

**INVENTORY MANAGEMENT OF SALT TRADING  
CORPORATION LIMITED**

**Submitted by:**

**Sabitri Lamichhane**

**Birendra Multiple Campus**

**T.U. Regd. No. : 7-2-240-126-2005**

**Exam Roll No. : 190030 (2065-067)**

**A Thesis Submitted to:**

**Office of the Dean**

**Faculty of Management**

**Tribhuvan University**

**In the partial fulfillment of the requirements for the degree of  
Master's in Business Studies (MBS)**

**Bharatpur, Chitwan  
February, 2013**



**TRIBHUVAN UNIVERSITY**  
**BIRENDRA MULTIPLE CAMPUS**  
Bharatpur, Chitwan

056 { 520253  
520689  
526159

Fax: 056-520253

**DEPARTMENT OF MANAGEMENT**

Use Only for Thesis

(Ref):

Date:

**RECOMMENDATION**

This is to certify that the thesis

Submitted by

**Sabitri Lamichhane**

Entitled

**Inventory Management of Salt Trading Corporation Limited**

has been prepared as approved by this department in the prescribed format of faculty of management. This thesis is forwarded for evaluation.

.....  
Baikuntha Pd. Bhusal  
Thesis Supervisor

.....  
Baikuntha Pd. Bhusal  
Chairperson, Research Committee

.....  
Sushil Dahal  
Programme Incharge

.....  
Dr. Keshav Bhakta Sapkota  
Campus Chief

Date:



**TRIBHUVAN UNIVERSITY**  
**BIRENDRA MULTIPLE CAMPUS**  
Bharatpur, Chitwan

056 { 520253  
520689  
526159

Fax: 056-520253

**DEPARTMENT OF MANAGEMENT**

Use Only for Thesis

(Ref):

Date:

**VIVA-VOCE SHEET**

We have conducted the Viva-Voce examination of the  
Thesis presented by

**Sabitri Lamichhane**

Entitled

**Inventory Management of Salt Trading Corporation Limited**

and found the thesis to be the original work of the student and written according to the prescribed format. We recommended the thesis to be accepted as partial fulfillment of the requirement for  
**Master Degree in Business Studies (MBS)**

**VIVA-VOCE COMMITTEE**

Chairperson, Research Committee: .....

Member (Thesis Advisor): .....

Member (External Expert): .....

Date:

## **DECLARATION**

I hereby declare that the work done in this thesis entitled "Inventory Management of Salt Trading Corporation Limited" submitted to Birendra Multiple Campus, Faculty of Management, Tribhuvan University is my original work. It is done in the form of partial fulfillments of the requirement of the degree of Master of Business studies (M.B.S.) under the supervision and guidance of Baikuntha Pd. Bhusal, Lecturer of Birendra Multiple Campus.

Date: .....

**Sabitri Lamichhane**  
Researcher  
Birendra Multiple Campus  
T. U. Regd. No. 7-2-240-126-2005

## **ACKNOWLEDGEMENT**

This thesis entitled "Inventory Management of Salt Trading Corporation Limited" has been prepared in the prescribed form as required by the central department of management for the partial fulfillment of master degree in business administration.

I would like to express my thesis supervisor Baikuntha Pd. Bhusal (Chairperson of research committee) respected lecturer of Birendra Multiple Campus, for his valuable suggestion and guidance.

My thank goes to Campus Chief Dr. Keshav Bhakta Sapkota, Sushil Dahal (MBS program incharge) and Sudip Wagle lecturer of Birendra Multiple Campus for their proper encouragement & cooperation.

I would like to express my hearty thanks to my family members and my husband Nagendra Bastakoti & brother Bipan Lamichhane for their regular inspiration, encouragement and continuous contributions for completion of this dissertation.

Last, I am also grateful to my brother C. M. Adhikari for printing, designing this dissertation.

Date:

**Sabitri Lamichhane**  
**Birendra Multiple Campus**

# TABLE OF CONTENTS

<b>Recommendation</b>	<b>I</b>
<b>Viva-Voce Sheet</b>	<b>II</b>
<b>Declaration</b>	<b>III</b>
<b>Acknowledgment</b>	<b>IV</b>
<b>Table of Contents</b>	<b>V-VIII</b>
<b>List of Tables</b>	<b>IX</b>
<b>List of Figures</b>	<b>X</b>
<b>Abbreviations</b>	<b>XI</b>
<b>CHAPTER ONE</b>	<b>Page No.</b>
<b>INTRODUCTION</b>	<b>1-7</b>
1.1 Background of the study	1
1.2 Statement of Problem	4
1.3 Objectives of the Study	5
1.4 Significance of the study	5
1.5 Limitation of the Study	6
1.6 Organization of the study	6
<b>CHAPTER TWO</b>	
<b>REVIEW OF LITERATURE</b>	<b>8-41</b>
2.1 Conceptual framework	8
2.1.1 Inventory Concept	8
2.1.2 Inventory Management Concept	10
2.1.3 Purpose of Inventory	11
2.1.4 Inventory Cost	12
2.1.5 Objectives	12
2.2. Purchasing	14
2.2.1 Objectives of Purchasing	14
2.2.2 Purchasing Procedure	15
2.3 Material Handling	15
2.4 Store Keeping	17
2.4.1 Objectives of Store Keeping	17

2.4.2 Bin Card	18
2.4.3 Store Ledger	18
2.4.4 Issuing and Pricing	18
2.5 Cost Concept	18
2.6 Inventory Management Techniques	20
2.7 Ordering and Carrying Costs Trade off	22
2.7.1 Trial and Error Approach	22
2.7.2 Order Formula Approach	23
2.7.3 Graphic Approach	24
2.7.4 Quantity Discount	25
2.8 Re-order Point	28
2.8.1 Lead Time	29
2.8.2 Re-order System	29
2.9 Statistical Inventory Controls System	31
2.10 Safety Stock	31
2.11 ABC Analysis	32
2.12 Blankets Rules	34
2.13 Inventory Valuation	34
2.13.1 Various Method of Valuation of the Inventory	35
2.14 Inventory and the Financial Manager	36
2.15 Monitoring Amounts	36
2.16 Watching Inventory Risks	37
2.17 Review of Related Study	38
2.18 Research Gaps	41
<b>CHAPTER THREE</b>	
<b>RESEARCH METHODOLOGY</b>	<b>42-49</b>
3.1 Introduction	42
3.2 Research Design	42
3.3 Nature and sources of data	42
3.4 Populations and Sample Size	43
3.5 Methods of Data Collection	44

3.6 Tools Used	44
3.6.1 Financial Tools	45
3.6.1.1 ABC Analysis:	45
3.6.1.2 EOQ Model:	45
3.6.1.3 Ratio Analysis:	45
3.6.2 Statistical tools	46
3.6.2.1 Trend Analysis	46
3.6.2.2 Mean:	47
3.6.2.3 Standard Deviation ( $\sigma$ )	47
3.6.2.4 Coefficient of variable (CV)	48
3.6.2.5 Coefficient of Correlation(r)	48
3.6.2.6. Probable error (PE)	49
<b>CHAPTER FOUR</b>	
<b>PRESENTATION AND ANALYSIS OF DATA</b>	<b>50-86</b>
4.1 Introduction	50
4.2 Demand Forecasting (Determination of Goal/Target)	51
4.3 Procurement Procedure of Salt and Sugar	51
4.3.1 The Diplomatic Channel/Assistance from Donor Agencies	52
4.3.2 World Market/Commercial Purchase	52
4.3.3 Procurement Process through Inviting Tenders	52
4.3.4 Negotiation	53
4.4 Warehousing and Packing of Salt and Sugar	53
4.5 Distribution Network	55
4.6 Transportation	55
4.7 Issue of Inventory Management in STCL	56
4.7.1 Economic Order Quantity (EOQ)	57
4.7.2 Lead Time	57
4.7.3 Re-order Point	57
4.7.4 Safety Stock	58
4.7.5 Quantity Discount	58
4.7.6 ABC Analysis	58



4.8 Calculation of Margin	58
4.8.1 Net Profit Margin	58
4.8.2 Gross Profit Margin	60
4.9 Sales of food items (salt, sugar, ghee and floor )	62
4.10 Analysis of Sales and Stock	64
4.10.1 Analysis total stock and Stock of food item (that is salt and sugar)	65
4.10.2 Analysis Stock of Non-food Items and Others as a Total Stock	67
4.10.3 Analysis of Sales	69
4.10.4 Analysis of sales of non-food items and others as total sale	70
4.11 Sales and Closing Stock	72
4.12 Procurement Trend of STCL	72
4.13 Inventory and Working Capital	75
4.14 Inventory Turnover Ratio	76
4.15 Warehousing of Salt and Sugar	78
4.16 Targeted Sales and Actual Sales	80
4.17 Major Findings	83
<b>CHAPTER FIVE</b>	
<b>SUMMARY, CONCLUSION AND RECOMMENDATION</b>	<b>87-94</b>
5.1 Summary	87
5.2 Conclusion	90
5.3 Recommendation	92
<b>Reference</b>	<b>95-96</b>
<b>Appendixes</b>	<b>97-110</b>

## LIST OF TABLES

Table 2.1	Total costs of various lot orders	23
Table 2.2	Quantity Discount	26
Table 2.3	Calculation of Total costs	28
Table 4.1	Calculation of Net Profit Margin	59
Table 4.2	Gross profit margin	61
Table 4.3	Sales of food items	62
Table 4.4	Fitting the Diagram by Least Square	63
Table 4.5	Closing Stock of food items as a Percentage of Total Stock	64
Table 4.6	Stock of food items and other items	66
Table 4.7	Sales of different items from STCL in different yerars	67
Table 4.8	Sales of agriculture items, fuel, lubricants and tyre and others as total sale	68
Table 4.9	Calculation of sales	69
Table 4.10	Sales and Closing Stock	70
Table 4.11	Mean, Standard Deviation and C.V. of Sales and Closing Stock	72
Table 4.12	Procurement Trend of STCL	73
Table 4.13	Fitting the Diagram by Least Square	74
Table 4.14	Inventory and Working Capital	75
Table 4.15	Calculation of Inventory Turnover Ratio	76
Table 4.16	Calculation of Mean and Standard Deviation	77
Table 4.17	Salt and Sugar Warehousing Capacity of STCL	78
Table 4.18	Warehousing Capacity of STCL by Zone	79
Table 4.19	Targeted Sales and Actual Sales	80
Table 4.20	Calculation of Mean, Standard Deviation and C.V.	82

## LIST OF FIGURE

Figure 2.1 Material Handelling	16
Figure 2.2 Economic Order Quantity Function	25
Figure 2.3 Re-Order Point Under Certainty	<b>Error! Bookmark not defined.</b> 9
Figure 2.4 Two-Bin System	30
Figure 2.5 Re-Order Pooint Under Uncertainty	32
Figure 2.6 Graphic Presentation of ABC analysis	33
Figure 3.1 Organizational Structure of STCL	44
Figure 4.1 STCL Flow chart	55
Figure 4.2 Net profit trend of STCL	60
Figure 4.3 Bar diagram of net profit and sales	60
Figure 4.4 Trend of Gross profit	61
Figure 4.5 Trend of sales of food items	62
Figure 4.6 Stock of food items as a percentage of total stock	65
Figure 4.7 Stock of agriculture items, fuel, lubricants and tyre and other items	66
Figure 4.8 Showing trend of sales of different items form STCL	67
Figure 4.9 Sales of agriculture items, fuel, lubricants and tyre and others as total sale	70
Figure 4.10 Sales and closing stock of STCL	71
Figure 4.11 Trend of closing stock	71
Figure 4.12 Procurement Trend of STCL	73
Figure 4.13 Trend of Targeted Sales and Actual Sales	81

## ABBREVIATIONS

AIC	:	Agriculture Input Corporation
BNTL	:	Bottlers Nepal (Terai) Limited
BOD	:	Board of Director
Co.	:	Company
CV	:	Coefficient of Variation
EOQ	:	Economic Order Quantity
FIFO	:	First In First Out
FY	:	Fiscal Year
HPPCL	:	Herbs Production and Processing Company Limited
L/C	:	Letter of Credit
LIFO	:	Last In First Out
M. ton	:	Metrics Tones
No.	:	Number
NTL	:	National Trading Limited
PE <sub>s</sub>	:	Probable Error
RDL	:	Royal Drug Limited
ROL	:	Re-order Level
ROL	:	Re-order Level
Rs.	:	Rupees
STCL	:	Salt Trading Corporation Limited

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

An inventory is the stock of any idle item or resource in a firm for future use. In manufacturing organizations, typically, have inventories of raw materials, components, sub-assemblies, tools and equipments, semi-finished goods, finished goods etc. In service organizations, inventory refers to the tangible items to be sold and used in various service operations. Inventories are greatly affected by the level of sales. Since inventories are acquired before sales can take place, an accurate sales forecast is critical to effective inventory management. Inventory represents a large proportion of current assets. Inventory helps to make short-term decision regarding working capital as it is a part of working capital. No business can exist without proper management of inventory.

A manufacturing company must maintain a certain amount of inventory during production process that has been partly fabricated and it is strongly influenced by the length of production period. The time between placing raw material in production and completing the finished product is the production period. Decreasing the production period can increase the inventory turnover. One means of accomplishing this is new techniques such as just in time inventory management. Another means is to buy item rather than make them.

Inventory management is primarily about specifying the shape and percentage of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials. The scope of inventory management concerns the fine lines between replacement lead time, carrying costs of inventory, assets management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment,

returns and defective goods, and demand forecasting. Balancing these competing requirements leads to optimal inventory levels, which is an on-going process as the business needs shift and react to the wider environment.

Inventory management involves a retailer seeking to acquire and maintain a proper merchandise assortment while ordering, shipping, handling, and related costs are kept in check. It also involves systems and processes that identify inventory requirements, set targets, provide replenishment techniques, report actual and projected inventory status and handle all functions related to the tracking and management of material. This would include the monitoring of material moved into and out of stockroom locations and the reconciling of the inventory balances. It also may include ABC analysis, lot tracking, cycle counting support, etc. Management of the inventories, with the primary objective of determining/controlling stock levels within the physical distribution system, functions to balance the need for product availability against the need for minimizing stock holding and handling costs.

To maintain the large size inventory in a firm considerable funds are required. Both excessive as well as inadequate inventories are dangerous to any firm. An excessive inventory ties up the firm's fund and losses the profit. It also increasing carrying cost and therefore may also run the risk of liquidation. General motives for inventory management are:

**Transaction motive:** Transaction motive emphasis's the need to maintain inventories to facilitate smooth production and sales operation.

**Precautionary motive:** Precautionary motive are necessities holding of inventories to guard against the risk of unpredictable change in demand and supply forces and other factors.

**Speculative motive:** Speculative motive influences the decision to increase or reduce inventory levels to take advantages of price fluctuation.

To know the cost of inventory management, the manager should identify all the cost involved in purchasing and maintaining inventories. These costs are ordering and carrying costs.

**Ordering costs:** Ordering costs are the costs of placing and receiving an order. The cost of each order generally is fixed regardless of the average size of inventory. Total ordering cost (TOC) is the product of number of order (N) and fixed cost per order (O). Thus,  $TOC=N \times O$ .

**Carrying costs:** Carrying costs associated with inventory include the funds tied up, storage costs, insurance, and depreciation. The annual total carrying cost (TCC) is equal to the product of average inventory in units ( $Q/2$ ), annual percentage carrying cost and price per units. Thus,  $TCC=Q/2 \times C$ .

**Total inventory costs:** Total inventory cost (TIC) is equal to the sum of total carrying and ordering cost. Thus,  $TIC=C \times Q/2 + O \times N$

Similarly, inventory has direct relationship with profit planning to prepare different budgets, especially for the production budget and purchase budget that is.

Production Units = Sales units + closing inventory - opening inventory

Purchase units = production units + closing inventory of raw materials – opening inventory of raw material.

Thus, the management should pay adequate attention to the inventory management to reduce the cost of production. Inventory should be maintained in appropriate quantity so as to avoid both under stock and over stock. The aim of inventory management is to maintain optimum level of inventory for the smooth production and sales. Therefore, inventory management is primarily concerned with minimizing total cost.

This research work is concerned with the inventory management of salt trading corporation limited. Since it is larger business organization and big inventory holders of Nepal. The researcher keeps keen interest to analyze its inventory management system and condition. It is important to find out the real situation

of inventory management of this type of organization keeping this in mind whole research is being conducted.

## **1.2 Statement of Problem**

Salt trading corporation is the only organization having the responsibility to provide salt, sugar, agriculture materials, construction materials, fuel and lubricants and others. Among them it's provided large quantity of salt and sugar. Salt trading has its own delivery network of food item and chemical goods. STCL is the pioneer trading organization-providing salt in the country.

Its main objective is to provide salt at the right time and right place. STCL enough care for inventory management because if salts are not provided at the right time its objective may not be achieved. So to solve the great problem of demand and supply of salt STCL should use the scientific techniques of inventory management.

Now, STCL is providing required quantity of salt and sugar to the consumer in the remote village of the country. To meet the basic objective of STCL all the department use scientific inventory system which will solve the problem of over stocking and shortage.

Some major issues of this research work are as follows:

1. How inventories are managed in STCL?
2. Is there appropriate number of warehouse for salt and other goods that is distributed by STCL?
3. Whether they implement scientific inventory management?
4. Whether they plan for inventory for smooth running?
5. Whether they manage EOQ?
6. Is there any relationship between inventory, working capital and other components of profit planning?



### **1.3 Objectives of the Study**

The basic objectives of this study are to analyze the present position of inventory management and Present procurement and distribution process of food items (major items is Salt and Sugar). Analyzing the process of inventory management that is followed by STCL is the main objectives of this study. The specific objectives of this study are as follows:

1. To exam the existing inventory system applied by STCL.
2. To evaluate the warehouse facilities in different zones for varies goods.
3. To analyze the present position of inventory management system.
4. To find out the optimal inventory level of food items and others goods.
5. To find the relationship between inventory, working capital and different components of profit planning covering production budget, purchase budget by focusing inventory policy.

### **1.4 Significance of the study**

Inventory management is an important concern for managers in all types of the business. Every business/manufacturing organization however, big or small has to maintain some inventory. No any organization can achieve organizational goal and objective without efficient and effective inventory management system. Inventory helps the company quickly responding to the customer demand which is an important element of competitive strategy. Inventory of finished goods of the current items to meet the market demand at the different point of the time within a reasonable response time play an important role in a company's ability to compete in the market. Inventories of raw materials or partially processed goods can help a company complete the production cycle in a much shorter time than would otherwise be possible. The knowledge of sound keeping inventory management helps both organization and customers. So this study will try to emphasis on the importance of inventory management in the organization. What is the Weakness of the organization while keeping sound inventory management system? Which tools and techniques can be used

while keeping sound inventory management in the organization? There are lots of theses on this topic. Although, thesis related on this topic as a cooperative study are not found more. So, this topic has been selected for the study.

### **1.5 Limitation of the Study**

There are some limitations faced by researcher while conducting this research work, some of them are;

1. The study will consider only STCL and will be based up on annual report of STCL.
2. The study covers only inventory aspect.
3. This study is based on data provided from companies and other available resources.
4. Hence this study is based on secondary data as well as primary data
5. The study cover and year performance of STCL from fiscal year 2060/2061 to fiscal year 2067/68.
6. Financial tools and statistical tools are used in analyzing the inventory management of Salt trading corporation limited.
7. The major goods supplied by STCL i.e. salt and sugar.

### **1.6 Organization of the study**

This study has to be complete within the format provides by the Research Department of Central Department of Management, the faculty of Management, the research is divided into Five Chapters, Which are as follows,

**Chapter One:** It includes general background of the study, introduction of the Company, Statement of the problem, objective of the study and limitation of the study.

**Chapter Two:** This Chapter includes reviews of literature. The researcher has divided this chapter into two portions, first being theoretical framework and second is review of previous studies.

**Chapter Three:** The chapter includes research methodology, research design, nature and soundness of data, data collecting procedure, presentation and analysis techniques and tools. Both primary and secondary data are used in this study. But Secondary data are used considerers.

**Chapter Four:** Fourth chapter of this study will concern with data presentation and analysis. This is the main part of the study. Obtained data are presented in the tabular and other forms. Various statistical presentation are used in the analyzing the collected from different sources. Actual results are obtained after analysis of data by using financial and statistical tools and techniques. Major findings are drawn after analysis of data.

**Chapter Five:** This is the last chapter of the study and includes summary, conclusion and recommendations.

Bibliography and appendices have been also presented at the end of the study.

## **CHAPTER TWO**

### **REVIEW OF LITERATURE**

A literature review is a body of text that aims to review the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to particular topic. Literature reviews are secondary sources and as such, do not report any new or original experimental work. Also, a literature review can be interpreted as a review of abstract accomplishment.

This chapter attempt has been made to present the review of literature regarding the inventory management. Review of literature divided different sub section. Theoretical review of inventory management related studies on the inventory management.

#### **2.1 Conceptual framework**

##### **2.1.1 Inventory Concept**

The inventory refers to assets, which will be sold in outlook in the normal classes of big business operation. The assets that the firm stores as inventory in anticipation of need are raw materials work in process/semi finished goods and finished goods.

“Inventory as a current assets; differ from the other current assets because only financial manager are not involved rather all the financial areas i.e. finance, marketing, production and purchasing are involved. The views concerning the appropriate level of inventory would differ among the different functional areas” (Khan and Jain, 2003:20).

