CHAPTER – 2

REVIEW OF LITERATURE ON PROCESSED FOOD SECTOR

2.1 Introduction

Food supply chain management has been one of the important areas to achieve food security and eliminate food shortages by reducing spoilage of food. It is evident by steep increase in practitioner and academic publications, conferences, professional development programs and university courses. The supply chain as discipline got attention in 1980’s. The previous studies had highlighted the fragmented nature of the supply chain management. These studies had also shown the relationship and impact on industrial economics, systems dynamics, marketing, purchasing and inter-organizational behavior. The scientific development of a coherent supply chain management discipline requires that advancements be made in the development of empirical and theoretical models to inform understanding of supply chain phenomena. As an illustration, the application of Forrester's (1961) industrial dynamics model applied to supply chains (Forrester Effect). Its value lies in the ability to aid understanding of the actions of materials across a supply chain and had provided a basis for further advancement of understanding supply chain dynamics (Sterman, 1989).

The term agri-food supply chains (ASC) has been coined to describe the activities from production to distribution that bring agricultural or horticultural products (Aramyan et al., 2006) from the farm to the table. In this chapter, an effort is made to introduce a new term processed food supply chain management (PFSCM). It can be utilize to study all the aspects of the supply chain management of processed food sector from agriculture grower to consumer. In this context a processed food can be defined as the food that has undergone some value addition. It may be first level, just cutting, cleaning with fresh water, packaging and marketing them under a brand name. The second level of processed food may be by converting fruits and vegetable into flakes, flavors, pulp, paste, frozen fruit, frozen vegetables and frozen meat. The
third level of processing can be extracting juices from fruits and vegetables, soups concentrate from vegetables like tomato, cauliflower, potato etc., ketchups from tomato, biscuits, namkeens (Indian snacks like peanuts, potato flicks etc.), snacks, noodles, ready to eat meals, coffee, tea bags, pasteurized milk, floured milk, probiotic milk as well as curd, yogurt of all kind and ice creams. At this point it is important to understand what differentiates agri supply chains (ASC) from general supply chain. ASC got importance due to its nature such as perishable nature of food products, temperature controlled SCM known as cold chain. Cold chain is capable to manage issues like food quality and food safety, seasonality and weather related variability. To understand more on PFSCM, intense and extensive literature review is being discussed on lines of the definition, importance of PFSCM, storage of perishables, cold chain management, use of IT as support to logistics, comparison of CCM with general supply chain management etc. It also includes comparison among three agri SCM before 1990’s, 1990-2000 and 2000 onwards in table 2.1.

2.2 Supply Chain Management

Simchi-Levi, et al. (2008) defined supply chain management (SCM) as a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores so that merchandise is produced and distributed in the right quantities, to the right locations and at the right time, in order to minimize system wide costs while satisfying service level requirements. The key feature of the current business environment is the idea that supply chains compete, not companies (Christopher, 1992). This implies the existence of a climate wherein holistic SCM is possible. Indeed an early move in this direction was proposed by Kraljic (1983), that is purchasing required to be seen from perspective of the wider supply chain. In other words, the selection of suppliers, the location of facilities and the choice of distribution channels should all be driven by the goal of enabling the marketing objectives of the organisation to be achieved.

In the ideal world, supply chains would be designed from the customer backwards rather than the conventional approach which tends to be from the factory outwards (Christopher et al. 2006). Managing supply chains effectively is a complex and challenging task as a result of the continuing trends of expanding product variety, short product life cycles, increased outsourcing, globalization of businesses, and
continuous advances in information technology (Lee, 2002). In recent years, supply chain management (SCM) has grown in acceptance. The discipline that had a difficult time getting the attention of senior managers in firms now has representatives in the top echelons of most organizations (Lancioni, 2000, Ellinger et at. 2012).

2.2.1 Food Supply Chain Management

The term food supply chain management appears to be defined by various authors with little consensus. In 2008 Outlook published that food processing industry encompasses the chains of raw material supplies, processing machinery, know-how and packaging technology etc. In 1990, Christopher, define network of organizations that are involved, through upstream and downstream linkages in different processes and activities that produce value in the form of products and services in the hands of the ultimate customer. Zanoni and Zavanella (2012) identified different processes and activities that produce value in the form of products and services for consumers. Van Donk et al., (2008) defined food supply chain as the seamless flow of products and information from supplier to customer. Food chains are product specific and have their own characteristics. These characteristics often limit the possibilities for supply chain integration in food supply chains.

The sale of perishable goods is of vast importance for grocery retailers worldwide. Perishable products are also the main driver through which retailers are able to create competitive advantages to attract additional customers apart from pricing strategies (Thron, 2007). Many German food processors, for instance, show only very limited degrees of internationalization and have mainly entered markets characterized by geographical and cultural proximity. They have so far refrained from investing in more distant markets, for instance in Asia (Heyder et al., 2011). Transparency of a supply chain is the extent to which all its stakeholders have a shared understanding of and access to the product-related information that they request without loss, noise, delay and distortion (Deimel et al., 2008). In promoting and building strong food supply chains, companies need to understand the way competition is changing. Because of product proliferation (as a consequence of mass customization), future competitiveness will depend on effective participation in and control of global food supply chains. To be competitive, supply chain partners have to coordinate and share information. Integrated information systems are needed to accomplish (Hvolby et al., 2010). Food supply chains are deal withed with increasing consumer demands on food quality and safety.
The chains are considered to be composed of the actors in these networks which vertically work together to add value to customers. A chain is defined as the processes linking supplier and user companies, from the initial raw materials to the ultimate consumption of the finished product (Omta et al. (2001).

2.2.2 Sustainable Agri Supply chain Management

The agri supply chain network is compared among three phases i.e. before 1990s, 1990 to 2000 and 2000 onwards. There is shift in focus from making food available for subsistence level before 1990’s towards the higher degree of processing using advanced technology (demand driven) between 1990-2000. Where as from 2000 onwards, focus radically shifted towards food safety, cold chain, traceability and sustainable supply chain management. Welch and Mitchell (2000) had elaborated the food supply chain management (FSCM). It is illustrated in figure 2.1 and 2.2. Before1990, the food raw materials, which are mostly the products of plant and animal husbandry and fishing were consumed as fresh produce, processed into foodstuffs, or into ingredients for processing sector. A comparative of the supply chains is provided in table 2.1.

