REVERSE LOGISTICS IN FOOD PROCESSING INDUSTRIES WITH SPECIAL REFERENCE TO MADURAI

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ABSTRACT

This study is demonstrated Reverse Logistics (RL) in Food Processing Industries. Reverse Logistics (RL) is the process of backward flow of moving goods for the purpose of capturing value, proper disposal, remanufacturing and refurbishing activities. Reverse Logistics (RL) is emerging trend in Supply Chain Management to gain more competitive advantage in terms of their value, profitability, sustainability and provide additional advantage in any type of industry. The Reverse Logistics (RL) practices adapted in manufacturing industries to reduce wastage and reuse. Food Processing sector possess high growth for the past ten years. As well as Food Processing industries is going to concern, food loss is high. Carbon emission, environmental degradation and greenhouse gas are some effect of food loss, if they are not properly disposed to environment. By applying the Reverse Logistics Practices in Food Processing Industries will help to manage the future demand as well as save the environment. Here, the model is proposed for Reverse Logistics with the consideration and possible factors which can be applicable in India. In that model, stages of Reverse Logistics (RL), drivers and process are discussed. From that the benefits are pointed out. From the survey conducted in Madurai, I concluded this model for the Reverse Logistics practices.

KEYWORDS: Reverse Logistics, Food Processing Industries, Food loss, Environmental degradation.

1. INTRODUCTION

The term Reverse Logistics (RL) is first published by James R. Stock by the Council of Logistics Management in 1992. The concept further redefined in Reverse Logistics Programs by Reverse Logistics Association (1999). From the year 2000, Reverse Logistics can be applied in the industrial practice under logistics management. Reverse Logistics mainly focus to recovery of the product through 3R (Reuse, Remanufacturing and Recycle) concepts. In India, the National Environmental Policy, established in 2006 recognizes the informal sector and encourages the collection and recycling of waste.

Food waste or food loss is the uneaten food or not consumed by the consumers. The food loss occurs at each and every stage of supply chain with different quantities. In developing countries like India, 20% loss occurs at harvest stage, 40% of loss occurs at post-harvest stage and remaining 40% of loss occurs at retail and consumer stage (Food and Agriculture Organization of the United Nations, 2011). The backward flow of food products necessary to reduce the food waste and smooth flow of logistics

operations. The effect of food waste on environment increase the greenhouse gas, environmental degradation and increase pollution. The Reverse Logistics can be applied on the Food Processing Industries to reduce food wastage. The significant of Reverse Logistics in the Food Industry is evident in the requirement to provide quality and safe food to consumers without posing any threat on human health, wellbeing and the environment (I. P. Vlachos, 2014).

In this paper, the characteristics and process are discussed and the application of Reverse Logistics in Food Processing sector is suggested. As consider to India, the food loss at agriculture and cereals at 2010 and 2015 is listed as percentage and the comparative graph is plotted. The loss is somewhat reduced due to the increased cold storage, Government initiated food parks, transportation and other factors. So it is an attempt to reduce the waste by applying Reverse Logistics in Food Processing Industries. The environmental effect of food waste is discussed from the source BIO, Germany. The existing model which is practicing in foreign countries are discussed. From those models the factors, drivers and process which can be applicable in India is chosen and model is derived.

2. LITERATURE REVIEW
Reverse logistics journals

Hoek (1999), provided the solution of Reverse Logistics (RL) from environmental damage. The framework to support Reverse Logistics (RL) was developed and the challenges were discussed.

P. de Brito et al (2002) discussed six case studies in United Nations and they identified the critical factors of reverse logistics. They developed their plan for inventory, network structure, relationships, information technology, planning and control of recovery activities.

Erdogmus et al (2011) described the reverse logistics concepts and importance of reverse logistics. The model for reverse logistics was developed with the steps and unique characteristics of reverse logistics are discussed.

Skapa (2012) focused the study on Czech market and formulated strategic plans for the reverse logistics field. The forces for reverse logistics were identified by the author and the plan for operations was created.

