 Attribute that makes purchase of frozen pea by consumer

Exhibit 4.7 represents that most important attribute required by consumers is better quality of frozen pea. 76% respondents seek better quality whereas 30% respondents want lower price and only 4% looking variety in product.

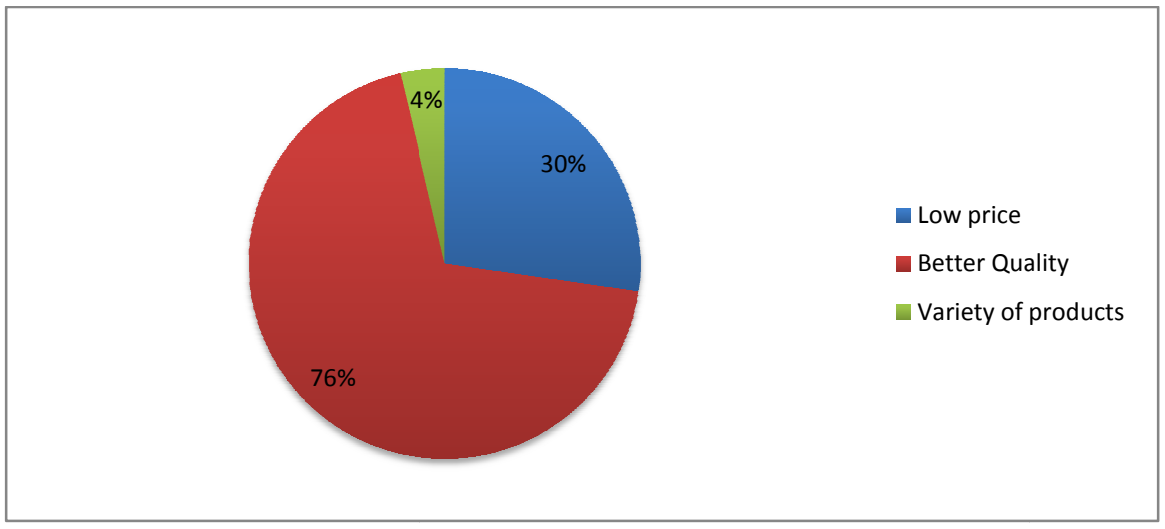

Exhibit 4.7 Attribute that makes purchase of frozen pea

4.1.15 The customer service at frozen pea retail store

Exhibit 4.8 shows that 45% respondents saying slow service, 34% not sufficient service, 19% with not good service and only 2% fast service. It shows most of the customer getting not well service due to lack of cold storage capacity by the retailer so shortage of frozen pea availability.

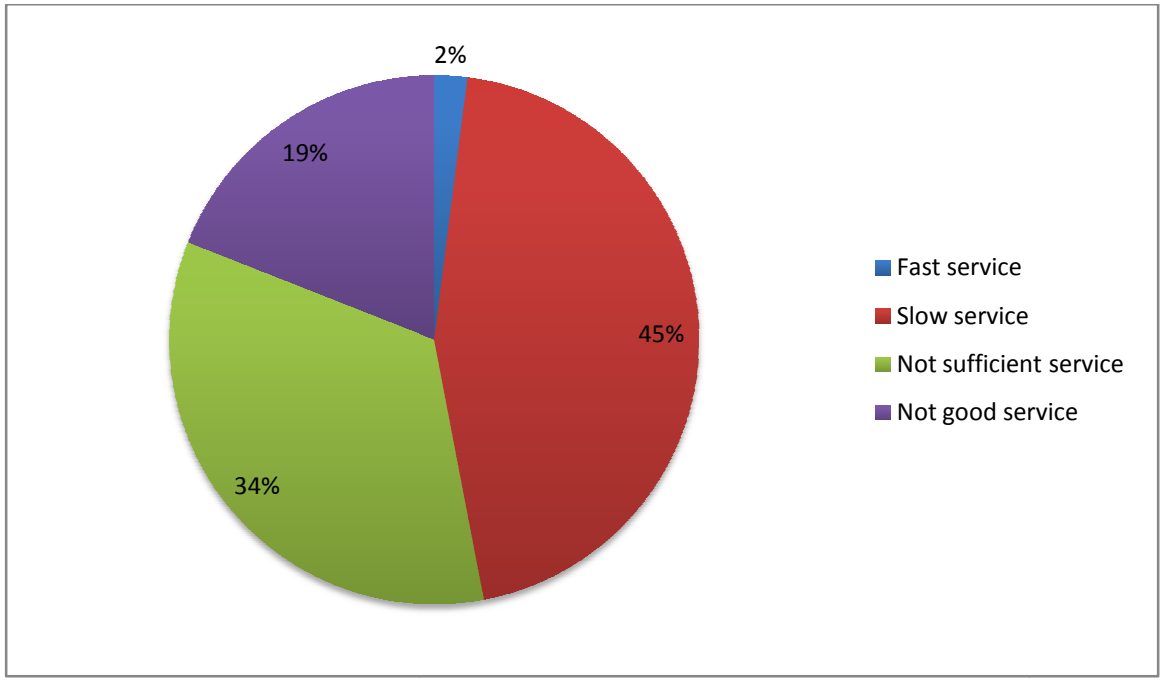

Exhibit 4.8 The customer service in retail store

4.1.16 Analysis of availability of frozen pea in demand

Exhibit 4.9 shows that under the demand frozen pea availability is average by the 55% respondents and 15% respondents consider poor availability. Good and excellent availability by 22% and 8% respondent respectively. During peak demand of frozen pea there is not efficient delivery by the distributers, wholesalers. Due to lack of required transportation facilities.

