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# Future Benefits of Reverse Logistics: A Study for Long-Run of A Company

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***Abstract:*** ***Reverse Logistics is the most important process followed by most of the companies now-a-days. Reverse Logistics function helps any type of company to become sustainable in the long-run and its growth. This paper deals with the Reverse Logistics practices in Food Processing Industries. Food is perishable one. By applying Reverse Logistics concepts on the companies, the future benefits of the companies can be derived. It helps to find out the economic benefits obtained by the company. This paper focusses on the Reverse Logistics concepts used by the food processing companies taken for analysis. The analysis of the selected companies resulted in formulation of predicting equations. By using these equations, the probability of benefits that can be obtained from adoption of Reverse Logistics concepts are calculated.***
***Keywords: Reverse Logistics, Long-run, Growth and Food companies.***

## I. INTRODUCTION

As per the Ministry of Food Processing of India (MOFPI), 'Food Processing' is defined as the process of value addition to the agricultural or horticultural produce by various methods like grading, sorting and packaging. Food is the important source for human living. To reduce the food waste, Reverse Logistics concepts can be used to get benefits for Food Processing Companies. 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 information sector and encourages the collection and recycling of waste.

## II. LITERATURE REVIEW

Emy Ezura A Jalil et al., focused household recycling by using reverse logistics and waste management system. The purpose of the study is to investigate the symbiosis effect for exchanges between household waste recycling systems and usehold recycling behaviour within the reverse logistics disclosure.

Kannan Govindan et al., presented a comprehensive review of papers and state of the art papers in RL/CLSC regarding vast number of publications in different scientific journals in RL and CLSC issues. The author tried to make different of levels of decision-making and defined new decision variables. The authors recommended nondeterministic approaches, robust optimization approaches, forecasting methods, nonlinear programming and convex optimization models for the future approach.

Jimenez-Parra et al., focused on the management recovery of products once they are no longer desired or can no longer be used by consumers in order to obtain an economic value from the recovered products. The author also considered decision-making process related to supply chains.

Karthick S et al., focused the supply chain barriers in Indian Food Supply Chain Management. In this paper the author point out the challenges which happens at Indian food supply chain. Underexposure of Organized Logistics is the major challenge for food supply chain in India and the author also suggested the ideas to overcome the barriers.

Kang explained the importance of Reverse Logistics by raising and changing environmental factors. The authors suggested the effective and efficient reverse logistics systems which can be applied with strategies in order to generate additional benefits. This view of planning helps to improve reverse logistics planning.

Terrace (2001) focused to measure the internal logistic performance which is to be formed as Supply chain metrics. The authors formed the framework which translates the performance into the shareholder's value and identified that the complexity of the network happens by overlapping of supply chain and made it difficult.

Paulraj et al (2004) done the study of entire supply chain from upstream to downstream and found that the challenges were created while coordinating the supply chain. The authors created framework of SCM and identified that stimulates and facilitates for the critical constructs of SCM, and also their impact on supply chain.

Caroline (2006) identified that the barriers, possibilities and key trends of recent supply chain management. The authors focused to



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found out the range of key barriers and the enablers. An assessment of the main trends also be concluded by the authors.

According to Ekenem et al (2012), India had the low food processing as compare to the large range of production of food. The authors concluded that the consumption rate is 10 percentage. The authors showed the trend and also this study was focused the growth rate which is slowing down. The authors suggested that to use the full potential to get the maximum benefits.

Sharma et al (2013) analyzed the gap between productivity and processing in Food Processing Industries. The authors found the sources of that gap are S&T capability, employment generation capacity and skills required for that industries. The authors concluded the difference existed at lagging in India behind the conventional and modern technology.

Vantana et al (2014) studied that, Confederation of Indian Industry (CII) and the food processing sector had the potential of attracting US$ 33 billion (Rs.1,50,000 Crores) of investment in next ten years(within 2025). By CII, the prediction of market rate in the year 2025(after ten years) will be nearby 40% as compared to market rate in 2015. The authors recommended to utilize the untapped sector which has more potential, revenue yieldable also.

Yogesh et al (2014) had conducted the study about food processing industries India. This study found that climate, irrigation, production of milk, wheat, pulses and export of spices are the key influencing factors of this industry. The author stated that infrastructure facilities, food safety, adequate polices and unskilled man power were the challenges.

