

# **An Empirical Investigation of Inventory Management Practices of Processed Food Supply Chain in Sri Lanka-Manufacturer's Perspective: A Case Study**

**Harishani L. Liyanage**  
**Department of Transport and Logistics Management**  
**University of Moratuwa, Colombo, 10400, Sri Lanka**

## **Abstract**

In today's highly competitive business world demand for processed food is becoming popular among the Sri Lankan society, therefore proper management of the processed food supply chain is vitally important. It is argued that the final resort for any supply chain is the proper management of the inventory among the players within the chain. Less number of research has been conducted about inventory management practices and the issues within Sri Lanka in this sector. This study was conducted to investigate the inventory management practices and the issues of processed food supply chain in Sri Lanka. This study conduct to fill the gap in theoretical and empirical knowledge of inventory management practices of processed food supply chain in Sri Lanka. The study was conducted as a single case study analysis. Data was collected using in-depth structured and non structured interviews with senior managers, lower level managers, operational workers, site-observations and analysis of existing documented data sources. Validity of the data is ensured through triangulation. This qualitative research uses critical analysis of the facts to present aspects of the findings. The research findings reveals that manual operation of the inventory management process, no proper linkages with in the supply chain partners, focus towards developing computerized inventory management system with lack of commitment from the relevant stakeholders, no proper analysis of demand data and raw materials as major hindrances of the existing inventory management practices that ultimately affect all the partners in the processed food supply chain. Recommendations based on the findings for the enhancement of the inventory management practices of the processed food supply chain were discussed.

## **Keywords**

Inventory management practices, supply chain, processed food

## **1. Introduction**

In today's highly competitive business world, proper supply chain management among all the players in the supply chain is vitally important, [5, 10, 11]. It is argued that today competition is not among the individual firms but among the supply chains, [15]. Distribution, procurement, logistics management and inventory management can be considered as the main components of any supply chain, [4]. It is argued that the final resort for any supply chain is the proper management of the inventory among the players within the chain. Especially with regard to the processed food supply chain speed of delivery, on-shelf availability, management of stock keeping units, proper information flow act as critical success factors in achieving competitive advantage. One way to maintain these critical success factors in a favorable status, is proper management of the inventory within the organization and among the all players of the supply chain [7].

In today's Sri Lankan economy the importance of the processed foods are increasing than ever before. The research on inventory management practices of Sri Lankan processed food supply chain can be considered as less researched area. Therefore in order to fill the knowledge gap in this area within Sri Lankan context, this research aims to explore in-depth manner the existing inventory management practices of the processed food supply chain from manufacturer's perspective using a case study. Findings of this research give insight in to future researchers of the same field to develop a research using large sample and come up with findings that are more generalizable in any processed food supply chain.

## **2. Literature Review**

Supply chain management has received substantial attention from researchers and practitioners, yet in many companies management is struggling to implement supply chain processes within their firms and across the supply chain,[7].Inventory management act as a major component of any supply chain irrespective of whether it is product or service supply chain. Inventory management plays an important role in matching demand and supply within the each and every partner in the entire supply chain, ultimately providing flexibility in coping up with external and internal events of the today's uncertain, globalized business environment,[7].17<sup>th</sup> annual state of logistics report of the Council of Supply Chain Management Professionals stated that huge amount of cost is recorded as the cost of holding inventory in United States economy,[17].It is evident that this truth is applicable to many other countries of the world. In situations where all the partners in a supply chain manage inventory effectively and efficiently, this will be resulted with less interruptions in production process, reduction in storage cost, product availability and many other organization specific quantitative and qualitative benefits leading to the organizational performance.

World has been moved towards integrated and collaborative approach to inventory management within the supply chain rather than isolated approach to manage inventory,[16].In previous research studies it was found out that most of the inventory mangers tend to take inventory management decisions based on intuition due to lack of the professional expertise in the field, no proper analysis of inventory data, human bias of the senior managers that result with use of rule of thumb, no user involvement in inventory management systems, inventory decisions are not integrated with strategic needs of the organizations, and ultimately result with no proper inventory management practices with an organization. Proper inventory management practices are really important for fast moving consumer goods such as processed foods. Therefore this research tries to explore the existing inventory management practices of processed food supply chain in Sri Lanka.