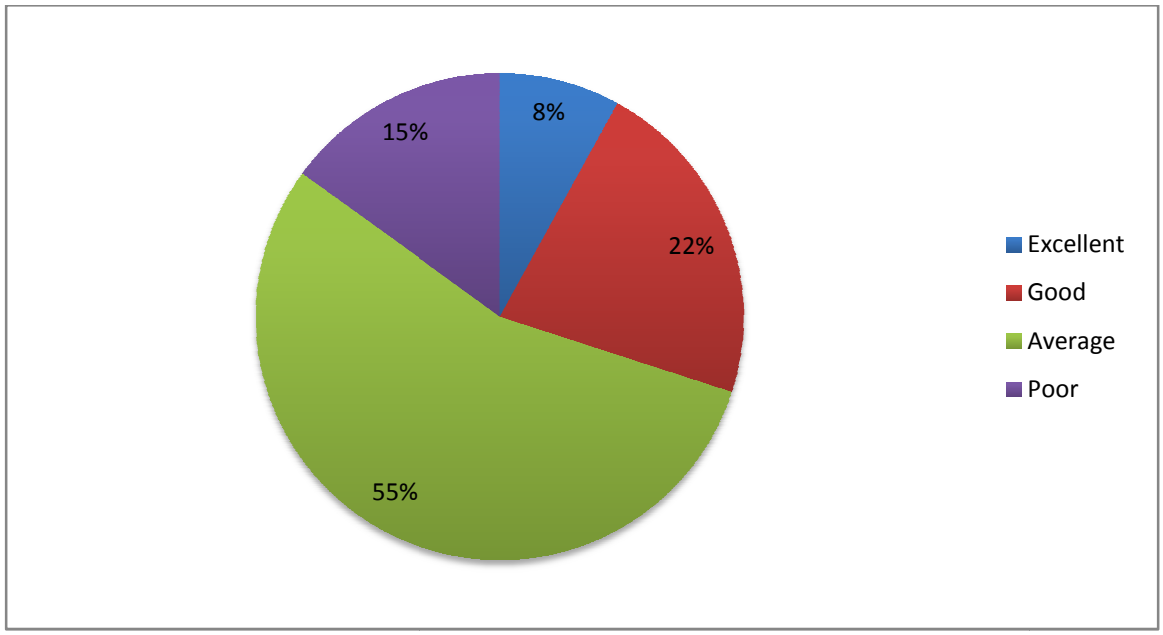

Exhibit 4.9 Availability of frozen pea in demand

4.1.17 Analysis of customer intention to enter in the frozen pea retail

Exhibit 4.10 clearly shows that 68% respondents want product quality and availability in a frozen pea retail store and 16% respondents require low price. There is a great scope in improving quality, availability through improved supply chain from farmers field to consumers end.

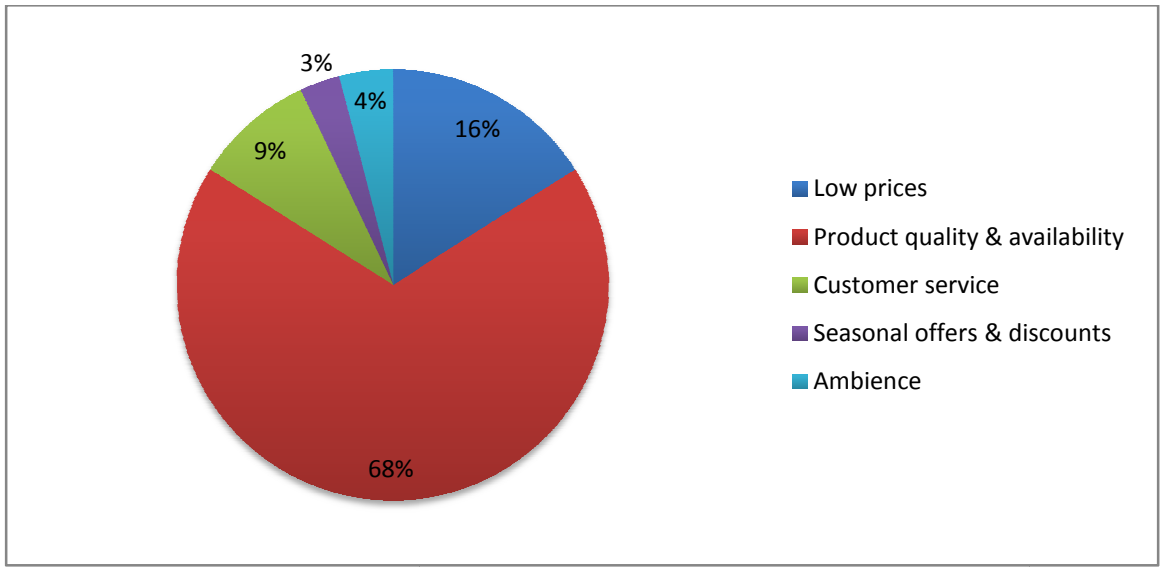

Exhibit 4.10 Customers intention to enter the store

4.1.18 Analysis of consumers about frozen pea quality earlier

Exhibit 4.11 shows past experience about frozen pea quality by the 47% respondents were average and for some people 14% poor kind but there is 39% respondents which said good quality.