R. N. Mahapatra et al (2013) proposed a model for demand and found a methodology to minimize the consumption of raw material by the adapting the reverse logistics.

The importance of reverse logistics was focused on the solutions to find out use of non-renewable sources (Xavier et al. 2013). This was done by reviewing a number of case studies at international level and development of a framework for the development and implementation of Reverse Logistics System (RLS).

Prabesh Luitel et al (2014) addressed eight different network design configurations from the manufacturer side and discussed the practical implications of two different methodologies for Reverse Logistics System.

B. Bolat (2014) discussed the emergence of Reverse Logistics (RL) and Reverse Logistics Network Design (RLND) through the analysis of quality and cost.

The integrated forward and reverse logistics network was designed by Muelas (2014) in the consumer goods industry. He found that the total costs, locations, warehouse and decisions for consumer goods were reduced by the implementation of the new network.

P. Rajagopal et al (2015) reviewed and identified the types of logistics and compared the Reverse Logistics with Forward Logistics for better understanding and gaining competitive advantages.

Food Processing Journals

I. P. Vlachos (2014) aimed at examining the reverse logistics across the food product life cycle. In that paper, he identified variables for effective supply chain by reviewing five research stream: food specific features, cost, competitive advantage, regulation and legislation and information management. From that the future of the product was determined and quality problems were managed.

Vijayan et al (2014) focused on their study at food retail industry as grocery stores, convenience stores, supermarkets and hypermarkets. They developed the conceptual framework based on the variables under the environmental concern, firmographics, barriers and adoption level of reverse logistics. In their study they also included the quality, reduction of returned goods and better waste management technique.

Sowmyiwa et al (2014) conducted the empirical survey targeting reverse logistics management in the food and beverages companies carrying on business in Nigeria. They have taken framework from the author De Brito (2003) and they applied and analyzed their data to reduce total logistics cost, improved customer satisfaction, enhance competitive advantage and minimizing environmental impacts.

M. Anne et al (2015) explained about reverse logistics and the influence of competitiveness among the food processing industries in Kenya. They proposed a framework for reverse logistics practices. From the analysis, they found that there is a positive relationship between reverse logistics and proper utilization of material and also reduces cost and enhance competitiveness of the firm.

N. B. Ngadiman et al (2016) demonstrated the reverse logistics in the food and beverage industries in Malaysia. They have formed the framework based on five dimensions and collected the feedback. From that the feedback they highlight the present scenario and investigated the internal and external barriers of the industries.

3. REVERSE LOGISTICS

The term Reverse Logistics (RL) is first published by James R. Stock by the Council of Logistics Management in 1992. Reverse logistics is defined as "all activities associated with a product/ service after the point of sale, the ultimate goal to optimize or make more efficient aftermarket activity, thus saving money and

environment resources" (Reverse Logistics Association, 2009). Reverse logistics is the process of retrieving the product from the end consumer for the purposes of capturing value or proper disposal. Activities include collection, combined inspection/ selection/ soring, re-processing/ direct recovery, redistribution and disposal (Mwaura Anne, Letting Nicholas, Ithinji Gicuru and Orwa Bula, 2016). Reverse logistics networks have some generic characteristics related to the coordination requirement of two markets, supply uncertainty, returns disposition decisions, postponement and speculation (Amemba et al., 2013). Reverse logistics are hard to forecast, require more distribution points and specialized equipment, packaging is often damaged, pricing is vague, product life cycle is not determined and transparency and traceability are low (Vaidyanathan and Yadong, 2007; Pokharel and Mutha, 2009).

