

Assessing and Minimizing the Wastages in Perishable Cargo

Case of Vegetables Supply Chain in Sri Lanka

A. PRIYANKARA DAHANAYAKE

159205C

Research submitted in partial fulfilment of the requirements for the degree of
Master of Business Administration in Supply Chain Management

Department of Transport and Logistics Management

University of Moratuwa

Sri Lanka

February 2018

DECLARATION OF ORIGINALITY

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Signature:

Date:

A. Priyankara Dahanayake

COPY RIGHT STATEMENT

I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis/dissertation, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

All Rights Reserved.

Signature:

Date:

A. Priyankara Dahanayake

STATEMENT OF THE SUPERVISOR

The candidate has carried out research for the MBA in Supply Chain Management in the Department of Transport and Logistics Management of University of Moratuwa under my supervision.

Signature of the supervisor:

Date:

Dr. Y.M.M.S. Bandara

ABSTRACT

Agriculture is the most common livelihood of Sri Lankans, and almost eighty (80) different varieties of fruits and vegetables are grown in Sri Lanka's in varied agro-climatic areas. Sri Lanka produces around 710,000 metric tons of vegetables and around 540,000 metric tons of fruits annually. Most of the population involved in agriculture is small producers or home garden growers whose individual extent of land does not exceed a hectare. Fruits and vegetables are damaged due to inappropriate methods of picking, packing, storage and transportation. A considerable portion of products are perished during this process. Insufficient information flow is another major handicap. Therefore, it is very important to study the whole supply chain and find out the necessary remedies to develop Sri Lankan fruit and vegetable industry. Agricultural wastage is a country wide issue in Sri Lanka. According to the past researches done, there are over 40% in fruits and over 30% in vegetables been wasted while passing through the supply chain from farm-gate to the final consumer. Common supply chain for fruits and vegetables can be identified in several stages in the traditional supply chain namely farm-gate to collector, collector to whole-seller and whole-seller to the retailer. The collection and distribution of vegetable in the country is largely based on several economic centers situated across the country which were established with intuitive judgments about the locations suitability interns of transport and distribution optimization attributes. Nevertheless, the mode of transport is mainly by trucks and fruits and vegetable are packed in to plastic sacks by the supplier or intermediaries. As a result of handling, transportation, and distribution, it is reported that there is a considerable portion of fruits and vegetables are wasted.

The present research focuses on assessing the wastage levels, due to transport, handling, and identify a strategy that will minimize the wastages in perishable cargo supply chain in Sri Lanka. Objectives of this research are, to identify the factors that lead to high wastage of vegetables, to assess the level of vegetable wastage in the perishable supply chain, and to identify strategies to minimize wastage during transport of vegetables in Sri Lanka.

This study identified sample of 100 retailers to examine the supply chain of fruits and vegetables in identical numbers. Samples were drawn from the Manning Market in Colombo, Welisara Economic Center, Meegoda Economic Center, Dabulla Economic Center, Narahenpita Economic

center and other vegetables Markets in Colombo and suburbs. The sample consisted the farmers, collectors, traders.

Primary data were collected by a questionnaire consisted of fifty questions and pocket discussions and interviews. Face to face interactions and other communicative channels were used to collect information on the vegetable supply chain.

According to the survey results, 65% of the supply is directly transported from farm gate to Colombo or city whole sale vendor. The average waste per Kilo of fruits and vegetables is higher in which comes through shops. Leafy vegetables total productions come from the farm gate. Higher proportion of the vegetable samples, were packed into net bags and poly sack bags. Loading method of the poly sack bags in the vehicle were identified as one poly bag on top of the other thus the ventilation to the cargo in the bags were minimal. Lowest wastage for fruits and vegetables were identified as packing into cardboard boxes. The study revealed that lowest wastage exits when vegetables come directly from farm gate. Further it was identified that the wastage levels will depend on the nature of vegetables. More wastage can occur for soft vegetables when transported in large Lorries. Distance is not a significant factor to the wastage in Sri Lankan vegetable supply chain.