Figure 2.1 Agri Supply Chain Management before 1990

Figure 2.2 Agri Supply Chain Management during 1990-2000 (Welch and Mitchell, 2000)
A sustainable agri supply chain is depicted in figure 2.3

![Diagram of Sustainable Agri Supply Chain Management](image)

**Figure 2.3 Sustainable Agri Supply Chain Management**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Agri Supply Chain Management during</th>
<th>Sustainable Agri Supply Chain Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Food treated as commodity</td>
<td>Food commodity, partially turned to brand</td>
</tr>
<tr>
<td>2.</td>
<td>Followed traditional means of processing, storage etc.</td>
<td>New innovations in areas of processing, storage etc.</td>
</tr>
<tr>
<td>3.</td>
<td>Absence of cold chain</td>
<td>Adhoc cold chain practices</td>
</tr>
<tr>
<td>4.</td>
<td>No focus on food safety</td>
<td>Desired food safety</td>
</tr>
<tr>
<td>5.</td>
<td>Logistics management</td>
<td>Shift from logistics to ASCM</td>
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</table>
2.2.3 Sourcing of Agri Products for Food Supply Chain

The term food chain refers to the total supply process from agricultural production, harvest or slaughter, through primary production to storage and distribution to retail or use in catering and by end users. The large-scale empirical research on how food chain actors perceive and cope with uncertainty in the face of volatile agricultural markets remains scarce. How enterprises on the upstream and downstream stages of food value chains perceive risks, how they manage these risks and what this means for the adaptation of food chains to volatile markets have only rarely been analyzed (Zazie von Davier et al., 2010). The developing countries are experiencing a food system revolution, spurred by rapid urbanization, rising incomes, and market liberalization (Mergenthaler et al., 2009; Schipmann and Qaim, 2011; Reardon and Timmer, 2012). These trends may have important implications for agricultural and wider rural development. There may be direct gains in income that accrue to farmers participating in high-value markets (Rao and Qaim, 2013).

2.2.4 Food Processing and Manufacturing

Food crisis in India during 1960s forced the Government to adopt green revolution which helped in self-sufficiency in food and focus on improving the poor sections of the society. To improve the livelihood of the poor sections of the society, land ceiling act was enforced during 1972 with the aim is to provide land to landless farmers. It also limits the area of land held by a farmer. Focus on food processing industry started in 1991 after the economic reforms. Government allowed 100% foreign direct Investment (FDI) in food processing industry, export promotion incentives and other schemes to attract investments. However, investment in this sector has been very low in India. The Government has identified food and agro processing industry as one of the sunrise sectors that has high potential for domestic demand and export markets (Deloitte Report, 2009). The food industry has a clear view of consumer behavior. It is nonetheless constrained by highly structured external factors, the sourcing, pricing of raw materials, changes in consumer behavior, distribution channels, public health regulations and standards etc. Therefore, it seems essential that each group detail its strategy by explaining its development priorities, such as gain in market share, improved profitability, international development or development in high-potential countries, support provided for existing brands and acquisitions (KPMG, 2009). The
Indian food processing industry holds tremendous potential to grow, considering the still nascent levels of processing at present. Though India’s agricultural production base is reasonably strong, wastage of agricultural produce is sizeable. Processing of fruits and vegetables is a low 2%, around 35% in milk, 21% in meat and 6% in poultry products. By international comparison, these levels are significantly low. Processing of agriculture produce is around 30% in Thailand, 40% in China, 70% in Brazil, 78% in Philippines and 80% in Malaysia. Value addition to agriculture produce in India is just 20%, wastage is estimated to be valued at around ₹50,000 crores annually (MOFPI, 2012).

2.2.5 Food Distribution

Researchers have focused relatively early on the design of distribution systems considering the supply chain as a whole. Recent and comprehensive overview of models and approaches for the analysis of a distribution network elaborated and discussed by Nagy and Salhi (2007), Alumur et al. (2008), Melo et al. (2009) and Chen (2012). In order to achieve an overall optimal and integrated solution to the configuration of a distribution network, firms are facing another critical issue such as allocation points of demand or customers to their suppliers. This is performed through location-allocation problem (LAP) modelling. The strategic planning of the proper site of food processing facilities, regional and local distribution centres, in accordance with the geographical population density, might reduce transportation costs, inventory costs throughout the chain and link raw material and consumers in a sustainable way (Yu and Wang, 2006 and Bosona et al., 2011). The two main leverages and issues in warehousing systems are the design, involving layout and structural patterns specifically devoted to food products and the operations, dealing with the problem of allocation, assignment, routing, etc. Complete overview on methods and models to respond to warehousing systems criticalities are summarized by Manzini (2012).

2.2.6 Cold Chain Management

For temperature sensitive and perishable products logistics, a special type of supply chain management called cold chain management (CCM) has been established. Kuo et al. (2010) pointed that temperature monitoring and control are essential mechanisms in CCM because they are necessary for maintaining food safety and
quality. However, they are costly to logistics service providers. Smaller shipments and timely deliveries offer unique challenges when operating a cold chain. The equipment and processes used to carry, keep chilled and frozen foods in the right shape and quality intact is known as the cold chain. The cold chain is a physical process that dominates the logistics of the processed foods. Joshi et al. (2009) made an observation based on recent studies that a strong and dependable cold chain in developing economies does not exist. They identified poor infrastructure and too many intermediaries as the main inhibitors of CCM.

Montanari (2008) observed that mostly food products are perishable and their shelf life can be greatly affected by temperature conditions in the supply chain. It is because time/temperature control becomes a critical issue in fresh food logistics and the efficient as well as effective tracking of cold chain conditions is one of the main points to be addressed. Technical and managerial solutions are available in order to achieve this objective, but no methodologies exist to select the most suitable solution in order to minimize the logistics cost.

Temperature requirements vary among food items, whether frozen or chilled and they even differ across types of frozen foods. The integrity of the cold chain ought to be preserved from the point of production or processing, through each of the transport phases loading, unloading, handling and storage and extends to storage at the consuming household, restaurant and hotels. Major operational tasks from engineering as well as from sales and marketing point of view, include the need to monitor temperatures, install and maintain equipment, move products rapidly, plug in the refrigerated containers and keep the doors on cold storage units closed. The mechanics of the cold chain are an important component of supply chain management for chilled and frozen foods to focus only on the engineering aspects narrows the perspective on the networks that comprise the cold chain and the food businesses that rely on it. These tasks are required to be performed and ensured at distributors, retail levels by front line sales team. As a value-preserving mechanism, the cold chain is a necessary condition for trade in certain higher value foods. Modern food processing technology and transportation methods have enabled manufactures of food products to solve age old problems associated with storage and transporting perishable products (Sunder et al., 1990).
The robustness of the cold chain is very important as the distance travelled or time taken is uncertain. Bruckner et al. (2012) and Bogataj (2005) observed that any changes in time-distance or temperature in the chain could cause the net present value of the activities and their added value in the supply chain to be perturbed. In reality the perturbations can be robust. It is important to know the effects of these perturbations in a supply chain on the stability of perishable goods. These analyses are especially important to assure the stability of cold chains in the cold chains management (CCM). The formulation obtained in the time domain were compared with the formulation in the frequency space of the complete logistic chain, where location and distance between the activity cells of logistic chain play an important role.