Inventory is the stock of materials or a product that frequently occurs in the manufacturing organization, depending upon the nature of industry and firm, inventories may be durable and perishable, valuable and inexpensive. When materials are purchased by an organization they have to be store until they are put into the production process. When the production is over the finished

products have to be stored until they are sold. In manufacturing there are four steps of inventories such as raw materials, work in process (semi-manufactured product), finished goods and office supplies (Pandey, 2002:755).

"Inventory is an idle resource which is useable and has value. The idle resources may be man, money, materials, and plants requirements" (Ahuja, 1993: 310). Sure inventory is an item of current assets which is the most important for the successful run of any enterprise whether it is commercial or manufacturing mainly raw materials, semi finished goods, finished goods parts and supplies are the forms of inventory. The need of inventories is for the transaction motive, precautionary motive and speculative motive.

"The function of directing or regulating the orderly arrangement of goods while the entire manufacturing cycle from the requisition of raw materials to the delivery of finished goods to meet the objectives of customer's service, minimum inventory investment and maximum manufacturing efficiency includes inventory control. The techniques of maintaining stock keeping item at desired levels whether they may be raw materials work process or finished goods" (American Production and inventory control society: 1998 see past research)

The fundamental reason for carrying inventory is that, "It is physically impossible and economically impractical for each stock item to arrive exactly where it is needed exactly when it is needed" (Adam and Ebert, 2002: 454).

"Inventories constitute is the most significant part of current assets of a large majority of companies" (Pandey, 2002: 884). Inventory represents investment of a firm's fund. The objectives of the inventory management should be the maximization of value of the firm. The firm should therefore consider

1. Cost
2. Return
3. Risk factor
4. In establishing its inventory policy.

"Inventories form a link between production and sale of a product. A manufacturing company must maintain a certain amount of inventory during production, the inventory known as work in process. Although other types of inventory namely raw materials and finished goods are not necessary in the strictest sense they allow the company to be flexible," (Van Horne, 2000: 376).

"Inventories which may be classified as (i) supplies (ii) raw materials (iii) work in process and (iv) finished goods are an essential part of virtually all business operations " (Brigham, 2000: 35.62). Manufacturing firms normally have three kinds of inventories (i) raw materials (ii) Work in process (iii) Finished goods. The level of raw materials inventories is influenced by anticipated production, seasonal production reliability of sources of supply, and the efficiency of scheduling purchase and production operations. Work in process inventory is strongly influenced by the lengths of production period, which is the time between placing raw materials in production and completing the finished product.

Decreasing the production period can increase inventory turnover one means of accomplishing this is new techniques such as just in time inventory management. Another means is to buy items rather than make them. The level of finished goods inventory is a matter of coordinating production and sales (Western and Copeland, 2005: 814).

### **2.1.2 Inventory Management Concept**

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer in of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy. Competent inventory management also seeks to control the costs associated with the inventory, both from the perspective of the total value of the goods included and the tax burden generated by the cumulative value of the inventory.

Inventory management is not limited to documenting the delivery of raw materials and the movement of those materials into operational process. The movement of those materials as they go through the various stages of the operation is also important. Typically known as a goods or work in progress inventory, tracking materials as they are used to create finished goods also helps to identify the need to adjust ordering amounts before the raw materials inventory gets dangerously low or is inflated to an unfavorable level.

Finally, inventory management has to do with keeping accurate records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a sub-category contained in the finished goods inventory to account for any returned goods that are reclassified as refurbished or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time. ([www.barcodesinc.com](http://www.barcodesinc.com))

### **2.1.3 Purpose of Inventory**

The basic reason for keeping inventory is that it is physically and practically impossible to meet the needs of customers whenever and wherever they are needed. In addition to this reason, other reasons for maintaining inventory are as follows:

1. To maintain independence of operations/decoupling.
2. To meet variation in product demand/buffer stock.
3. To allow flexibility in production schedule.
4. To provide a safeguard for variation in raw materials.
5. To take advantages of economic purchase order.
6. To increase return on investment.

#### **2.1.4 Inventory Cost**

Cost of inventory includes price of raw materials, transportation, insurance, store charges etc. All these costs directly affect the cost and price of goods. To maximize profit of an organization management should focus on minimization of inventory cost. Thus, inventory cost can be classified in the following categories.

##### **Procurement/Ordering Cost**

It includes those costs, which are incurred for placing orders, or the setup cost if goods are manufactured. It focuses to minimization of these costs.

##### **Holding/Carrying Cost**

Holding cost is incurred for keeping stock in the store. It includes rent insurance, security, heat, light, power, taxes, thefts, leakage, spoilage etc.

##### **Shortage/Stock Out Cost**

Stock out refers the shortage of stock to meet the demand of customers. Stock out cost includes the cost of demand of back order, loss of goodwill, loss of the profit, expenses incurred for receiving the stock from suppliers and notifying the customers when goods have arrived.

#### **2.1.5 Objectives**

The basic responsibility of the financial manager is to make sure that the firms cash flows are managed efficiently. Efficient management of inventory should ultimately result in the maximization of owners' wealth. In order to minimize cash requirements, Inventory should be turned over as quickly as possible avoiding stock-out that might result in closing down the production line or lead to a loss of sales. It implies that while the management should try to purchase the financial objective of turning inventory as quickly as possible it should at the same time ensure sufficient inventories to satisfy production and sales demands. In other words, financial manager has to reconcile these two conflicting requirements stated differently the objective of inventory management consists of two counter balancing parts:



1. To minimize investment in inventory and
2. To meet a demand for the product by efficiently organizing the production and sales operations.

These two conflicting objectives of inventory management can also be expressed in terms of cost and benefit associated with inventory. That the firm should minimize investment in inventory implies that maintaining inventory involves costs, such that the smaller the inventory, the lower is the cost to the firm. But inventories also provide benefit to the extent that facilitates the smooth functioning of the firm. The larger the inventory the better it is from this view point. (Khan and Jain: 2003:20)

The quantity of inventory should not be excess or inadequate but optimal level. So, it should be stream point using scientific and modern techniques on the point basis, the objectives of inventory management are:

1. Service to customer
2. Effective use of capital.
3. Reduction of risks of loss.
4. Promotion of manufacturing efficiency.
5. Economy in Purchasing.
6. Avoidance of out of stock danger.

To get above objectives inventory should be manage in proper way.

"Inventory management is mainly concerned with minimizing investment of investment of inventory is one hand and minimizing cost of inventory maintaining on the other hand. Both physical as well as financial dimensions of inventory should be managed effectively. The main duty of top-level management is to maintain optimum level of inventories investment for achievement of desired goal. (Bose, 2000: 350)

Generally, Inventory management covers function of: -

1. Purchasing
2. Store Keeping
3. Issuing and Pricing.

## **2.2. Purchasing**

Purchasing is the first phase of materials management. Purchasing means procurement of goods and services from some external agencies. The object of purchase department is to arrange the supply of material, spare parts and services or semi-finished goods, required by the organization to produce the desired product from some agency or source outside the organization. The purchased items should be of specified quality in desired quantity available at the prescribed time at a competitive price.

Purchasing is a managerial activity that goes beyond the simple act of buying. It includes research and development for the proper selection of materials and sources, follow up to ensure timely delivery; inspection to ensure both quantity and quality; to control traffic, receiving, store keeping and accounting operations related to purchased.

### **2.2.1 Objectives of Purchasing**

The objectives of purchasing should conform with the overall objectives of the organization. It is one major activity where reasonable optimization can be accomplished. Following are the major objectives of purchasing.

1. To procure materials which are most appropriate to the product and are supplied in right quantity and quality at right time and right price?
2. To control the quantity of material following economical order size and optimal inventory management system.
3. Procuring for the utility by a schedule sufficiently in advance of the production department so that the production work shall not suffer due to lack of materials.

4. Buying the quality, which is neither too much that involves belonging of capital, nor too little that holds up the regular supply for production.
5. Maintenance of company's competitive passion i.e. the market by having company's quality standard's in accordance with the demand of customers.

### **2.2.2 Purchasing Procedure**

Following are the purchasing steps that are commonly followed by the various departments:

- Step 1** Various departments are requested to send their requirements on a proper requisition form.
- Step 2** Purchasing department consolidates the requirements from various departments to know the total requirement for each order.
- Step 3** Market explanation is made to locate the good and services of desired quality and quantity at the reasonable price.
- Step 4** Potential suppliers are identified from catalogues, quotations and past records.
- Step 5** Purchase order in specified form is prepared and sent to the approved suppliers.
- Step 6** After some time of placing the order, following up process starts to get quick delivery of the items.
- Step 7** The items are received by the purchasing department at the time of delivery and the items of delivery and the items received are compared with purchase order.

### **2.3 Material Handling**

Material handling involves movements of materials mechanically or manually in batches or one by one with the plant. Movement may be horizontal, vertical or a combination of the two. One of the important features of conversion process is movement from one place to another, one department to another, one machine to another. This movement directly affects cost and quality of goods

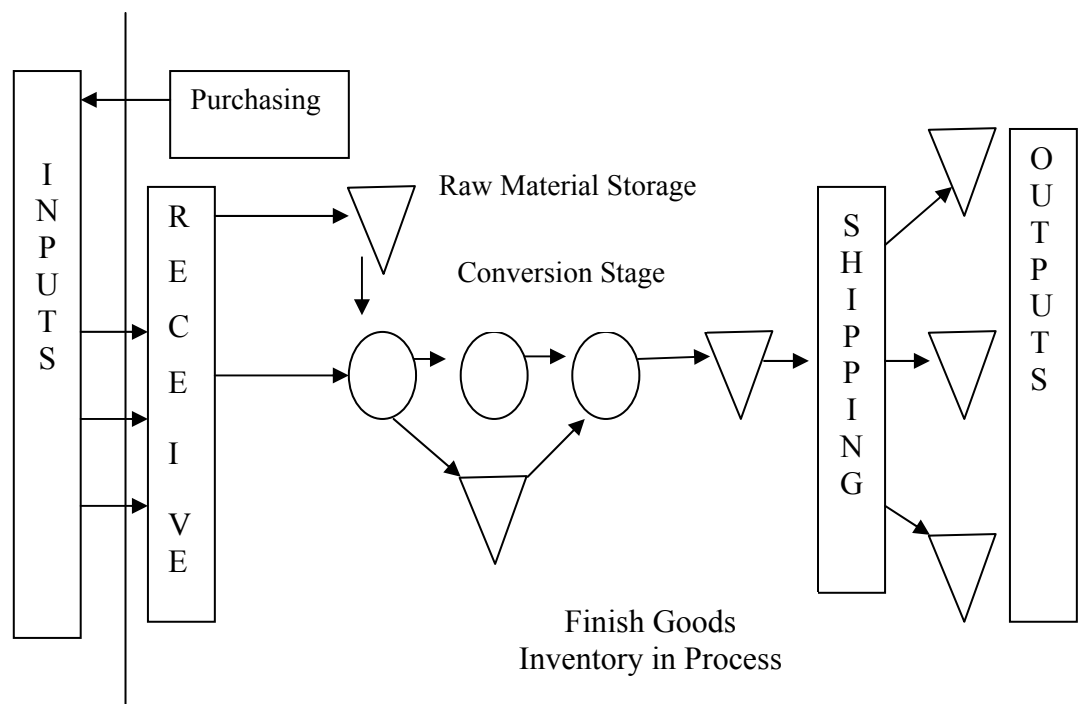
and services. It is a major consideration for effective and efficient production system. Therefore it is to be considered as a separate discipline of study. Materials handling includes all those transportation or movement activities of material, work in process, supplies from one place to another place.

The main objectives of the study of materials handling are as follows: -

1. It helps to reduce need for handling from one place to another place by eliminating unnecessary movements of men and machines.
2. It reduces the cost of materials handling.

In order to achieve the above objectives, first of all, facilities and department should be arranged under criteria of minimum and distance.

**Figure 2.1**  
**Material Handling**



*Source: Stapith, et al., 2010*

The following factor should be considered in developing materials handling system.

Types of production system

Capacity of equipment.

Size of load.

Weight of container.

Volume of materials.

Nature of materials.

Method of packing.

## **2.4 Store Keeping**

Materials obtain a high part of cost of production of a product. It is therefore necessary to have a close watch on proper use of materials. The best method of maintaining materials properly is store keeping; storekeeping is a service function in a manufacturing concern which deals with the physical store of goods under the custodian of a well trained and experienced person turned as storekeeper. Raw materials are usually known as storeroom. Storekeeping is that aspects of inventory control that is concerned with the physical storage of goods. The responsibility of stock keeping management are "to receive materials, to protect them in store from damage or unauthorized removed, to issue the materials in the right quantity at the right time to the right place and provide these services promptly and at least cost." (Goel, 2001)

### **2.4.1 Objectives of Store Keeping**

1. Receiving, handling and issuing goods economically and efficiently.
2. Using the available store space and labor efficiently.
3. Protection of all goods against all cases like fire, theft, obsolesces etc.
4. Facilitating ordering or required materials.
5. Maintaining regular supply of raw materials at all times when properly authorized.
6. Minimizing the inventory holding cost.
7. To achieve the above objectives a firm generally uses different types of controlling techniques like:

### **2.4.2 Bin Card**

Bin card is a record of receipt and issue of materials. Quantity of store received is entered with receipt column and the quantity of store issued is recorded in the issue column of Bin Card. Balance of quantity of stores is ascertained after every receipt or issue. It shows the balance of the stock at any moment of time. Bin Card is maintained by the store-keeper. He is answerable for any difference between physical store and the balance shown by the Bin Card. Thus Bin Card does not only record the receipt and issue of the stores but also assist the store keeper for control of the stock. For each item of stores minimum level, maximum level and ordering level are shown in the part of the Bin Card. By seeing the Bin Card the store keeper sends the material requisition for the purchase of materials from time to time.

### **2.4.3 Store Ledger**

This ledger is kept in the costing departments and is identical with the bin card except that receipt, issue and balance are shown along with their money values. This contains an account for every item of store and makes a record of the receipt, issue and the balance, both in quantity and value. Thus, this ledger provides the information for the pricing of materials issued and the money value at any time of each item of storage. ([www.publishyourarticles.net](http://www.publishyourarticles.net))

### **2.4.4 Issuing and Pricing**

Materials should be issued against materials requisition slip. The price of the issue can be determined on the basis of cost price or market price.

### **2.5 Cost Concept**

Cost is certainly a considerable factor in purchasing, production, and maintaining inventory. To solve the cost problem, the decision factors are when to purchase and to how much to purchase at a time. The various factors should be considered and are applied to use the mathematical techniques in order to get the optimum and idle inventory management system to bring the less cost consequence to the company. Lack of adequate knowledge regarding inventory

policies to production manager and absence of formal records derives critical situation for economy purchase.

**Cost Associated with inventories. (Weston Copeland, 816)**

**(A) Carrying Cost**

1. Storage cost.
2. Insurance.
3. Property taxes.
4. Cost of capital tied up.
5. Depreciation and obsolesces.

**(B) Ordering Cost**

1. Cost of placing order o production set up cost.
2. Shipping and handling cost.
3. Quantity discount taken or loss.

**(C) Cost Related to Safety Stock**

1. Loss of sales
2. Loss of customer goodwill
3. Disruption of production schedules.

Part A involves carrying costs. Obviously the larger the inventory the larger will be storage cost, insurance and property taxes. Warehousing cost is likely to be more directly related to the size of the inventory item rather than to the value of item purchased. However all of the other carrying costs vary with the value of the item, for example both insurance cost and property taxes are related to the value of the inventories. In addition, more valuable items in inventory may require extra protection and extra safeguards. Therefore, storage costs and carrying is usually measured as some percentage of inventory value, carrying costs are a type of variable costs. As in economics, when a cost is a fixed amount per quantity produced or sold this is generally regarded as a

variable cost. To the extent that a firm has a safety stocks the carrying costs related to a fixed amount of safety stocks may be regarded as fixed cost.

The second category of costs set is ordering costs. Ordering costs are the costs of placing an order if the items are purchased from other or production set up costs if produced within the firm. Ordering costs include the cost of running a purchasing department. Personnel and telephone or letter writing expenses associated with placing orders and the costs of preparing specification. Ordering costs would also include the related costs of receiving and inspecting the material and costs of paying invoices. Another type of ordering cost is represented by quantity discounts, which may be available if the size of the purchase order is large enough.

It is difficult to draw the line between variable and fixed ordering costs. The basic costs of running an order department, including the salary of purchasing agent and the cost of typewriter, desks and telephone may be regarded as fixed. Given his basic purchasing facility the cost of increasing the number of order over a moderate range may be relatively small. As the number of order increases it may be necessary at some point to increase the space allocated to the purchasing department to acquire additional personnel and so forth. In this situation the ordering costs become variable.

The third category of costs is related to safety stocks. Safety stocks represent the inventories held by the firm in the effort to avoid running short of goods to meet sales opportunities. If safety stocks are inadequate the firm will insure lost of sales and cost of customer goodwill. If we consider an inventory production system, running short may require overtime and other disruption of production schedules.

## **2.6 Inventory Management Techniques**

In managing inventories the firm objectives should be in consonance with the shareholders wealth maximization principle. To achieve this, the firm should determine the optimum level of inventory. Ineffective inventory control results unbalanced inventory and inflexibility. The firm may sometimes run out of



stock and some time may pick up unnecessary stocks. This increases the level of investment and makes the firm unprofitable.

To manage inventories efficiency answer should be straight to the following two questions:

1. How much should be ordered?
2. When should it be ordered?

The first question, how much to order relates to the problem of determining economic order quantity and is answered with an analysis of costs of maintaining certain level of inventory. The second question when to order arises because of uncertainty and is a problem of determines the re-order point (Pandey, 2002: 819)

To solve these question use several techniques quoted few lines of James Morgan "Due to friction and uncertainty mancet since 1970s the cost of inventory as a buffer stock has been extensively developed to solve the inventory problems. But each company has to develop its own systematic analytical approach rather than borrowing techniques and formula.

### **Economic Order Quantity**

EOQ is the quantity of the goods to be ordered which minimizes the total annual cost of the inventory. Order quantity decisions affect the amount of inventory to be maintained at various stocking points. Large order quantities may decline the frequency of orders to be placed to procure inventory items and reduce the total ordering cost. But this decision will increase the cycle stock inventories and cost of carrying inventories. The determination of order quantities (lot size of production) increases the question of what order (or lot) size provides the most economical tradeoff between relevant inventory costs, i.e. ordering, carrying and stock out costs. The ordering quantity decision is stated in terms of economic order (or lot size) quantity (EOQ).

EOQ is essentially an accounting formula that determines the point at which the combination of order costs and inventory carrying costs are the least. The result is the most cost effective quantity to order. In purchasing this is known as the order quantity and in manufacturing it is known as the production lot size.

The economic order quantity is that inventory level, which minimizes the total of ordering and carrying, cost (Pandey, 2002: 889). "The economic order quantity may be defined as that level of inventory order that minimizes the total cost associated with inventory management" (Khan and Jain, 2003: 22)

### **Assumption of the EOQ model**

1. Demand for the items is constant and uniform throughout the period.
2. The item cost doesn't vary with the order size (that is no quantity discounts).
3. Lead time (time for ordering to receipt) is constant.
4. Ordering or set up costs are constant.
5. All the order is delivered at the same time (that is no back order conditions).
6. The cost of holding inventory is a linear function of the number of items held (that is no economics of the scale in holding cost).

### **2.7 Ordering and Carrying Costs Trade off**

The optimum inventory size is commonly referred to as economic order quantity; it is that orders size at which total cost of ordering and holding is the minimum. Follow approaches the trial and error approach, the formula approach and the graphic approach to determine the economic order quantity (EOQ). We assume that total annual demand is known with certainty and usage of materials is steady. Also ordering cost per order and carrying cost per unit are assumed to be constant (Pandey, 2002: 886)

#### **2.7.1 Trial and Error Approach**

The trial and error approach also called Analytical approach to resolve the order quantity problems can be illustrated with the help of a simple example:

Illustration

Let,

Total Annual demand (A) = 2800

Ordering cost per order (O) = Rs.5.25

Carrying cost (C) = 20% of price per unit

Price per unit (PPU) = Rs.30

Here we trail 80, 50, 40, 20, 14, 1 number of orders.

Economic order quantity (EOQ) =?

**Table 2.1**

**Total costs of various lot orders**

<b>Number of orders</b>	<b>80</b>	<b>50</b>	<b>40</b>	<b>20</b>	<b>14</b>	<b>1</b>
Ordering size	35	56	70	140	200	2800
Average inventory	17.5	28	35	70	100	1400
Total ordering cost	420	262.5	210	105	73.5	5.25
Total carrying cost	105	186	210	420	600	8400
Total cost	525	430.5	420	525	673.5	8405.25

In the above table 70 units is the economic order quantity where the total cost is least i.e. Rs. 420.

### **2.7.2 Order Formula Approach**

An easy way determining economic order quantity (EOQ) is to use the order formula approach. Here annual requirement cost per order and carrying cost per units are given:

Total Annual requirement =A

Carrying cost per unit=C

Ordering cost per order=O

Hear, EOQ formula

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Illustration:

Let, total annual requirement (A) = 2800 units

Ordering cost per order (O) = Rs 5.25

Carrying cost per unit (C) = Rs 6

Number of Order (N) = 40

Economic order quantity (EOQ) = ?