Direct transportation from farm gate to the Colombo vendors is another advantage to reduce the wastage. When vegetables are transported through intermediate vendors, the wastage will increase. Number of additional handling will impact such wastage in this chain. Therefore, this research identifies the importance of introducing advanced handling methods and usage of new equipments main recommendations. Further the study discusses the importance of the effective use of the equipment, structural changes should be carried out inside the shops, store areas and loading & unloading bays to facilitate direct cargo loading process into the vehicles to minimize wastages.

Keywords: Post-Harvest, Perishable goods, Vegetable supply chain, Wastage, Distribution Centers, Packing, Transport

ACKNOWLEDGEMENT

I thank the Internal Supervisor of the Research Dr. Mahinda Bandara, Senior Lecturer, Department of Transport & Logistics Management, University of Moratuwa for the great assistance delivered as Research Coordinator of the programme of Master of Business Administration in Supply Chain Management 2017.

I am most grateful to Professor Amal S Kumarage, MBA coordinator and Dr. T. Sivakumar, Head of Department of Transport and Logistics Management and all the academic staff of the Department of Transport and Logistics Management for organizing and facilitating the research project.

LIST OF ACRONYMS

SCM : Supply Chain Management

EDB : Export development Board

EU : European Union

FAO : Food and Agriculture organization of the United Nations

MT : Metric tons

DC : Distribution Centers

TABLE OF CONTENT

DECLARATION OF ORIGINALITY	ii
COPY RIGHT STATEMENT	iii
STATEMENT OF THE SUPERVISOR.....	iv
ABSTRACT.....	v
ACKNOWLEDGEMENT	vii
LIST OF ACRONYMS.....	viii
TABLE OF CONTENT	ix
LIST OF FIGURES.....	xii
LIST OF TABLES.....	xiv
CHAPTER 1.....	1
INTRODUCTION.....	1
1.1. Background of the Study.....	1
1.2. Statement of the Problem	5
1.3. Research Objectives.....	6
1.4. Scope of the Research.....	7
1.5. Significance of the study	7
1.6. Limitations of the Research	8
CHAPTER 2.....	9
LITERATURE REVIEW	9
2.1. Vegetables Supply Chain.....	9
2.1 Primary Activities	10
2.1.2 Secondary Activities	11
2.3. Vegetables Supply Chain in Sri Lanka.....	12
2.3.1. The Global Supply Chain Factors and their Functions	12
2.4. Current Practices in SCM	14
2.4.1. Vegetables Procurement Management in Sri Lanka	14
2.4.2. Distribution Management of Vegetables Industry	16
2.4.3. Transport and Logistics of Vegetables Industry in Sri Lanka.....	17
2.4.4. Inventory Management of Vegetables Industry.....	17
2.4.5. Information Technology of Vegetables Industry	18

CHAPTER 3.....19

RESEARH METHODOLOGY19

3.1. Research Strategy 19

3.2. Research Method / Conceptual Framework..... 19

3.3. Data collection Method and Tools..... 21

3.3.1. Primary Data Collection Method 21

3.3.2 Secondary Data Collection Method 21

3.4. Sample Selection 21

3.5. Research Process 22

3.6. Data Analysis..... 24

3.6.1 Organize the Data 25

3.6.2 Identify a Framework..... 25

3.6.3 Sort the Data 25

CHAPTER 04.....26

ANALYSIS RESULTS AND DISCUSSION26

4.1: Achievement of objectives.....27

4.2. Descriptive Analysis of the Sample 28

Descriptive Analysis of wastage in Carrot..... 28

Descriptive Analysis of Beans..... 33

Descriptive Analysis of wastage in Beans 33

Origin points of Beans..... 33

Descriptive Analysis of Kangkong 38

Descriptive Analysis of Cabbage 42

4.2. Regression Analysis of the Sample..... 50

Regression analysis of factors affecting the wastage 50

CHAPTER 05.....52

CONCLUSION AND RECOMMENDATIONS52

5.1. Summary of Findings..... 52

5.2. Conclusion of the Research..... 53

5.3. Recommendations of the Research..... 54

5.4. Future Research Directions..... 55

REFERENCES..... 56

APPENDIXES i
Appendix 1.1. Data Set of the Research i
Appendix 1.2. Residual Output of the Regression Analysis iv

