CHAPTER – 1

INTRODUCTION

1. Introduction

The food processing sector in India is increasingly seen as a potential source for driving rural economy as it brings synergy between industry and agriculture. A developed food processing sector will be instrumental in increasing the farm prices translating into amplified rural incomes, reduced wastages, ensure value addition, promote crop diversification, generate employment opportunities as well as export earnings. With such a large and diversified production base coupled with low manpower cost and modern technology, the Indian food processing sector is poised for growth, if the advantages are leveraged optimally (MOFPI 2011-12).

Agriculture is an important sector in the Indian economy, accounting for about 18 percentage (%) of the gross domestic product (GDP), employing nearly 60% of the total Indian work force directly or indirectly. The down side of the agriculture sector is large amount of wastages of the farm produce like fruits, vegetables, food grains etc. The reasons for high wastages are twofold, first, lack of appropriate and adequate storage facilities and second, low levels of food processing capacity. Processing of fruits and vegetables is just 2%, which is quite low by international standards as processing of agriculture produce is around 30% in Thailand, 40% in China, 70% in Brazil, 78% in the Philippines and 80% in Malaysia.

The focus on food processing sector, which is just one link in the multi tiered food supply chain is justified by the fact that it has big potential to reduce agri wastages, provide food security to society and easy to use food for working professionals. The scope of ready to cook vegetables, soups, juices, meat, bakery items and cooking ingredients like garlic, ginger, onion pastes and packed spices has increased many folds. All these are due to economic prosperity and the need for ready to cook products.

The food processing has tremendous export potential, enabling the farmer and food processors to add value to produce both in terms of quality and quantity. They can adhere to the requirements and standards of the market at all stages of value chain,
cultivation, harvesting, storage, processing, distribution and retail. It can create rural supply chain infrastructure in terms of creation of cold chain, warehousing, food parks etc. near the farmland. Transportation, warehousing, logistics and information technology are other very important enablers for the various activities of the process food industry.

The rapid growth and immense capability of the information technology has brought new ways of dealing with conventional supply chain problems. Its role in the evolution of supply chains has already been recognized in the literature (Lancioni, Smith and Oliva, 2000). A primary benefit of information technology (IT) is more efficient way of exchanging information and data, which results in supply chain coordination, and facilitation of logistics activities. Furthermore, significant cost reduction opportunities are created, as a result of the improved supply chain coordination. Finally, another direct benefit is the expansion of target markets and the mass promotion opportunities. Most of the aforementioned benefits have also been recognized in the agri-food context.

The global packed food retail value is (United States of Americas’ dollars) US$1.95 trillion and expected to reach at US$2.14 trillion in 2015 (Euro Monitor, 2010). As per a study conducted by McKinsey and Confederation of Indian Industry (CII), the turnover of the total Indian food market is approximately ₹250,000 crores (US $ 69.4 billion) out of which value-added food products comprise ₹80,000 crores (US $ 22.2 billion) in 2012 (CII, 2012). It has grown from US$ 15 billion in 2008 to US$ 17 i.e. 14.4% growth in 2009 (Report on Packed Food in India, 2011). The processed food sector contribution to GDP of India was ₹44355 crores in 2004-05 and it has grown to ₹66078 crores in 2009-10 in absolute terms. The percentage growth is 25.77% over 2004-05 (MOFPI 2011-12).

The above discussions indicate that the processed food sector is very important for any economy as on one side it helps in ensuring food security and on other hand it helps to reduce the wastages. The value added by processed food sector (PFS) helps to increase the income to the farmers and make available food products throughout the year and in all geographies. Due to the changes in the demography, the demand of processed food is expected to rise. Nuclear families, working women and high disposable income are the drivers to boost the demand provided the sector is able to provide quality products in the local markets.
1.1 Key Issues in the Growth of PFS

The Government initiative to cut the excise duty on refrigerated vehicle led to a drastic improvement in the supply chain network and cold chain facilities in India. In 2010, the Global Cold Chain Alliance came to India to explore opportunities for development of cold chains. State Governments like West Bengal initiated plans to establish cold storage facilities in order to assist both agriculture and frozen processed food. Initiatives are also being taken in the areas of food quality and food safety. In 2006, by an act, Government established Food Safety Standards Authority of India (FSSAI) and also implemented Hazard Analysis Critical Control Point (HACCP) (FASSI, 2011). Inspite of these and many other initiatives by the Government and food processing industry, following are the key issues effecting the growth of processed food sector in India

a. Improper primary processing, storage and distribution
b. Agriculture Produce Marketing Committee (APMC) Act dependence
c. Inadequate link between production and processing because of lack of desirable varieties
d. Seasonality of operation and low capacity utilization, Inadequate focus on quality and safety standards
e. Lack of new product development
f. Supply chain gaps