Solution,

We know that

$$\begin{aligned} EOQ &= \sqrt{\frac{2AO}{C}} \\ &= \sqrt{\frac{2 \times 2800 \times 5.25}{6}} \\ &= 70 \text{ units} \end{aligned}$$

Hence economic order quantity is 70 units.

Total cost = Total ordering cost + Total carrying cost

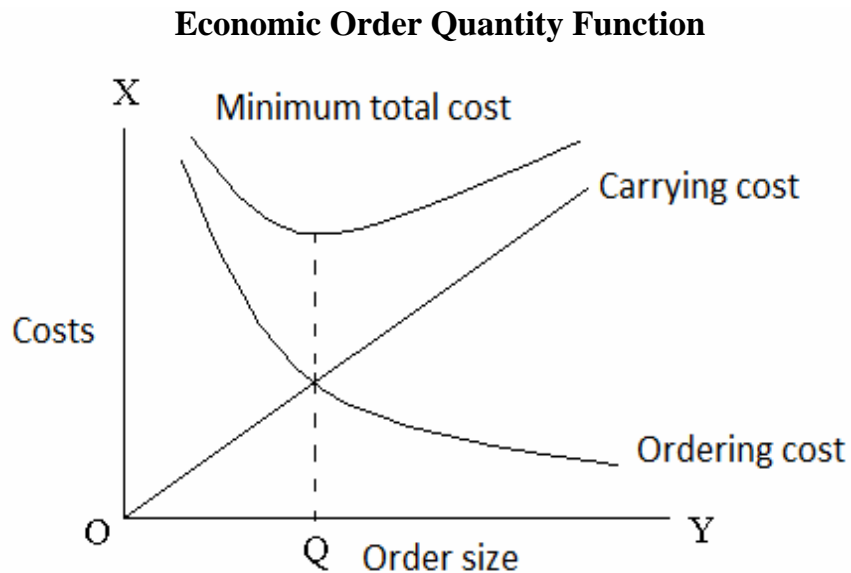
$$\begin{aligned} &= N \times O + Q/2 \times C \\ &= 40 \times 5.25 + 70/2 \times 6 \\ &= 210 + 210 \\ &= \text{Rs. 420} \end{aligned}$$

### 2.7.3 Graphic Approach

The economic order quantity can also be found out graphically figure 2 illustrates the EOQ functions. In the figure 2, costs carrying ordering and total are plotted on vertical axis and horizontal axis is used to respect the order size. Note that total carrying costs increase as order size increases, because on an

average. A larger inventory level will be maintained and ordering costs decline with increase in order size because larger order size means less no. of orders.

**Figure 2.2**



*Source: Stapith, et al., 2010*

The behavior of total cost line is noticeable since it is sum total of two cost ordering cost and carrying cost. The downward slopping ordering cost shows that the ordering cost will be decrease as per the no. of orders increases, and the upward slopping curve from left to right shows the caring cost will be increase when the no. of order increased. EOQ at the Q point where two cost curve tangent each other, at point Q the EOQ occur where two cost curve tangent each other. At point Q the EOQ occur where the total cost is minimum thus the firm's operating profit is maximized at point Q. (Pandey, 2002: 886)

#### **2.7.4 Quantity Discount**

An incentive offered to a buyer that results in a decreased cost per unit of goods or materials when purchased in greater numbers. A quantity discount is often offered by sellers to entice buyers to purchase in larger quantities. The seller is able to move more goods or materials, and the buyer receives a more favorable price for the goods. At the consumer level, a quantity discount can

appear as a BOGO (buy one, get one discount) or other incentives such as buy two, get one free. ( <http://www.investopedia.com>)

To avail the quantity discount, this will reduce the number of orders and increase the average inventory holding. Thus, in addition to discount savings, the firm will save on order costs but will incur additional carrying costs. The net return is the difference between the resultant saving and additional carrying costs. If the net return is positive, the firm's order size should equal the quantity necessary to avail the discount. If negative its order size should be equal to EOQ. (Pandy, 2002: 856)

**Table 2.2**  
**Quantity Discount**

<b>Discount Category</b>	<b>Order size</b>	<b>Discount</b>	<b>Unit cost</b>
1.	0-999	0	Rs.5
2.	1000-2499	3%	Rs.4.85
3.	2500 and over	5%	Rs.4.75

Above example shows that 5% discount is really appealing but excess Inventory involves high carrying cost also. Therefore analysis is done as follows.

Let, carrying cost per unit (C) = 20% per year

Ordering cost per order (O) = Rs. 49

Total annual requirement (A) = 5000 unit per year

Step-1 Calculation of EOQ in each category

$$\begin{aligned}
 EOQ_1 &= \sqrt{\frac{2 \times AO}{C}} \\
 &= \sqrt{\frac{2 \times 5000 \times 49}{5 \times 0.20}} \\
 &= 700. \text{the first discount category.}
 \end{aligned}$$

$$\begin{aligned} \text{EOQ}_2 &= \sqrt{\frac{2AO}{C}} \\ &= \sqrt{\frac{2 \times 5000 \times 49}{4.85 \times 0.20}} \end{aligned}$$

=710.the second discount category.

$$\begin{aligned} \text{EOQ}_3 &= \sqrt{\frac{2AO}{C}} \\ &= \sqrt{\frac{2 \times 5000 \times 49}{4.75 \times 0.20}} \end{aligned}$$

= 718. The third discount category.

EOQ<sub>2</sub> and EOQ<sub>3</sub> does not quality for quantity discount because EOQ<sub>2</sub> lies below 1000 units and EOQ<sub>3</sub> lies below 2500 units where as EOQ<sub>1</sub> has 700 units lies between 0 to 999.

Step-2 For those EOQ which are too small to quantity for the assumed discount price adjusted order quantity that allows the discount.

$$\text{i.e. } \text{EOQ}_2=1000$$

$$\text{EOQ}_3=2500$$

Step-3 for each of the order quantities resulted from step-1 and step-2 calculate the total annual cost using the price from the respective discount category. The order quantity that yields the minimum total annual cost is the optical order quantity.

$$\text{TC} = A/Q \times O + Q/2 \times C + AC$$

Where, A=annual demand

O=ordering cost per order

C=carrying cost per unit

AC= annual purchase cost.

The Annual purchase costs vary for different discount criteria. Therefore this cost has to be included here.

**Table 2.3**  
**Calculation of Total Cost**

Category	Unit cost(Rs)	Order quantity	Annual carrying cost (Rs)	Annual ordering cost (Rs)	Annual purchase cost (Rs)	Total Annual cost (Rs)
1.	5	700	350	350	25000	25700
2.	4.85	1000	485	245	24250	24980
3.	4.75	2500	1198	98	23750	25036

Since, the total cost is minimum Rs. 24980 for second category; the second quality discount offer is optimal.

Note: - costs are completed for each category as.

Ordering cost =  $A/Q \times O$ , where A= 5000. O = Rs.49.

Carrying cost =  $Q/2 \times C$ , Where C = 0.20.

Purchase price =  $A \times C$ , Where A = 5000 and Q and C are respectively values.

### **2.8 Re-order Point**

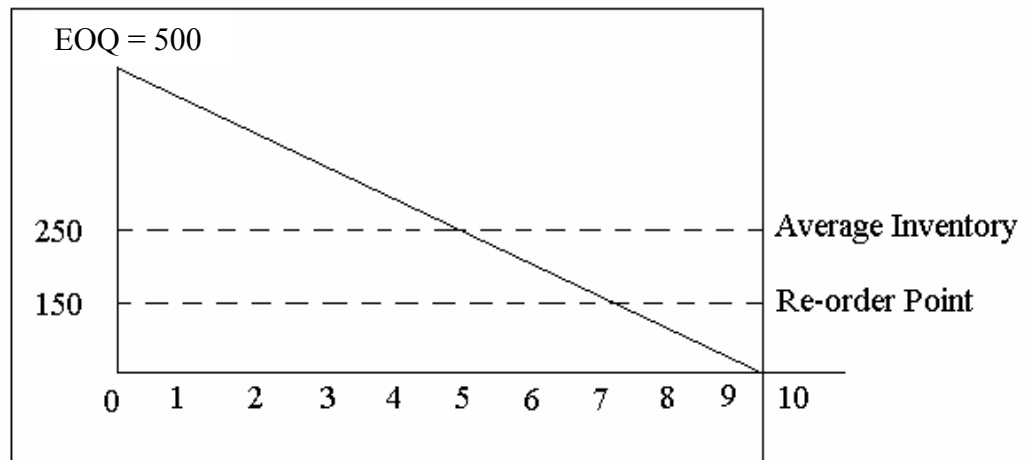
The re-order point is that inventory level at which an order should be placed to replenish the inventory. To determine the Re-order point under certainty.

- (a) Lead-time.
- (b) Average Usage
- (c) Economic Order quantity

Lead-time is time normally taken in replenishing inventory of for the order has been placed. In the case certainty the usage and lead-time do not fluctuate. Under such a situation, re-order point is simply that inventory level, which maintain for consumption during the lead-time. That is:



**Figure 2.3**  
**Re-Order Point under Certainty**



*Source: Stapith, et al., 2010*

Reorder point = Lead time  $\times$  Average Usage

### **2.8.1 Lead Time**

It is assumed that a firm would get supplies of materials immediately after placing order but there may be a span of time between receiving and ordering. This span of time is known as lead-time i.e. a firm places 20 times order per year or every 18 days. If the lead-time is 7 days management simply should to order 11 or 12 days after the previous delivery.

### **2.8.2 Re-order System**

The Supply situation is dynamic changing at all times. Therefore, re-order level and safety stock should be reviewed. This requires continuous monitoring of the stocks, which is very difficult as well as time consuming. So, to solve this kind of problem the following methods are used to review the level of inventory.

#### **(i) Period Review System**

In this system, the physical number of materials is known only at the time review i.e. no record of running inventory is made. This system is useful in cases where the materials are so economics and stock of dating is not possible in each transaction.

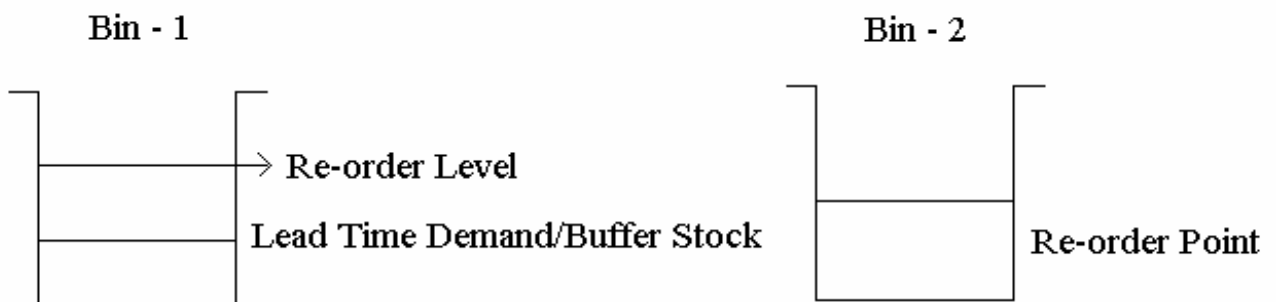
### (ii) Fixed Order Cycle System

Under the fixed order cyclic system the materials are received perceptually on the fixed time, interval time. Due to variation in demand and usage date, the inventory levels fluctuate over the time. It ultimately results the order size also fluctuate.

### (iii) Two Bin System

In this system, the stock of each item is separated in two piles of groups. At the first a sufficient supply is kept to meet current demand over a designated period of time, in second stock is available to meet the demand deriving the lead-time necessary to fulfill the order. When the first bin's stock has been exhausted re-ordering occurs and the stock in the second bin is used to cover the requirement.

**Figure 2.4**  
**Two-bin System**



*Source: Stapith, et al., 2010*

### (iv) Minimax System

This is one of the oldest methods and still widely in use. For each types of inventory maximum level is set that demand safety requires Preventing out of stock condition. The minimum level also governs the ordering points. An order of sufficient size is placed to bring inventory to the maximum point when minimum level is reached.

## 2.9 Statistical Inventory Controls System

A number of firm with widely spread distribution system finds the use of mathematical model and electronic pattern in inventory location and levels that best reconcile consideration of customs service, manufacturing and distribution cost and inventory turnover. Thus, mathematical approaches have been developed to help inventory management decision. In the use of more operation research efforts has been devoted in controlling the inventory that to any other problem area in business and industry.

## 2.10 Safety Stock

A safety stock is the minimum level of inventory that a firm keeps on hand. Safety stocks are held to avoid shortages (a) If demand increases or (b) if shipping delays are encountered. The cost of carrying safety stocks is equal to the percentage cost of carrying inventories times the purchase price per unit times the number of units held as the safety stock.

Due to the uncertainty between the estimated demand and supply of goods is bound to be difference. So the corporation always has the policy of eliminating the uncertainties maintain the appropriate level of inventory. Those types of inventory are called safety stock or buffer stock. The level of extra inventory held as a protection against uncertainty and possibility of stock out is safety stock. The size of safety stock determined unpredictable lead-times and demand variation by using following method. (Goel, 2001: 276-277)

1) On the situation when demand rate varies: -

Safety Stock = Lead time (maximum demand rate – average demand rate)

2) On the situation when both demand rate and lead-time fluctuate.

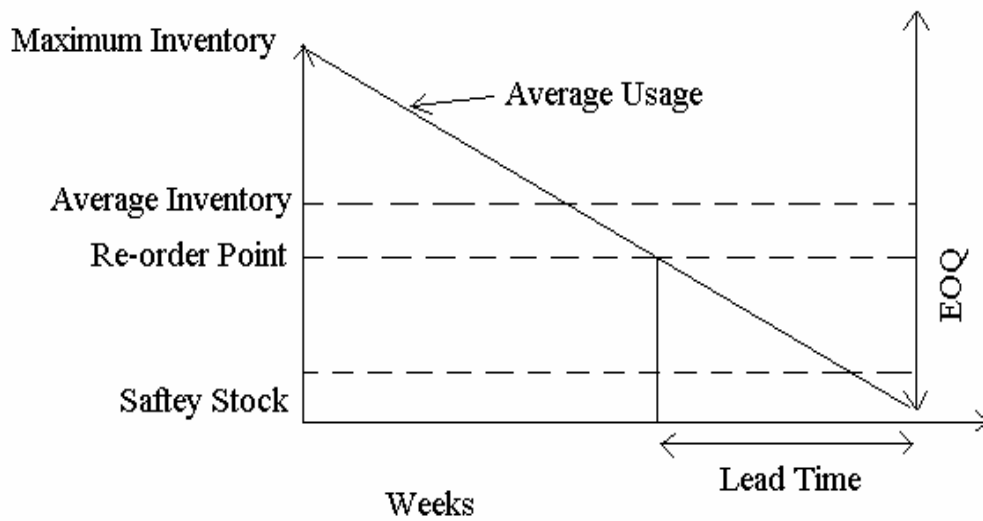
Safety stock = (Maximum lead-time x Maximum demand rate)

(Average lead-time x Average demand rate)

(3) On the situation lead-time varies demand uniform.

Safety stock = (maximum lead time – Average lead time × demand rate)

**Figure 2.5**  
**Re-order point under uncertainty**



*Source: Stapith, et al., 2010*

### **2.11 ABC Analysis**

An analysis of a range of items that have different levels of significance should be handled or controlled differently. It is a form of Pareto analysis in which the items are grouped into three categories (A, B, and C) in order of their estimated importance. 'A' items are very important, 'B' items are important, 'C' items are marginally important. For example, the best customers who yield highest revenue are given the 'A' rating, are usually serviced by the sales manager, and receive most attention. 'B' and 'C' customers warrant progressively less attention and are serviced accordingly.

(<http://www.businessdictionary.com/definition/ABC-analysis.html>)

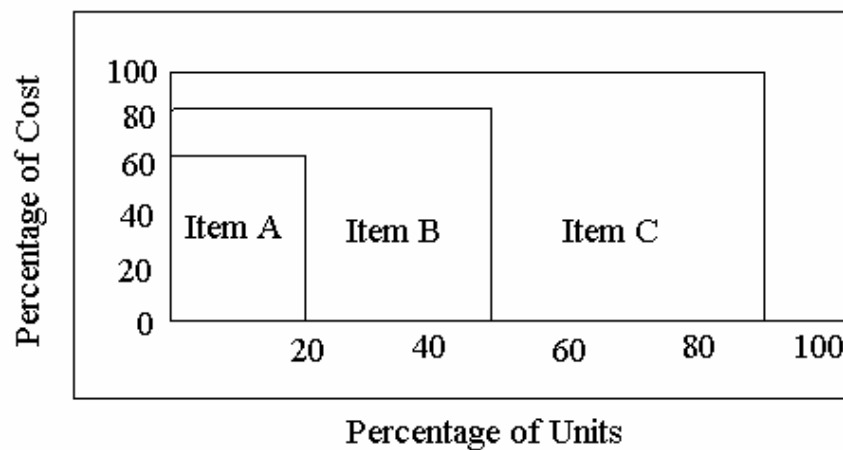
The following steps are involved in implementing the ABC analysis:

1. Classify the items of inventories determining the expected use in units and the price per unit for each item.
2. Rank the items in accordance with the total value giving first rank to the item with highest total value and so on.

3. Compute the ratios (percentage) of number and units of each item to total units of all items and the ratio of total value of each item to total value of all items.
4. Combine items on the basis of their relative value to form three categories- A, B and C.
5. Determine the total value of each item by multiplying the expected units by its unit price.

**Figure 2.6**

**Graphic presentation of ABC analysis**



There is no hard and fast rule that all inventory items are classified to only A, B and C Groups. There can be more than three groups like A, B, C, D and E depending on the requirement of the company. Similarly the volume and usage of items on each class may vary according to the company policy and requirement.

According to above table, the feature of A, B, C group's inventories are discussed individually on following heading.

**Item A.** A items generally account for 60% of the total inventory cost and they constitute about 20% of total items. They are regard very critical items thus needs rigid control and is done by top management. As they are high priced,

the focus is given to place low unit on safety stock. This low safety stock requires good forecasting, and maximum effort is given to reduce the lead time.

**Item B.** B items are medium valued and their number lies in between A and C items (25% inventory cost and 25% items). Such item need moderate control. They are more important than C items. They are purchased on the basis of past requirements and procurement order is placed as soon as the quantity touches reorder point.

**Item C.** C items are low valued, but has the maximum number or quantity. They generally account for 15% of the total inventory cost and they constitute about 55% of the total items. These items need very least control. Any excess control is rather uneconomical. These are least important items. These are generally procured just before they finish.

### **2.12 Blankets Rules**

Blankets Rules are generally rules such as "always carry a month's supply on all items." Reorder when you take out the last case of any item, and don't order any inventory that won't fit in this room." These rules almost always afford an opportunity to evaluate the rule in light of the economics of total annual inventory costs.

### **2.13 Inventory Valuation**

In any firm different goods are purchased at different time at different price rate. But the problem emerged to identify the position of current assets of the firm is to assign value to those goods. Balance sheet of the firm should true and fair view of the financial position of the firm. For these purpose assets including inventory should be properly valued to exhibit a true and fair view. True profit cannot be calculated unless assets are properly valued.

The false valuation of the inventory directly affects the profit. If inventory is valued at a lower value than actual the profit will decrease and as a result shareholders would get less dividend. On the other hand, if inventory is valued more than actual value. The profit would be increased and the shareholders

would receive more dividends, a part of which would than be paid out of capital. Payment of dividend out of capital would be insolvent. Moreover, under or over valuation of inventory will not only affect these for the next period because closing stock of the current period will become opening stock of the next period.

Valuation of inventories affects profit of the year. Therefore, method of valuation of inventory should not be changed year to enable comparison of profit of different year.

### **2.13.1 Various Method of Valuation of the Inventory**

#### **First in First Out Method: [FIFO]**

In this method the earlier lots of materials or goods purchased or goods manufactured are exhausted first and closing stock is out of the latest consignment received or goods manufactured and are valued at cost of such goods. In other words, cost of goods sold is calculated keeping in view the earliest lots exhausted on the presumption that units are sold in the order in which they were acquired. (Jain and Narang, 2006)

#### **Last in First out: [LIFO]**

LIFO, which stands for "last-in-first-out," is an inventory costing method which assumes that the last items placed in inventory are the first sold during an accounting year. Thus, the inventory at the end of a year consists of the goods placed in inventory at the beginning of the year, rather than at the end. LIFO is one method used to determine Cost of Goods Sold for a business. The main feature of the LIFO method for cost of goods sold is that it selects the last item you purchased first and then works backward until you have the total cost for the total number of units sold during the period.

#### **Higher In First Out Method: [HIFO]**

This method is based on the assumption that closing stock of items always remains at the minimum value. So, lots of the higher cost of materials purchased or goods manufactured is exhausted first. As this method always

undervalues the stock it is not popular. It is used I the monopoly products and cost plus product as well.

### **Just-In Time Inventory:**

The management of inventory has become very sophisticated in recent year. In certain industries, the production process lends itself to "Just in time" (JIT) Inventory control. As the name implies the idea is that inventories are acquired and inserted in production at exact times they are needed. This requires efficient purchasing very reliable supplies and as efficient inventory handling system. One thing that has made this possible is the advent of instant information through sophisticated computer networks (Van Horne, 2000).