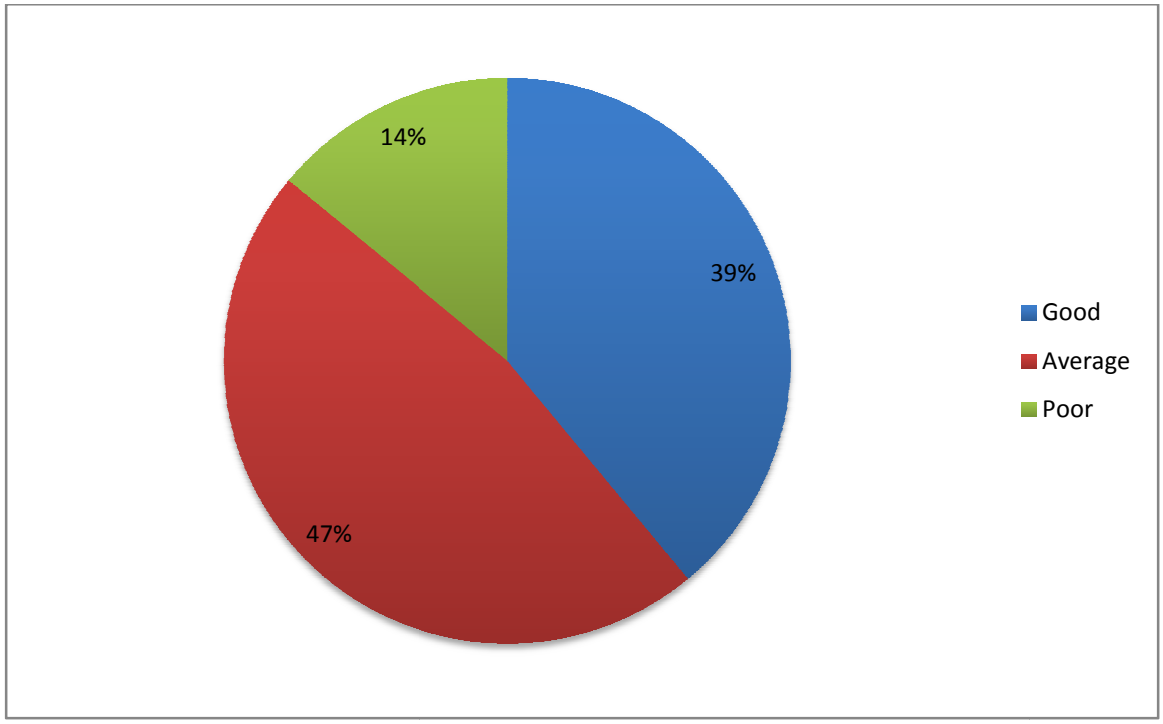

Exhibit 4.11 Consumer experience about frozen pea quality earlier

4.1.19 Analysis of retail store maintaining frozen pea Quality

Exhibit 4.12 shows most of retailers maintaining frozen pea quality is of average type by the 79% respondents, for the 9% consumers it is poor and only 12% respondents saying it is maintaining good quality.