## **3. Research Problem**

Especially within the Sri Lankan context research done on the inventory management practices of processed food supply chain is limited. Therefore research problem of this study is "What are the existing inventory management practices and issues in processed food supply chain in Sri Lanka?" The results of this work will benefit processed food industry in specific by identifying weak points and how inventory management practices can be improved as well as it will signal to academics where future research is required.

## **4. Research Objectives**

This research specifically aims to achieve the following objectives, while contributing to the development of existing knowledge about the inventory management practices of processed food supply chain in Sri Lanka using the case study approach.

- To identify existing inventory management practices of processed food supply chain in Sri Lanka
- To identify the issues in inventory management practices of processed food supply chain in Sri Lanka

## **5. Methodology**

It is possible to use more than one research strategy in any particular study, but when the research focuses on how and why questions about a contemporary set of elements the use of case study research is more desirable, (Yin, 1994).This study is conducted as an exploratory case study using a popular large scale processed food supply chain in Sri Lanka. This study was based on basically primary data collected from the selected organization further secondary data also collected. In depth interviews with senior managers, lower level managers and operational workers, structured and non structured questionnaires, site-observations, analysis of existing documented data sources are used in data collection. Collected data were critically analyzed; further use diagrams to present the certain aspects, while identifying the existing inventory management practices, effective and efficient practices as well as ineffective and inefficient practices. Since the study is a qualitative research the validity was measured through triangulation.

## 6. Analysis

### 6.1 Existing inventory management practices of selected case study processed food supply chain

The selected case study organization has reputed brand name within Sri Lanka. Its head office is located in Colombo. It has owned 3 factories including the selected processed meat food manufacturing site. The selected manufacturing facility's main purpose is production of processed meat products. In this process management of inventory plays a critical role. The factory is located in suburb city from Colombo and its outsourced distribution centers with cool room storage facilities are located around 8 km from the factory premises. Factory distributes the products manufactured using their vehicles through out the country.

Selected organization need to maintain the appropriate levels of stock, which results with ability to supply the products needed, mainly to their retail supermarket customers and other customers such as hotels, other small food outlets and export demand from Asian countries. Figure 1 includes a schematic representation of the selected organization's processed meat supply chain.