### **2.14 Inventory and the Financial Manager**

The inventory control methods give us a means for determining an optimal level of inventory as well as how much should be ordered and when. These tools are necessary for managing inventory efficiently and balancing the advantages of additional inventory against the cost of carrying it. Computers have opened new world to inventory control and operation research has many applications to inventory management.

### **2.15 Monitoring Amounts**

#### **Tied up in Inventories**

Although management is not the direct operating responsibility of the financial manager, the investment of funds in inventory is an important aspect of financial management. Consequently the financial manager must be familiar with ways to control inventories effectively. Cost of funds invested in inventory the lower optimal level of average inventory and the lower optimal order quantity all other things held constant. The EOQ model also can be useful to the financial Manager in planning for inventory financing.

When demand or usage of inventory is uncertain, the financial manager may try to effect policies that will reduce the average lead time required to receive inventory once an order is placed. The lower average lead time the lower safety



stock needed and lower the total investment in inventory all other things held constant. The greater opportunity cost of funds invested in inventory the greater the incentive to reduce this lead-time. The purchasing department may try to find new vendors that promise quicker delivery or it may pressure existing vendors to delivery faster. The production department may be able to deliver finished goods faster by producing a smaller fun. In either case, there is a tradeoff between the added cost involved in reducing the lead-time and the opportunity cost of funds tied up in inventory.

### **2.16 Watching Inventory Risks**

The financial manager is concerned also with the risks involved in carrying inventory. The risk is that the market value of specific inventories certain types of inventory are subject to obsolescence, whether it is in technology or in consumer tastes. A change in technology may make an electronic component worthless. A change is style may cause a retailer to sell dresses at substantially reduced prices. Other inventories such as agricultural products are subject to physical deterioration with determination of course inventories will have to be sold at lower prices all other things being the same. In other situation, the principal risk is that of fluctuations in market price. Sometimes of inventory such as copper are subject to rather wide price swings. The financial manager is perhaps in the best place to make an objective analysis of the risks associated with the firm's investment in inventories. These risks must be considered in determining the appropriate level of inventory the firm should carry.

The opportunity cost of funds is the link by which the financial manager ties inventory management to the overall objectives of the firm in this regard inventory can be treated as an assets to which capital is committed as any capital budgeting projects. Different items of inventory may involve different risk and there differences can be incorporated into an analysis of risk similar to that for capital budgeting. We know that the greater the efficiency with which the firm manages its inventory, the lower the required investment and the greater the shareholder wealth all other things being the same.

## **2.17 Review of Related Study**

Thesis work cannot be completed without review of related study. This is a valuable ornament for this regard. These related previous studies can help to find out the research gap for this study. Some studies have been made in the subject of inventory management but a few studies have been gone on some studies will be reviewed in this chapter.

Sigdel (2002) has studied about the inventory management of agricultural Input Corporation for his degree thesis. Some major points stated by Mr. Sigdel are reviewed below.

The main objective of the study was to analyze the present system of inventory management in agriculture Inputs Corporation or zonal basis. This study was based up on quality as well as price aspects.

1. To study the present procurement procedure transportation faculties of chemical goods.
2. To study the warehouse facilities for various fertilizers.
3. To analyze present positions of inventory management.
4. And to provide suggestions based on findings.

The major procurement procedures were through inviting global tender through negotiation, through aid/assistance from donor agencies/countries and through negotiation/agreement of two governments. Besides other ways of AIC prefers procurement through inviting global tender because other procedures are not reliable and costly. He concluded that AIC is not using scientific models of inventory management. Although they do not calculate EOQ for the easy supply of chemical fertilizer they order in lots of 1000 to 2000m ton. This is positive aspect of inventory management. There is no evidence of taking trade discount by AIC. Lead-time is also not calculated properly. Generally it takes 3 to 6 months to receive an order after the order placement; Reorder point is also not fixed. Regarding butter stock, although AIC has capacities warehouse throughout the country.

Bhandari (2002) studied the subject of his Master thesis "Inventory Management of Multi Food Industry (P) Limited Balaju Industrial" his main objectives if to analyze the following.

1. To access the maintained inventories and other consequences on cost and profit.
2. To find out the applied techniques and to manage the inventories in the factory.
3. To present and analyze the inventory management system of MFI.
4. To compare sales revenue and production cost.
5. To suggest proper inventory models of MFI based on the analysis.

He finds that the company has not determined the re-order level, maximum stock level. The company used direct method for purchasing of raw materials and producing of models. Sometimes the company suffers the shortage of inventory, which is imported from third country. Inventory turnover ratio of the company was not satisfactory.

Gaire (2008) has studied a research work on the topic of "Inventory management: A case study of Royal Drug Ltd.". The main objective of his study is to identify the problem underlying in inventory management and control system of RDL. Other objectives of his study are:

- To assess the types of inventory maintained in RDL.
- To examine the techniques begin employed to manage the inventory in RDL.
- To suggest proper inventory model to RDL bases on analysis.
- To find out inventory position of RDL.

On the basis of study conducted by Mr. Gaire the following suggestion have been recommended.

- a. The company should define its objective and goals clearly.
- b. The company should follow all the quantative techniques and model such as EOQ model, ABC analysis model so that total inventory can be reduce.

- c. Ledger cards can also be used to manage inventory in a simple way.
- d. General manager should be professional on and he should not be changed frequently due to political interference.

Timilsena (2009) on the topic of "Inventory Management and Control Herbe & National Trading". The main objective of his study tries to focus on the need of comprehensive inventory management are:

The objectives of the study are as follows:

1. To analyze the inventory level maintained by National Trading Limited and Herbs Production and Processing Company Limited.
2. To study the inventory management and control system followed by National Trading Limited and Herbs Production and Processing Company Limited.
3. To examine the techniques being employed to manage the inventory by these enterprises.

The major findings are as follows:

- i) The inventory management and controlled tools followed by both companies are ABC analysis, EOQ and Level setting.
- ii) Purchase of inventory and goods haphazardly by the national trading and HPPCL. Both company have not categorized its inventory for the purpose of control and paid equal attention for the entire inventory held in the store.
- iii) Cost related with ordering and holding inventory is not recorded separate in both companies which are recorded as a whole.
- iv) As the question asked to HPPCL about the problem faced by the HPPCL in managing the inventories.
- v) The fluctuation in stock of RM during the study period is very high. Defective purchasing policy and poor planning of raw materials are the main responsible factors for such fluctuation. There is no fixed policy of purchasing materials.

Bhandari (2010) on the topic of "Inventory management of Bottlers Nepal (Terai) Limited". The main objective of her study tries to focus on the need of

comprehensive inventory management are: to study the methods or systems used for managing the inventory of BNTL. To analyze the inventory levels maintained by BNTL. To study the present practice of procurement policy of BNTL. To study the trend of procurement and sales of BNTL. To identify the problem faced by BNTL in the management of inventory.

The major findings of her study are as follows:

Letter of Credits used to import raw materials from foreign countries. By coefficient of variation, the annual requirement is more consistent than annual purchase. The average actual inventory cost is higher than that of the economic inventory costs. Thus the company should make economic order size to minimize the inventory cost. In an average actual purchase slightly greater than the actual sales. Value of both S.D. and C.V. signifies the consistent nature of actual sales compared to actual purchase.

### **2.18 Research Gaps**

Though there are various studies conducted on inventory management but only countable number of research are carried out on overall inventory management of salt trading corporation limited. The purpose of the research work is quite different from the studies made by the other persons. They have used only profitable aspect. To fulfill these gaps the researcher has selected the inventory management of STCL and has used not only profitable aspect but also to manage over and under stock problem and analyze the performance of the sales and procurement trend of salt, sugar and other items. This study is little bit different than previous studies it may be the first research study in the field of inventory management taking the case study of working capital and closing stock of trading public enterprises. This research has further tried to identify the correlation between sales and closing stock, working capital and closing stock, targeted sales and actual sales under study which plays a significant role to achieve organizational and objectives. This study also used original data received from STCL. However, utmost effort has been put upon to save it from allegation of being copy of previous research work done in the same topic.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

The research methodology is the process of arriving to the solution of the problem through planning and systematic dealing with the collection analysis and interpretation of the fact's and figures. It refers to the various sequential steps to be adopted by a researcher who is studying a problem with contain object in a view. The objectives of this study are to analyze inventory management of salt trading corporation Ltd. For the propose of achieving the objectives the following methodology has been proposed to the following which includes nature of research design and source of data collection instrumental and quantitative technique applied to analyze the data.

#### **3.2 Research Design**

Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to cancel variance. As this definition suggests, any research project would be unthinkable without a research design clearly by the researcher. Research design is highlighted for ascertaining the basic objectives of study. It therefore frames a basis to relate two or more facts and data within which the research is conducted. Research design includes definite procedures and technique which guide to sufficient way for analyzing and evaluating the study. In the study, necessary data and information are collected from the concerned authority. Further, descriptive cum analytical research design is being followed to analyze the inventory management of the STCL to achieve the prescribed result.

#### **3.3 Nature and sources of data**

Nature and sources of data refers to the type of data used for analysis and the source that is the collection point. The nature of data required for this research work is primary as well as secondary.

### **3.4 Populations and Sample Size**

For this study the population is concerned with STCL. For the secondary data Annual report and reports from STCL for primary data various official were selected for personal interview according to the requirement of the study. As for the questionnaire, in total STCL have zonal office, branch and sub branch license offices. As for this research is concern, STCL's central office at Kalimati, Kathmandu is chosen.

The trading corporation listed in the Nepal stock exchange is the population of this study. Despite of multiple sectors of inventory management like Nepal food corporation, National trading Ltd, Gorkhapatra Corporation, Humla Cement company Ltd. STCL have been chosen for the specific field research. Various officials were selected for personal interview according to requirement of the study.

A judgment sampling technique is used to select the company. Therefore, out of the listed company, STCL is selected as sample for the study. The sample covers 8 years i.e. 2060/2061 to fiscal year 2067/2068.

#### **Salt Trading Corporation**

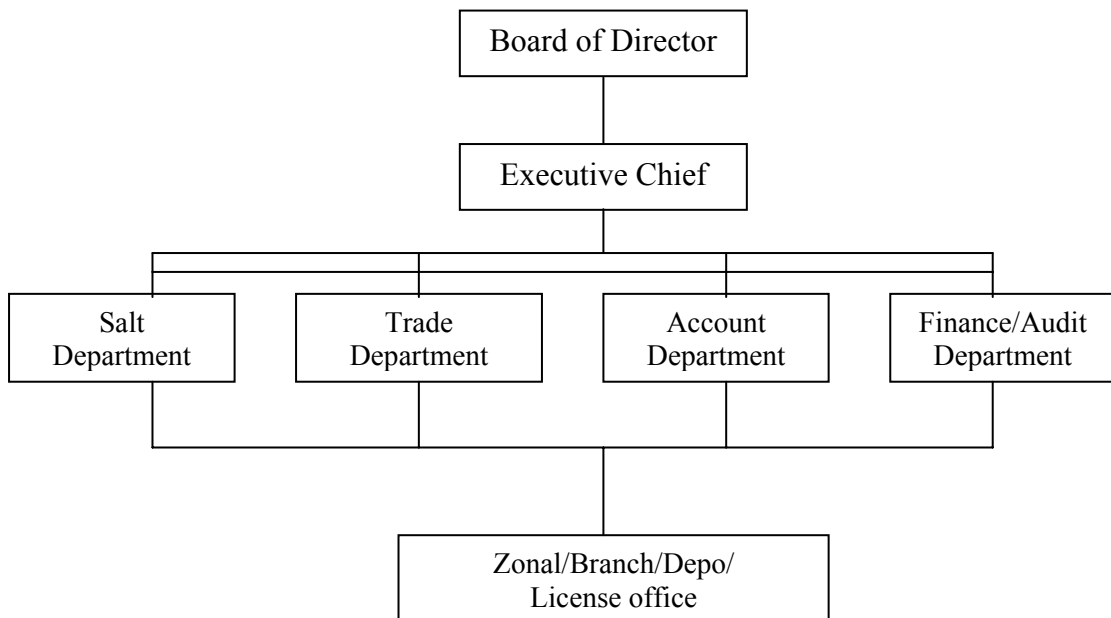
Salt Trading Corporation (STC) Limited is one of the largest business organization in Nepal established as an experiment of the utility of Public Private Partnership (PPP) for a developing country under PPP act of Government of Nepal. About 48 years ago (established in 1963 AD), the corporation was launched with objective to avail iodized common salt (since salt is not produced in Nepal and depends on import from India and China) for all citizens throughout the country. In the long run of its dedicated service to the nation, STC has great contribution to ensure proper supply and distribution of essential daily consumable goods (listed in Nepal Government's Gadget), erode black-marketing (regulate market and artificial scarcity) and industrial development in Nepal. With the proportion of 79:21 investment from private-public (state owned National Trading Limited), STC is managed by joint effort of state (Government) and private (shareholders). In the business journey, Salt

Trading Corporation is a brilliant example of success that provides its services through 93 offices (22 Offices and 71 liaison offices) that include nearly whole population of the country as customers. STC has over 400 staff and has provided opportunities for over 1000 workers and labours.

### **Organizational structure of STCL**

STCL is governed by the board of director led by chairman and under this (BOD) chief executive is the head of management. The following is the structure of the STCL.

**Figure 3.1**  
**Organizational Structure of STCL**



### **3.5 Methods of Data Collection**

Primary data will be collected through observation and interviews with officers as well as non-officers of STCL. Secondary data will be collected from annual reports of STCL. Beside above available journals bulletins, which highlight STCL, are also studied.

### **3.6 Tools Used**

The tools of analysis are comparison between demand and supply of data of major goods that is distributed by STCL. Further various approaches of



inventory management such as under stocking overstocking etc will be carried out with the help of compression table. Some of the statistical and financial tools can be used to complete my research are mentioned as:

### **3.6.1 Financial Tools**

There are various types of financial tools in order to evaluate and examine inventory management in the research process are given below:

#### **3.6.1.1 ABC Analysis:**

ABC analysis is a selective inventory control technique, which adopts selectivity based on the value of consumption. According to usage value, inventories are classified as A,B and C groups. 'A' items has the low volume but highest annual value of inventories, thus are placed strict control. 'C' items represent relatively small value items and would be under simple control and are paid least attention compared to A items. The B items are in between, having moderate volume and value and are thus moderately controlled.

#### **3.6.1.2 EOQ Model:**

EOQ is essentially an accounting formula that determines the point at who at which the combination of order costs and inventory carrying costs are the least. The result is the most cost effective quantity to order. In purchasing this is known as the order quantity and in manufacturing it is known as the production lot size.

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Where, A = Annual Demand, O = Ordering cost, C = Carrying Cost

#### **3.6.1.3 Ratio Analysis:**

A ratio is an expression of the quantitative relationship between two numbers. There are various types of ratios used in order to evaluate and examine inventory management in the research process are given below:

$$\text{Gross Profit Margin} = \frac{\text{Gross Profit}}{\text{Sales}} \times 100\%$$

$$\text{Net Profit Margin} = \frac{\text{NetProfit}}{\text{Sales}} \times 100\%$$

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of goods Sold}}{\text{Average Inventory}}$$

### **3.6.2 Statistical tools**

Statistical analysis is one particular language which describes the data and makes possible to talk about the relation and the difference of the variables. Without the adequate understanding of the statistics, the investigator in social science may frequently be like a blind man groping in a dark closed for a black cat that is not there. The method of statistics is useful in an ever widening range of human activities in any field of thought in which numerical data may be. There are various statistical tools which can be used for the evaluation of inventory management position of Salt Trading Corporation limited. Among them Trend Analysis, Mean, standard deviation, coefficient of variance have been used in this study for the evaluation of inventory management of selected STCL.

#### **3.6.2.1 Trend Analysis**

Trend Analysis is an analysis of inventory turnover ratio over time used to determine the improvement or decline of inventory situations. Trend analysis informs about the demand of goods and the need of stock, future achievement of the STCL, inventory condition as well as many other information which would be helpful to concerned parties of the Company. In this study, the method of least square is selected as a statistical tool for the analysis of inventory condition of STCL. The formula of least square method for the straight line is represented by the equation:

$$Y_C = a + bx$$

Where,

$$Y_C = \text{Trend Value.}$$

$$a = Y \text{ intercept or the mean of } Y \text{ value when } X = 0.$$

b = Slope of the trend line of the amount of change in Y variable that is associated with change within 1 unit of X variable.

X = Variables that represent time i.e. time variable.

The value of the constants a and b can be determined by solving the following two normal equations:

$$\sum Y = Na + b \sum X \text{ -----I}$$

$$\sum XY = a \sum X + b \sum Y \text{ -----II}$$

Where,

N= No. of years

### 3.6.2.2 Mean:

Mean is the most commonly used of all averages. This is due to the simplicity of its calculation and other advantages. It is defined as the value which we get by dividing the aggregate of various items of the same genus by the total number of items. The average of a set of n data  $x_i$

$$\bar{X} = \frac{\sum X}{N}$$

Where,

$\sum X$  = Sum of total items,

N = Number of items

### 3.6.2.3 Standard Deviation ( $\sigma$ ):

This is the most commonly used measure of the increase or dispersion of data around the mean. The standard deviation is defined as the square root of the variance ( $V$ ). The variance is defined as the sum of the squared deviations from the mean, divided by  $n-1$ . Operationally, there are several ways of calculation:

$$\text{Standard Deviation ( } \sigma \text{ )} = \sqrt{\frac{\sum (x - \bar{x})^2}{N-1}}$$

### 3.6.2.4 Coefficient of variable (CV):

Although the standard deviation of analytical data may not vary much over limited ranges of such data, it usually depends on the magnitude of such data: the larger the figures, the larger  $s$ . Therefore, for contrast of variations (e.g. precision) it is often more suitable to use the relative standard deviation (RSD) than the standard deviation itself. The *RSD* is spoken as a portion, but more usually as a percentage and is then called coefficient of variation (CV). Often, however, these terms are puzzled.

$$CV = \frac{\sigma}{\bar{X}} \times 100$$

Where,

$\bar{X}$  = mean of series

$\sigma$  = Standard deviation

### 3.6.2.5 Coefficient of Correlation(r)

Coefficient of correlation is used for measuring the magnitude of linear relationship between two variables. The value of Coefficient of Correlation always lies between +1 and -1, +1 shows the perfect positive correlation between the variables and -1 means perfect negative correlation between the variables and when Coefficient of Correlation( $r$ ) = 0 that means there is no relationship between the variables.

$$\text{Correlation Coefficient (Simply, } r) = \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Correlation analysis describes the relationship between variables i.e. positive or negative. It helps to determine the following.

- a. A positive or negative relationship exists.
- b. The relationship is significant or insignificant.
- c. Establish cause and effect relation if any.

The statistical tool-correlation analysis is used in the study to measure the relationship between variables in determining within the relationship is significant or not. For the purpose decision making interpretation are based on the following terms.

1. When,  $r = 1$ , then is perfect positive correlation.
2. When,  $r = -1$ , then is perfect negative correlation.
3. When,  $r = 0$ , then is no correlation.
4. When, 'r' lies between 0.7 to 0.999 (-0.7 to 0.999), then is high degree of positive (or negative) correlation.
5. When, 'r' lies between 0.5 to 0.6999 there is moderate degree of correlation.
6. When, 'r' is less than 0.5, there is low degree of correlation.

#### **3.6.2.6. Probable error (PE):**

The probable error of a quantity is a value describing the probability distribution of that quantity. It defines the half-range of an interval about a central point for the distribution, such that half of the values from the distribution will lie within the interval and half outside. This specifies the probable error  $\gamma$  as being fixed a multiple of the standard deviation,  $\sigma$ , where the multiplying factor derives from the normal distribution.

$$\text{P.E.} = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$$

Where,

$r$  = Correlation coefficient

$N$  = Number of pairs of observations

If the value of 'r' is less than the probable error, there is no evidence of correlation, i.e., the value of 'r' is not at all significant. Then, if the value of 'r' is more than six times of the probable error, the coefficient of correlation is practically certain, i.e. the value of 'r' is significant.

## CHAPTER FOUR

### PRESENTATION AND ANALYSIS OF DATA

#### 4.1 Introduction

Presentation and analysis of data is very important stage of research study. Its main purpose is to change the unprocessed data into understandable form. It is the process of organizing the data by tabulating and then placing that data in presentable form by using various tables, figures and sources. Inventory management is one of the most important factors that have been developed to facilitate effective inventory management of STCL. Inventory management is the formal expression of the STCL goals and objectives. Optimum inventory cost is the basic indicator for determining profit. The main purpose is to assess the inventory management of STCL. Present chapter will discuss the various aspects of inventory management and their actual accomplishment. Actually, inventory management is a fundamental managerial tool, which is applied in manufacturing and non-manufacturing organization. For this respect, it will analyze the data by using various financial and statistical tools to meet the stated objectives of the study. Besides this, it also presents the various funding generated from data analysis. STCL has been established to co-operate the aggregate mission of increasing distribution network of salt, the basic food item. It is a commercial enterprise, which trades salt and sugar and other item to the consumers. From FY 2059/060 the STCL was merged the items and emerged food items combining salt, sugar, ghee, floor and tea. It has to maintain sufficient stock of salt. Especially there are salt, sugar, other items and tools. However this study focuses only on food items that is salt, sugar, ghee, floor and tea which is more crucial and controversial item of STCL. Items are in various forms i.e. salt, sugar, spare parts and other.