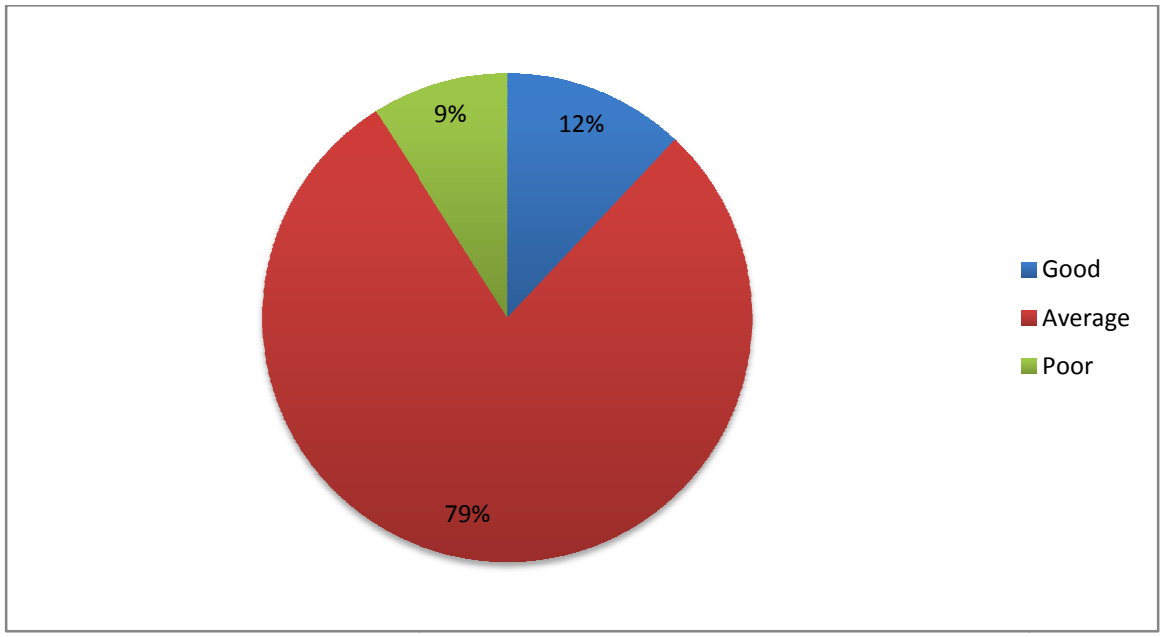

Exhibit 4.12 Frozen pea retail store maintaining product Quality

4.1.20 Availability of frozen pea in retail store

Exhibit 4.13 shows that according to 52% respondents availability of frozen pea are never on just in time and by the 35% respondents availability is most of time and always availability for 13%. It clearly shows inadequate frozen pea supply.

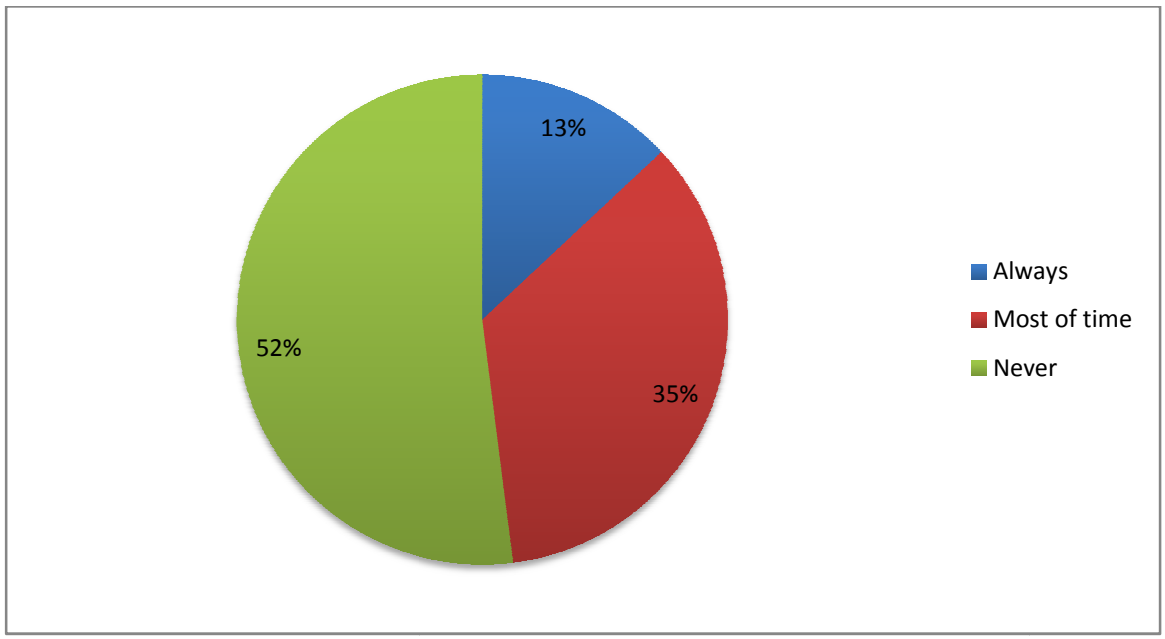

Exhibit 4.13 Availability of frozen pea in retail store

4.1.21 Analysis of packaging material quality

Exhibit 4.14 shows 72% respondents believe that average packaging of frozen pea, 10% poor packaging and 28% in the side of good packaging of frozen pea. The behind this is unavailability and high cost of packaging material. This will increase cost of production for the frozen pea processors.