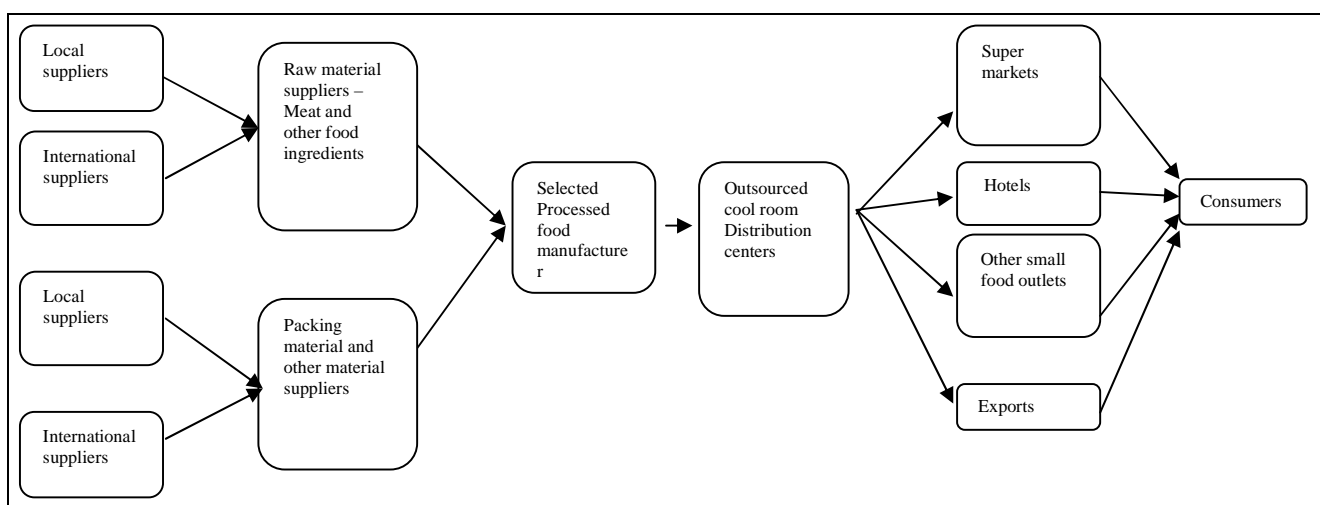


Figure 1: A schematic representation of the Selected Processed food supply chain

It is really important to maintain adequate amount of raw material stocks, finished goods inventory, when considering their demand requirements especially for processed meat food items, which have uncertain, demand patterns. Maintaining zero stock level is not possible for the selected organization but need to keep stocks to allow for variations and uncertainty in demand. The primary aim of selected inventory management system is to ensure that these inventories are kept at an optimum level with in the factory while reducing costs related with keeping stocks.

It has 44 different finished goods inventory types,8 stock keeping units,20 raw material types,15 varieties of packaging materials. Selected organization has independent demand from their supermarket customers, hotels, other small food outlets and exports which is unpredictable and it has dependent demand for 20 meat raw material types which is predictable and depend on the production plans. It has 2 separate stores locations for dry items and fresh meats and small area for finished goods inventory dispatching. All the other items other than fresh meat are stored in the store allocated for the dry items. Fresh meats inventory are stored in the receiving department stores. This includes relevant cooling facility needed to keep fresh meat in healthy condition. Two separate store managers are in charge of dry material stores and receiving stores of the factory. There are assistants for those managers in dry material stores and receiving stores. These staff responsible for managing store activities such as handling documents and management of stores and packing materials, fresh meat and as a whole managing all the store functions and coordinating with all the other departments of the factory. Stores managers are directly reported to the production manager of the factory.

All raw materials' and packing materials' goods receipts are managed using manual bin card system. Each type of raw material and packing material stock item has a regular usage and are replenished when the stock level reaches the minimum level or depend on the known production plans, store managers' intuition and depend on expected future production levels. Organization is not using any highly sophisticated inventory management method or any mathematical model for managing inventory. And also neither fixed order quantity nor fixed time period method is used as inventory control system for all types of inventories, but features of both methods are implied in the organization's present inventory management system. Review and monitoring of the re order level of each stock item is done by stores managers and clerk regularly. They use their experience in the company in deciding the time and amount of raw material requisition needed. Requisition of material is one of the important activities of the stores. Two stores are dedicated to maintain stock of all the items without stock out situation. Replenishing the raw materials and packing materials at the store is done according to the production plan requirements, lead time for procurement, minimum, maximum and reorder level of each stock, review by other factory officials. Raw material replenishment is manually happen within the stores department.

The basic inventory management decisions of the stores department are, what stock items to be ordered, when an order should be placed and how much should be ordered. Production department executives, after take in to consideration of strategic plans, normal demand from supermarket chain, outsourced distribution centres' inventory sheet, hotel demand, export demand and other seasonal demand patterns decide the production plan for the next month. This plan is divided in to weekly and daily production targets and display at production flow as well as send to the stores managers. Stores manager decides the material required to fulfill the production requirement. Stores manager this point will consider the last 6 months patterns, existing stock level, minimum stock level, maximum stock level, lead time, supplier availability and prepare the material requisition report. Stores manager send this to production executive and get the approval and then send the material requisition report to the relevant suppliers and copy will send to the head office for the payments. Every time receipt or issue of item taken place, stores assistants need to include the balance of the bin card in relevant column. Moment the balance reaches minimum stock level or according to sudden production requirement material requisition is done by the store manager adhering to the formal approval process.