The types of goods that is distributed by STCL are as follows:

- Food items (salt ,sugar, ghee, floor and tea)
- Agriculture material
- Fuel, lubricants and tyre tube

- Construction Materials
- Spare Parts
- Others etc.

Food item includes major part of inventories. Among the food items salt and sugar are highly dominant.

#### **4.2 Demand Forecasting (Determination of Goal/Target)**

For the better performance of any enterprises they should forecast the demand of commodity accurately considering various factors. It also determines its future targets. Although STCL is a service oriented trading concern they do not prepare profit plan, but make their future goal to purchase as well as supply salt and other goods. STCL generally takes the following consideration when determining the target of salt and other goods.

1. Guideline prescribed by aggregate plan.
2. Past years sales trend (progress report).
3. Requirement determined by the offices in district level of STCL.
4. Proposed program received from various depots and dealer.

On the basis of above consideration STCL sets annual program of supply.

#### **4.3 Procurement Procedure of Salt and Sugar**

So far, there was no any proper plan have established in Nepal to procure salt. Nepal has been depending upon Indian for salt. There was no any organization that procures salt in the country. However there is some business involved in sugar industries but there is no any private sector to import salt for foreign countries. Nepal was given the fixed quantity of annual quota of salt by Indian government.

STCL has used four channels

1. The diplomatic channel/Assistance from donor agencies.
2. World market/commercial purchase.
3. Through inviting tender.
4. Negotiation.

#### **4.3.1 The Diplomatic Channel/Assistance from Donor Agencies**

Sometimes STCL can procure salt and sugar through donor agencies and countries. But it is not reliable procedure.

#### **4.3.2 World Market/Commercial Purchase**

It can be a more convenient source of STCL to procure salt and sugar that fulfill peak demand of salt and sugar.

#### **4.3.3 Procurement Process through Inviting Tenders**

The main important and confidential procurement sources is inviting tender through international market. Its procedure involve as follows:

##### **1. Estimation of Requirement**

The quantity needed for coming year/seasons is estimated on the basis of projection made by planning and estimated stock position in various field offices.

##### **2. Inviting Tender**

The advertising for submitting tender is published in national newspaper. STCL use to put down all the terms and conditions in tender. The foreign company firm has to submit the tender from as prescribed by STCL. They have to fill the form containing the amount of commission, currency, payment procedure and other terms and conditions.

##### **3. Evaluation of Bids**

A committee is formed to open the tender and evaluate the bids. The committee consists of four members. They are Administrative departments, representation representative procurement departments, finance department representative and Ministry of Commerce. The committees evaluate bids with reference to price, term and condition offered by the suppliers. Usually lowest bid is selected however quality is not neglected on the lowest price.



#### **4. Ordering**

After the completion of evaluation and selection process the selected quotation is requested to meet the supply. Activities like agreement with suppliers import license from the government, arrangement of foreign currency with letter of credit (L/C) should be completed before placing of orders.

#### **5. Dispatch Order to Clearing and Forwarding Agents**

Normally, it takes two months for salt to reach Kathmandu from Kolkata port from the suppliers. After the expiry of specific date the agents will contact suppliers of goods.

#### **4.3.4 Negotiation**

This is new way of procuring salt sugar practiced by STCL. Especially when is short, generally tenders are not possible BOD does negotiation. STCL negotiates with interested person, parties and institution to fulfill the demand of salt and sugar from the international market. Under which the process and conditions are same as tendering. Though it is easy and simple source of procuring salt and sugar past trend show that negotiator (supplier) has broken the term and condition prescribed by STCL. Consequently the salt and sugar do not reach on time, therefore this procedures has shown more and more controversies.

#### **4.4 Warehousing and Packing of Salt and Sugar**

##### **a) Warehousing**

Warehousing is a commercial building for storage of goods. Warehousing is used by manufactures, importers, exporters, wholesalers, transport businesses etc. It's plays vital role in inventory management. Good storage helps the storekeeper to maintain the quality of goods, facilities production process, and smooth sales and also helps to provide good service to the customer. Storing is the major aspect of inventory management; no storage no inventory management. Modern storage facility is a most necessary condition to safeguard the quality of goods being stored. Salt and sugar have been evergreen in nature and very much liable to get demand by festival and occasion if better

storage facility does not exist. It can be demanded even in the good storage condition if the inventory managers do not give sufficient vigilance.

Salt is not produced in Nepal but were received through foreign assistant and under commercial purchase from assistant and under commercial purchase from international market. Salt procured throughout the year. Similarly, sugars are also procuring from Korea and other international market by STCL and stored in warehouse considering its sensitiveness. Good storage of salt maintains proper quality of iodine in salt. This salt and sugar have to be stored properly without deteriorating its quantity until it is used by the needy consumer. Majority of Nepalese consumers are not in a condition to buy salt and sugar in advance because of their poor economic status. Furthermore, they lack the appropriate mechanism and skill to store the salt and sugar in their own house without deteriorating the quality of salt and sugar. Thus, consumer have tendency to buy salt and sugar whenever they need to there is urgency to use salt and sugar. This fact necessity the sufficient and scientific management of buffer stock of salt and sugar. In Nepalese context maintenance of buffer stocks of salt and sugar should be examined from another dimension, its supply. This uncertainty in the arrival of imported salt and sugar and locally produced sugar due to geographical remoteness and the difficulties created by monsoon for transportation strongly provoke the needs of buffer stock of salt and sugar in the country. The salt and sugar need to be stored for an average duration of 5/6 month (source: STCL central office). To insure the timely supply of salt and sugar in the hands of ultimate consumer and also maintain the balance between demand and supply of salt and sugar, STCL has warehouse located at different parts of the country with a total storage capacity of 75000 metric tons.(source: STCL central office)

#### **b) Packing**

Imported salt are packed in 1 kg bags. These bags are made from plastic each weighting 4 gm. The bags are marked with product details and other specification clearly. Though salt is distributed all over the country in 50 Kg bags it is also repacked or bags in different sizes containing 4 to 40 Kg. bags

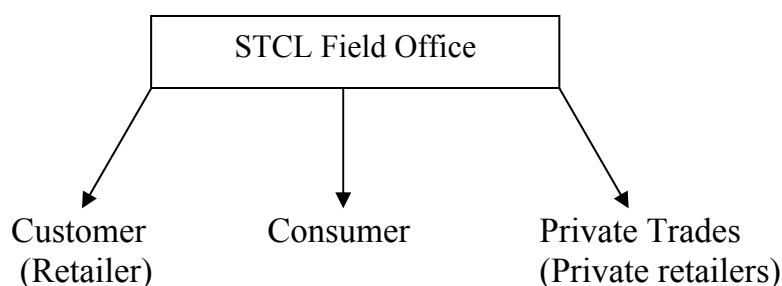
for hill transpiration where salt is carried on animal and human backs. Similarly, Sugar is also packed in different sizes containing 50 Kg and 100 kg bag. Most of sugar is packed in 50 Kg bag to distribute small retailer. The bags are marked with product detail and monogram, year, treated etc.

#### 4.5 Distribution Network

STCL field office operates as the wholesale and retail point in the salt and sugar distribution chain, sales of salt and sugar to the consumer are channeled through co-operatives trader's retailers and directly sales from field offices to the consumer as shown in figure 7.

**Figure 4.1**

**STCL Flow Chart**



In district, STCL field office acts as wholesale distribution and co-operatives act as its retailer. Similarly, private traders are also acts as retailers. STCL filed office also acts as retailers because it sales consumer goods directly to needy consumer as they required. For the efficient and economic transportation of salt and sugar to the entire district generally, trucks are used where possible. Where there is no motorable road facility for trucks and other vehicles STCL use mule (Khachhar) transportation. Especially mule is used in remote hilly and mountainous areas. Sometimes, plane charter is been used to transport salt and sugar to hilly region when the mule transportation exceeds the plane charter cost and in emergencies.

#### 4.6 Transportation

Mainly major means of transportation are railway, truck, air service, maritime ropeway, trail porter, mule and so on. Being a land lock and hilly country Nepal is out of the maritime or ship service. Sugar and salt imported from

overseas have to under two-district phase of transportation before they are reach STCL godowns. The first phase entails transportation from Calcutta port to railheads adjoining the indo Nepalese border. In this phase STCL can use the service of railways as well as truck service. The second phase of internal phase of transportation starts when STCL takes the delivery of salt from different railways across the border and the transport it to its godown located in Terai and foothill areas. Mainly trucks are used in this phase of transportation. STCL does not have adequate fleet of trucks so in most cases transport companies under contractual arrangements carryout this job. Similarly STCL use mule.

#### **4.7 Issue of Inventory Management in STCL**

STCL is known as trading as well as service-oriented concern. It supplies different inputs to the consumer. STCL deal with main component is as follows:

- Food item (salt and sugar)
- Agriculture material
- Fuel, lubricants and tyre tube
- Construction Materials
- Spare Parts
- Others etc.

Out of these six components food items is the most crucial components of STCL. It covers 64 % of total trade and remains 36% covered by agriculture materials, fuel, lubricants and tyre, construction materials, spare parts and others.(source: annual report of STCL from 2061 to 68.) For the better performance of corporation STCL should manage the inventory of salt and sugar by paying more attention to the demand and supply of salt and sugar to the ultimate consumer. STCL does not have inputs of raw materials it buys and sales the same materials. Only it processes salt in plant. However STCL should manage the inputs appropriately to supply them to the consumer the inputs appropriately to supply them to the consumer on time. For the good management of inventory various scientific technical have been developed. Here this study focuses on whether STCL is using these techniques or not.

#### **4.7.1 Economic Order Quantity (EOQ)**

EOQ is scientific technique of inventory management, which assist to solve the problem, how much to purchase or order? EOQ is based on annual requirements ordering cost and carrying cost. In STCL almost ignore the concept of EOQ. Although they do not calculated EOQ, for the easy supply of Salt and sugar they order to purchase in lots of 1000 to 2000 mt. salt. This is positive aspect of EOQ model. The cost concept regarding to ordering and carrying cost of STCL is not clear and could not trade out easily. According to STCL ordering cost is included in STCL administrative expenses and carrying cost includes obsolesces, interest charge, internal transportation, storing cost etc.

#### **4.7.2 Lead Time**

The lead time is the duration between placing an order until receiving the order. From the moment the requisition for an item is raised it may take several weeks or months before the supply are arrived and inspected and then taken in to stock. This time is called lead-time. Regarding STCL, lead-time is not same for all products but for the salt is takes 4-5 month in average. They import salt from India. They import sugar from different countries so all the countries have different distances which will cause the variety of lead-time. So it is quite hard to calculate lead-time in case of salt and sugar for STCL. Lead-time for one product is not same for all products. Therefore, it is quite hard to calculate lead-time.

#### **4.7.3 Re-order Point**

EOQ solves the problem, how much to order? But there is a question, when to order? Finding order point called solves the problem. Re-order point is that inventories level at which an order should be placed to manage inventory. To determine the re-order point under certainty it should know lead-time average usage and EOQ safety stock is also taken under uncertainty. But in STCL lead-

time, average usages EOQ as well as safety stock are not fixed so, it is difficult to determine the re-order point.

#### **4.7.4 Safety Stock**

Because of uncertainty it is difficult to predict or forecast accurate usage and lead-time. The demand of inputs may fluctuate from day to day or from week to week. Similarly, the actual delivery time may differ from the normal lead-time. If the actual usage increases the firm can face problem of stock out, which can prove to be costly for the consumer. In STCL these are capacious warehouse for the buffer stock in different part of country but the stock is overstocked in the off-season and out of stock in peak demand.

#### **4.7.5 Quantity Discount**

Many suppliers encourage their customers to place large order by offering them quantity discount. With quantity discount the firm will save on the per unit purchase price. However the firm will have to increase its order size more than EOQ level to avail the quantity discount. But STCL is neither using EOQ technique nor having quantity discount.

#### **4.7.6 ABC Analysis**

Generally a firm has to maintain several types of inventories. All the inventories do not have identical value and all the inventories cannot be treated and controlled in same way or management. Therefore the firm should pay maximum attention to those items with the higher value. STCL has different item like salt, sugar spare parts and other item.

### **4.8 Calculation of Margin**

#### **4.8.1 Net Profit Margin**

Net profit margin is a key financial indicator used to assess the profitability of a company. Net profit margin is an indicator of how efficient a company is and how well it controls its costs. The higher the margin is the more effective the

company is in converting revenue into actual profit. Net profit margin is calculated using the formula below:

$$\text{Net Profit Margin} = \frac{\text{Netprofit}}{\text{Sales}}$$

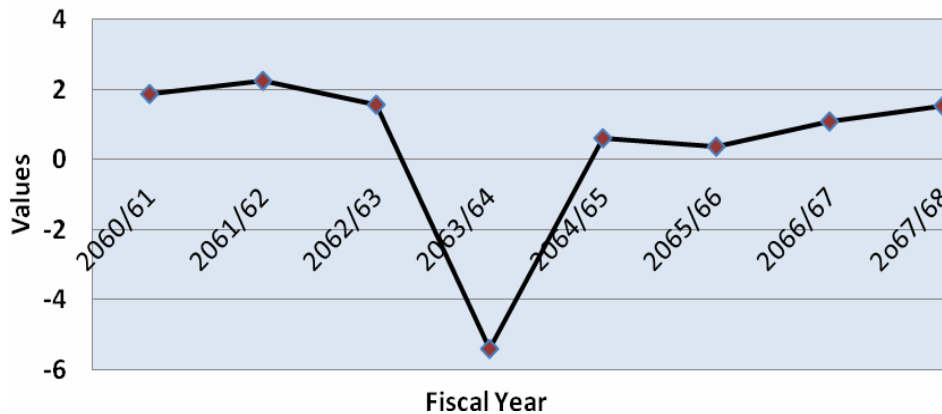
**Table 4.1**  
**Calculation of Net Profit Margin (Rs. In Lakhs)**

<b>Year (B.S.)</b>	<b>Sales</b>	<b>Net Profit</b>	<b>Net Profit Margin %</b>
2060/61	38989	730	1.87
2061/62	21939	498	2.27
2062/63	18505	290	1.56
2063/64	19162	(1036)	-5.4
2064/65	21389	130	1.56
2065/66	31904	115	0.36
2066/67	33663	371	1.1
2067/68	38740	600	1.5

*Source: STCL Annual Report from 2060/61 to 2067/68*

Above table shows higher net profit margins is an indication of the higher overall efficiency of the business and better utilization of total resource. Poor financial planning and low efficiency is the indication of lower ratio. The data of STCL shows the overall efficiency of the business and utilization of total resources. The data shows that year 2061/62, 2060/61, 2062/63, 2064/65 and 2067/68 are effective year of the organization but in the year 2063/64, the company get heavy loss and all the other remaining year are proved to be ineffective resources. The data show that the organization is going moderate profitable year by year. The government provide subsidy to the STCL to avoid the heavy loss. STCL Should implies scientific management techniques system. This will help the corporation to go better in the maximization of the net profit. Above data can be also analyzed by the help of following graph.

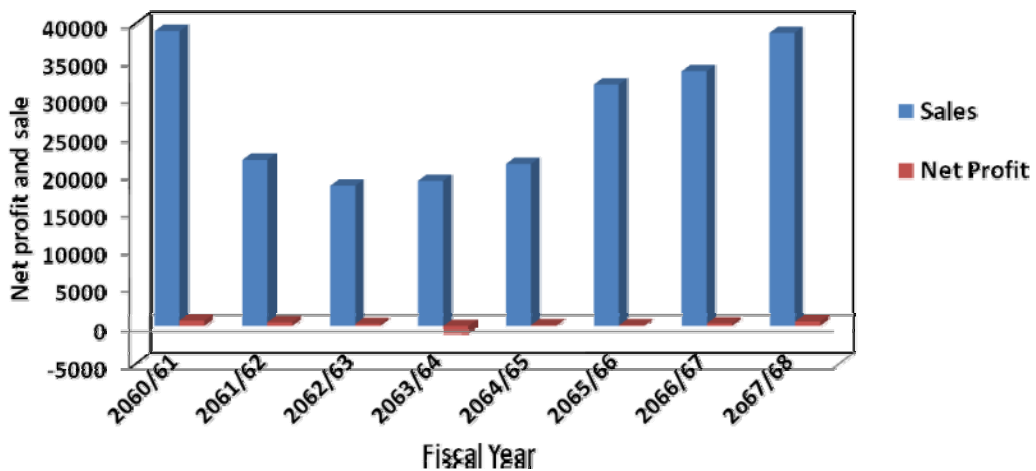
**Figure 4.2**  
**Trend of Net Profit**



Bar diagram showing net profit and sales of STCL. The figure shows STCL has higher net profit except in the year 2063/64 BS. This year has loss it may be due to lack of efficient inventory management systems.

**Figure 4.3**

**Bar Diagram of net profit and sales**



#### 4.8.2 Gross Profit Margin

Gross profit is a company's profit before operating expenses, interest payments and taxes. Gross profit is also known as gross margin. Greater the gross profit margin the better the operating position of the firm. Fewer profit margins indicate the income and efficiency of the firm is poor. Below table shows that gross profit of margin of the firm is in increasing. It started from 7.58% in FY



2060/61 and it has been increasing up to 50% in FY 2066/67 and finally it reaches 16.78% in FY 2067/68. Gross profit margin is calculated using the formula below:

$$\text{Gross Profit Margin} = \frac{\text{Gross Profit}}{\text{Sales}} \times 100\%$$

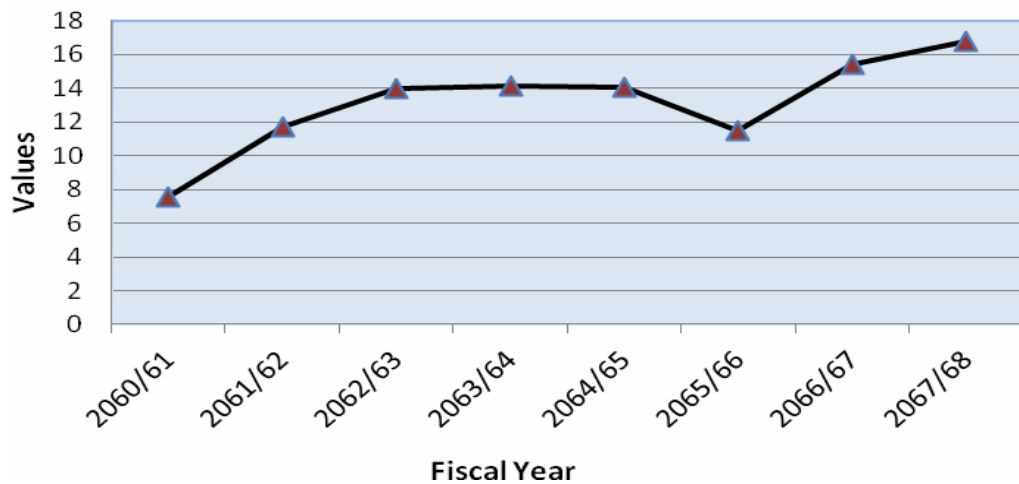
**Table 4.2**  
**Calculation of Gross Profit Margin (Rs. in Lakhs)**

Year (B.S.)	Sales	Gross Profit	Gross Profit Margin %
2060/61	38989	2956	7.58
2061/62	21939	2567	11.7
2062/63	18505	2584	13.96
2063/64	19162	2716	14.17
2064/65	21389	3013	14.08
2065/66	31904	3669	11.5
2066/67	33663	5183	15.39
2067/68	38740	6501	16.78

Source: STCL, Annual Report: 2060/61 to 2067/68 B.S.

**Figure 4.4**

**Trend of Gross Profit Margin**



The trend of gross profit margin is presented in the following graph for better understanding. The figure shows that the gross profit margin from the FY

2060/61-2062/63 is increasing sharply and it remained constant up to FY 2064/65. Gross profit margin is surprisingly reduced in the FY 2065/66 and then again increasing in the later years.

#### 4.9 Sales of food items (salt, sugar, ghee and floor )

STCL has sold different types of commodity as a Food item. Among the food items salt and sugar are highly dominant. Below table 6 shows the sales of food items from F/Y 2060/61 to 2067/68.