LIST OF FIGURES

Figure 1: Common Supply Chain in Vegetable industry.....	4
Figure 2: Sri Lanka Common Vegetable Supply Chain	23
Figure 3 : The Origin point of Carrot.....	28
Figure 4: Lorry Type in Carrot Delivery	29
Figure 5 :Sample Size of the Packing Type of Carrot	30
Figure 6: Distance of Carrot Delivery	30
Figure 7: Carrot Waste per kg over 31 days	31
Figure 8: Carrot Average Waste per kg based on the origin.....	31
Figure 9 : Carrot Average Waste per kg Based on Packing Type	31
Figure 10 : Carrot Average Waste per kg Based on Lorry Type of Delivery.....	32
Figure 11 : Carrot Average Waste per kg Based on Distance of Delivery	32
Figure 12 : Distance of Beans Delivery.....	33
Figure 13 : The Origin point of Beans	33
Figure 14 : Sample Size of the Packing Type of Beans.....	34
Figure 16 : Beans Waste per kg over 31 days.....	35
Figure 17: Beans Average Waste per kg Based on Distance of Delivery	36
Figure 18: Beans Average Waste per kg Based on Origin	36
Figure 19: Beans Average Waste per kg Based on Packing Type.....	37
Figure 20: Beans Average Waste per kg Based on Lorry Type of Delivery	37
Figure 21: Sample Size of the Distance of Kangkong Delivery.....	38
Figure 22 : Kangkong Average Waste per kg Based on Distance of Delivery.....	38
Figure 23: Kangkong Sample Size of the Origin	39
Figure 24 : Kangkong Average Waste per kg Based on Origin of Source	39
Figure 25: Sample Size of the Packing Type of Kangkong.....	40
Figure 26: Sample Size of Lorry Type of Kangkong Delivery	40
Figure 27: Kangkong Average Waste per kg Based on Lorry Type of Delivery	41
Figure 28 : Kangkong Waste per kg over 31 days.....	41
Figure 29: Kangkong Average Waste per kg Based on Packing Type.....	42
Figure 30: Sample Size of the Distance of Cabbage Delivery.....	42

Figure 31: The Origin point of Cabbage.....	43
Figure 32: Sample Size of the Packing Type of Cabbage	43
Figure 33: Lorry Type of Cabbage Delivery	44
Figure 34: Cabbage Waste per kg over 31 days	44
Figure 35: Cabbage Average Waste per kg Based on Distance of Delivery	45
Figure 36: Cabbage Average Waste per kg Based on Origin	45
Figure 37: Cabbage Average Waste per kg Based on Packing Type	46
Figure 38: Cabbage Average Waste per kg Based on Lorry Type of Delivery	46
Figure 39: Comparison of Average Wastage between Packing Materials	47
Figure 40 : Comparison of Average Wastage between Vehicle Types	48
Figure 41: Comparison of Average Wastage between Distances of Delivery.....	49
Figure 42: Comparison of Average Wastage between Origins of Source	50

LIST OF TABLES

Table 1: Land area and Production volume of Major Fruit Crops in 2016..... 3

Table 2 : Land area and Production volume of Vegetables-2016..... 3

Table 3: Average waste per kg (kg) 28

Table 4: Comparison of Average Wastage between Packing Materials..... 47

Table 5: Comparison of Average Wastage between Vehicle Types (average wastage in kg) 48

Table 6: Comparison of Average Wastage between Distances of Delivery (average wastage in kg) 49

Table 7: Comparison of Average Wastage between Origins of Source (average wastage in kg) 50