Store racks are arranged depending on the experience of the stores staff the fast moving goods are stored in upper racks. Slow moving stocks are stored at lower levels. Inventory is arranged according to the ISO requirements. Stores as well as receiving department uses first in first in first out (FIFO method) method in handling materials. Stores will conduct stock taking at the end of every month, normally final Friday of the month is allocated for this. This control measure is used to ensure the accuracy of the stock items. Lead times of the raw material purchased from Sri Lankan suppliers are based on the experience of the store manager, distance, relationship with the supplier. Lead time of the raw material and packing material imported is decided based on distance, transportation method used. Minimum, maximum and reorder levels of raw materials, packing materials in the inventory are decided by the production requirement for last 6 months usage and experience and intuition of the store managers. Dry stores division and meat receiving department stores use bin card system to control the stock of all varieties of raw materials. Store managers maintain one bin card for each one variety of raw materials and packing materials. Every receipt of materials from suppliers is recorded as a receipt of the bin card. After the raw materials received to the stores transport staff unload the materials to the store. Security officers are involved in order to reduce the fraudulent activities that can happen. Every time inventory issued to the production, stores manager issue document including 3 parts. Every issue of materials to production is sample tested by the quality assurance department as well.

All the requirements needed to fulfill the ISO quality certificate is processing within the organization as it is an ISO certified organization. It has separate comprehensive quality manual documents. It includes one page description of the product specification for each product category, guidelines for hazard assessment, flow diagrams for production, hazard analysis sheet. It has separate lab for quality testing of the meat fast foods. Packeting of meat products will be done on a conveyer belt and final product will be going though a metal detector. This machine will ensure those products are free of metal parts. Then final product inventory is moved to cool room. There by according to the customer orders received these products are transported to the outsourced distribution centers. Figure 2 indicates a schematic representation of the raw material inventory management process of the selected organization.