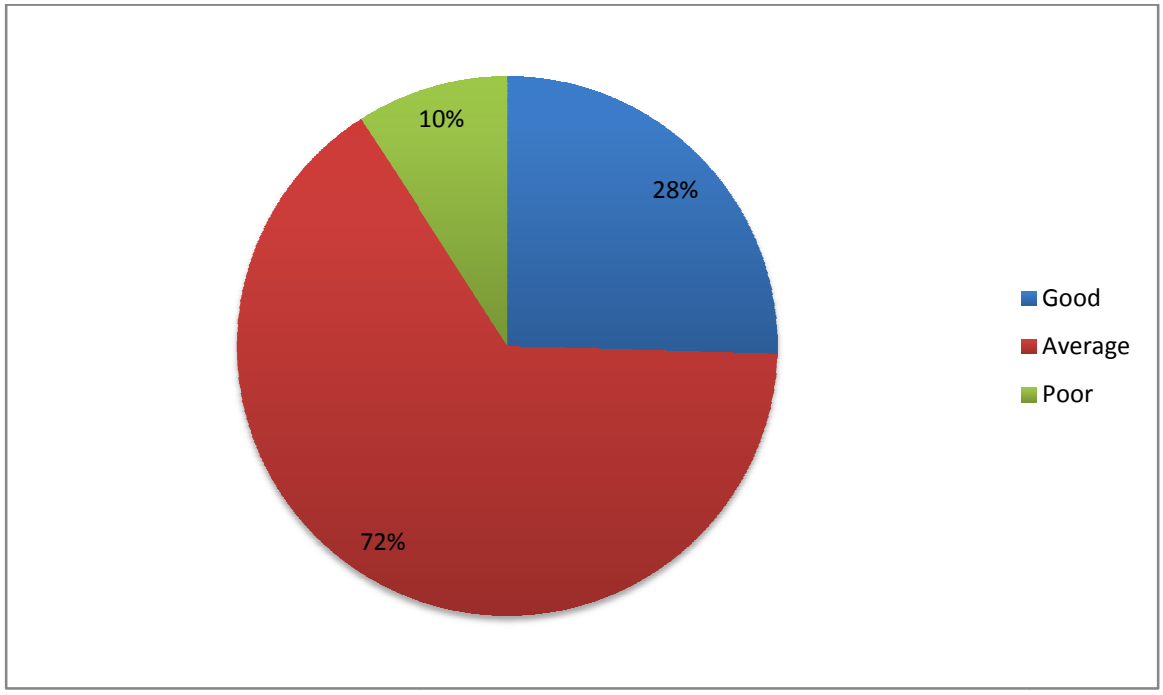

Exhibit 4.14 Analysis of packaging material quality

4.2 Determination of Farmer's knowledge & awareness

4.2.1 About post harvest management

Table 4.8 shows that 60.93 % farmers were aware of quality seeds and 39.07% farmers were unaware of quality seeds.

Table 4.8 Farmer's knowledge & awareness about post harvest management

Post-harvest management	**Distribution of farmers(N=24)**	
	Aware	**Unaware**
The stage (Maturity Indices) to harvest pea from the field for the best quality	16	8
To make crop produce free form the splitting, hail, dirt, leaves or other foreign matter, mildew or other diseases & insects Washing, Sorting & Grading is done	20	4
Sugar content and flavor decrease rapidly after harvest unless green peas pre-cooling	6	18
Optimum moisture content to reduce the deterioration rate during storage about 12%	16	8
The optimum storage temperature to store fresh peas at 0 °C	19	5
Recommended best mode of transportation to maintain quality of produce is Refrigerated trucks	22	2
Colour, taste and texture in the final product due to Blanching	4	20
Retailer store processed frozen pea for selling in Cold storage/Refrigerator	14	10
Total percentage (%)	60.93	39.07

4.2.2 About Quality Seeds

Table 4.9 shows that 66.66 % farmers were aware of quality seeds and 33.34% farmers were unaware of quality seeds.

Table 4.9 Farmer's knowledge & awareness about Quality Seeds

Quality Seeds	**Distribution of farmers(N=24)**	
	Aware	**Unaware**
Kind of seeds should be used for pea crop production for quality produce Certified seeds	13	11
Seeds should be free from of insect & disease inoculums, Inert matters and Rotten seeds	24	0
Minimum germination percentage of pea seeds for sowing in field should be 80%	8	16
Pea seeds should be treated with *Rhizobium* culture before sowing to protect its quality	20	4
Factors responsible for your crop yield - Timely Irrigation, Use of balance fertilizers, Use of quality seeds & Cultural practices	21	3
Quality seeds insures good germination, rapid emergence, and vigorous growth	10	14
Total percentage (%)	66.66	33.34

4.2.3 About Processing & value addition

Table 4.10 shows that 50.69 % farmers were aware of pea processing & value addition and 49.31% farmers were unaware of pea processing & value addition.

Table 4.10 Farmer's knowledge & awareness about Processing & value addition

Processing & value addition	**Distribution of farmers(N=24)**	
	Aware	**Unaware**
Raw produce is processed: To enhance its quality, To increase its shelf life, To make it hygiene in food	18	6
Colour, taste and texture in the final product comes because of proper Blanching	2	22
Sorting, grading and washing are done during peas processing to separate Over & under mature pod seeds, Infected seeds, To get Desire seeds	20	4
Processing, Preservation techniques helps to make pea availability in a better quality throughout the year	15	9
Pea used in different recipes and products as its value addition	8	16
Processed peas are available in market as frozen, dry, canned, cooked, soup, nutritional pea protein and ready to eat etc	10	14
Total percentage (%)	50.69	49.31

4.3 Mitigation strategies for identified challenges in supply chain of pea processing industry

4.3.1 Cold Chain issues

There are various issues related to cold chain in Rudrapur, such as lack of cold chain facilities, inadequate capacity of cold chain, lack of cold chain network. Due to this concern it has become difficult for the farmers, pea processors and wholesalers to do their business effectively and get proper remuneration for their produce. The concerned factors effecting the Supply Chain of Pea processing sector pertaining to Rudrapur and their corresponding mitigation strategies to overcome from these challenges

- Lack of cold storage & warehousing facilities.
- Infrastructure in term of cooling shed, cold storage.
- Inadequate cold chain capacities to serve the need.

Mitigation strategies:

- ✓ Development of cold chain infrastructure at the central area of major pea production belt.
- ✓ Cold storage facilities may be set up by private players or cooperatives societies.

4.3.2 Transportation issues

Transportation plays a very important role in the supply chain. Without proper transportation the goods can't be delivered to the customer in a right time and in a right quality. It plays even a more important role in Perishable food like Pea processing because of short shelf life, high perishable, and required controlled temperature. Transportation related challenges are very high in the Rudrapur because of unavailability of well transportation mode, high cost of transportation, lack of temperature controlled vehicle for the movement of goods etc.