1.2 Key Issues in Supply Chain Management of PFS

Process food sector is highly sensitive to quality, availability, preferences and choices of the consumer. To be successful, different players namely Government, Industry, organization, regulatory agencies etc. have to play a proactive role. Further, efforts need to be done right from farming to end consumer through harvesting, storage, processing, distribution and retailing. In all these stages, out of several issues, the critical issues identified and studied are quality, safety and standards, logistics, cold chains and information technology.
1.2.1 Food Quality and Food Safety

Food supply chains (FSCs) require quality, health and safety as central consideration. The scope of the food supply chain encompasses several parts, extending from the production of the raw materials, through processing and distribution, to the customer. It includes food processing factories, commercial supply chains of wholesalers, retailers, food service restaurants and trading services. Therefore, FSCs play a critical role within the food industry network, on the manufacturer's, wholesaler's and retailer's side in making safe food (Faccio et al., 2013). The food quality activities thus need to be initiated right from farm stage including fertilizer and irrigation and upto the consumer.

With consumers placing more trust in the food actors and institutions involved in the food supply chain, they are more likely to have trust in food safety (Chen, 2008). Individuals differ in the extent to which they trust the actors and institutions involved in the food supply chain, such as the transportation system, the local food supply system, and the regulatory institutions. From production to consumption and throughout the entire supply chain, there are many food safety approaches taken by stakeholders along with the development of food safety systems (FSSs) in the last decade. While hazard analysis and critical control point (HACCP) is the basic principle used in FSSs to specify the level at which food safety precautions are implemented, the ISO 22000, ISO 9001, International Food Standard (IFS), and the British Retail Consortium (BRC) are also often followed worldwide. As a result of mentioned changes the growing importance of food quality and safety standards in international markets are influencing production and marketing conditions of farmers’ worldwide (Handschuch et al., 2013).

1.2.2 Cold Chain

The main challenge of the SCM in PFS is short shelf life of the perishable goods. Perishable goods refer to products that have short life cycle and required to be stored, transported and distributed in special conditions. This gives rise to the concept of cold chain management (CCM). The CCM is referring to time and temperature control of perishable products. CCM manages activities related to perishable food products like dairy, fruits & vegetables, mushrooms, meat etc. (Rediers et al., 2009; Montanari, 2008; Samant et al., 2007; Xia, 2007). A step further an optimal temperature monitoring is a prerequisite for cold chain management. It is useful for the reduction of food waste.
and economic losses (Raab et al. 2011). The CCM has numerous activities usually spread over multiple functions across various organizations for various time horizons. Processed food products have many features that set them apart from a typical supply chain management (SCM). Some of these features include shelf life limitations, seasonality, production facilities and equipments like refrigerated transportation requirements, refrigerated storage, depot, traceability, quality and safety of product (Aramyan et al., 2007; Mangina and Vlachos, 2005, Shabani et al. 2011). Hence, monitoring all stages of the cold chain (CC) is required. Otherwise, the consequences are vitiating, toxicities, environmental and operational dangers, and wastes (Kuo and Chen, 2010; Rediers et al., 2009).

1.2.3 Food Distribution, Traceability, RFID and Information Technology for PFS

During current modern era, the consumers have the privilege to consume food products sourced from diverse locations. Production and distribution patterns have become much more complex than was common even 30 years ago. The consumer preferences have evolved to include specialist foods and all type of food products round the year (Skees et al., 2001). Traceability is defined as the ability to trace the history, application or location of that which is under consideration (ISO, 2000). It is the ability to trace and follow a food, feed or food-producing animal or substance intended to be or expected to be incorporated into a food or feed through all stages of production, processing and distribution (EU, 2002). Basil et al. (2012) had identified key drivers for improving traceability such as efficient traceability could be supported by national policies towards supply chain transparency, due diligence, consumer safety and produce quality consolidation. There is no requirement to record either transformations of the traceable units that take place within a company or to have internal traceability systems. Transformations in the food sector, especially mixing, have been shown to be important points of information loss (Donnelly, Karlsen and Olsen, 2009, Barbosa et al. 2010).

