Supply Chain Management of Food Processing Industry in Manipur: Challenges and Perspectives

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ABSTRACT: The crisis of food and wastage has been reported remarkably from all over the world and several stakeholders are concentrating to overcome these issues locally and globally. About 30% of the total food produce in India alone is lost due to inadequate logistics. Certain gaps related with supply chain management have been identified as challenges. Some of the challenges faced by the Indian food processing industries include raw material, storage, transportation, technology, competeveness, etc. In Manipur context, raw material availability in near proximity, transportation in hilly terrains and competition with MNCs are major challenges often faced by the food processing industries. The ineffective supply chain management is responsible mainly for the food wastage from the source to consumption. In this regard, the researchers aimed to explore the present status of the supply chain management of food processing industry in Manipur, India. A total of 45 food processing units licensed under the Food Safety and Standards Authority of India (FSSAI) are considered for the study. The results are presented using simple statistics. Certain findings based on the results such as supply chain management players, information technology, market, raw materials, etc. are discussed in the paper.

I. INTRODUCTION

Food, the basic need for living beings should be delivered deliberately to all sections. The crisis of food and wastage have been reported remarkably from all over the world and several stakeholders are concentrating to overcome these issues locally and globally. The Food and Agriculture Organisation FAO) of the United Nations estimated that one third of the worldwide food production is wasted between farm to fork and it has a variety of causes, such as spillage or breakage, degradation during handling or transportation, and waste occurring during the distribution phase [11]. The quality of food is also degraded over the time and environmental conditions is another factor, both are influenced by the supply chain configurations for instance, packaging, way of loading, and the availability of temperature controlled packages, transportation and warehouses etc. [18]. In contradiction to this, the amount of food demand is increased as the population is growing [24]. According to United Nations' report on population, the world population is likely to increase around 8.5 billion within little more than a decade and almost 10 billion by 2050. UN has identified combat hunger and malnutrition as challenge for sustainable development goal [40] as one-third of the food produced for human consumption are lost or wasted; millions are going hungry [34]. Therefore, it is very important to reduce the amount of food wastes along the food supply chain.

In India, about 30 per cent of the total food produce is lost due to inadequate logistics [16]. Among the major challenges identified by the Ministry of Food Processing Industries (MoFPI) includes supply chain infra gaps and supply chain institutional gaps [38]. Another challenge is that the SMEs are not able to transport their products from one part of the country to other due to lack of infrastructure in terms of logistics [31]. At the same time, due to lack of proper adequate facilities, only 2% of the fresh fruits and vegetables produced in India can be stored in the warehouse [39].

Among the most politically disturbed state, Manipur is a state with poor road infrastructure. Such problem impacted to the community of entrepreneurs [32]. Among the major challenges highlighted by Department of Trade Commerce & Industries, Manipur (DTCIM) is locational disadvantages and transportation bottleneck are among them [10]. The problems are more worsening in food processing sector as the quality of food degrades over the time. For this reason, the researchers had chosen food processing industry in Manipur. The present study attempts to explore the present status of supply chain management players with reference to the food processing industry in Manipur.

The term 'supply chain' was first described in 1982 by Oliver and Webber as a 'network of organizations involved, through upstream and downstream linkages,

in the different processes and activities of production and services to reach the ultimate consumer' [5, 33].

SCM is defined as the management of the flow of materials, information, and funds, starting from suppliers to component producers, final assemblers and distributors (warehouses and retailers) and to the consumers [4]. It also includes the logistical flows, the customer order management and production processes and the information flows necessary to supervise [17].

The business community is becoming immensely competitive day by day and businesses are looking for new dimensions in order to get competitive advantages over others. The only ways to bring such advances are through management since it enhances the businesses. SCM is a vital part of management which role is making the material flow effective and efficient from source to the point of consumption. The success of industrial company depends on the interactions between the flow of information, materials, money, and manpower and capital equipment. In SCM, multiple firms, multiple business activities, and the coordination of other such activities across functions and across firms are involved [19]. In the supply chain network, different actors are involved which differs from one type of business to another. Hence, supply chain management of food processing has Food producer, Trader, Food processor, Caterer (hospitality), Retailer, Distributor, Wholesaler and Consumer as shown in Fig. 1 [6].
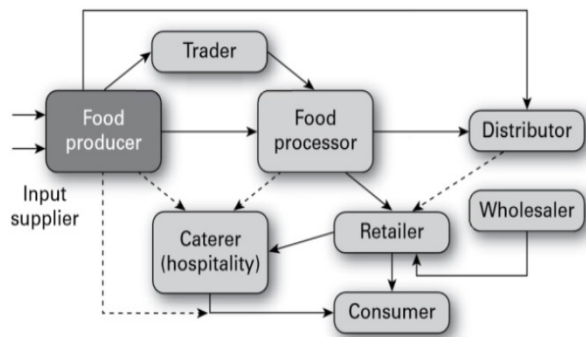