Joshi et al. (2011) used Delphi-AHP-TOPSIS approach to select the best strategy for monitoring the performance of a cold chain. They used seven criteria namely cost, return on investment, innovativeness, quality, service level, traceability and relations. For each criterion, sub criteria are also identified. Use of radio frequency identify device (RFID) and global positioning system (GPS) are selected as the best method of performance monitoring. A supply chain of perishable items is referred to as a cold chain. A cold chain protects a wide variety of food, pharmaceutical, and chemical products from degradation, improper exposure to temperature, humidity, light or particular contaminants to keep them frozen, chilled and fresh (Bishara, 2006). A comparison of PFSCM, CCM and general supply chain is presented in table 2.2.

2.2.7 Food Retailing

Global retail sales in the food and grocery sector are estimated at US$6,717 billion in 2011. The total has increased by 90% since 2001 (Euromonitor, 2012). The continuous growth in sales has become essential for the survival of food retailers. They have increased their power in vertical relationships with suppliers. In the search for sales growth food retailers have become more international. The emergence of large international firms has generated a change in the structure of the sector resulting in more market concentration and a greater sectoral capacity to influence consumption (Dawson, 2013). Major food retailers have developed ranges of product. They are controlled by the retailer. Customer loyalty can more easily be built on store brands than it can on manufacturer brands (Zentes, Morschett and Schramm-Klein 2011).
2.2.8 Logistics Management of Processed Food

Logistics integration, firms can have the potential benefits of vertical integration in terms of quality, dependability, planning and control and lower costs without having it in the physical sense (La Londe and Masters, 1994). Improved logistics integration between supply chain partners yields a number of operational benefits, including reduction in costs, lead time (Liu et al., 2005) and risks (Clemons et al., 2008) as well as improve-mint in sales, distribution, customer services and service levels (Seidmann and Sundararajan, 1997) and customer satisfaction (Kim, 2009). The typical issues involving SCM are the analysis, design and control of integrated logistic architectures. Supporting-decision methods and mathematical models can be adopted to tackle strategic issues (such as the proper site of the manufacturing facilities or the distribution centres), tactical issues (e.g. the determination of the flows of materials moved within the system and fulfilment decisions) or operational issues (e.g. vehicle routing and delivery scheduling as well as material handling and inventory) (Manzini, 2012a). Logistics plays an increasingly important role in FSCM, but this awareness must grow more and more to be shared between different actors in the chain (Manzini et al., 2013).

2.2.9 Food Quality and Food Safety

In cold chains, temperature conditions affect the risk potential, the shelf life and final quality of chilled products. The progress of predictive microbiology enables researchers to model food safety and quality by considering the effect of temperature, intrinsic characteristics and packaging environment (Montanari, 2008). The cold storage or low temperature of fresh products is essential because it can minimize the risk of food-borne illnesses, maintain optimal quality by reducing several physiological activities and reduce the growth rate of spoilage microorganisms (Rediers, Claes, Peeters and Willems, 2009). Customers expect that the products they order can be received in safe, fresh conditions and on time. Any temperature changes during the logistics process may cause loss of flavor or even spoilage.

According to Manning et al. (2006), a food safety management system would include the following pre-requisites programmes:
Product specifications
- Standard operation procedures (SOP)
- Personal hygiene programmes
- Premises hygiene programmes and waste control procedures
- Equipment control and site maintenance procedures
- Reputable suppliers and supplier approval and raw material inspection procedures
- Pest control programmes
- Water quality
- Calibration and training programmes

It is well known that temperature is an important parameter in food safety and quality (Montanari, 2008; Ovca & Jevšnik, 2008). Supply chain integration is widely considered by both practitioners and researchers a vital contributor to supply chain performance. The two key flows in such relationships are material and information. Previous studies have addressed information integration and material (logistics) integration in separate studies (Prajogo et al., 2012).

Saltini and Akkerman (2012) mentioned that only in Europe food borne illness affects about 1% of population (approximately seven million people) each year. Only in 2011, approximately 16.7% of population (47.8 million people) got sick in America in relation to food related illness (Resende-Filho et al., 2012). The contemporary food supply chain (FSC) should adequately provide information that consumers and other concerned bodies need to know such as variety of the food attributes, country of origin, animal welfare, and genetic engineering related issues. For this, effective food traceability system (FTS) is important (Bosona et al., 2013).

In food quality, contamination is a big challenge. FASSI (2012) had seen the issue of contamination from two perspectives (a) accidental contamination (where education, standards development and certification and infrastructure investment would help with prevention efforts) and (b) intentional contamination (fraud and adulteration), for which monitoring, traceability, and information sharing might discourage opportunism.

A number of examples are cited and advice for the way forward includes approaches at the global, national and local levels. To improve the system following recommendations are included such as improve local enforcement, private certification
of suppliers, monitoring, traceability, education, information sharing at all levels, expanding both public sector and private use of risk analysis, expanding the reach of the European Union rapid alert system, improved communication and oversight (including border inspection) and maintaining strong private accountability for contamination.