- Unavailability of transportation mode.
- Inefficient and costly transportation for the movement.
- Lack of refrigerated vehicles for the transportation of in rural areas.

Mitigation strategies

- ✓ State government refrigerated transportation system can be set up for pea transport.
- ✓ Refrigerated vans can be initiated in rural areas by public private partnership.

4.3.3 Fragmentation issues

One of the main issues in the supply chain of pea processing industry in Rudrapur is the large number of local trader and intermediaries who eat all the share of farmer's income. The whole supply chain in Rudrapur is dominated by local traders.

- Large number of intermediaries present in the supply chain.
- Traders dominant supply chain.
- Farmers have greater reliance on intermediaries.
- Presence of large number of local agents and commission agents.

Mitigation strategies:

- ✓ At producers/farmers level, the state government agencies could take up the function of a village level aggregator.
- ✓ Cooperative marketing societies may be created by the village farmers.
- ✓ State government agencies can enter into the higher value addition activity of Pea processing.

4.3.4 Integration issues

Linkage and integration between the various players in the supply chain plays a very important role to make the whole supply chain effective and profitable. But in the supply chain of pea processing industry in Rudrapur there is a lack of forward and backward integration between the farmers and the other partners.

- Lack of Backward-Forward integration from farmer to customer.
- Lack of linkages between industry, government and institution.
- Poor linkage in the marketing channel, from farm gate to mandi because of small land sizing farmers.
- Lack of linkage between farmer and processing unit because of unavailability of processing unit.

Mitigation strategies:

- ✓ Contract farming may be done with the private food companies.
- ✓ Outsourcing of Pea can done by processing units.

- ✓ NGOs can play a vital role as an intermediary between farmer and companies.

4.3.5 Infrastructure issues

Supply chain infrastructure plays an important role in the pea processing industry. Proper and adequate infrastructure helps farmers and Agri pea processors to run their business successfully and helps to deliver the goods in the right time with right condition. In Rudrapur, Infrastructure in the main impediment in the supply chain of agricultural products which leads to high amount of losses.

- Lack of storage / warehousing condition in village areas.
- Poor loading / unloading facilities in the farm and mandi place.
- Lack of processing facilities like washing.
- Poor road connectivity.
- Poor transportation infrastructure (road, rail etc.)
- Infrastructure connecting the farm is very poor.
- Inadequate marketing infrastructure such as grading, standardization and other machinery near the farm region and at mandi place.

Mitigation strategies:

- ✓ Semi processing unit can be set up by govt.
- ✓ Agencies / entrepreneur nearer to pea produce area.
- ✓ Small size Food Park can be developed at various center points of packaging, semi processing, grading, better equipment for loading and unloading and machinery for value addition in Pea.

4.3.6 Post-harvest losses issues

Post-harvest losses are the major problem in the supply chain of pea processing industry in Rudrapur. There are huge amount of losses in the supply chain of perishable food in reaching to the main market, processing units etc. Around 30-40 % of total food produce gets wasted in Rudrapur. Huge amount of losses incurred during transportation and storage of fresh food produce. Postharvest losses are high in Rudrapur because of lack of cold chain facilities, poor logistics connectivity in the area etc.

- High wastage along the supply chain.
- High wastage in reaching to the processing unit.
- Losses during transportation and storage are high.
- High level of wastage because of lack of cold chain and infrastructure.

Mitigation strategies:

- ✓ Setting up cold chain facilities in various districts and major production belts.
- ✓ Cold chain can be set up in area where lack of road facilities is there.
- ✓ Setting up of food processing unit needs to be emphasized.
- ✓ Semi processing unit can be set up by entrepreneur nearer to pea produce area.
- ✓ Construction of post harvest facilities.

4.3.7 Market Demand and Information issues

Proper information is the basis of efficient supply chain. Without proper information regarding market demand the supply chain cannot run successfully. In Rudrapur, farmers have lack of information regarding the prices in the market, demand, food processing units etc. Poor information leads to poor realization of prices, high amount of losses, late delivery of goods in the market place etc.

- Lack of market information to the farmers such as prices, flow of the product, food processing unit etc.
- Lack of knowledge about the demand in the market.
- Lack of timely information.
- Lack of knowledge about the intermediaries.

Mitigation strategies

- ✓ Knowledge on demand forecasting.
- ✓ ITC initiation of e-chaupal can be replicated in the Pea processing sector.
- ✓ Government portal can be developed showing daily prices of Pea.

4.3.8 Packaging issues

Packaging is very important for pea as they are highly perishable goods and it needs proper packaging for the handling of these fresh produce. Without proper packaging it is very difficult

to maintain their shelf life. Cost is very important factor for this issue. High cost of packaging material makes difficult for the farmers to do proper packaging of their goods.

- High cost of packaging material.
- Unavailability of packaging material.

Mitigation strategies:

- ✓ State government can tie up with the packaging material providing company.
- ✓ Packaging unit can be set up by federation which will provide employment opportunities to the local people.