The increasing need for industry standards so that multiple information technology (IT) solutions can be provided with systems that can talk to each other among food chain members (Senneset et al., 2007). Each day, more than 14 million customers shop at Wal-Mart store and there are more than 1.3 million employees worldwide. To keep its competitiveness level intact, Wal-Mart needs to transport and track products efficiently. With the recognition of the potential benefits that RFID could bring to the company, it
is required that top 100 suppliers to put tags on their products. Although these RFID mandates intensified a love-hate relationship between the retailer and its suppliers, the implementation was successful (Roh et al., 2009). RFID system is the most cutting edge technology for supply chain integrity and traceability (Kumar and Budin, 2006, Mehrjerdi, 2011). Mehrjerdi (2013) said that RFID is a technology whose full benefits are not being percolated down to all industries yet. It will bring a good opportunity for improving supply chain efficiency and to enhance the profitability level of the organization.

1.2.4 Performance Management System

Interest in performance measurement and management has increased notably in the last 20 years. It is crucial to notice that over a period of time there is a shift of focus from measuring performance from financial perspective to non-financial perspective (Taticchi et al., 2010). Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action. It is the periodic measurement of progress toward explicit short-run, long-run objectives and the reporting of the results to decision makers in an attempt to improve program performance (Neely et al., 1995). Robert Kaplan and David Norton developed the balanced scorecard in 1990. The effectiveness of the performance measurement system (PMS) depends on issues like how systematically data are collected, in what way inter-relationships among objectives and measures are understood and how these objectives are correlated to the mission and vision of organisation. Therefore, one can understand that supply chain performance is concerned with managing dependencies between various supply chain members and the joint efforts of all supply chain members to achieve mutually defined goals (Charan, 2013).

1.3 Strengths, Weaknesses, Opportunities and Threats Analysis of Processed Food Sector

Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is a strategic-level analysis. It is a method of analyzing a business, its resources and its environment. Strengths and weaknesses are positive and negative internal factors whereas opportunities and threats are external factors. Strengths typically represent the internal strong points of an organization and these are the things companies do well over their
competitors so that they would find it difficult to emulate. Weaknesses are the factors which do not meet the standards we feel they should meet. Opportunities are presented by the environment within which our organizations operate. Opportunities may arise from market, competition, industry/government and technology. Threats are those factors which can put in danger the survival of the organization but if recognized on time they can become opportunities (Antony, 2012). It provides a mechanism to systematically find out the extent to which the company can cope with its ambient environment. A SWOT analysis is generally associated with strategic planning, in which strengths and weaknesses are associated with the internal environment of an organization and opportunities and threats generally related with the external environment (Agarwal et al., 2012).

The SWOT exercise is performed on Indian processed food sector with respect to its present status in India. It is illustrated in table 1.1. It is further reiterating the importance of PFSCM in India.

Table 1.1 SWOT Analysis to Illustrates the Importance of PFS in India

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>• Abundance of raw material</td>
<td>• Inadequate infrastructural facilities</td>
</tr>
<tr>
<td>• Priority sector status for agro-processing by Government of India</td>
<td>• Inadequate quality control and testing methods as compared to international standards</td>
</tr>
<tr>
<td>• Titanic network of manufacturing facilities</td>
<td>• Inefficient SCM due to intermediaries</td>
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<tr>
<td>• Huge domestic market</td>
<td>• High requirement of working capital</td>
</tr>
<tr>
<td></td>
<td>• Inadequate R&amp;D</td>
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<td></td>
<td>• Seasonality of raw material</td>
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<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Large crop and material offering potential for processed food sector</td>
<td>• Affordability and cultural preferences of fresh food</td>
</tr>
<tr>
<td>• Setting of Special Economic Zone (SEZ) and food parks</td>
<td>• Competition from big global players</td>
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<tr>
<td>• Rising income and changing consumption habits</td>
<td>• Trade barriers by importing countries</td>
</tr>
<tr>
<td>• Opening of global markets</td>
<td>• Agri produce highly dependent upon rain for irrigation</td>
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This SWOT analysis indicates that processed food sector’s strengths and opportunities outperform the sectors weakness and threats. It illustrates that PFS has huge potential for growth in future.

1.4 Objectives of the Study

a) To identify the key issues related to PFS
b) To determine the relative importance of key issues
c) To study the quality and food safety dimensions of PFS
d) To study the logistics issues related to PFS
e) To study the importance of IT in PFS
f) To identify the important matrices in PMS of PFS

1.5 Methodology

The present research work was carried out by deploying four step methodology. The research was initiated with extensive review of literature on processed food supply chain management. The present research is a mix of qualitative and empirical research. The qualitative research is carried out through case studies on processed food sector. The empirical research is conducted through structured questionnaire. The collected data is filled in Statistical Package for Social Sciences (SPSS) version 21 for analysis. A systematic scheme of four step research methodology is depicted in figure 1.1.