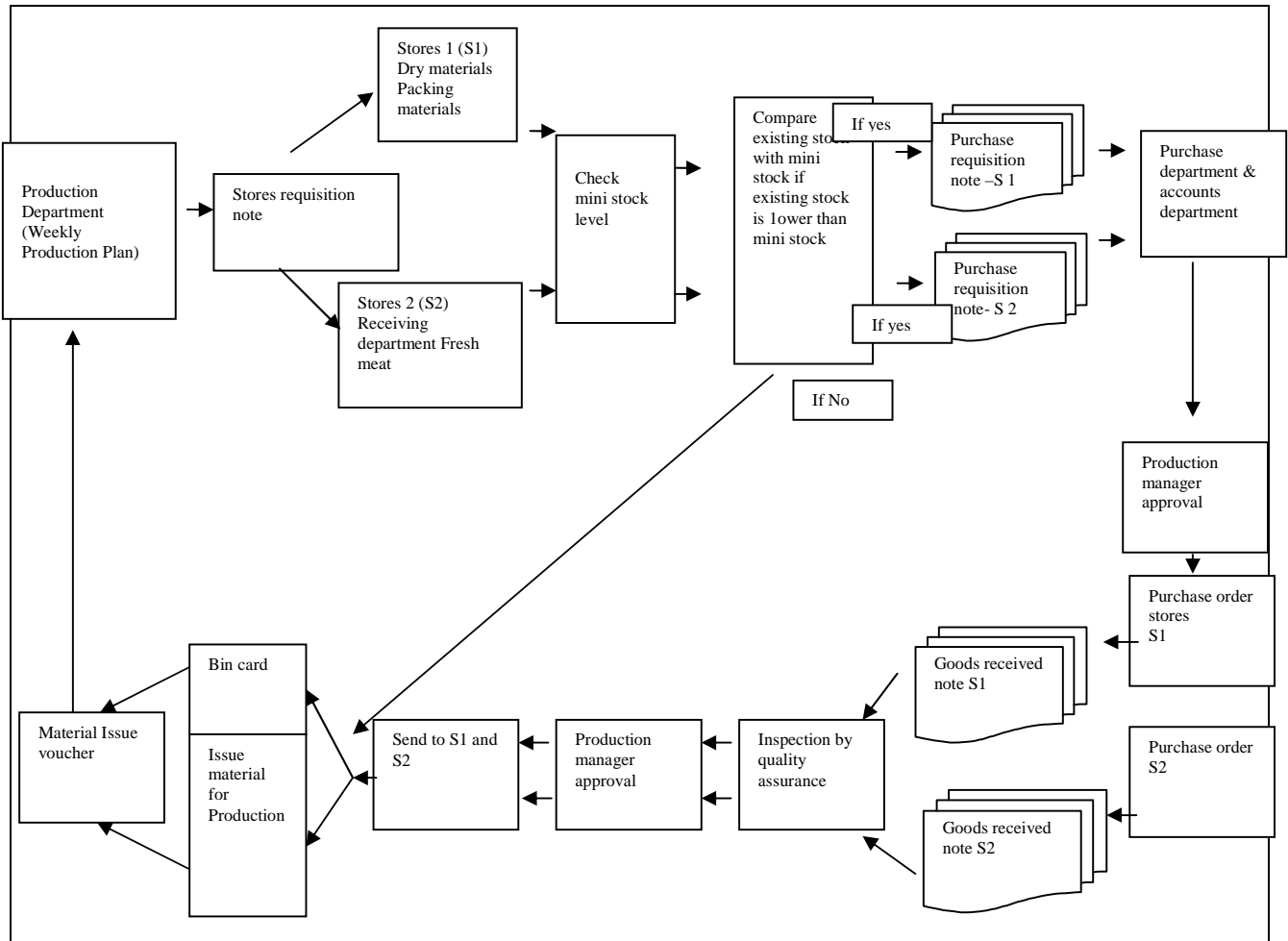


Figure 2: A schematic representation of the raw material inventory management process

### 6.2 Issues in inventory management practices of selected processed food supply chain

It was found out that manual operation of the inventory management process, no proper linkages with in the supply chain partners, focus towards developing computerized inventory management system with lack of commitment from the relevant stakeholders, no proper analysis of demand data and raw materials as major hindrances of the existing inventory management practices that ultimately affect the entire supply chain. Many parts of the inventory management system are based on informal and manual operations. Customer demand information forms are given to factory through e-mails. Some of their supermarket customers have a system to record the stock at the end of the day, but this kind of system is not available within the factory. Therefore sending customer orders are complicated, since factory has large number of products. This will make confusion and many human errors especially with respect to large variety of inventory items. There are frequent incidents that orders are record in incorrect way. In cases where the orders are recorded in incorrect way, results with so many issues such as preparation of wrong production plans, dissatisfied customers.

Selected organization doesn't have proper linkages with their around 120 supermarket customers. This creates finished goods return, not sending products needed and back orders. To reduce improper inventory handling, the head office has taken certain steps to implement an information system within factory linking factory with all the members of the supply chain for inventory management. But this system designing, planning and implementation is problematic due to no user involvement in the designing stage, no proper training provided for factory staff and most importantly the lack of technological software and know-how. Selected organization is not involved in any type of

analysis and also they don't have practice of recording data properly other than the bin card records available and data used for accounting purposes. Table 1 indicates the ranking of the most important inventory management issues prevailing in the selected organization according to the perception of respondents of the study.

Table 1: Ranking of the inventory management issues

Inventory management issues	Rank
1. Informal inventory management practices	3
2. Staff with lack of inventory management knowledge	5
3. No proper integration with customers	1
4. No proper integration with suppliers	2
5. No. of back orders	7
6. No. of discrepancy reports	8
7. Not using proper inventory management information system for inventory handling	4
8. Non availability of user training	6

## 7. Conclusions and Recommendations

Overall conclusion of this indepth case study reveals that the inventory management practices of the selected organization is not up to the standards and this affects the performance of entire supply chain. Integration within the entire supply chain partners can be considered as the major point lacking in the selected case in making inventory management practices more productive. Implementation of inventory management information system is advisable to reduce many errors. In planning and implementation it need to consider stake holder needs, indepth analysis of the processed food supply chain, its interlinkages and user training.