5. RECOMMENDATION FOR ACTION

The study was focused on analyzing the challenges faced in the supply chain of frozen pea by the farmers, wholesalers, retailers and pea processing plants via Naini Frozen Foods, M/S Sharda Agri Foods, Grandeur Agro tech Ltd., KLA Foods operating in Rudrapur.

5.1 Conclusion

The study conducted on the Supply chain analysis of frozen pea industry in Rudrapur suggest that there is an improper supply chain management, lack of cold chain infrastructure and pea Processing units which are leading to maximum inefficiencies and resulting to losses and quality degradation of frozen pea. The entire supply chain of frozen pea is laden with the issue of post-harvest losses and wastages due to long and fragmented chain, dependency on intermediaries, poor road infrastructure, inadequate cold chain infrastructure facilities, high cost of packaging, poor quality of distribution, weak link in supply chain etc. which resulting to poor price realization of pea growers on one hand and exorbitant prices paid by consumers on the other end. Highly inefficient supply chain and cold chain infrastructure is the major impediment in the path of speedy growth of pea processing industry. Which is require immediate attention that can support in mitigating the identified challenges and provide impetus to supply chain of frozen pea industry.

5.2 Recommendations

Based on the analysis following recommendations are as follows:

- Development of cold chain infrastructure at the central area of major pea production belt. Cold storage facilities may be set up by private players or cooperatives societies. Setting up cold chain facilities in various locations and major production belts. Cold chain can be set up in area where lack of road facilities is there.
- State government refrigerated transportation system can be set up for pea transport. Refrigerated vans can be initiated in rural areas by public private partnership.
- Outsourcing of Pea can be done by processing units. Contract farming may be done with the pea processors. Semi processing unit can be set up by entrepreneur nearer to pea produce area.

- Government portal can be developed showing daily prices of Pea.
- Small size Food Park can be developed at various center points of packaging, semi processing, grading, better equipment for loading and unloading and machinery for value addition in Pea.
- State government can tie up with the packaging material providing company. Packaging unit can be set up by federation which will provide employment opportunities to the local people.

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ANNEXURE I

Questionnaire for the Pea Processor

1. Name of Company _____
2. Address _____
3. Country _____

4. Tel _____ 5. Fax _____ 6. Website _____

7. Contact person: _____ 9. E-mail: _____
8. Position in company: _____

11. Sector Types: ☐ Manufacturing ☐ Service ☐ Both

12. Industry: ☐ Food Processing ☐ Automotive Other (define) _____

13. In what level your company is facing the problems below in terms of cold chain infrastructure, fragmentation issues, integration issues, transportation issues, market demand & information issues and packaging issues in doing their business successfully?

1) Cold chain infrastructure issues:

Such as cold storage & warehousing facilities, cooling shed, pre-cooling, cold chain capacities	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					
M/S Sharda Agri Foods					
Grandeur Agro tech Ltd.					
KLA Foods					

2) Fragmentation issues:

Such as Large number of intermediaries, farmers have greater reliance on intermediaries, large number of local agents and commission agents	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					
M/S Sharda Agri Foods					
Grandeur Agro tech Ltd.					
KLA Foods					

3) Integration issues:

Such as Backward-Forward integration, linkages between industry, government and institution, Poor linkage in the marketing channel	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					
M/S Sharda Agri Foods					
Grandeur Agro tech Ltd.					
KLA Foods					

4) Transportation issues:

Such as refrigerated vehicles, Efficient and cost saving transportation for the movement,	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					
M/S Sharda Agri Foods					
Grandeur Agro tech Ltd.					
KLA Foods					

5) Market demand & information issues:

Such as market information to the farmers such as prices, flow of the product, food processing unit etc, knowledge about the demand in the market, timely information	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					
M/S Sharda Agri Foods					
Grandeur Agro tech Ltd.					
KLA Foods					

6) Packaging issues:

Such as High cost of packaging material, Unavailability of packaging material	No problem at all (1)	Little problem (2)	Some problem (3)	Significant problem (4)	Serious problem (5)
Naini Frozen Foods					
M/S Sharda Agri Foods					
Grandeur Agro tech Ltd					
KLA Foods					

ANNEXURE II

Questionnaire for Dealer

1) Name of respondent:_____
2) Contact No.:_____
3) Location:_____
4) Sale quantity (in Kg):_____
5) Which factor do you consider most important out of following in dealing of frozen peas?
   a) Quality/Brand
   b) Price
   c) Availability
   d) Other
6) Do you think that installed capacity of cold storages and no. of refrigerated trucks or reefer vans in frozen peas supply are sufficient? (Yes/No)

ANNEXURE III

Questionnaire for Retailer

1) Name of respondent:

2) Address:

3) What attributes makes you to sell frozen pea?

Rank	1	2	3	4
Attributes	Most important	Important	less important	Not important
Margin				
Demand				
Brand name				
Replacement				
Other				

4) What you think about improvement in following factors that makes you to sell frozen pea?