Fig. 1. Players in food supply chain management (adopted from [6]).

As far as supply chain of food processing is concerned, these actors in food supply chain can be studied as players since their role in the network can vary the effectiveness and efficiency of the particular unit in reaching the consumer which is the ultimate goal. For the study, we have chosen food producer, trader, food processor, retailer, wholesaler, distributor and consumer. Caterer (hospitality) and wholesaler has not been considered for the study as it has less evidence of involvement in the chain during the pilot survey conducted in 10 units which were comprised of beverages, bakeries and packaged foods. The food producer and trader have been treated as supplier. Further, the distributor and retailer are also considered as one entity in this study.

The studies relating to SCM of food processing industries had focus on many dimensions. It includes the supply chain design [37], SCM [7, 26], issues and challenges [28, 20, 9] classification of logistic

outsourcing levels and impacts on service performance [13], traceability [2, 36, 1], supply chain integration [22, 29], sustainability [12, 41], collaboration [8], information sharing [15], etc. However, these studies have no relevance with the food processing industry in Manipur. Therefore, the present study will address the present status of the SCM of food processing industry in Manipur in terms of challenges and perspectives.

II. METHODS

In the present study, the researchers considered 45 food processing units. The sample units are FSSAI registered and licensed food processing units in Manipur. FSSAI is the only licensing authority that governs the food products in India. The units are categorised as packaged foods, beverage and bakery according to the nature of the products for the study. In packaged foods, units which produce products such as pickles, value added dry fruits, ready to eat foods; indigenous foods, etc. are grouped. In beverage, packaged drinking water, juice, squashed, etc. are considered. And in bakery; biscuits, cakes, breads, cookies, etc. are considered. 15 units each from these three categories have selected for the study. The units were visited and competent authorities were interviewed using a scheduled prepared for the study. After the necessary primary data had been collected, the data were organised for analysis using simple statistics such as frequency and for analysing ranking Henry Garrett Ranking method was used. The following are the demographic profile of the sample units:
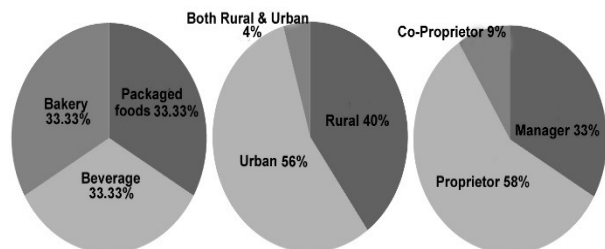

Fig. 2. Demographic profile of the units, location and respondents (source: Researcher's calculation).

III. RESULTS AND DISCUSSION

In the food processing industry, raw material sourcing and procurement are very important as many raw material items are mostly perishable and often inconvenient for transportation. For ensuring quality and consistency across the whole production platform, raw materials control programs must be designed for each supply chain [3]. The raw materials of food processing units in Manipur are mostly supplied by traders (64.4%). However, it depends on the categories such as packaged foods, beverage and bakery. The raw materials for packaged foods are mostly supplied by farmers and traders. But the raw materials for bakery are mostly supplied and procured from traders. The raw materials on the other hand are not supplied only by local suppliers (Table 2). It is observed that the units procure raw materials from the local as well as from other suppliers. But some of the units (35.6%) procure from local suppliers only.

Table 1: Raw material suppliers.