Anand et al (2015) discussed the supply chain of fruits and vegetables sector in India and the related issues which may be the reason to affect it. The corresponding mitigation strategies are also discussed and the solution for those issues and challenges are identified. The authors made this study beneficial to various stakeholders like the farmers, state government, transporters and food processing units. This study suggested that the improvement may be made for better planning and management in the supply chain of fruits and vegetables.

According to Tribhuvan et al (2015) the skills required for the people who working in food processing industries were discussed and analyzed. The generic value chain involved in food processing was helped to find out the skill requirements. The skill gaps at each step in value chain was analyzed and few amicable solutions to reduce those gaps also suggested by the authors.

According to Vishnu et al (2015) the challenges of food industries were wastage, cultural habits of preferring fresh food, relatively low level of mechanization and many more are posing challenges. The authors found out various challenges to the industry and concluded some major challenges and opportunities by following the consumption patterns.

Tambe (2015) observed that the changes in agriculture and food processing sectors. Reforms had more or less bypassed the agriculture sector till recently. The author concluded that the efficient food marketing system forces the sector by demographic factors, changing lifestyles and consumer demand at different variety.

Sathiyagoathai B and Saravanan S (2017) , focus on the growth of food processing industries in national level. It also taken into account the growing concern of wastage in food processing industries in India. Carbon emission, environmental degradation and greenhouse gas are some effect of food loss, if they are not properly disposed. They proposed a model to adopt reverse logistic processes in food processing industry so that an attempt can be made to reduce the wastage.5.

## III. DEFINITION AND SCOPE

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). As Per The Council Of Logistics Management, “Reverse Logistics Is The Process Of Planning, Implementing And Controlling The Efficient, Cost-Effective Flow Of Raw Materials, In-Process Inventory, Finished Goods And Related Information From The Point Of Consumption To The Point Of Origin For The Purpose Of Recapturing Value Or Proper Disposal”.

### *A. Objectives*

*1)* To study about the Reverse Logistics in Food Processing companies.
*2)* To find the variables which affects the Reverse Logistics in Food Processing companies.
*3)* To analyse the relationship between the firmo-graphic profile and variables in Food Processing companies.
*4)* To formulate the Regression equation for the future Reverse Logistic practices and its benefits to the company.
*5)* To suggest the reduction of food waste by applying Reverse Logistics practices in Food Processing companies.

### *B. Scopes*

*1)* This study scopes that Reverse Logistics play an important role in proper disposal of perishable products to the environment.
*2)* This scope of the study brings out the channel of reverse logistics and its disposal mechanism by the companies.



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3) The scope of this study is to identify the factors which affects Reverse Logistics practices of the company.
4) This study also helps to find out the benefits and probability to proceed the Reverse Logistic practices of the company.

## IV. RESEARCH METHODOLOGY

### A. Research Design

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.

### B. Type of Study

Descriptive research. It includes surveys and fact-finding enquiries of different kinds. The research problem is described by the researcher using questionnaire and schedule.

### C. Sampling Design

The sampling design of the study is convenience sampling.
Sampling Element: Food Processing Company
Sample Size: 102
Sampling Method: Convenience Sampling
Sample Media: Questionnaire

### D. Data Collection Methods

The nature of data used may be primary or secondary. Primary data is the first hand collection of information. Secondary data is making use of published or from published sources.

1) *Primary Dara*: Primary data are fresh data collected through survey with the customers of Mobile Networks through questionnaire.

2) *Secondary Data*: Secondary data are collected from internal source, books and various journals to make a conceptual framework regarding research problem.

### E. Questionnaire

Questionnaire is the most popular and widely adopted instrument for gathering data. The questionnaire is given to the respondent companies to be filled up. The success of survey methods depends on the strength of the questionnaire use.

## V. ANALYSIS AND INTERPRETATION

### A. Relationship between Location and Waste Disposal Mechanism

1) *Null Hypothesis $H_0$:* There is no significance difference between location and waste disposal mechanism followed by the company.
2) *Alternative Hypothesis $H_1$:* There is a significance difference between location and waste disposal mechanism followed by the company.

Table 4.1 Relationship between Location and Waste Disposal Mechanism

| Cross Tabulation | | Waste disposal mechanism | | | |
|---|---|---|---|---|---|
| | | Landfill | Municipality dustbins | Others | Total |
| Location | City | 1 | 9 | 1 | 11 |
| | Urban | 28 | 43 | 0 | 71 |
| | Rural | 10 | 9 | 1 | 20 |
| Total | | 39 | 61 | 2 | 102 |

Calculated chi square value $\chi 2$ = 10.012
Level of Significance = 5%
Degree of Freedom = (r-1) (c-1)



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= (3-1) (3-1)

= 2*2

= 4

Tabulated Value $\chi 2$ (16, 0.05) = 9.488 (From Chi-Square Table)

*3)* Result: Since calculated $\chi 2$ value 10.012 is higher than tabulated $\chi 2$ value 9.488. Therefore $H_0$ is rejected.