1) Availability

2) Capacity of cold storage

3) Relationship

4) Quality

5) Distributor Behaviour

6) Prompt supply

ANNEXURE IV

Questionnaire for Consumer

1. Name of the Respondent:_____

2. Age of the Respondent:

	Below 20	21-30	31-40	41-50	Above 50
Age					

3. Place: _____

4. What is the purpose of buying frozen pea?

a) Restaurant & hotel purpose

b) Hostel purpose

c) House purpose

d) Occasionally purpose

e) Other purpose

5. How frequently do you visit frozen pea retail store?

a) Once in a week

b) Once in 15 days

c) Once in a month

d) Once in 2-3 months

6. Which source made you to visit a frozen pea retail store?

a) News paper

b) F.M radio

c) Social media/internet

d) Friends/others

7. Why do you make purchase of frozen pea from its retail store?

a) Low price

b) Better Quality

c) Variety of products

8. How is the customer service in store, is it?

a) Fast service

b) Slow service

c) Not sufficient service

d) Not good service

9. How is availability of frozen pea in demand?

a) Excellent

b) Good

c) Average

d) Poor

10. What is your intention to enter the store?

a) Low prices

b) Product quality & availability

c) Customer service

d) Seasonal offers & discounts

e) Ambience

11. What are you experience about frozen pea quality earlier?

a) Good

b) Average

c) Poor

12. How is frozen pea retail store maintaining product Quality, Quantity?

a) Good

b) Average

d) Poor

13. Do you feel that frozen pea always available JIT?

a) Always

a) Some time

b) Never

14. How is packaging of frozen pea?

a) Good

b) Average

c) Poor

ANNEXURE V

Questionnaire for the Farmer

Name of Farmer_____ Contact No._____

Age_____

Address_____

Land Holding_____

I. Post Harvest management:

1. What is the stage (Maturity Indices**)** to harvest peas from the field for the best quality?

a) Before physiological maturity
b) At any time after seeds setting in pod
c) After physiological maturity
d) None of these

2. What should be done to make crop produce free form the splitting, hail, dirt, leaves or other foreign matter, mildew or other diseases & insects?

a) Washing
b) Use of chemicals
c) Washing, Sorting & Grading
d) None of these

3. Sugar content and flavor decrease rapidly after harvest unless green peas are promptly pre-cooled to?

a) 7 °C
b) -18°C
c) Close to 0 °C
d) Not required

4. What should be optimum moisture content to reduce the deterioration rate during storage?

a) About 12%
b) About 14 to 18%

c) <20%

d) About 20 to 25%

5. What is the optimum storage (Controlled Atmosphere) condition to store fresh peas?

a) Can be store for 1 to 2 weeks at 0 °C with 95 to 98% RH

b) Can be store for 1 to 2 week at room temperature

c) Vary with person t person

d) No need to store

6. What is recommended best mode of transportation to maintain quality of produce in transit from the field/farm to Mandi or processing unit?

a) Trucks

b) Refrigerated trucks

c) Any mode of transport equipped with cooling facilities

d) Both b & c

7. What is done to retain colour, taste and texture in the final product during processing?

a) Freezing

b) Washing

c) Blanching

d) Use of additive

8. Retailers store processed pea packets for selling in?

a) Cold storage/Refrigerator

b) Normal containers

c) Anywhere in shop

d) Sacks

II. Quality Seeds:

1. What kind of seeds should be used for pea crop production for quality produce?

a) Locally available seeds

b) Previous year crop seeds

c) Certified seeds

d) Other source seeds

2. Seeds should be free from of_____?

a) Insect & disease inoculums
b) Inert matters
c) Rotten seeds
d) All of above

3. What should be minimum germination percentage of pea seeds for sowing in field?
a) 80%
b) 65%
c) 70%
d) 90%

4. Pea seeds should be treated with _____before sowing to protect its quality?
a) Fertilizers
b) Hot water
c) *RHIZOBIUM* culture
d) Not required

5. What you think that which is responsible for your higher crop yield?
a) Timely Irrigation
b) Use of balance fertilizers
c) Use of quality seeds
d) Cultural practices
e) All of these

6. Who insures good germination, rapid emergence, and vigorous growth?
a) Higher seed rate
b) Costly seeds
c) Quality seeds
d) Other factors

III. Processing & value addition:

1. Why raw produce is processed by companies?
a) To enhance its quality
b) To increase its shelf life
c) To make it hygiene in food
d) All of these

2. Do you know colour, taste and texture in the final product comes because of proper?

a) Addition of additive

b) Blanching

c) Washing

d) Processing

3. Why Sorting, grading and washing are done during peas processing?

a) Over & under mature pod seeds

b) Infected seeds

c) To get Desire seeds

d) All of these

4. Do you know pea processing, preservation techniques helps to make pea availability in a better quality throughout the year?

a) Yes

b) No

5. Do you know peas used in different recipes and products as its value addition?

a) Yes

b) No

6. Do you know processed peas are available in market as canned, cooked, soup, nutritional pea protein and ready to eat food etc?

a) Yes

b) No

VITA

Mohammad Aamir, the author of this manuscript, was born on 30 June, 1989 at Udham Singh Nagar, district of Uttarakhand. He had completed his High School and Intermediate examinations from Uttarakhand Board in 2007 and 2009 respectively. Further, he took admission in the College of Agriculture, G. B. Pant University of Agriculture and Technology in 2010 batch and obtained Bachelor of Science (Agriculture) degree in June, 2014. Therefore, clearing the CMAT examination he got selected at College of Agribusiness Management, G. B. Pant University of Agriculture and Technology. He has successfully completed his summer training with Kasturi Feed & Allied Industries.

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