Food industry types	Farmers	Traders	Processors	Total
Packaged Foods	5	9	1	15
Beverage	4	6	5	15
Bakery	0	14	1	15
Total	**9**	**29**	**7**	**45**
Percentage	**20**	**64.4**	**15.6**	**100**

Source: Researcher's calculation

Table 2: Procurement of Raw Material from local suppliers

Food industry types	Yes	No	Total
Packaged Foods	7	8	15
Beverage	5	10	15
Bakery	4	11	15
Total	**16**	**29**	**45**
Percentage	**35.6**	**64.4**	**100**

The suppliers are not micro small enterprises in nature by business. More than half (i.e. 64.4%) of the suppliers are not micro small enterprises. Around 35.6% of the raw materials are supplied by micro small enterprises. This may be the reason of being that micro small suppliers are not reliable for long run of the business as they are small in nature of business.

Table 3: Suppliers are micro small enterprises

Food industry types	Yes	No	Total
Packaged Foods	6	9	15
Beverage	5	10	15
Bakery	5	10	15
Total	**16**	**29**	**45**
Percentage	**35.6**	**64.4**	**100**

All together 24 units (54.3%) out of 45 units of food processor units in Manipur have integrated distribution system for products. This is distributed equally across the three food processing sectors i.e. 8 packaged foods units, 9 beverage units and 7 bakery units. Generally, integrated distribution system help the units in covering wider area as well as in minimising the cost of transportation for raw material procurement and delivery of products.

Table 4: Integrated distribution system.

Food industry types	Yes	No	Total
Packaged Foods	8	7	15
Beverage	9	6	15
Bakery	7	8	15
Total	**24**	**21**	**45**
Percentage	**54.3**	**46.7**	**100**

The raw materials of 34 the units (75.6%) are mostly not perishable by nature. However, the raw materials of some units of packaged foods (7 units), beverage (3 units) and one unit of bakery are perishable. The packaged food units as mentioned earlier includes products such as pickles, value added dry fruits, ready to eat foods; indigenous foods, etc. of which some of the raw materials of this products are perishable. The raw material of beverage units which products includes juice is also perishable as they process fruits as raw materials.

Table 5: Raw Materials are perishable.

Food industry types	Yes	No	Total
Packaged Foods	7	8	15
Beverage	3	12	15
Bakery	1	14	15
Total	**11**	**34**	**45**
Percentage	**24.4**	**75.6**	**100**

Online marketing helps the firms in reducing the cost thereby benefiting the small-scale business with low budget [30]. The units do not partner with online marketers for wider distribution as well as for product awareness. A total of 84.4% of total units do not partner with online marketer. However, 6 packaged food units and 1 bakery unit partner with such marketer. For packaged foods, the life span is longer and has ease during transportation as compared to beverage and bakery which life span is short. Because of this reason, beverage and bakery do not prefer to partner with online marketers.

Table 6: Online marketing partner

Food industry types	Yes	No	Total
Packaged Foods	6	9	15
Beverage	0	15	15
Bakery	1	14	15
Total	**7**	**38**	**45**
Percentage	**15.6**	**84.4**	**100**

Exclusive retail outlets are equally important for showcasing the products as well as for sales. But 29 units (64.4%) do not have an exclusive retail outlet. Among this, beverage amounts to 14 units out of 15. In retail outlets, products are showcased as well as sold. For bakery it is very important to have such outlets and so as for packaged foods. However, for beverage, outlets don't seem suitable as it is evidenced from the study. Also, it can be mentioned that beverage has lesser number of product items as compared to packaged foods and bakery.

Table 7: Exclusive retail outlet.

Food industry types	Yes	No	Total
Packaged Foods	7	8	15
Beverage	1	14	15
Bakery	8	7	15
Total	**16**	**29**	**45**
Percentage	**35.6**	**64.4**	**100**

Food products are challenging in delivery as well as distribution since it is accompanied with a limited life span especially bakery products. Half of the units (i.e. 53.3%) can cover other districts of the state other than the districts where the units are located. Packaged foods may have conditions of preference and taste. But beverage and bakery unlike packaged foods can reach other districts. However, only 5 bakery units can reach other districts. This may be due to the reason that the other districts may have same products available. The beverage units on the other hand are covering other districts very well.

Table 8: District coverage.

Food industry types	Yes	No	Total
Packaged Foods	8	7	15
Beverage	11	4	15
Bakery	5	10	15
Total	**24**	**21**	**45**
Percentage	**53.3**	**46.7**	**100**

Reaching neighbouring state from a state like Manipur which is politically not stable as well as backward in road infrastructure is quite challenging. In such situation, marketing bakery products which has a short life span is not possible. Packaged foods (5 units out of 15) and one beverage are reaching other neighbouring state. These two have a longer life span than bakery products which are not at all reaching.