3.1. Reverse Logistics in Food Processing Industries

ASI 2012 compiled that there are 18 sub-sectors of food processing industry. In this industry, on an average, the fixed capital per registered factory is Rs. 4.27 crore indicating the most of the factories in this sector are micro and small enterprises under the definition of Micro, Small and Medium Enterprises Development (MSMED) act 2006. The different stages of losses are harvesting, collection, thrashing, grading/ sorting, winnowing/ cleaning, drying, packaging, transportation and storage depending upon the commodity (FAO 2015-'16). The study has estimated that harvest and post-harvest losses of major agricultural produces at national level was of the order of Rs. 44,143 crore per annum at 2009 wholesale prices.

3.2. Food Loss - Effect on Environment

Changes in lifestyles, easy availability of raw material, trends, economic situation and involvement of technology are the influencing factors of the newly emerging food processing industries. At the same time, the use of technology advancement also creates the environment pollution. Table shows the effect of food waste to the environment.

S. No	Product	Environmental effects
1	Cereals	Carbon emission, Blue water and Contamination of arable land
2	Vegetables	Carbon emission Pests encouraged onto the site
3	Fruits	Blue water hotspot, Pests encouraged onto the site
4	Meat	Carbon footprint Air pollution Infection and diseases

Table: 3.1 Food product and its effect on Environment. (Source: BIO-Intelligence Services report 2013, Germany)

FAO in 2013 estimated that the global carbon footprint was 3.3 billion tonnes of CO_2 emissions due to

the food wasted and not proper handle of food waste. There is the direct relation of food waste and CO_2 emission. In global level it is found that 10% of Greenhouse gas emission occurs due to food waste (Stuart & Tristram, 2014). It is also the major threaten that the price of food commodity is double in next ten years (Chrobog & Christian Karim, 2014).

3.3. Application of Reverse logistics in Food Processing Industries

Reverse logistics 'close the loop' of a typical forward supply chain and includes reuse, remanufacturing and/or recycling of materials into new materials or other products with value in the marketplace. In so doing a firm tends to increase efficiency by reducing the costs of acquiring virgin raw materials, thus increasing its profit margins (Mwaura Anne, L.N, 2015). This process can be applied to Food Processing Industries in effective manner to reduce environmental pollution, increasing profit margin and beneficial for long term growth. In this paper, the variables which influences the food waste is concern and the proposed model of Reverse Logistics practices in Food Processing Industry is developed by considering theoretical and literature reviews.

The Horticulture and Cereal loss in the year 2009-2010 and 2014-2015 is tabulated. Total loss is expressed in terms of percentage with respect to total production. The loss value of horticulture and Cereal corps possess INR 42,143 crore in 2009-2010 and INR 92,651 crore.

Horticulture and Cereal crops

Horticulture and Cereal Crops	2009-2010	2014-2015
Guava	18.0	15.88
Mango	12.7	9.16
Apple	12.3	10.39
Grapes	8.3	8.63
Papaya	7.4	7.76
Banana	6.6	6.7
Wheat	6.0	4.93
Paddy	5.2	5.53
Bajra	4.8	5.23
Maize	4.1	4.65

Table: 3.2 Loss in percentage of Horticulture and Cereal Crops (Source: FAO 2015-2016)
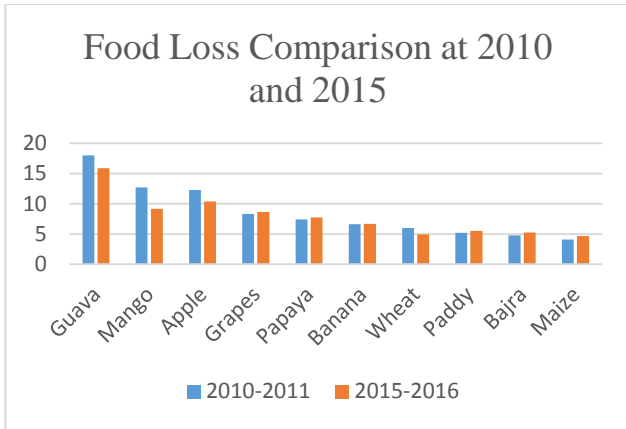
Fig 3.1 Food Loss Comparison at 2010 and 2015

The Ministry of Food Processing Industries is implementing the Scheme for Infrastructure development which has 3 components, namely Mega Food Parks, Integrated Cold Chain and Setting Up/ Modernization of Abattoirs. Government is taking improvement steps for Quality control, food testing laboratories, Research and Development and Promotional activities (FAO 2015-2016).