Rong et al. (2011) integrated food quality in decision-making with production and distribution in a food supply chain. Fotopoulos et al. (2011) identified and priorities using Pareto analysis the inhibitors in the implementation of HACCP. It is given in table 2.2.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Inhibitors in the implementation of HACCP</th>
<th>S.No</th>
<th>Inhibitors in the implementation of HACCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limited Knowledge</td>
<td>17</td>
<td>To increase the reputation of the company</td>
</tr>
<tr>
<td>2</td>
<td>Skills and commitment to food safety by employees</td>
<td>18</td>
<td>Difficulties in verification and validation of HACCP plan</td>
</tr>
<tr>
<td>3</td>
<td>Resistance to change and attitudes of employees</td>
<td>19</td>
<td>To improve competence</td>
</tr>
<tr>
<td>4</td>
<td>Increased financial resources</td>
<td>20</td>
<td>To expand foreign markets</td>
</tr>
<tr>
<td>5</td>
<td>Lack of employee training</td>
<td>21</td>
<td>To reduce cost</td>
</tr>
<tr>
<td>6</td>
<td>Length of time to develop and Implement HACCP</td>
<td>22</td>
<td>To obtain other third party accreditations</td>
</tr>
<tr>
<td>7</td>
<td>Lack of technical expertise and support</td>
<td>23</td>
<td>To obtain a leadership position</td>
</tr>
<tr>
<td>8</td>
<td>Need to satisfy stakeholders customers</td>
<td>24</td>
<td>Insufficient planning</td>
</tr>
<tr>
<td>9</td>
<td>Low availability of human resources</td>
<td>25</td>
<td>To improve profit margins</td>
</tr>
<tr>
<td>10</td>
<td>Excessive paperwork and documentation of HACCP</td>
<td>26</td>
<td>To improve product quality</td>
</tr>
<tr>
<td>11</td>
<td>Improper organizational infrastructure and prerequisite programs</td>
<td>27</td>
<td>Media pressure</td>
</tr>
<tr>
<td>12</td>
<td>Difficulties related to production technology and design</td>
<td>28</td>
<td>Inappropriate company suppliers</td>
</tr>
<tr>
<td>13</td>
<td>Difficulties related to product type</td>
<td>29</td>
<td>To reduce waste</td>
</tr>
<tr>
<td>14</td>
<td>Small company size</td>
<td>30</td>
<td>To reduce customer complaints</td>
</tr>
<tr>
<td>15</td>
<td>Legal requirements</td>
<td>31</td>
<td>Lack of suitable physical conditions in the company</td>
</tr>
<tr>
<td>16</td>
<td>Lack of support from government and authorities</td>
<td>32</td>
<td>Poor reliability of certification bodies</td>
</tr>
</tbody>
</table>
2.2.10 Traceability in Food Supply Chain

International Standard Organisation (ISO) define traceability is the ability to trace the history, application or location of an entity by means of recorded identifications (Olsen and Aschan, 2010; Kelepouris et al., 2007; Karlsen et al., 2013). The definition of food traceability, forces that drive the implementation of food traceability, technological innovations, benefits of food traceability and barriers to the implementation of food traceability were investigated (Bosona et al., 2013). Food trade is one of the largest global businesses today and traceability throughout the food supply chains has gained considerable importance over the last few years (Thakur and Hurburgh, 2009). Requirements related to food safety, traceability and associated legislation and certification have increased a lot in recent years. Among these are the requirements for systematic recordings to be made throughout the supply chain so that in case of a food crisis it is possible to trace back to source of contamination and to perform a targeted recall of potentially affected food items. These systematic recordings must be connected to the food items through unique identifiers and the recordings, the identifiers and the documentation of how ingredients and food items join or split up as they move through the supply chain is what constitutes a traceability system. For the food industry, the traceability system is also an important tool for controlling and optimizing production for getting better industrial statistics and better decisions and for profiling desirable product characteristics. Current status is that many food producers have good, often electronic traceability systems internally, but exchange of information between the links in the supply chain is very time-consuming or difficult due to the diversity and proprietary nature of the respective internal systems (Storoy, 2013). Research into traceability systems covers a number of topics: traceability system development (Thakur and Hurburgh, 2009); traceability modelling (Thakur and Donnelly, 2010), operating mechanism and consumers perceptions of traceability system (Zhang et al., 2011). The specific research is being carried out on traceability in the product specific areas i.e. agri SCM, beef and cattle etc. (Feng et al., 2012).

2.2.11 Performance Management of Food Supply Chain

The balance score card (BSC) first appeared in the results of a research developed in 1990 by Kaplan and Norton (1992), involving many companies, moved by the
growing dissatisfaction with traditional financial measures as a sole measure for company’s performance. The BSC is a tool for aligning business activities to the vision and strategy of the organization, improving internal and external communications, and monitoring organization performance against strategic goals. It includes various performance indicators, namely customer perspective, internal-business processes, learning and growth and financials (Kaplan and Norton, 1993, 1996, 2001a, b). The BSC distinguishes four different perspectives of performance measures customer, Internal processes, learning and growth and financial. Li et al. (2009) found that supply chain integration is significantly related to supply chain performance. It has become apparent that in the near future the design and operation of food supply chains will be subject to more stringent regulations and closer monitoring, in particular those for products destined for human consumption. This implies that the traditional supply chain practices and the corresponding performance measurement should be subject to revision and change (Ahumada and Villalobos, 2009). In recent years, the development and implementation of performance measurement systems (PMSs) has become a growing focus of research interest across a wide range of topics and contexts. There are several comprehensive accounts of its development (e.g. Franco-Santos et al., 2007). As the subject evolves it is clear that research gaps still exist (Bititci et al. 2012), one of which being the dearth of systematic empirical research on the effective implementation of PMS (Nudurupati et al. 2011). Bourne (2001) was one of the first to examine PMS implementation. Six crucial factors were advocated to measure performance of an organization by Taylor and Taylor (2013) as follows, strategy formulation process, senior management leadership, organisational learning orientation, information systems support, strategy implementation process, quality management culture.

2.3 PFSCM Issues in Selected Countries

Australia

Australia’s food-processing industry does not seem to have a good record of performance. Output growth has been slow, competitiveness against imports weak and export growth relatively slow. This raises questions about whether there have been constraints that have impeded the ability of food-processing industries to attract investment capital for innovation-based growth in domestic and international markets.
It has been amply demonstrated that Australian manufacturing has an inward-looking focus and food-manufacturing industries are no exception (Ratnatunga, 1995).

China

Since attracting foreign direct investment (FDI) to agriculture is an important policy concern for the Chinese Government. It is necessary to develop benchmarks of the inward FDI performance. LV et al. (2010) had explored the determinants of FDI and evaluate the inward FDI performance in China’s agriculture. International retailers have been in China for more than ten years, during which period a series of profound changes has occurred in the Chinese retail sector. International retailers introduced advanced retail techniques and managerial approaches, domestic retailers grew more sophisticated in their supply chain management. Foreign-based retailers in China can compete in hypermarket and supercentre formats because they offer higher-quality products and achieve larger economies of scale. Domestic retailers compete by operating smaller formats and maintaining good relationships with governments and local communities (Hingley et al., 2009).

The purpose of research was to examine patterns of recent changes in China’s international export trade in vegetable products between 2001 and 2005 following China’s membership of the World Trade Organization (WTO) and to measure consequent changes in its export competitiveness. It also aims to consider infrastructural issues in relation to supply (Xue et al., 2009).

Switzerland

For the food industry, the depletion of arable land and a growing world population demand controlling the sustainability of agricultural inputs to the industry. Controlling the sustainability of these supplies means controlling the economic, social and environmental performance of the supply chain. In practice, little is known about how companies can efficiently extend their existing supply chain controls to cover these aspects (Hamprecht et al., 2005).