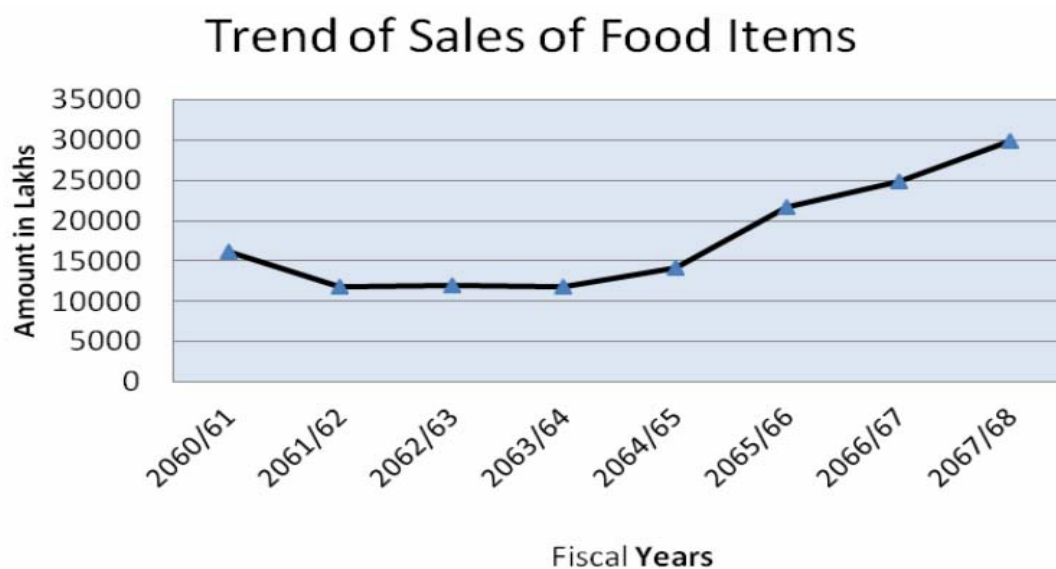
**Table 4.3**  
Sales of food items (Rs. in Lakhs)

Year	Amount
2060/61	16125
2061/62	11762
2062/63	12037
2063/64	11818
2064/65	14222
2065/66	21672
2066/67	24894
2067/68	29946

Source: STCL, Annual Reports, 2060/61 to 2067/68

Amount of sales of food items can be analyzed with the help of Trend line in the below figure.

**Figure 4.5**



The trend of sales of food items is presented in the above graph for clarity. The figure shows the sales of food items from the FY 2060/61 to 2063/64 is slightly fluctuating. After this year sales of those items have been increasing. To analyze the trend of actual sales of food items: salt and sugar estimated the future sales by using least square method as a statistical tool.

**Table 4.4**

**Calculation of trend of sales of food items using by Least Square methods**  
(Rs. in Lakhs)

FY (X)	Sales (Y)	X=(X- 064.5)	X <sup>2</sup>	XY
2061	16125	-3.5	12.25	-56438
2062	11762	-2.5	6.25	-29405
2063	12037	-1.5	2.25	-18056
2064	11818	-0.5	0.25	-5909
2065	14222	0.5	0.25	7111
2066	21672	1.5	2.25	32508
2067	24894	2.5	6.25	62235
2068	29946	3.5	12.25	104811
Total	$\sum Y = 142476$	$\sum X = 0$	$\sum X^2 = 42$	$\sum XY = 96858$

Source: STCL, Annual Reports, 2060/61 to 2067/68

n=8

$$\bar{X} = \frac{\sum X}{N} \quad \text{Where } \sum X = \text{total sum of year, } n = \text{number of item}$$

$$= 16516/8$$

$$\text{Mean} = 2064.5$$

$$\text{Trend line } Y = a + bx \dots\dots\dots (i)$$

$$a = \sum Y / N$$

$$\text{Or } a = 142476/8$$

$$= 17809.5$$

Again,

$$b = \sum XY / \sum X^2$$

$$= 96858/42$$

$$= 2306$$

Putting the value of a and b in equation (i)

$$Y = 17809.5 + 2306x$$

This analysis shows that the sales of food items will increase 2306 per year, if the trend of past year continues in future. This analysis shows positive sales figure for future. By using trend equation it can estimate the sales of salt for FY 2068/069.

This value of X for the year 2068/069 is equal to 4.5 (2069-64.5) the sales for FY 2068/69 will be  $y = 17809.5 + 2306 \times 4.5 = 28186.5$

Here we can find that the sales of food items in 2068/69 will be 28186.5(Rs. in Lakhs), which is increasing over the years. There is some reason behind this trend of sales like:

- To provide sufficient quantity and quality.
- Increasing awareness among consumer.
- Efficiency of top-level management.

#### **4.10 Analysis of Sales and Stock**

##### **4.10.1 Analysis total stock and Stock of food item (that is salt and sugar)**

Closing stock is major part of inventory management. The given table 8 shows the closing stock of food items as a percentage of total stock. Closing stock of food items has covered more than 64% in every year. After the year 2061/62, it has increased rapidly.

**Table 4.5**

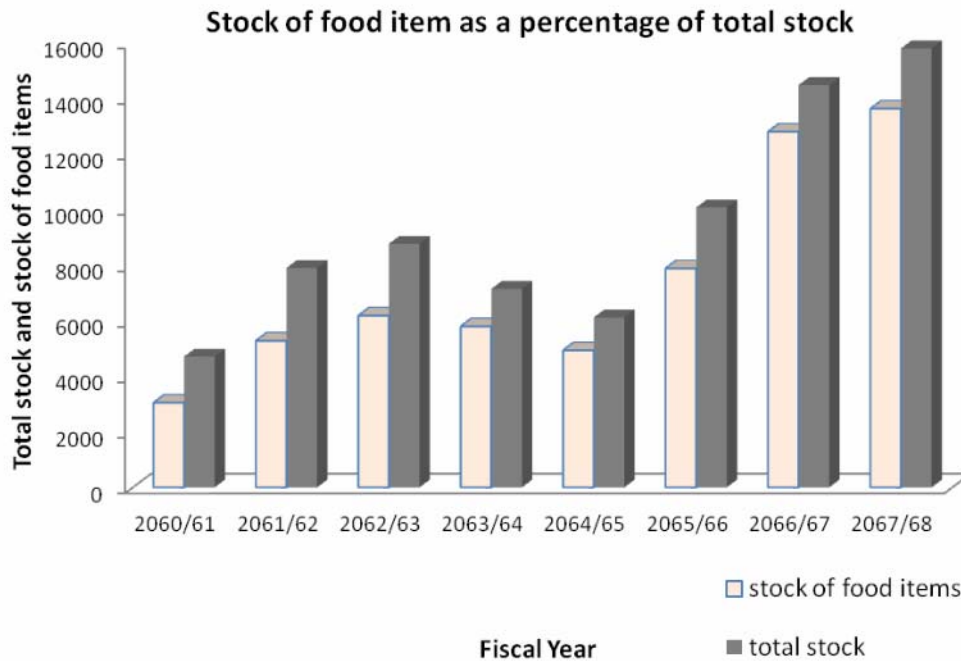
**Closing Stock of food items as a Percentage of Total Stock (Rs. in Lakhs)**

<b>Year</b>	<b>Stock of food items</b>	<b>Total stock</b>	<b>Percentage</b>
2060/61	3046	4706	64.72
2061/62	5277	7898	66.81
2062/63	6180	8765	70.50
2063/64	5796	7144	81.13
2064/65	4935	6116	80.68
2065/66	7880	10071	78.24
2066/67	12796	14475	88.40
2067/68	13623	15794	86.25

*Source: STCL, Annual Report, 2060/61 to 2067/68*

We can also plot this figure in bar graph as:

**Figure 4.6**



This analysis shows that the stock of food item is a major factor that affects the total stock of STCL. Out of the total stock, stock of food items has covered 64.72%, 66.81% and 70.50% in the year 2060/61, 2061/62 and 2066/63, respectively. After that, the stock of food item is increasing order and also has increased of total stock. In the final year 2067/68 stock of food item covered 86.25%. There is positive trade between stock of food item and total stock wherever the percentage of stock of food item increases or decreases.

#### **4.10.2 Analysis Stock of Non-food Items and Others as a Total Stock**

STCL is also trading other different commodities except food items. These other commodities are agriculture items, fuel, lubricants and tyre and others. Table 9 shows that stock of agriculture items, fuel, lubricants and tyre and other items as a total stock. These items have also minor effect in total stock which represents 22% of total items in an average. .

**Table 4.6**

**Stock of Food Items and Other Items (Rs. in Lakhs)**

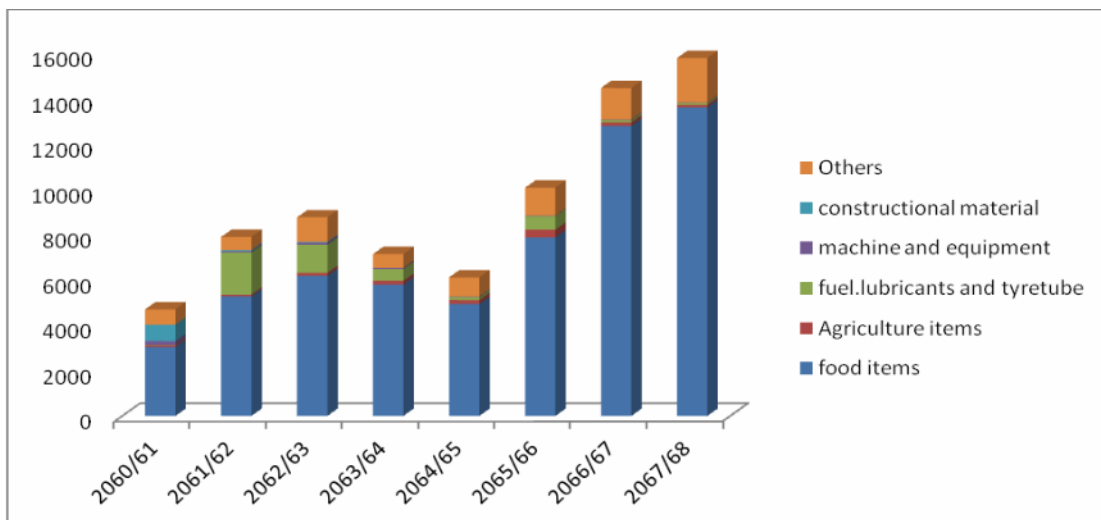
Year	Total stock	Food Items	Agriculture items	Fuel, lubricants and tyre tube	Construction material	Machine and equipment	Other
60/61	4706	3046	75	10	726	168	678
61/62	7898	5277	74	1868	44	48	585
62/63	8765	6180	133	1243	31	89	1087
63/64	7144	5796	160	525	-	45	617
64/65	6116	4935	173	131	-	24	850
65/66	10071	7880	335	597	-	22	1234
66/67	14475	12796	153	105	-	21	1397
67/68	15794	13623	106	76	-	21	1966

Source: STCL, Annual Report, 2060/61 to 2067/68

We can also plot this figure in multi Bar Diagram.

**Figure 4.7**

**Stock of agriculture items, fuel, lubricants and tyre and other items**



Above figure shows that the stock of agriculture items, fuel, lubricants and tyre tube, machine and equipment, constructional material and others items is a minor factor than food items that affects the total stock of STCL.

### 4.10.3 Analysis of Sales

STCL has sold various items like as food items, agriculture materials, construction materials, chemical item, fuel, machine and equipment. The below table shows the total sales amount of STCL from F/Y 2060/61 to 2067/68.

**Table 4.7**

**Total Sales of STCL in different years (Rs. In Lakhs)**

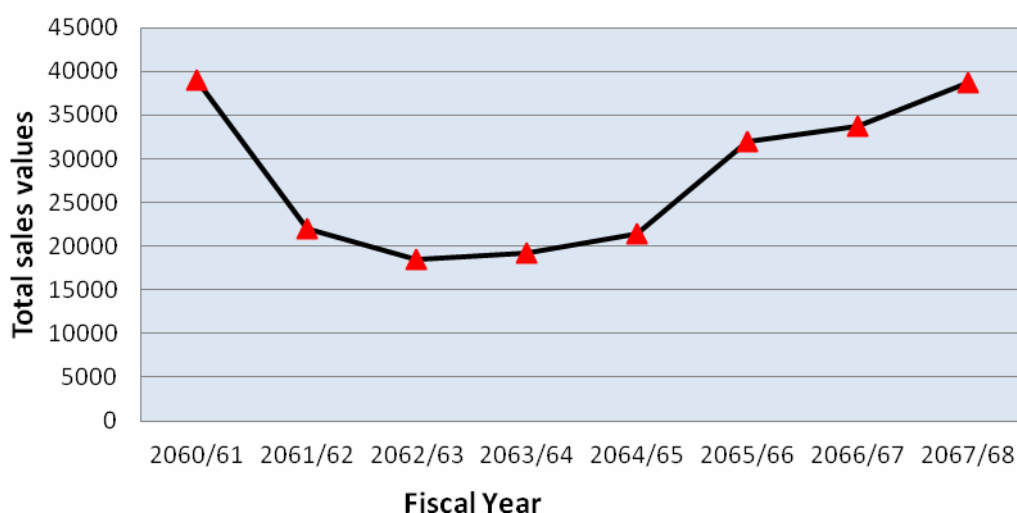
Year	Total Amount( sales)
2060/61	38989
2061/62	21939
2062/63	18505
2063/64	19162
2064/65	21389
2065/66	31904
2066/67	33663
2067/68	38740

*Source: STCL, Annual Report, 2060/61 to 2067/68*

The above figures can also be presented in the following graph.

**Figure 4.8**

**Total sales Trend**



The above graph shows that the sales were decreased from the year 2060/61 to 2062/63 after that it has slightly increased for a year and then later year's total sales have been increasing. In the year 2067/68 it has reached to 38740 Lakhs

which is nearly equal to beginning year. To analyze the diagram of actual sales and estimate future sales least square method is used as statistical tool.

**Table 4.8**

**Calculation of total sales trend by using least square method**

Year (x)	Sales (y)	X= x-2064.5	X <sup>2</sup>	Xy
2061	38989	-3.5	12.25	-136462
2062	21939	-2.5	6.25	-54848
2063	18505	-1.5	2.25	-27758
2064	19162	-0.5	0.25	-9581
2065	21389	0.5	0.25	10694.5
2066	31904	1.5	2.25	47856
2067	33663	2.5	6.25	84157.5
2068	38740	3.5	12.25	135590
Total	$\sum Y = 224291$	$\sum x = 0$	$\sum X^2 = 42$	$\sum XY = 49650.5$

n=8

$$\bar{X} = \frac{\sum X}{N} \quad \text{Where } \sum X = \text{total sum of year, } n = \text{number of item}$$

$$= 16516/8$$

$$\text{Mean} = 2064.5$$

$$\text{Trend line } Y = a + bx \dots\dots\dots (i)$$

$$a = \frac{\sum Y}{N}$$

$$\text{Or } a = 224291/8$$

$$= 28036.37$$

Again,

$$b = \frac{\sum XY}{\sum X^2}$$

$$= 49650.5/42$$

$$= 1182.15$$

Putting the value of a and b in equation (i)

$$Y = 28036.37 + 1182.5x$$



This analyze shows that the sales will increase by 1182.5 (Rs. in Lakhs) per year if the trend of past year continues in future. By using this trend equation, we can estimate the sales of FY 2068/69.

The value of x for the year 2068/69 is equal to 4.5 (69-64.5) then, sales for 2068/69 will be.

$$Y = 28036.37 + 1182.5 \times 4.5$$

33357.62(Rs. in Lakhs)

Here, the estimated sales in 2068/69 will be 33357.62 (Rs. in Lakhs), which is fluctuating over the years. There are some reasons behind this trend of sales like as.

1. Due to involvement/introduction of private sector in this area.
2. Due to lack of government subsidy.
3. Lack of coordination between the department, Zonal offices and branch offices.

#### 4.10.4 Analysis of sales of non-food items and others as total sale

**Table 4.9**

**Sales of agriculture items, fuel, lubricants and tyre and others as total sales**  
(Rs. in Lakhs)

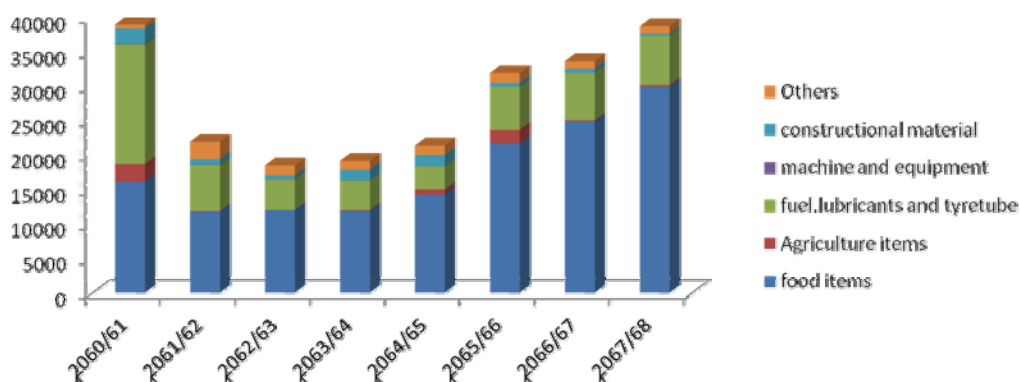
Year	Food items	Agriculture items	Fuel lubricants and tyre tube	Machine and equipment	Constructional Material	Others
2060/61	16125	2586	17359	110	2231	576
2061/62	11762	99	6651	69	815	2540
2062/63	12037	1	4409	33	560	1463
2063/64	11818	173	4310	26	1547	1286
2064/65	14222	773	3364	19	1625	1383
2065/66	21672	1993	6243		- 546	1469
2066/67	24894	151	6888	1	600	1127
2067/68	29946	231	7184	3	277	1096
<b>Total</b>	<b>142476</b>	<b>6007</b>	<b>56408</b>	<b>261</b>	<b>8201</b>	<b>10940</b>

*Source: STCL, Annual Report, 2060/61 to 2067/68*

Above table shows the various commodities which have sold from the STCL from F/Y 2060/61 to 2067/68. Among those items, a food item is the highest in overall items. We can also plot this figure in multi Bar Diagraph.

**Figure 4.9**

**Sales of agriculture items, fuel, lubricants and tyre and others as total sale**



This analysis shows that the sale of agriculture items, fuel, lubricants and tyre tube, machine and equipment, constructional material and others items is a minor factor than food items that affects the total sales of STCL. Out of the total sales, sale of non-food items has covered 36% in an average.

**4.11 Sales and Closing Stock**

Sales and stock is major part of inventory. Below table shows the total sales and closing stock of STCL from F/Y 2060/61 to 2067/68.

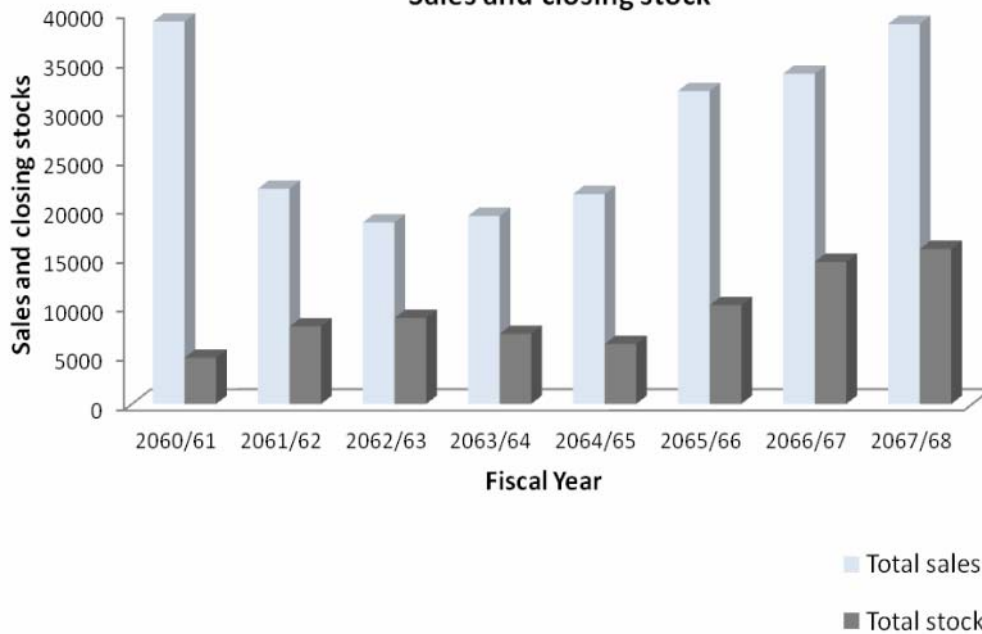
**Table 4.10**  
**Sales and Closing Stock (Rs. in Lakhs)**

Year	Total sales	Closing stock
2060/61	38989	4706
2061/62	21939	7898
2062/63	18505	8765
2063/64	19162	7144
2064/65	21389	6116
2065/66	31904	10071
2066/67	33663	14475
2067/68	38740	15794

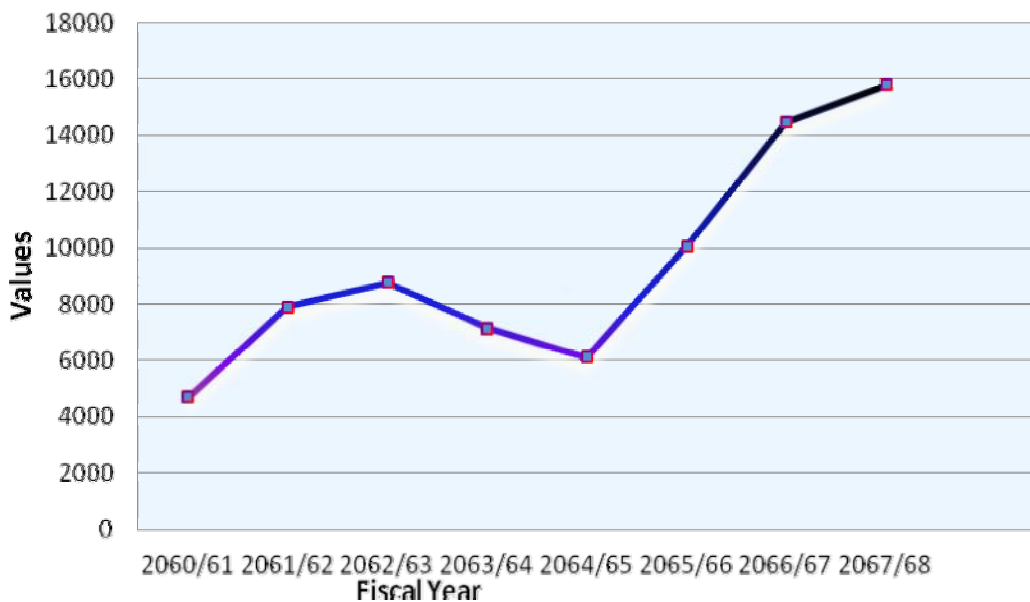
Source: STCL, Annual Report, 2060/61 to 2067/68

The above figures can be also presented in the bar diagram.