Table 9: Reach to neighbouring state.

Food industry types	Yes	No	Total
Packaged Foods	5	10	15
Beverage	1	14	15
Bakery	0	15	15
Total	**6**	**39**	**45**
Percentage	**13.3**	**86.7**	**100**

With the advancement of information technology, production units are also introducing and selling products over internet through web portals. However, the food processing units in Manipur are not so prone to adopt such technology. Only 4 out 45 units have own web portal. This may be due to lack of human resource to manage or lack of capital investment in such area.

Table 10: Own online portal.

Food industry types	Yes	No	Total
Packaged Foods	1	14	15
Beverage	2	13	15
Bakery	1	14	15
Total	**4**	**41**	**45**
Percentage	**8.9**	**91.1**	**100**

Packaging defects and expired products are often evidenced in the food industries and contribute to food wastage. Such items are often collected through reverse logistics and examined for better quality production and continuous improvement. A good reverse logistics practices can make a firm more competitive by reducing the customer's risk, resulting in reduced costs, increase revenues and help the firm be more agile [27]. 27 units have such reverse logistic facility to address such circumstances. These are mostly done by packaged foods (11 units) and bakery (11 units) as compared to beverage (5 units).

Table 11: Reverse logistics.

Food industry types	Yes	No	Total
Packaged Foods	11	4	15
Beverage	5	10	15
Bakery	11	4	15
Total	**27**	**18**	**45**
Percentage	**60**	**40**	**100**

Maximum of the units across the food industry ensure health safety while handling the products and during transportation as it may lead to defect of the product.

But 2 bakery units (Table 12 and 13) do not ensure such health safety and quality standard.

Table 12: Health safety.

Food industry types	Yes	No	Total
Packaged Foods	14	1	15
Beverage	14	1	15
Bakery	12	3	15
Total	**40**	**5**	**45**
Percentage	**88.9**	**11.1**	**100**

Table 13: Quality Standard.

Food industry types	Yes	No	Total
Packaged Foods	15	0	15
Beverage	15	0	15
Bakery	13	2	15
Total	**43**	**2**	**45**
Percentage	**95.6**	**4.4**	**100**

Production of semi-finished products is also often practiced by many manufacturing units to meet the demands and even act as a supplier. The food processing units in Manipur are not practicing well in this regard. Only 5 units out of the 45 units include semi-finished production. This may be due to lack of demand and storage facility or quality concern as it may affect the health of the products.

Table 14: Semi-finished production.

Food industry types	Yes	No	Total
Packaged Foods	3	12	15
Beverage	1	14	15
Bakery	1	14	15
Total	**5**	**40**	**45**
Percentage	**11.1**	**89.9**	**100**

To improve supply chain performance, it is necessary to implement effective information sharing at the executive level [42]. The use of information technology for demand and supply in the units are not satisfactory. A total of 23 units i.e. 51.1 % use technology for such, even though information technology is part and parcel of day-today life. On the other hand, for monitoring the traceability of the products, technology such as bar code, QR code, etc. which is printed on packs of the products are introduced and practiced by 8 units only (Table 16). Using such technology can ease transportation as well as sale by providing an effective inventory of the product. Traceability systems also maximize the production and distribution of safe or quality products thereby minimizing the potentials for bad publicity, liability, and recalls [1].

Table 15: Use of IT for demand & supply.

Food industry types	Yes	No	Total
Packaged Foods	11	4	15
Beverage	7	8	15
Bakery	5	10	15
Total	**23**	**22**	**45**
Percentage	**51.1**	**48.9**	**100**

Table 16: Monitoring the traceability.

Food industry types	Yes	No	Total
Packaged Foods	3	12	15
Beverage	4	11	15
Bakery	1	14	15
Total	**8**	**37**	**45**
Percentage	**17.8**	**82.2**	**100**

Firms can improve customer service and reduce costs by outsourcing multiple logistics functions to third party logistics service providers [25]. Outsourcing to third-party logistics service providers are practised for minimising the cost of transportation. If the logistics service of the unit stays idle, then unnecessary cost will be incurred. 25 units out of 45 units outsource its' transportation to third-party logistics service providers as a strategy to minimise cost of transportation and minimise the cost of administrative maintenance.

Table 17: Third party logistics.