Japan

Childs had examined the Japanese food distribution channel structure with special emphasis on food wholesalers and food retailers. Reviews channel inefficiencies in
Japan with attention to historical development, regulations, consumer attitudes and food shopping behaviour, transportation and logistics, transportation alternatives, consolidation and new developments, distribution centers’ and information processing (Childs, 1997).

**United Kingdom (UK)**

Hollingsworth (2005) tried to study the impact of the competition commission’s report on the competitiveness of the UK food retail sector. Although the report found little evidence of monopolistic behaviour, the findings indicated both significance of buyer concentration and need for voluntary regulation. Recent developments are examined along with current research perspectives. This evidence suggests that not only will buyer power continue to concentrate in the hands of the major retail players but also further concentration and consolidation in the food retail sector will continue to take place.

**United States of America (USA)**

Explores’ the adoption of strategic planning techniques by agribusiness, specifically agricultural co-operatives. It offers implications for policy makers. A survey was conducted on a sample of 345 co-operatives listed in the US Department of Agriculture’s agricultural cooperative Service’s directory of farmer cooperatives. Co-operatives have widely adopted many of the sophisticated strategic planning techniques such as environmental analysis, core competences and SWOT analysis (Piercy et al., 1989). An analysis of the FAO’s food balance sheets for 2007 suggests that food waste in North America and Europe is roughly 95–115 kilograms (kg)/capita/year compared to 6–11 kg/capita/year in South/Southeast Asia and Sub-Saharan Africa (Gustavsson et al., 2011). Food losses can be qualitative, such as reduced nutrient value and undesirable changes to taste, texture, or color, or quantitative as measured by decreased weight or volume. Here, food loss is a subset of post-harvest losses (or post-production) and represents the edible amount of food available for human consumption but is not consumed. Food waste is a subset of food loss. According to Bloom (2010), food waste occurs when an edible item goes unconsumed as a result of human action or inaction and is often the result of a decision made farm-to-fork by businesses, governments, and individual consumers.
Definitions of food loss and waste are not universal worldwide. There is some movement to use a wider definition of food waste to frame the problem within a policy context (Buzby, 2012). Dutch Ministry of Economic Affairs, Agriculture, and Innovation more broadly defines food waste to include quality considerations and residual and waste flows in addition to the food loss analyzed here (Waarts et al., 2011).

**Philippines**

Jongwanich (2009) examines the impact of food safety standards on processed food exports in developing countries with special reference to Philippines by using a panel data econometric analysis of determinants of processed food exports. The sanitary and phytosanitary (SPS) is incorporated into the model to capture the impact of food safety standards. The empirical model suggested that imposing food safety standards by developed countries could impede processed food exports from developing countries. In fact, the SPS agreement by itself aims to facilitate trade between developed and developing countries by improving transparency, promoting harmonization and preventing the imposition of arbitrary food safety standards. However, the negative impact of food safety standard found in this could emerge first because during the implementation, SPS tends to be less transparent than tariff or quotas. There is an ample room for developed countries to tweak the standards stronger than necessary for achieving optimal levels of social protection and to twist the related testing and certification procedures to make their competing imports more competitive. Secondly, there are limited resources and manpower as well as institutional constraints for developing country exporters to overcome food safety standards.

**Thailand**

Salin et al. (2003), had examined that business relationships in the cold chain used for exporting food to new markets in developing countries. The American Potato Trade Alliance, a cross-network alliance that includes all levels of the value chain, is the subject of case study research involving participant observation and fieldwork in the Philippines and Thailand. Multinational restaurant companies
manage technical challenges in target markets with tight specifications and exclusive supply chains, while smaller firms use extensive networks to supply imported frozen potatoes.

Malaysia

The initial objective of the research was to examine the strategic approaches, processes and factors involved when food companies enter a foreign Asian market. The study focused on the South-East Asian Market, specifically Malaysia, given both the region's and the country's growing importance in world trade (Muthaly et al., 1999). The rationales for foreign MNCs investing in Malaysia are as follows:

a) Malaysian market demand for the goods
b) Vision of parent company and global expansion into the region
c) To use Malaysia as a window into the ASEAN
d) Malaysia's excellent infrastructure
e) Availability of educated, English speaking and good quality workforce
f) Corporate policy for investment in the region
g) Competitive cost of labour
h) Malaysia's growth potential in the region and Accessibility to raw materials
i) Low production costs
j) Malaysia's political stability

Brazil

Brazilian mango and grape exports to Europe has excellent potential. According to the Food and Agricultural Organisation (FAO) report on tropical fruits, the mango represents 36 per cent of tropical fruit production worldwide. Latin America is responsible for 17 per cent of world mango production and Brazil is the third largest mango producer (FAO, 2007). Almost 100 per cent of Brazilian mango and grape exports come from the Saõo Francisco region, located in the Brazilian Northeast. The European Union is the main destination for Brazilian mango and
grape exports, 90 per cent and 68 per cent respectively. The industrial concentration of the retail sector is one of the main events in the study about food chains. One of the outcomes of this industrial concentration is the increase of requirements (such as traceability and certificates) and suppliers have to make investments in order to meet those. It is well argue that retail suppliers are spread over different countries (de Castro Souza, 2012)

2.4 A Framework for the Categorisation of Literature

The grown interest in the food supply chain management is evident by steep increase in practitioner and academic publications, conferences, professional development programs and university courses. The present research also support the claim of sudden increase in research articles on FSCM, but the research still resides in narrow functional silos such as cold chain, agri supply chain etc. Having recognized this gap in the knowledge base of FSCM and in order to develop a better understanding of the subject matter, a two way approach is adopted to fill the knowledge gap. Firstly, to craft a framework for the categorisation of literature linked to processed food supply chain management and to contribute in food research for the benefit of researchers, academicians and corporate. Secondly, to present a commentary of systematically selected, studied, analyzed research articles.