*B. Relationship between Age of the Company and Value Added on Returns*

*1)* Null Hypothesis $H_0$: There is no significance difference between age of the company and the value added on returns.

*2)* Alternative Hypothesis $H_1$: There is a significance difference between age of the company and the value added on returns.

| Cross Tabulation | | Value Added on Return | | |
|---|---|---|---|---|
| | | Yes | No | Total |
| Age of the Company | 0-10 yrs | 55 | 1 | 56 |
| | 11-20 yrs | 21 | 1 | 22 |
| | 21-30 yrs | 17 | 0 | 17 |
| | 31-40 yrs | 0 | 1 | 1 |
| | 41 & above | 4 | 2 | 6 |
| Total | | 97 | 5 | 102 |

Table 4.2 Relationship between Age of the Company and Value Added on Returns

Calculated chi square value $\chi 2$ = 31.853
Level of Significance = 5%
Degree of Freedom = (r-1) (c-1)

= (5-1) (2-1)

= 4*1

= 4

Tabulated Value $\chi 2$ (16, 0.05) = 9.488 (From Chi-Square Table)

*3) Result:* Since calculated $\chi 2$ value 10.012 is higher than tabulated $\chi 2$ value 9.488. Therefore $H_0$ is rejected.

*C. Binomial Logistic Regression*

Binomial Logistic Regression predicts the probability that an observation falls into one of two categories of a dichotomous dependent variable based on one or more independent variables that can be either continuous or categorical.

*1) RESALE*

Dependent variable : RESALE
Independent variable : Quantity of production per month, Percentage of Cost recover and Percentage of Return.
Categorical variable : Age of the company

$$P_{resale} = \frac{e^{(0.228*q - 0.807*cr - 0.27*r - 0.407)}}{1 + e^{(0.228*q - 0.807*cr - 0.27*r - 0.407)}}$$

*2) Reprocessing*


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Dependent variable : REPROCESSING
Independent variable : Quantity of production per month and Percentage of Waste.
Categorical variable : Age of the company

$$P_{reprocessing} = \frac{e^{(-0.967*q + 1.078*w + 3.384)}}{1 + e^{(-0.967*q + 1.078*w + 3.384)}}$$

*3) Reuse*

Dependent variable : REUSE
Independent variable : Quantity of production per month, Percentage of Return and Percentage of Waste
Categorical variable : Age of the company

$$P_{reuse} = \frac{e^{(-0.469*q + 1.224*r - 0.89*w + 0.089)}}{1 + e^{(-0.469*q + 1.224*r - 0.89*w + 0.089)}}$$

*4) Reverse Logistics*

Dependent variable : REVERSE LOGISTICS
Independent variable : Quantity of production per month, Percentage of Cost recover, Percentage of Return and Percentage of Waste.
Categorical variable : Type of Operation

$$P_{reverse\ logistics} = \frac{e^{(0.23*q - 0.326*r - 1.049*w - 0.257*cr + 3.037)}}{1 + e^{(0.23*q - 0.326*r - 1.049*w - 0.257*cr + 3.037)}}$$

## VI. RESULT AND DISCUSSION

The result of category of company, 3.9% of processed vegetables and fruits, 2.9% of Vegetable & Animal oil, 2% of Dairy products, 58.8% of Grain Mill, 2.9% of Bakery product, 19.6% prepared meals and dishes, 2.9% soft-drinks and mineral water and 6.9% of other food products.

*A. Chi-Square*

1) There is a significance difference between location and waste disposal mechanism followed by the company.
2) There is a significance difference between age of the company and the value added on returns.