![Figure 1.1 Four Steps Methodology of Research](image-url)
a) Literature review and interaction with practitioners and researchers in the area of PFS

b) Questionnaire based empirical study

c) Analysis of responses

1.6 Research Design

To collect data and information from targeted set of respondents a structured questionnaire was prepared. On the basis of discussion with professionals from corporate, food experts, academicians and literature review, a preliminary questionnaire was developed. The questionnaire was tested through first pilot testing with processed food sector experts and academia. The feedback was received on pilot tested questionnaire. The final questionnaire was developed through incorporating suggested, few changes in the use of terminology, in the sequencing and presentation of questions. The research questionnaire titled study on processed food sector in India. It has four parts, part A was on the processed food advantages, part B dealt with schemes to promote processed food sector by MOFPI, food quality and safety issues part C raised logistic issues, performance measures for processed food and part D on the profile of the respondents. The personal interviews were conducted with 252 experts in Delhi and national capital region (N.C.R). The respondents were asked to rate the intensity of each factor on a five-point likert scale (5-Strongly agree, 1-Strongly disagree). The respondents were selected from the directories available at All India Food Processors’ Association (AIFPA), Confederation of Indian Industries (CII), Associated Chambers of Commerce and Industry of India (ASSOCHAM). The personal interviews were carried out during March 2011-April 2012.

1.7 Organization of Thesis

The thesis is organized in eight chapters. A brief outline of each chapter is given below and chapter plan in the thesis depicted in figure 1.2.

Chapter 1

Chapter 1 begins with an introduction of the processed food sector, its status in India and abroad, its importance for India and the major roadblocks in the growth of PFS in India.
Chapter 2

Chapter 2 provides an extensive review of literature on relevant aspects of processed food supply chain management (PFSCM). This chapter discusses the concept, importance of PFSCM, quality and food safety issues, cold chain management (CCM), use of IT to support logistics of perishable food items.

Chapter 3

This chapter deals in the research methodology used in carrying out research.

It discusses the process of questionnaire development, validation and analysis. It shed light on advantages, constraints and counter measures for growth of PFS in India.

Chapter 4

The chapter 4 presents crucial issues related to information technology and logistics management in the Indian processed food sector and role of integrated information technology and logistics management to enhance performance of PFS.

Chapter 5

Food safety issues in processed food were discussed in chapter 5. The chapter is dichotomized into two parts, the first part is on Global food safety: determinants are Codex Standards and WTO’s SPS food safety regulations and second part talks about the Indian PFSCM post millennium basin with WTO stand on food safety. In second part, the regression was run with equivalence to international standards as dependent variable and food safety objective, traceability, HACCP, harmonization in regard to WTO classification, and scientific justification in procurement as independent variables. Based upon the analysis of the results of hypothesis testing, various aspects of food safety discussed and inferred.

Chapter 6

The chapter 6 deals in three case studies of processed food sector. The first case study is of Indian frozen peas market and food processing technique used in case known as individual quick freezing technique. The second case study explains the implementation of Hazard Analysis and Critical Control Points (HACCP), food safety
controls and its status in India using a case study of Deli Processed Food Products Ltd. The third case study is built on situation-actor-process (SAP), learning-action-performance (LAP) model which is an approach to analyze quantitative and qualitative issues of supply chain performance initiatives in a single model and its impact on the performance of the supply chain.

Chapter 7

Chapter 7 deals in the performance measurement system (PMS) for the processed food supply chain management. Quality, cost, flexibility, dependability and innovations are taken as five perspectives to measure the performance of the Processed Food Supply Chain Management (PFSCM). These perspectives represent an aggregation of the most common approach used in the study of performance management. A holistic PMS for PFSCM has been proposed.

Chapter 8

It summarizes the research on processed food supply chain management in the thesis. It briefly states the research findings, key insights from survey and major implications. This chapter concludes with the limitations of the present research work and also provides the direction for future research. The chapter plan is illustrated in figure 1.2.

1.8 Conclusion

In this chapter an over view of the processed food sector is presented to make a case for the research in this sector. The main motivation for the research is the need to reduce the wastages and made available a hygiene food throughout the year in all geographies. The chapter also identifies the objectives, methodology and the scope of the work. Chapter wise brief outline is also presented.
Figure 1.2 Chapter Plan in the Thesis