Processed food supply chain carries processed food (PF) using its network that comprises of farmers, food processors, manufactures, carrying and forwarding agents (C&F’s), distributors and retailers. The food items are transported by the channel members under controlled temperature conditions depending upon nature of products. To make definition more clear, table 2.3 is furnished, stating differences among processed food supply chain management, cold chain management and general supply chain management.
Table 2.3 Comparison of Various Types of Food Chains with General Supply Chain Management

<table>
<thead>
<tr>
<th>Processed Food Supply Chain Management (PFSCM)</th>
<th>Cold Supply Chain Management (CSCM)</th>
<th>General Supply Chain Management (GSCM)</th>
</tr>
</thead>
</table>
| • Processed food has three levels of processing.  
  • Level I, chopping, cleaning and packaging fresh fruits & vegetables and marketing them at +4 to +6 degree | • Specific temperature is required to maintain products quality.  
  • Dairy & its culture products like lassi, curd etc. at +4 to +6 degree.  
  • Ice creams at -22 to -24 degree  
  • Frozen items like vegetables & fruit and Meat at -18 degree | • Controlled temperature is not required, for items like Non eatables, consumer durable – electronic goods etc. |
| • Level II, Processed food developed by converting fruits and vegetable flakes, pulp, paste frozen fruit & vegetables, meat, poultry and fishery.  
  • It requires cold chain for PFSCM | • Require automated information system for success of Cold Chain.  
  • Cold chain includes condition and time along with transaction and location | • Connected through mostly manual information system: information of indent, dispatch order, payment terms, warehouse & delivery location & its status.  
  • Firms are realizing Importance of Modern MIS, therefore some automation is beginning |
| • Level III, The third level of processing can be juices, ketchups, biscuits, namkeens (Indian snacks like peanuts, potato ficks etc.), snacks, noodles, ready to eat meals, coffee, tea bags (under normal conditions), pasteurized milk, yogurt, ice creams(Cold Chain) | • If proper required temperature is not maintained then quality of product get & degraded where ever the cold chain breaks | • Continuous degradation in value right from the producer till final consumption |
| • PFSCM may or may not utilize the cold chain depending upon the nature of product under SCM.  
  • The dry products like bakery items, namkeens, by and large FMCG (fast moving consumer goods) do not require cold chain | • Refrigerated vehicles are mandatory for transportation, when struck in traffic jam require keeping the refrigeration system in a running state, which devour more cost.  
  • Different temperature is required for different products | • Less transportation cost as ordinary trucks, vehicles are used.  
  • Different products can be loaded based on the space available |
2.4.1 Food Supply Chain

A review of 100 research papers published in peer reviewed international journals on food supply chain is carried out. All these research articles were published during 1991 to 2012. They were randomly distributed across the world. The international journals were assessed through two major commercial databases such as Emerald and Science Direct (Elsevier). An initial key word search for articles containing term food supply chain (limited to citations and abstracts of periodicals) revealed that there were more than 35,635 articles present in both the databases. The key word search was subsequently limited to the exact phrase, processed food supply chain resulted into 8447 articles (as of October 2012). The quality of search was improved by limiting our search to peer-reviewed publications only in international journals. With this additional restriction, the number was reduced to 850. The research The prefaces, editorial notes, book reviews and interviews, in addition to any articles from magazines or industry publications were excluded from this set, leaving 620 usable articles. A comprehensive approach would require that all 620 articles be reviewed. Instead, statistical methods were used to generate a representative random sample. To be ninety percent confident of being correct to within \(0.1\) of the true proportion of all articles, a minimum sample size of articles was needed (Berenson and Levine, 1996). This sample was increased to 100 to reduce the probability of Type II error. Figure 2.4, depicts the process used for selection of research paper for analysis. The above mentioned systematic process was followed to classify the literature along salient conceptual and research methodological dimension. In order to achieve laid down objectives, it is necessary to explore the underlying phenomena and processes embodied within these contrasting yet complementary bodies of literature to develop a categorization encapsulating the evident processes and phenomena of interest to supply chain researchers (Glaser and Strauss, 1967). In order to develop the categorization, two categorization principles are followed:-

**Content-oriented principle:**

Research contributions have been categorized on the basis of their content.

**Methodology-oriented principle:**

It was based on the framework used by Ellram (1995) which categorized researches as primarily descriptive or prescriptive and empirically or conceptually based.

This was very helpful not only in developing categorization, but also in assessing gaps in current theories, methods and empirical results analyzed.
Figure 2.4 Process Used for Selection of Research Papers

- Time Period for selection of Research articles between 1991-2012
- Database Utilized Emerald – Elsevier
  - With Key term researched FSCM
  - Total Number of Articles 35635
- Key Word Processed Food supply chain to limit 8447 articles, further limiting the search to peer-reviewed to 850
- Editorial, book reviews, in addition to any articles from magazines were excluded leaving 620 articles
- Statistical methods were used to generate random sample at 90% confident, correct to within $^\pm 0.1$ of the true proportion of all articles sample increased to at 100 articles selected
- Select articles that utilized of following research designs Survey Methods, Case studies single or multiples, focus groups

Probable Outcome of Present Research

Gap Analysis

Significant findings

Future Research

34
2.4.2 Content Oriented Principle for Categorization

The main challenge is how to address the different aspects of networks and their analysis. For instance, one can classify literature on the basis of the operational processes. It deals with sourcing of agri supply chain, processing/manufacturing, planning and control, design, accounting, logistics of perishables, cold chain management, food safety etc. and on the basis of performance parameters like cost, time, quality, flexibility, service etc. (Cooper et al., 1997). A uni-dimensional approach to literature content enables to address level of analysis and the processes of supply chain management in a better manner.

The review is classified into three levels:

1. Dyadic level: It considers the two party relationships between supplier and manufacturer or manufacturer and distributor or retailer
2. Chain level: It encompasses a set of dyadic relationships including a supplier, a supplier's-supplier, a customer and a customer's customer
3. Network level: It concerns a network of operations (upstream/downstream or total/immediate)

The external chain of definition authored by Saunders (1995) followed and consequently, do not explore the internal food supply chain level of analysis. The figure 2.5, depicts the kind of research article on food reviewed e.g. dyadic, chain and network.

![Figure 2.5 Kind of Research Articles on Food Reviewed](chart.png)
The figure 2.5, illustrates that 12% of the research article belongs to dyadic level, chain level received 11% attention and the network level had received highly significant attention of researchers. It has received 77% attention of global food chain researchers.

The categorization scheme is shown in figure 2.6.

The first distinction is made between theoretical works which set out to provide explanations of cause and effect relationship, define for underlying propose, analytical concepts and empirical work which focuses on reporting practice. The second distinction is between prescriptive and descriptive work, highlighting the emphasis of the work on either proposing normative models or summarizing current practices. The concern has been to identify the theoretical foundations of food supply chain management in terms of its antecedents, but more importantly in terms of the development of food supply chain management theory, to identify and analyze the development of research into the management of food supply chains.