*B. Binomial Logistic Regression*

*1) RESALE*

$$P_{resale} = \frac{e^{(0.228*q - 0.807*cr - 0.27*r - 0.407)}}{1 + e^{(0.228*q - 0.807*cr - 0.27*r - 0.407)}}$$

*B. Reprocessing*

$$P_{reprocessing} = \frac{e^{(-0.967*q + 1.078*w + 3.384)}}{1 + e^{(-0.967*q + 1.078*w + 3.384)}}$$

C. *Reuse*

$$P_{reuse} = \frac{e^{(-0.469*q + 1.224*r - 0.89*w + 0.089)}}{1 + e^{(-0.469*q + 1.224*r - 0.89*w + 0.089)}}$$

*C. Reverse Logistics*

$$P_{reverse\ logistics} = \frac{e^{(0.23*q - 0.326*r - 1.049*w - 0.257*cr + 3.037)}}{1 + e^{(0.23*q - 0.326*r - 1.049*w - 0.257*cr + 3.037)}}$$

## VII. FUTURE DIRECTION OF RESEARCH

This paper considered only 8 type of companies and future research leads to the consideration of all eighteen type of companies. Further economic factors to be considered in future research.

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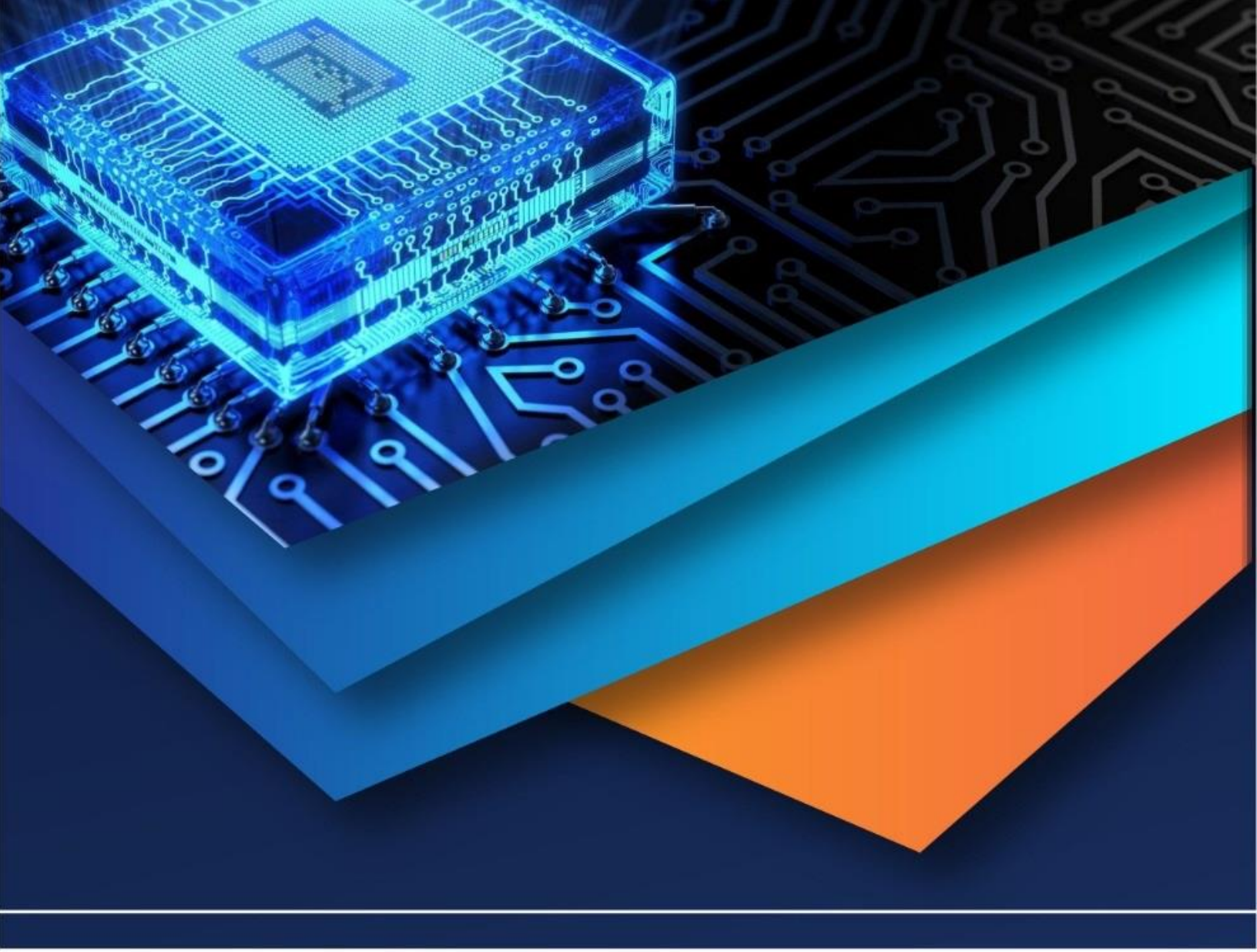

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