Food industry types	Yes	No	Total
Packaged Foods	10	5	15
Beverage	8	7	15
Bakery	7	8	15
Total	**25**	**20**	**45**
Percentage	**55.6**	**44.4**	**100**

Suppliers are selected on the basis of certain criteria by the processor. The criteria often considered are mentioned in Table 18 below. After analysing the rankings provided by each respondents and further calculating the scores using Henry Garret Ranking method, the rankings are obtained. As observed in the table, it is found that quality of the raw material is given more emphasis followed by price of the raw material, reliability of the supplier, delivery capability of the supplier, etc. while selecting suppliers. However, joint decision should be taken while procuring raw materials as joint decision of buyers and vendors is more effective over independent decision [21].

Table 18: Supplier selection criterion.

Criteria	Score	Average score	Rank
Quality	3577	79.49	1
Price	3052	67.82	2
Reliable	2730	60.67	3
Delivery	2543	56.51	4
Long-term relationship	2397	53.27	5
Service	2151	47.80	6
Size	2055	45.67	7
Flexible	2027	45.04	8
Geographical proximity	2010	44.67	9
Personal relationship	1915	42.56	10
Economic dependence	1833	40.73	11
Confidence	1781	39.58	12
Information technology & services	1179	26.20	13

IV. CONCLUSION

The food processors in Manipur rely more on traders than other suppliers but depends on the food industry i.e. packaged food, beverage or bakery. Procuring raw materials from traders are more convenient than other sources such as farmers. However, vertical coordination should be adopted as it has improved market access in perishables fruits and vegetables [23] and joint decision should be taken [21]. The local suppliers neither micro nor small business are the only source of raw materials. But not all the raw materials are perishable. The units have integrated distribution system and do not partner with online marketers. But some of the packaged food processors partnered with such marketers. The reason may be the demand through such marketers and life span of the products. Only one-third of the food processors have exclusive retail outlets. But these are mostly packaged food processors and bakery. Literally, bakery needs such outlets for the purpose of showcasing and sales. However, transactional cost should be reduced by reducing the influence of intermediaries and improving connectivity [23]. Not all the units can cover other districts of the state, but few packaged foods can reach neighbouring state. As mentioned earlier, packaged food has more life span and demand over other products.

The use of Information Technology (IT) are known to many [14], but these units are not adopting such culture of having own online portal for sales or promotion. However, not only for demand and supply of products but also for monitoring the traceability of products, some units are relying on IT. Considering the health and quality of the products, most of these units maintained the standard. More than half of the units are minimizing the cost of transportation by outsourcing to other third party logistics service providers. But this is not suitable for long run as they are not dedicated specifically for a particular unit. Semi-finished items are also not produced by these units. This may be due to inconveniences for the producers as well as consumers which also has impact on health and quality standard of the products. For the purpose of supplier selection by the units, criteria such as quality and price are given more importance. These two criteria are important as without quality raw materials, production of quality products is impossible. On the other hand, even if the quality is good and the price is very high then it will also be difficult to market the product.

From the above findings, it can be mentioned that traders are main source of raw materials and distribution are mainly done by the processors except for some processors which have retail outlets and others which partnered with other marketers. Overall, the present status of food processing industry in Manipur needs to be developed for future course. Contract suppliers/ farmers are not introduced by the processors. This may benefit both the processors and farmers. Traders being a middle-men charge unnecessary cost to raw materials which may lead to increase in the price of the product. According to the economic times, 566 million internet users are in India as on March, 2019 [14]. Introducing products in internet through different medium may also improve the sales as well as awareness. At the same time, food products have less life span as compared to other non-food products. Using information technology will allow products move faster and to the right place at the right time. An improved wide coverage of food network is important for quality food delivery ensuring health safety to all. All the varieties of foods are not equally available and it varies from place to place. But for healthy lifestyle, human needs to consume a variety of food. Such varieties can be delivered to different places after properly processed through a proper supply chain. Effective Supply chain management should be responsible for delivering the quality products to the consumers at the fastest possible manner and at the minimum possible prices.

V. FUTURE SCOPE

The problem of less market coverage is evidenced from the present study. The logistics of the units need to study further to improve the supply chain performance. The supply chain management practice of the units along with the logistics should be studied for overall improvement of the performance of the food processing industry.

Conflict of Interest. The paper does not have any conflict of interest and it is the original study of the researchers.

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