An observation is made that literature is dominated by theoretical descriptive studies to the tune of 50%. The empirical descriptive work has been also developed of the order of 34%.
In figure 2.7, classifying of literature is presented in four quadrants based on methodology adopted. The most significant findings have been the relative lack of prescriptive work in the area of food supply chain. The concern with the outcome is that literature work on food supply chain is primarily focused on theoretical-descriptive. There is a huge scope for future research on empirical and theoretical prescriptive form of research.

![Figure 2.7 Classifying Literature According to the Methodology Adopted](image)

### 2.5 Commentary of Research Papers

The refereed international journal articles on food supply chain management were reviewed. These were published from 1991 to 2012 depicted in figure 2.8. The wide range of research titles was published during the mentioned period on food supply chain. The favorite titles were on agriculture sourcing, manufacturing or processing, processed food supply chain networks, their exchange in terms of product, information, finance, services, logistics, food safety, channel of distribution, traceability, RFID, retailing and consumers etc.

![Figure 2.8 Year wise Publication of Research in International Journal](image)
The major reason for selecting 1991 as the starting year for research was that Indian economy got liberalized in 1991. From 1993 till 1999, it had been a constant trend in publications. The publications had begun to rise in 2000 onwards. There was a steep rise in publication from 2005 till 2012. The figure 2.9, has depicted that the most of publications happened with the British Food Journal 32%. There were 17% articles published in Supply Chain Management: An International Journal. The third most famous international journal emerged out to be Food Control 12%, followed by International Journal of Physical Distribution and Logistics Management with 9%, Food Policy 7%, Journal of Food Engineering 6% and International journal of production economics 5%. The rest of 12% articles were published in international journals such as Benchmarking: An International Journal, Trends in Food Science and Technology, International Journal of Productivity and Performance Management, Journal Expert Systems with Applications: An International Journal, International Journal of Food Microbiology, China Agricultural Economic Review, Asia Pacific Journal of Marketing and Logistics, Asia Pacific Journal of Marketing and Logistics and Journal of Small Business and Enterprise Development.


It is proposed to classify the research in processed food sector into following seven major broad areas such as fruits & vegetables, dairy sector, fast moving consumer goods (FMCG), grains and oilseeds, dietary products, meat & poultry and marine sector. The results are depicted in figure 2.11.

It is found that under broad categories of FSCM, the agriculture especially fruit & vegetable based processed food products studies published 26%, fruits alone 2% and vegetables 3%. The close to half of research articles were on cross-section 57% i.e. research articles related
to more than one processed food category like F&V, dairy, FMCG, meat & poultry, dietary products, grain & oil seeds. The meat and poultry products were studied around 8%, beef 4%, pork, sheep, lamb and poultry 1%. The marine sector was studied to the extent of 3%, e.g. fish 2% and rest of marine sector 1%.

Figure 2.9 Journal wise Classification
The dairy and FMCG sector got attention in terms of publications around 2%. The grains and oil seed and dietary products were researched 1%. The fishery sector has been neglected as it got 2% attention of researchers, even though this sector is promising for growth. Since ages it is a fragmented sector and operates by small fishermen (Peterson et al. 2000).

The poultry sector also had received only 1% attention from international researchers. The dairy and FMCG had gained only 2% publication. Therefore, there is huge potential for international research and publications in the broad categories of fishery, poultry, dairy, grain and oil seeds, FMCGs and dietary products. The dietary products are the future of PFSCM and in the years to come the researchers are expected to do research on these food categories.

In order to depict the contribution of global publication in international journals for the convenience sake we have illustrated six rings. Three are double rings and three single rings. The double rings are indicating clubbed regions like Western and Eastern Europe, Middle East and Africa and Asia Oceania. The respective contribution was as follows, Asia Pacific 16%, Asia Oceania 6%, Latin America 2%, North America 23%, Middle East & Africa 2%, Western Europe 46% and Eastern Europe 5% in figure 2.12.
Figure 2.11 Broad Research Categories of FSCM

Figure 2.12 Global Contributions of Authors in International Journals Publications on FSCM continentwises

Figure 2.13, shows the nation wise contribution of research in the FSCM, which reflects the country focus on the food supply chain research activities. The maximum contribution has been done by British authors 22%, followed by North American authors 15%, Australian
authors 6%, Canadian, Chinese and Netherland authors 5%, Finland, Italy, Norway, Taiwan, New Zealand and Indian authors 3%, Belgium, Denmark, Germany, Greece, Slovenia, Spain, Sweden and Switzerland 2%, rest of countries authors like Iran, Japan, Malaysia, Philippines, Poland, South Korea, Turkey and UAE had contributed 1% each.

The earth is divided into seven continents geographically. In order to depict the contribution of global publication in international journals for the convenience sake present chapter have illustrated six rings. Three are double ring and three single rings. The double rings are indicating clubbed regions like Western and Eastern Europe, Middle East and Africa and Asia Oceania.

![Bar Chart: Global Contributions of Authors in FSCM Research](image)

**Figure 2.13 Global Contributions of Authors in FSCM Research**

Under content orientation a uni-dimensional level view was followed and research papers were classified into three levels: dyadic, chain and network. It illustrates that articles were classified as 12% dyadic, 11% chain and 77% network level. In India and many other developing nations both poultry and marine sector is characterized by a large number of fish
farms. They are fragmented in nature (Peterson et al. 2000, Cunnigham 2001). The absence of well developed chains may also explain the lack of research. It highlights the need for research to be carried out in these sectors. The dairy sector was also neglected in FSCM literature. The highest numbers of articles were from F&V sector. The broad areas of processed food research have been presented in table 2.4.