4. EXISTING MODEL FOR REVERSE LOGISTICS FOR FOOD PROCESSING INDUSTRIES

Mwaura et al, (2016) create the model for reverse logistics for food waste and its effect on competitiveness of food processing industries.
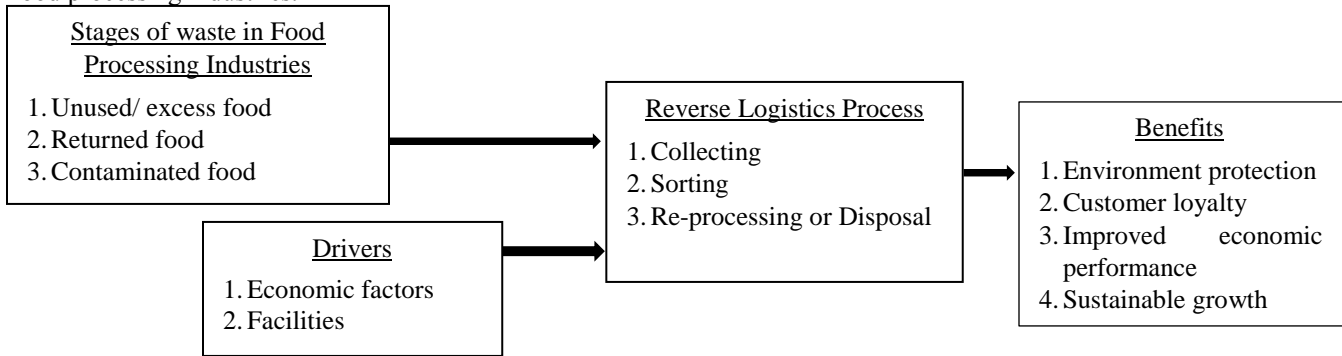

Figure 4.4 Framework of Proposed model

discussed economic performance of company and Vlachos, I. P. (2014) discussed the sustainable growth from Reverse Logistics.

This model is proposed by considering these four factors, reviewing the literature in reverse logistics practices, food processing industries and FAO report.

5. CONCLUSION

In this paper we are attempting the application of Reverse Logistics practices in Food Processing Industries to reduce food loss. Here the model is developed as a concept oriented model based on the literature and practical implication of Reverse Logistics in Foreign Countries. It will be helpful for the company to be sustainable for long-run and the food loss can be reduced. The future research leads the practical application of this

Gowri Vijayan et al, (2014) has developed the framework in which they found environmental concerns, firmographics, barriers to adopt the reverse logistics are found and also they explains the benefit of proposed methodology too.

Somuyiwa et al, (2014) discussed drivers of the reverse logistics and they adapted De Brito's (2003) model for reverse logistics. In that model the impact of reverse logistics on economic performance was analyzed by the authors.

4.1. Proposed Model

Stages: Sowmyiwa et al (2014) explained the stages of food waste in Why-Returning factor. This is discussed to consolidate the return reason of food supply chain. FAO report 2014-2015 also provided the process of Reverse Logistics of food loss.

Drivers: Vijayan et al (2014) explained the reverse logistics process affects the economic performance and benefits. Sowmyiwa et al (2014) considered the facilities driver as a firmographics driver.

Reverse Logistics: Xavier, H. L. (2013) focused in his study to analyze the various flows – direct, reverse and closed-loop supply chain that many contemporar companies have to manage.

Benefits: The benefits for supply chain is taken out from the proved results from the studies conducted in Kenya, Malaysia and Nigeria. Sowmyiwa et al (2014)

model in Food Processing Sector and make it as a beneficial one for improved performance and efficiency.

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