**Figure 4.10**  
**Sales and closing stock**



**Figure 4.11**  
**Trend of closing stock from FY 2060/2 to 2067/68**



The trend analysis also is made in case of closing stock. The above figure indicates that the closing stock has been gradually increasing for the first three year, from 4706 in FY 2060/061 to 8765 in FY 2062/63. It has decreased From FY 2062/63 to FY 2064/65. After this year the closing stock has been in increasing trend.

Arithmetic mean, standard deviation and coefficient of variation of sales and closing stock are calculated to find out the nature of variability. Summarized result of these statistical tools is presented in table 14 and detail calculation is given in Appendix-1.

**Table 4.11**

**Arithmetic mean, Standard Deviation and C.V. of Sales and Closing Stock**

<b>Statistical tools</b>	<b>Sales</b>	<b>Closing Stock</b>
Arithmetic Mean	28036	9371
Standard Deviation	8718	3921
Coefficient of Variation	31%	41%

*See Appendix –I for detail calculation*

Arithmetic mean shows that there is difference between actual sales and mean sales which is not favorable sign. Again there is big difference between means of sales and closing stock. To find out the correlation between sales and closing stock Karl Person's coefficient of correlation (r) is calculated. For the purpose of calculating r, sales is assumed A and closing stock is assumed B and there is positive correlation between sales and closing stock. To know the significance of the calculated value of (r) probable error (PE<sub>s</sub>) is calculated. The detail calculation of r and (PE<sub>s</sub>) is presented in Appendix-I coefficient of correlation (r) = 0.43 Probable error (PE<sub>s</sub>) = 0.19

The value of r = 0.43 shows that there is a positive correlation between sales and closing stock considering probable error (PEs). It is found that calculated value of (r) is not concluded as  $(r < 6 \times PE)$ .

**4.12 Procurement Trend of STCL**

**Procurement** is the acquisition of goods or services. STCL has procured different type of commodities like salt, sugar, fuel, oil, construction material, spare parts and other from national and international market. Table 14 shows the total purchase amount of goods by STCL from F/Y 2060/61 to 2067/68.

**Table 4.12**

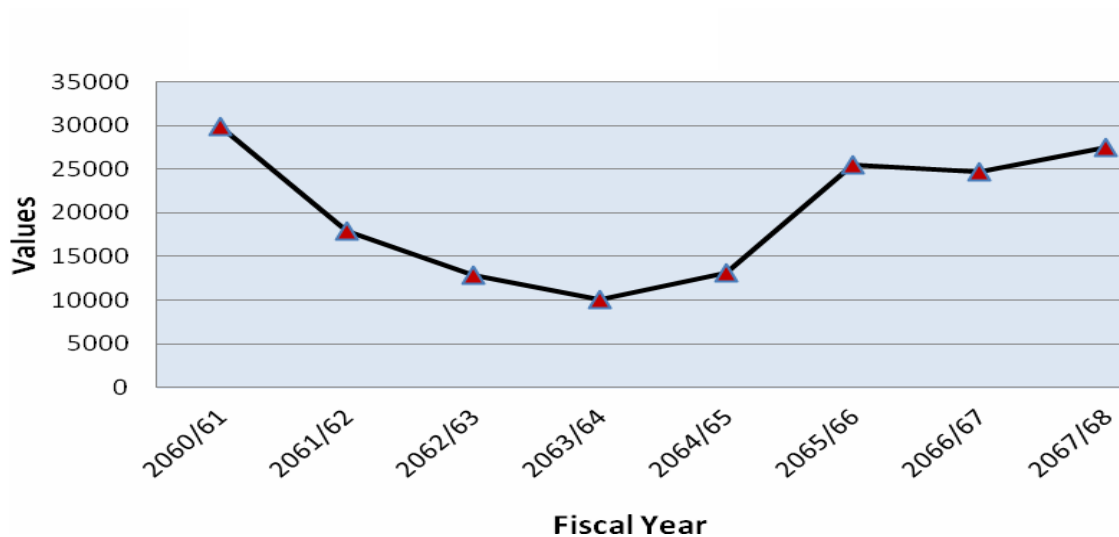
**Procurement Trend of STCL (Rs.in Lakhs)**

year(B.S)	Amount
2060/61	29825
2061/62	17884
2062/63	12797
2063/64	10082
2064/65	13172
2065/66	25467
2066/67	24635
2067/68	27488

*Source: STCL, Annual Report, 2060/61 to 2067/68*

The trend of procurement is presented in below figure for better understanding. The figure shows that the procurement trend of total goods has decreased rapidly from the FY 2060/61 to 2063/64. In fiscal year 2063/64, it has only 10,082 Lakhs which is the lowest in overall and after this year it has started to increase. From fiscal year 2064/65, it has sharply increased.

**Figure 4.12**  
**Procurement Trend of STCL**



To analyze the figure of procurement of commodities estimate the future procurement trend by using least square method as statistical tool.

**Table 4.13**

**Calculation of procurement trend of STCL by using Least Square method**

<b>F/Y (X)</b>	<b>Procurement (Y)</b>	<b>X=X-2064.5</b>	<b>X<sup>2</sup></b>	<b>XY</b>
2061	29825	-3.5	12.25	-104387.5
2062	17884	-2.5	6.25	-44710
2063	12797	-1.5	2.25	-19195.5
2064	10082	-0.5	0.25	-5041
2065	13172	0.5	0.25	6586
2066	25467	1.5	2.25	38200.5
2067	24635	2.5	6.25	61587.5
2068	27488	3.5	12.25	96208
<b>Total</b>	<b>161350</b>	<b>0</b>	<b>42</b>	<b>29248</b>

n=8

$$\bar{X} = \frac{\sum X}{N} \quad \text{Where } \sum X = \text{total sum of year, } n = \text{number of item}$$

$$= 16516/8$$

$$\text{Mean} = 2064.5$$

$$\text{Trend line } Y = a + bx \dots\dots\dots (i)$$

$$a = \frac{\sum Y}{N} \quad \text{Or } a = \frac{161350}{8}$$

$$= 20168.75$$

Again,

$$b = \frac{\sum XY}{\sum X^2}$$

$$= \frac{29248}{42}$$

$$= 696.38$$

Putting the value of a and b in equation (i)

$$Y = 20168.75 + 696.38x$$

This analysis shows that the procurement will increase by 696.38 (Rs. in Lakhs) per year, if the trend of past year continues in future. This analysis e shows positive purchase figure in the future. We can estimate the procurement of FY 2068/69.

The value of X for FY 2068/69 will be 4.5(69-64.5)

$$Y = 20168.75 + 696.38 \times 4.5 = 23302.46 (\text{Rs. in Lakhs})$$

Here the estimated value of the procurement of STCL will be 23302.46(Rs. in Lakhs), this value indicates that the procurement is increasing. The reasons behind positive trend might be:

- Due to increase in sales of products.
- High-level management efficiency.
- Withdrawal of companies share from bad performance company.
- Increase in company investment.

#### 4.13 Inventory and Working Capital

Inventory and working capital have a symbiotic relationship in business. Working capital is a financial formula that measures a company's operating liquidity. The basic working capital formula is current assets minus current liabilities, with inventory being part of a company's current assets. Companies that derive a large portion of sales will often have copious amounts of inventory, which can affect the working capital formula. Significant adjustments relating to inventory can signal improper operational or accounting techniques employed by a company. The given table shows the relation of inventory and working capital.

**Table 4.14**  
**Inventory and Working Capital (Rs. in Lakhs)**

Year (B.S)	Stock	Working capital	Percentage
2060/61	4706	3538	75.5
2061/62	7898	987	12.49
2062/63	8765	192	2.19
2063/64	7144	696	9.7
2064/65	6116	693	11.3
2065/66	10071	448	4.4
2066/67	14475	315	2.17
2067/68	15794	640	4.05

*Source: STCL Annual Report, 2060/61 to 2067/68 and Appendix – IV*

Above table shows as that the percentage of working capital on stock is the highest (75.5%) in F/Y 2060/61. After this year working capital percentage is less on stock and it is found to be lowest in the FY 2066/67.

#### 4.14 Inventory Turnover Ratio

Inventory Turnover Ratio is one of the efficiency ratios and measures the number of times, on average, the inventory is sold and replaced during the fiscal year. Inventory Turnover ratio has Measured Company's efficiency in turning its inventory into sales. Its purpose is to measure the liquidity of the inventory. A low turnover rate can indicate poor liquidity, possible overstocking, and obsolescence, but it may also reflect a planned inventory buildup in the case of material shortages or in anticipation of rapidly rising prices. A high inventory turnover ratio can indicate better liquidity, but it can also indicate a shortage or inadequate inventory levels, which may lead to a loss in business.

**Table 4.15**  
**Calculation of Inventory Turnover Ratio (Rs. in Lakhs)**

<b>Year (B.S.)</b>	<b>Cost of Goods Sold</b>	<b>Average Inventory</b>	<b>Ratio</b>
2060/61	32000	5794	5.5
2061/62	14692	6302	2.3
2062/63	11930	8331	1.4
2063/64	11703	7954	1.4
2064/65	14200	6630	2.1
2065/66	21526	8086	2.6
2066/67	20235	12257	1.6
2067/68	20235	15119	1.3

*Source: STCL Annual Report, 2060/61 to 2067/68 & Appendix V and VI*

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of goods Sold}}{\text{Average Inventory}}$$

Detail calculation of cost of goods sold and average inventory are presented in Appendix – V and VI, respectively. Every firm has to maintain a certain level of inventory to meet the requirement of business. The stock turnover ratio indicates whether the investment in inventory is efficiently used or not. It tests the efficiency in inventory management. It also explains whether investment in inventories is within proper limits or not. It indicates marketability of



inventories and reasonableness of quantity on hand. Inventory turnover ratio measures the velocity of conversion of stock in to sales.

A high stock turnover indicates efficient management of inventory because more frequently the stocks are sold the lesser the amount is required to finance the inventory. On the contrary a low stock turnover indicates over investment in stock dull business poor quality of goods. Stock accumulation accusation of absolute and slow moving goods low profit as compared to total investment and in efficient inventory management. The inventory turnover ratio of STCL has been fluctuating i.e. 5.5 times in F/Y 2060/61, 2.3 times in FY 2061/62, 1.4 times in FY 2062/63 and 2063/64, 2.1 times in FY 2064/65 2.6 times in FY 2065/66, 1.6 times in FY 2066/67, and finally it slow down to 1.3 times in 2067/68.

This analysis shows that the inventory management of STCL is not good. There is high investment in stock and the period that the stock converts in to sales is also high.

Arithmetic mean, standard deviation and correlation coefficient between closing stock and working capital are calculated to find all the nature of variability. Summarized result of these statistical tools is presented below from the detail calculation made in appendix - I and appendix – VII.

**Table 4.16**  
**Calculation of Mean and Standard Deviation (Rs. in Lakhs)**

<b>Statistical Tools</b>	<b>Closing Stock</b>	<b>Working Capital</b>
Arithmetic Mean	9371	567
Standard Deviation	3921	268

*Source: Appendix I and VII*

Again the correlation coefficient between working capital and closing stock, Karl Pearson's coefficient of calculating (r) should be determined. For the purpose of calculation (r) the working capital is assumed as independent variables and stock assumed dependent variable. The assumption in such case is that actual working capital decrease or increase in respect to stock.

This means there should be positive correlation between working capital and closing stock. There is positive correlation between working capital and stock i.e.  $r=0.91$ , this means when stock increase the working capital also increase. To test the significant of the calculated value of (r), probable error ( $PE_s$ ) is calculated. The detail calculated(r) and ( $PE_s$ ) presented in appendix – VII. Since the calculated ( $PE_s$ ) is 0.04 i.e.  $r > 6 \times PE$  so there is significant relationship between closing stock and working capital.

#### 4.15 Warehousing of Salt and Sugar

Warehouse is a commercial building for storage of goods. Warehouses are used by manufacturers, importers, exporters, wholesalers, transport businesses customs, etc. They are usually large plain buildings in industrial areas of cities and towns and villages. STCL has also made warehouses in different region and locations. To insure the timely supply of salt and sugar in the hands of ultimate consumer and also maintain the balance between demand and supply of salt and sugar, STCL has warehouse located at different parts of the country with a total storage capacity of 75000 metric tons. The below table 20 shows the salt and sugar warehousing capacity of STCL.

**Table 4.17**

**Salt and Sugar Warehousing Capacity of STCL (Unit: M. ton)**

Region	No. of Warehouse	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68
Eastern	40	21000	21000	21000	21000	21000	21000	21000	21000
Central	55	28875	28875	28875	28875	28875	28875	28875	28875
Western	30	15750	15750	15750	15750	15750	15750	15750	15750
Mid-West	10	5240	5240	5240	5240	5240	5240	5240	5240
Far-west	8	4135	4135	4135	4135	4135	4135	4135	4135
<b>Total</b>	<b>143</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>

*Source: STCL Central Office*

Above table shows that number and capacity of warehouse are not changed. It's neither increased nor decreased. The distribution of warehouse is not equal in all regions. More number of warehouses is in central region and less in far western region. Total capacity of warehouse is 75000 mt. and total number of warehouse is 143 since FY 2060/61. Out of 143 warehouses 67 warehouses are

salt warehouse and rest 76 warehouse are sugar and other warehouses. Similarly, out of 75000 mt. and slat warehousing capacity is 38000 mt. and rest 37000 mt. is sugar and other product.

Again the table shows that out of 143 numbers of warehouses, eastern development region has 40 warehouses, which is 25.81% of the total, but regarding total storing capacity it covers 28%. Similarly, in central development region warehouse represents 38.46 and 38.5% of the total number and salt and sugar storing capacity, respectively. The corresponding values for western development region are 20.98% and 21%, respectively. Finally, in mid western development region and in far western development region no. of warehouse and capacity of warehouse is 6.99%, 6.98% and 5.59%, 5.51%, respectively.

**Table 4.18**  
**Warehousing Capacity of STCL by Zone**

S. N.	Zones	No. of Warehouse	Capacity mt.	Percent of Total Capacity
1.	Mechi	12	6300	
2.	Koshi	22	11550	
3.	Sagarmatha	6	3150	
	Eastern D. Region	40	21000	28%
4.	Janakpur	13	7000	
5.	Narayani	19	9613	
6.	Bagmati	23	12262	
	Central D. region	55	28875	38.5%
7.	Gandaki	9	1800	
8.	Lumbini	13	6825	
9.	Dhaulagiri	8	7125	
	Western D. Region	30	15750	21%
10.	Rapti	6	2400	
11.	Bheri	4	2840	
	Mid Western D. Region	10	5240	6.98%
12.	Seti	4	1700	
13.	Mahakali	4	2400	
	Far-western D. Region	8	4100	5.46%
	Grand total	143	75000	100%

*Source: Basic Statistics of STCL, STCL Central Office Kalimati, 2011*

The individual capacity of these warehouse ranges from 40 tons to 2000 tons. The walls are built with bricks or stone as available locally with cement buildings, floors are of cement, roofs are made of corrugated of CGI sheets on wooden/Steel trusses. Most of warehouses have steel rolling shutters, some ware houses have wooden doors and are weatherproof and well ventilated STCL also have some cold storages and lab in different part of the country to store salt and for chemical analysis of salt and sugar. Staking, unloading, bagging etc. is done manually in a labor-intensive manner. Wooden pallets are used in all warehouses. Some warehouse does not have good access of roads making difficult to load and unload salt and sugar.

In the initial years, the consumption of salt and sugar was on very low scale as a consequence there was no sever problem of salt and sugar storage. Naturally ware-housing facilities were also limited. Initially, STCL had not developed its own warehousing facilities. It had managed storing salt and sugar hiring godown in rent.

#### **4.16 Targeted Sales and Actual Sales**

The below table 22 shows that in F/Y 2060/061, 62, 63, 64, 65, 66, 67 and 68 the actual achievement of sales is lower than targeted sales. When we analyze the budgeted and actual figure of each year we can say that the target is based on historical data or previous year's sales performance. The gap between the actual and targeted sales figure is fluctuating and not constant.

**Table 4.19**  
**Targeted Sales and Actual Sales (Rs. In Lakhs)**

<b>Year (B.S.)</b>	<b>Targeted</b>	<b>Actual</b>	<b>Achievement</b>
2060/61	42379	38989	92%
2061/62	24379	21939	89.9%
2062/63	20335	18505	91%
2063/64	21775	19162	88%
2064/65	24585	21389	87%
2065/66	32226	31904	99%
2066/67	34704	33663	97%
2067/68	40778	38740	95%

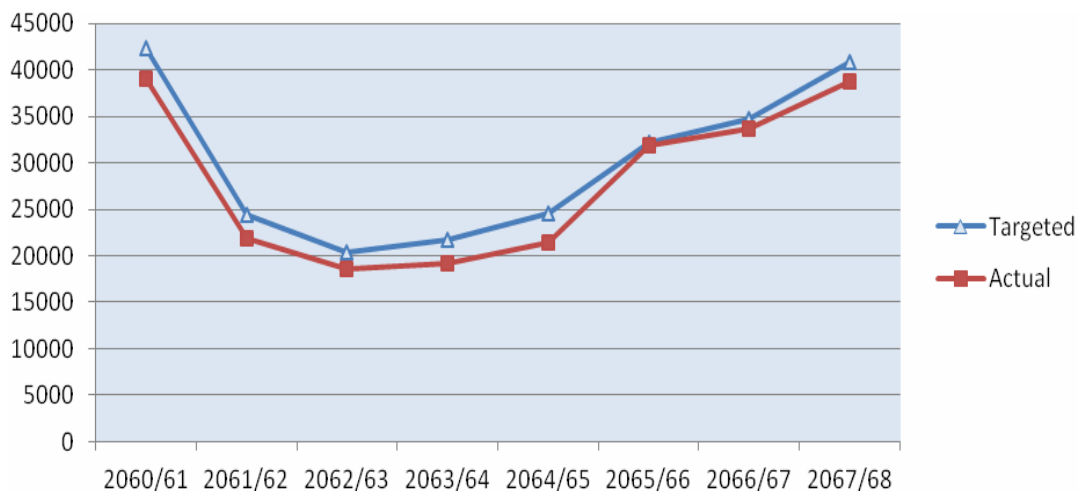
*Source: STCL, Central Office, Kathmandu*

In F/Y 2060/61, the achievement is 92%, while in F/Y 2061/62 actual achievement is only 89.9% in FY 2062/63, 063/64, 064/65, 065/66, 066/67, 067/68 actual achievement are 91%, 88%, 87%, 99%, 97% and 95% based on budget sales of corresponding year, respectively. Such small gap is created because of adequate consideration in planning.

The targets are set at high expectation and sometime target are very much pessimistic. The level represents the better efficiency of top-level management in co-ordination and integration the effort of others. Therefore series consideration should be made to improve such problem. Some gaps between targeted sales and actual sales are presented in the graph.

**Figure 4.13**

**Trend of Targeted Sales and Actual Sales**



The above figure shows that the total target sales and actual sales is fluctuating and the actual sales lines have never meet or crossed the sales target line. In some year the sales target is increased and actual sales is decreased. Arithmetic mean, standard deviation and coefficient of variation of the targeted sales and actual sales calculated to find out the nature of variability. Summarized result of these statistical tools is presented below from the detail calculation made in Appendix-VIII.

**Table 4.20**

**Calculation of Mean, Standard Deviation and C.V. (Rs. in Lakhs)**

<b>Statistical Tools</b>	<b>Targeted Sales</b>	<b>Actual Sales</b>
Arithmetical Mean	30145	28036
Standard Deviation	8604	8718
Coefficient of variation (%)	26.7	29.08

*See Appendix VIII for detail calculation*

Arithmetical mean shows that there is a huge difference between mean of targeted sales and actual sales, which is not favorable sign. Again, there is a big difference between standard deviation of targeted sales and actual sales this is also not favorable sign. Finally, the coefficient of variation of actual sales is 29.08% which is not good.

To find out the correlation targeted sales and actual sales Karl Person's coefficient of correlation (r) should be determined. For the purpose of calculating 'r' targeted sales and 'A' is assumed to be independent variable and actual sales 'I' is assumed to be dependent variable. The assumption in such case is that actual sales will increase or decrease in sales target respectively. This mean there should be positive correlation between A and I variable. To know the significance of calculate value of (r) probable error ( $PE_s$ ) is presented in appendix-VIII

Coefficient of correlation (r) = 0.99

Probable Error ( $PE_s$ ) = 0.047

The value of (r) is 0.99 shows are that there is positive correlation between targeted sales and actual sales. Increase in targeted sales will increase actual sales and vice-versa. The value of probable error ( $PE_s$ ) it was found that the calculated value of (r) is greater than  $6PE_s$  so it can be concluded that there is strong positive correlation between sales and actual sales.