Table 2.4 Research Themes of Processed Food Supply Chain

| Areas of Processed Food Research |
|---------------------------------|---------------------------------------------------------------|
| Sourcing                        | • Farmers cooperation’s  
• Growers/Supplier collaboration and Growers Market Assess  
• Agri Products Quality  
• Supplier selection  
• Contracts or Trust  
• Global procurement  
• Market sanctions, monitoring and vertical coordination within retailer-manufacturer relationships |
| Manufacturing or Processing     | • Meat, poultry, sea food processing  
• High pressure food processing  
• Consumers’ attitudes towards high pressure freezing of food  
• Techniques of Food Processing like IQF, Heating etc.  
• Effects of emerging food processing techniques  
• Categorizing genetically modified food products  
• Trends in food manufacturing and packaging  
• Exploratory framework of the role of inventory and warehousing in  
• Global SCM |
| Storage-and Warehousing         | • Cold Chain Management  
• Fruit and vegetable ripening chambers  
• Dimensional issues in agricultural warehouse designs  
• Centralized warehousing facilities  
• Features of storage and warehousing different geographies wise  
• Customer service: the distribution of seasonal food products |
| Distribution                    | • Third party distribution  
• Reducing the delivery lead time in a food distribution SME  
• Food Brokers in the Distribution Channel  
• Decision making of distributor channels centralized or decentralized  
• Geography wise research on distribution channels  
• Building alternative agro food network of distribution  
• Role of channels in promotion of food products  
• Retail history in the management context |
| Retail Management | • Retail Change and logistics case studies  
|                   | • International retail research  
|                   | • Developing a framework to improve retail category  
|                   | • Retail planning management  
|                   | • FDI in Retail  
|                   | • shelf replenishment with backroom monitoring in retail stores  
|                   | • Consumer Behavior studies on food |
| Consumers Behavior | • Factors influencing organic food purchase in various geographies  
|                   | • Monitoring consumer confidence food SCM  
|                   | • Demand-supply variation or price discrimination  
|                   | • Consumer demand for informative labeling of quality food and drink products  
|                   | • Impact of the Internet on consumers, online sales  
|                   | • role of food quality certification on consumers' food choices  
|                   | • World Trade Organization(WTO), Global Gap etc. observers on Food Safety |
| Food Safety, Observers | • Food Safety – Practices and Policies  
|                        | • The economics of food safety  
|                        | • Capacity Building: Harmonization and Achieving Food Safety  
|                        | • Ensuring Global Food Safety and HACCP  
|                        | • Food Safety initiatives geographies wise  
|                        | • Food safety: where from and where to ?  
|                        | • Traceability – Problem or Opportunity |
| IT and Traceability | • RFID-based traceability in the supply chain  
|                   | • Traceability as part of competitive strategy in the Food supply chain  
|                   | • Information asymmetry and traceability incentives for food  
|                   | • Business process reengineering of a supply chain and a traceability system  
|                   | • Electronically-enabled SCM  
|                   | • Information technology in agri FSCM  
|                   | • Supply chain management practices- Geographic Region wise |
| SCM and Logistics | • Performance measurement in agri supply chains  
|                   | • Value chain analysis  
|                   | • Challenges in Global food supply chains: vertical co-ordination  
|                   | • Collaborative practices in the logistics channel  
|                   | • Logistics behavior of small enterprises  
|                   | • logistics outsourcing in food supply chain networks  
|                   | • Logistics Transportation Vehicles systems  
|                   | • Multimodal transportation, logistics and the environment |
The respective contribution was as followed, Asia Pacific 16%, Asia Oceania 6%, Latin America 2%, North America 23%, Middle East & Africa 2%, Western Europe 46% and Eastern Europe 5%. The 69% of authors were from North America and Western Europe.

Figure 2.14. Peer Reviewed Articles Geographywise
The tools used in the FSCM research are presented in figure 2.15. FSCM, broadly utilized ten types of tools to perform research. The most favorite research tool emerged out to be qualitative research 35% followed by case study method 28%, descriptive statistics 11%, economic modeling 8%, ANOVA 7%, regression analysis, Pearson’s correlation 3% each, chi square, fuzzy logic 2% and logit regression 1%.

![Figure 2.15 Popular Research Tools in FSCM](image)

Figure 2.15 Popular Research Tools in FSCM

In figure 2.15, shows popular research tools used in most of FSCM, broadly there are ten types of tools being used to perform a research in food supply chain management. The most favorite research tool emerged out to be qualitative research 35% followed by case study method 28%, descriptive statistics 11%, economic modeling 8%, ANOVA 7%, regression analysis, Pearson’s correlation 3% each, chi square, fuzzy logic 2% and logit regression 1%.

2.6 Gap Analysis in Literature

Based on literature review, the major gaps identified are illustrated in table 2.5:
These gaps offered an opportunity for present research on processed food supply chain management. There is vast scope in this area due to the fact that processed food supply chain encompasses a wide range of activities, where integration reflects the reality of business activities. The effectiveness of processed food supply chain is highly dependent on technological inputs such as use of IT tools in support of logistics of PFSCM.

**Table 2.5 Key Identified Gaps in Literature**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Key Identified Gap</th>
<th>Another’s Contribution</th>
<th>Research to bridge gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Very few studies in Indian context. Most of them are in the developed countries like United States of America, Britain, and Australia etc. Therefore, processor had to conform to stringent legal standards, large retailers who dominated the food market at the end of the 20th century. Public health and related consumer needs have been central to these standards. The most of studies covering this matter are from outside Indian preview</td>
<td>Welch and Mitchell (2000)</td>
<td>A comprehensive empirical survey based study on Study of Supply Chain Management Practices of Indian Processed Food Industry has been conducted in present research, covers scope of food safety standards in India w.r.t. global food standards.</td>
</tr>
<tr>
<td>2.</td>
<td>Limited literature on application of IT in PFS and implementation of IT at grass route level for an effective PFSCM. A huge depositary of literature available on role of IT in supply chain in general not in case of processed food. Even though it is limited in discussions on its implication on one two issues of SCM i.e. strategies and top end techniques but not for entirely. The implementation of IT system at grass route level for an effective PFSCM has not received attention from researchers and practitioners.</td>
<td>Gunasekaran and Negi (2003)</td>
<td>A comprehensive empirical survey based study on Study of Supply Chain Management Practices of Indian Processed Food-Industry has been conducted in present research.</td>
</tr>
<tr>
<td>3.</td>
<td>Standalone studies on FSCM conducted mostly in foreign setting</td>
<td>Verbeke and Viaene, 1998</td>
<td>Therefore, the combination of empirical, case study and descriptive research planned and conducted presently to bridge research gap.</td>
</tr>
<tr>
<td>4.</td>
<td>Few studies on performance management system for PFS. Largely PMS requirement felt from metrics, tactical and functional. Because mainly three reasons such as lack of balanced approach, lack of understanding on deciding on number of metrics to used, lack of clear distinction among metrics at strategic, tactical and functional levels.</td>
<td>Gunasekaran et al., 2001</td>
<td>A empirically supported balanced score card was developed specially for processed food sector organizations in the present research work.</td>
</tr>
</tbody>
</table>
2.7 Conclusion

In this chapter a comprehensive review of literature was dealt with. The review has supported the claim of sudden increase in research articles on FSCM illustrated in figure 2.8. The research resides in narrow functional silos such as cold chain, agri supply chain etc. Having recognized this gap in the knowledge base of FSCM and in order to develop a better understanding of the subject matter, two way approach was adopted to fill the knowledge gap. Firstly, an attempt to craft a framework for the categorisation of literature linked to processed food supply chain management and to contribute in food research for the benefit of researchers, academicians and corporate. Secondly, to present a commentary of systematically selected, studied, analyzed research papers.