Features that should be incorporated to a computerized inventory management system in order to achieve effective and efficient activation of the inventory management within the entire supply chain are, ability to perform the functions of purchases, sales and payments of raw materials and demand for the produced fast foods, ability to create vendors list including local as well as international suppliers, purchase orders, product list, raw material list, packing material list, receiving lists, sales orders from supermarkets and other institutions, invoices for finished goods demand, ability to transfer orders between 120 supermarkets around Sri Lanka, other customers ,ability to transfer orders between suppliers, balances and various types of reports for monitoring factory performances, access to multi-user in group, ability to group products and raw materials in stores and types, ability to calculate real-time on hand, ordered allocated and available stock levels at any given time, ability to calculate real-time balance for each customer and vendor, ability to set up the appearance of the invoice, order, payment receipt and receiving list, create and print various types of reports, the system should be protected with data access control. It can restrict the unauthorized users accessing the system and altering values.

## 8. Future Research

Findings of this research confirm the related studies done in inventory management practices of some of the developing countries. It is expected that findings of this research will contribute to the enhancing the existing knowledge and be of important to the supply chain mangers, inventory managers as well as senior mangers of any organization. Further investigations in other supply chains of different industries may provide insights in to the development of the field in Sri Lanka.

## References

1. Ashayeri, J., Heuts, R., and Jansen, A., 1996, "Inventory management of repairable service parts for personal computers A case study.", *International Journal of Operations and Production Management*, vol. 16, no. 12, pp. 74-96.
2. Ballou, R.H., and Srivastava, S.K., 2007, *Business Logistics/Supply chain management*, 5th edition, Pearson education, New Delhi.
3. Buxey, G., 2009, "Reconstructing inventory management theory", *International Journal of Production and Operations Management*, vol. 26, no. 9, pp. 996-1012.
4. Ballou, R.H., and Srivastava, S.K., 2007, *Business Logistics/Supply chain management*, 5th edition, Pearson education, New Delhi.

5. Christopher, M. and Juetner, U., 2000, "Supply Chain Relationships: Making the Transition to Closer Integration", *International Journal of Logistics: Research and Applications*, vol. 3, no. 1.
6. Chandra, C. and Kumar, S., 2001, "Taxonomy of inventory policies for supply-chain effectiveness.", *International Journal of Retail and Distribution Management*, vol. 29, no.4, pp. 164-175.
7. Croxton, K.L., 2002, "The demand management process", *The International Journal of Logistics Management*, vol. 13, no. 2, pp. 51-66.
8. Douglas, K.L., Lambert, M. and Garcia-Dastugue S. J., 2002, "The Demand Management Process." vol. 13, no.2, pp. 51-65.
9. Donselaar, K.V., Woensel T. V., Broekmeulen R. and Eindhoven J.F., "Inventory control of perishables in supermarkets".
10. Krisztina, D., and Gelei, A., 2004 "Supply chain management framework: dimensions and development stages", Budapest University of Economic Sciences and Public Administration, Hungary.
11. Mentzer J.T., 2001, "Defining supply chain management", *Journal of Business Logistics*, vol. 22, no. 2, pp. 1-25.
12. Matopoulos, A., Vlachopoulou, M., and Manthou, V., 2007, "A conceptual framework for supply chain collaboration: empirical evidence from the agri-food industry, *Supply Chain Management: An International Journal*, Vol 12, No.3, 177-186.
13. Perera, M., Kodithuwakku, S.S. and Weerahewa, J., 2004, "Analysis of vegetable supply Chain of Supermarkets in Sri Lanka", *Sri Lankan Journal of Agricultural Economics*, vol. 6, no.1, pp. 67-81.
14. Rajeev, N., 2008, "Inventory management in small and medium enterprises, A study of machine tool enterprises in Bangalore.", *Management Research News*, vol. 31, no.9, pp. 659-669.
15. [www.martin-christopher.info](http://www.martin-christopher.info) 2009 "Supply chains compete, not companies", accessed 25 June, 2009
16. Williams, B.D., and Tokar, T., 2008, "A review of inventory management research in major logistics journals: Themes and future directions", *The International Journal of Logistics Management*, vol. 19, no. 2, pp. 212-232.
17. Wilson, R., 2006, 17th Annual State of Logistics Report, Council of Supply Chain Management Professional, Lombard, IL.
18. Yin, R.K., 1994, *Case study research design and methods*, 2nd edition, Sage publications, London.