#### 4.17 Major Findings

1. In total, STCL has 93 branch offices in 73 districts and 6000 dealer all over the country with central office located in Kathmandu.
2. According to the survey the duration between order placement and review order are 3 to 6 month, which shows that STCL should be more careful about re-order point and buffer stock. Because lead-time is long this may create shortage of food items (that is salt and sugar). But according to them re-order point is not calculated properly in STCL rather order is placed when needed or before pick demand.
3. It has been observed that that the number of warehouses is enough and the condition of warehouse is also good. All types of salt and other supplies are kept under same roof to make sales and distribution easier.
4. Regarding stock, STCL is never facing over stock as well as under stock problem because the order placement is taken properly. STCL place order when needed and lead time is so long which may cause under stock problem. Lack of proper inventory management and sufficient procurement of salt may also cause above problem.
5. According to the respondents, STCL forecasts sales target of salt, sugar and other items and its basic determines are previous trend demand of salt and sugar and recommendation of local retailer as well as government policy. But the sales target never meets. The main causes of difference between targeted lack of proper planning and insufficiency of salt and sugar in store
6. Few suggestions are also collected from the survey. Most of the respondents suggest using scientific inventory model/ systems prepare planning should be made and procurement and sales of salt and sugar should made regular.
7. The major procurement procedures/ways are through inviting global tender through negotiation, through aid/assistance from donor

agencies/countries and thorough negotiation/agreement of two governments. Besides other ways STCL prefers procurement through inviting global tenders because other procedures are not reliable and costly.

8. STCL procure sugar from domestic as well as international market and salt were procured from international market.
9. The procurement procedures followed by the corporation are estimation of requirements, inviting tenders evaluation of bids, placing the order and finally dispatch order for clearing and forwarding agents.
10. Warehousing capacity of salt and sugar is 75000 mt. in 2060/61 and it is constant till now. Distribution of warehouse is not equal in all regions i.e. capacity of warehouse in far western development region is very low that is 4100 mt. as compare to other regions.
11. Salt are packed and imported in 50 kg bags. The raw salt had been ionized and make easy accessible with 1 kg plastic bag to the consumer, small bag are used to hill transportation where salt and sugar are carried on animals and human backs. It facilities in transportation and sales of salt and sugar equally in hill and Terai.
12. STCL does not have adequate fleet of trucks. So in most cases transport companies under contractual agreement carryout this job. Similarly, STCL use mule, porter, as well as plane charter to carry the sacks of food items to the hill and Himali areas where modern transport service is not available.
13. STCL is not using scientific models of inventory management. Although they do not calculate EOQ for the easy supply of salt they order in lots of 1000 to 2000 mt. . This is a positive aspect of inventory management for the easy supply they have habit to use lots in order. There is no evidence of taking trade discount by STCL. Lead-time is not calculated properly; generally it takes 4 to 5 months to receive an order after the



order placement. Reorder point is also not fixed. Regarding buffer stock although STCL have capacious warehouses, it remains full of stock in all season. STCL have using ABC analysis in stock.

14. The purchase of food items (major include salt and sugar) is fluctuating year after which shows that the inventory level will decrease or increase in high volume, which makes inventory handling more difficult.
15. Net profit margin of the firm has been gradually improving but it was - 5.4% in year 2063/64 and thereafter up to 1.5% in year 2067/68 it shows the earning power of the country is good.
16. Percentage of stock of food items in total stock has been fluctuating over the year but in average more than 60% of closing stock covered by food items with low percentage of 64.72% was found in 2060/61 and high percentage in 2067/68 i.e. 86.25%.
17. The least square analysis shows that the sales of STCL is decreasing year by year and it will be 33357.62 (Rs. in lacks) in year 2068/69.
18. The least square analysis shows that the purchase or procurement of STCL is decreasing in Total and fluctuating over the years and it is estimated to be 23302.46(Rs. in lacks) in year 2068/69.
19. Percentage of working capital on stock in F/Y 2060/61 is the highest in overall. There is no proper plan for smooth running of inventory management because of its variable nature.
20. Stock turnover ratio indicates the more efficient management of the firm where as low inventory turnover shows the weakness of management to convert the stock into sales that generate revenue to the firm.
21. The coefficient of correlation of working capital and closing stock is 0.91 and the probable error ( $PE_s$ ) is 0.04. The calculated value of  $r > 6 \times PE_s$ . So there is highly significant relationship between closing stock and working capital.

22. Coefficient of variation of actual sales is 29.08% indicating that sales are quite fluctuating year after year.
23. The coefficient of correlation of targeted sales and actual sales is 0.99 and probable error (PEs) is 0.047 Calculated value of r is greater than 6 (PEs). So it can be concluded that whenever the actual sales increase the targeted sales also increase and vice versa.
24. Gross profit margin indicates the operating position of firm according to last 8 years date the gross profit margin is efficient. It is in increasing trend. It was 7.58% in the F/Y 2060/61 thereafter up to 16.78% in year 2067/68.
25. Out of 143 warehouses all over the country the central development region has 55 capacious warehouses, indicating that there is no equal distribution. This might be the reason of high population density in central development region.
26. Out of total sales, major part of sales are covered by sales of food items. It covers more than 60% of total sales of STCL.
27. There is positive correlation between sales and closing stock coefficient of correlation ( $r$ ) = 0.43 probable error ( $PE_s$ ) = 0.19. Considering probable error  $6 \times (PE_s)$  greater than  $r$ . So, there is no significant relationship.
28. Actual sales have never crossed and then never meet the targeted sales which indicate that there is some defect on sales program or in procurement schedule.

## **CHAPTER FIVE**

### **SUMMARY CONCLUSION AND RECOMMENDATION**

This chapter presents the summary of research finding obtained from the study of inventory management of salt trading corporation. This chapter is comprised of three sections: the first section deals with the summary of the study; the second section draws the conclusion of the study. Finally; the third section proposed the suggestions to the problem observed on the basis of the finding.

#### **5.1 Summary**

The trading sectors in Nepal covering largest section of economic activity which needs diversification and commercialization to raise the economic level of Nepalese trades. Currently this sector contributes more than 40% of GDP and provides employment to more than 50% of country population. Commercialization so far has been targeted mainly towards supply, transportation and distribution of commodity. It has been concerned on the development of the demand and supply of salt and sugar to trades all over Nepal.

STCL is a commercial enterprise established under government control. Its main objective is to provide quality salt in reasonable price at right quantity. Most of the people are under the stark of poverty in Nepal. So, they are nearly unable to buy and use quality salt in their daily use. Therefore, Government of Nepal was providing subsidy in price and transportation cost consequently in past years, which will obviously decrease the target of STCL. Government of Nepal discontinued the subsidy facilities because of private sectors involvement in those sectors.

This research concerned about inventory management of salt trading corporation. Inventory management involves a retailer seeking to acquire and maintain a proper merchandise assortment while ordering, shipping, handling, and related costs are kept in check. It also involves the systems and processes that identify inventory requirements, set targets, provide replenishment

techniques, report actual and projected inventory status and handle all functions related to the tracking and management of material. This would include the monitoring of material moved into and out of stockroom locations and the reconciling of the inventory balances. It also may include ABC analysis, lot tracking, cycle counting support, etc. Management of the inventories, with the primary objective of determining/controlling stock levels within the physical distribution system, functions to balance the need for product availability against the need for minimizing stock holding and handling costs. Inventory management is an important concern for managers in all types of the business. Every business/manufacturing organization however, big or small has to maintain some inventory. No any organization can achieve organizational goal and objective without efficient and effective inventory management system. Salt trading corporation is the only organization having the responsibility to provide salt, sugar, agriculture materials, construction materials, fuel and lubricants and others. Among them it's provided large quantity of salt and sugar. Salt trading has its own delivery network of food item and chemical goods. STCL is the pioneer trading organization-providing salt in the country. Its main objective is to provide salt at the right time and right place. STCL enough care for inventory management because if salts are not provided at the right time its objective may not be achieved. So to solve the great problem of demand and supply of salt STCL should use the scientific techniques of inventory management.

Though there are various studies conducted on inventory management but only countable number of research are conducted on overall inventory management of salt trading corporation limited. The main objectives of the study are to analyze the present position of inventory management and to find the warehouse condition for different commodities of STCL in different zones. To attain the objective of the study, various analytical and descriptive techniques have been used.

For the purpose of this study, the necessary secondary data were collected for the period 2060/61 to 2067/68 from the annual reports, handouts of STCL and its website: [www.stcnepal.com.np](http://www.stcnepal.com.np) and from the central office of this organization. This study used a variety of statistical tools to accomplish its objectives. Trend analysis informs about the demand of goods and the need of stock, future achievement of the STCL, inventory condition as well as many other information which would be helpful to concerned parties of the Company. The standard deviation and coefficient of variation were computed and compared to analysis between two variables. Coefficient of correlation is used for measuring the magnitude of linear relationship between two variables. Various types of financial tools are used in order to evaluate and examine inventory management in the research process. ABC analysis is a selective inventory control technique, which adopts selectivity based on the value of consumption. According to usage value, inventories are classified as A, B and C groups. EOQ is essentially an accounting formula that determines the point at which the combination of order costs and inventory carrying costs are the least. There are gross profit, net profit and inventory turnover ratios used in order to evaluate and examine inventory management in the research process. From the calculations the data show that Net profit margin of the STCL has been gradually improving however there was heavy loss in year 2063/64. Net profit of STCL has been observed for the FY 2067/68 was increased by 1.5%. This figure indicates the earning power of the STCL is good. There is highly positive correlation between working capital and closing stock of STCL. Similarly the correlation coefficient between net sales and closing stock of the firm has positive relationship but there is no significant relationship between those variables. According to inventory turnover analysis there was high investment in stock and the period that the stock converts in to sales was also high. A high stock turnover indicates efficient management of inventory because more frequently the stocks are sold the amount is required to finance the inventory.

The distribution of warehouse was not equal in all regions. Higher numbers of warehouses are observed in central region and less in far western region. This might be the reason of high population density in central development region. Total capacity of warehouse is 75000 mt. and total number of warehouse is 143 since FY 2060/61. Out of 143 warehouses 67 warehouses are salt warehouse and rest 76 warehouse are sugar and other warehouses. The individual capacity of these warehouse ranges from 40 tons to 2000 tons. The walls are built with bricks or stone as available locally with cement buildings, floors are of cement, roofs are made of corrugated of CGI sheets on wooden/Steel trusses. Most of warehouses have steel rolling shutters, some ware houses have wooden doors and are weatherproof and well ventilated STCL also have some cold storages and lab in different part of the country to store salt and for chemical analysis of salt and sugar.

## **5.2 Conclusion**

Inventory management is the crucial aspect of the financial management. It is the life-blood and controlling nerve center for any types of business organization because without the proper control upon it no business can run smoothly. Inventory management is necessary for day-to-day operations of any organizations. Furthermore, inventory management also assists in controlling troubles like shipping, ordering and dealing with supplies. In addition, the material management and tracking areas of inventory managing also include feature like supervision of components which are moved in or out of warehouses and reconciliation of inventory balances. Therefore the role of inventory management is more significant for every business organization irrespective to their nature. There have been a number of studies on inventory management from different experts in various enterprises, which covers the sales, purchase and all components of profit planning, of the firm.

The Trading companies should not neglect the inventory management but during the study STCL have attention towards the inventory management. Regarding stock, STCL is never facing over stock as well as under stock

problem because the order placement is taken properly. STCL place order when needed and lead time is so long which may cause under stock problem. Lack of proper inventory management and sufficient procurement of salt may also cause above problem. The major procurement procedures/ways are through inviting global tender through negotiation, through aid/assistance from donor agencies/countries and thorough negotiation/agreement of two governments. Besides other ways STCL prefers procurement through inviting global tenders because other procedures are not reliable and costly. STCL is not using scientific models of inventory management. Although they do not calculate EOQ for the easy supply of salt they order in lots of 1000 to 2000 mt. This is a positive aspect of inventory management for the easy supply they have habit to use lots in order. There is no evidence of taking trade discount by STCL. Lead-time is not calculated properly; generally it takes 4 to 5 months to receive an order after the order placement. Reorder point is also not fixed. Regarding buffer stock although STCL have capacious warehouses, it remains fall of stock in all season. STCL have using ABC analysis in stock

Warehousing capacity of salt and sugar is 75000 mt. in 2060/61 and it is constant till now. Distribution of warehouse is not equal in all regions i.e. capacity of warehouse in far western development region is very low that is 4100 mt. as compare to other regions. Salt are packed and imported in 50 kg bags. The raw salt had been ionized and make easy accessible with 1 kg plastic bag to the consumer, small bag are used to hill transportation where salt and sugar are carried on animals and human backs. Transportation facilities and sales of salt and sugar are not equally in hill and Terai. STCL does not have adequate fleet of trucks. So in most cases transport companies under contractual agreement carryout this job. Similarly, STCL use mule, porter, as well as plane charter to carry the sacks of food items to the hill and Himali areas where modern transport service is not available.

STCL invests huge amount of capital in the form of inventory. Out of which salt and sugar are most important. The expenses made for the function associated with inventory such as purchasing expenses; storage and

storekeeping expenses are also large. The concept of scientific inventory management, which is solve certainly inventory problems such as under and over stock of goods. There are some internal as well as external obstacles to adopt scientific inventory models but situation is not absolute unconditional to use the scientific inventory techniques for efficient management of salt sugar and other items.

### **5.3 Recommendation**

The inventory management is crucial part of management. The inventory management of STCL is not only necessary but also compulsion for the better performance of the enterprises. If STCL indicates step to the appropriate management of inventory, certainly it will cope its set objectives successfully. This study is just a small part to fulfill the partial requirements of master's degree. From above analysis of data and studies some findings are extracted. Concerning thus findings it may be appropriate to make some suggestions and recommendations. Although these suggestions may not enough as well as could very easily giving negative reflection they certainly suggest the areas that can be improved and require attention to bring some improvement in inventory management of salt, sugar and other items.

1. The objective of inventory management system is to control the inventory to minimize the variance between targeted sales and actual sales, which will help to increase profitability. In spite of calculating sales target from central office, individual STCL branch offices should be allowed to set their own target. Because people working at the area will have better knowledge of the actual situation.
2. To avoid the problem of over stoking and stock out problem. Following points should be considerable by STCL.
  - a) Target should be realistic.
  - b) Target should be with the capacity of being fulfilled.



- c) If STCL can be able to hold optimum level of ending stock and locked up capital will be reduced.
  - d) STCL should develop appropriate standard record keeping system of ending stock.
3. Again STCL should make an effort to match the targeted demand i.e. targeted sales and actual supply to overcome the overstocking and under stocking problem of inventory.
  4. For the timely procurement and supply of salt and sugar STCL should develop up on unreliable sources like government aid, negotiation and agreement of two countries but should only procure inviting tender. Because these system is more reliable and economic.
  5. Before calling global tender means of transportation lead-time and seasons of requirement should be considered.
  6. Lowest on cost bid reliable supplier as well as means of transportation agencies would be selected and STCL should be appropriate action to them if they follow against the terms and condition.
  7. STCL should attempt to use the scientific inventory models. STCL should use EOQ model to determine the order size which will minimize the cost of salt and sugar calculation of re-order point will help to determine when to order storing according to the ABC model will help to store right salt and sugar at the right place. Which will maintain the quality of salt and sugar will minimize the cost of salt and sugar and lift the enterprises towards achieving its goal with the help of scientific inventory models STCL can solve the over stock under stock as well as of stock problem and STCL can supply salt and sugar regularly to the consumer at the right place, quantity price and at right time.
  8. Number of warehouses should be made according to the area and consumption of salt and sugar, which will make the distribution of salt easier.

9. Although there are approximately 6000 private and institutional dealer/trader to distribute salt and sugar they are not receiving the sufficient quantity of salt, as they need. So the distribution should be made according to their demand.
10. Price of salt and sugar play a vital role in actual sales. Selling price should be maximum possible. The administrative expenses are too high, the direct selling expenses are also too high, and STCL should minimize these costs.
11. Government should open itself to inspire private to import salt in Nepal. Government should concentrate on development of infrastructure, research and extension marketing; advertisement should be in hence to growth the use of salt in remote area of the country.

## REFERENCES

### A) Books and Journals

- Adam, E. and Ebert, R. J. (2002). *Production and Operation Models and Behaviour*, New Delhi: Prentice-Hall.
- Agrawal, G. R. (2010). *Dynamics of Human Resources Management in Nepal*: Kathmandu: M. K. Publishers and Distributors.
- Ahuja, K. K. (1993). *Production Management*, New Delhi: CBS Publishers and Distributors.
- Bose, L. J. (2000). *Production Management*, New Delhi: Prentice Hall India Ltd.
- Brigham, E. F. (2000). *Managerial Finance*, New York: The Dryden Press International Edition.
- Dangol, R. M. (2005). *Financial Management (Theory and Practice)*, Kathmandu: Taleju Prakashan.
- Goel, D. (2001). *Managerial Economic*, New Delhi: Prentice Hall of India Pvt. Ltd.
- Jain, S. P. and Narang, K. L. (2006). *Cost Accounting*, New Delhi: Kalyani Publishers.
- Joshi, P. R. (2001). *Research Methodology*, Kathmandu: Buddha Academic publishers and distributors Pvt. Ltd.
- Khan, M. Y. and Jain, P. K. (2003). *Financial Management*. New Delhi: Tata Mc-Grew Hill Co. Ltd.
- Pandey, I. M. (2002). *Financial Management*, New Delhi: Vikas Publishing House Pvt. Ltd.
- Stapith, A. B., Yadav R. P., Tamang, G., Dhital, S. & Adhikari P. (2010). *Production and operation management*, Kathmandu: Asmita Books Publication and distributors (P) Ltd.

Van Horne, J. C. (2000). *Financial Management and Policy*, New Delhi, Prentice Hall of India Pvt. Ltd.

Western, J. F. and Copland, T. E. (2005). *Managerial Finance*, New York: The Dryden Press International Edition.

### **B) Unpublished Thesis**

Bhandari, K. (2002). *Inventory Management of Multi Food Industries*, An unpublished thesis submitted to Central Department of Management, T.U.

Bhandari, R. (2010). *Inventory Management Bottlers Nepal (Terai) Limited*, An unpublished thesis submitted to Central Department of Management, T.U.

Gaire, A. M. (2008). *Inventory Management: A Case Study of Royal Drug Limited*, An unpublished thesis submitted to Central Department of Management, T.U.

Sigdel, S. (2002). *Inventory Management of Agriculture input corporation*, An unpublished thesis submitted to Central Department of Management, T.U.

Timilsina, R. (2009). *Inventory Management Control Herbe and National Trading*, An unpublished thesis submitted to Central Department of Management, T.U.

### **C) Websites visited:**

<http://www.businessdictionary.com/definition/ABC-analysis.html#ixzz2CUaI3axN>

<http://www.investopedia.com/terms/q/quantity-discount.asp#ixzz2CUTGt75J>

[www.barcodesinc.com/articles/What-is-inventory-management.htm](http://www.barcodesinc.com/articles/What-is-inventory-management.htm)

[www.publishyourarticles.net/.../What-do-you-mean-by-store-ledger](http://www.publishyourarticles.net/.../What-do-you-mean-by-store-ledger)

[www.stcnepal.com.np](http://www.stcnepal.com.np) (Salt Trading Corporation Limited Nepal)

## Appendices

### APPENDIX – I

#### 1. Calculation of Mean Sales and Closing Stock (Rs. in Lakhs)

Year	Sales
2060/61	38989
2061/62	21939
2062/63	18505
2063/64	19162
2064/65	21389
2065/66	31904
2066/67	33663
2067/68	38740
	$\Sigma A = 224291$

$$N = 8$$

$$\bar{A} = \frac{\Sigma A}{n}$$

$$= \frac{224291}{8}$$

$$= 28036 \text{ (Rs. in Lakhs)}$$

#### 2. Calculation of Mean Closing Stock (Rs. in Lakhs)

Year	Closing Stock
2060/61	4706
2061/62	7898
2062/63	8765
2063/64	7144
2064/65	6116
2065/66	10071
2066/67	14475
2067/68	15794
Total	$\Sigma B = 74969$

$$N = 8$$

$$\bar{B} = \frac{\Sigma B}{N}$$

$$= \frac{74969}{8}$$

=9371(Rs. in Lakhs)

### 3. Calculation of Standard Deviation of Sales

Year	Sales (A)	(A - $\bar{A}$ )	(A - $\bar{A}$ ) <sup>2</sup>
2060/61	38989	10953	119968209
2061/62	21939	-6097	37173409
2062/63	18505	-9531	90839961
2063/64	19162	-8874	78747876
2064/65	21389	-6647	44182609
2065/66	31904	3868	14961424
2066/67	33663	5627	31663129
2067/68	38740	10704	114575616
			532112233

$$\Sigma(A - \bar{A})^2 = 532112233$$

$$N = 8$$

$$\begin{aligned} \sigma_A &= \sqrt{\frac{1}{n-1} \Sigma(A - \bar{A})^2} \\ &= \sqrt{\frac{1}{8-1} \times 532112233} \\ &= 8718(\text{Rs. in Lakhs}) \end{aligned}$$

### 4. Calculation of Standard Deviation of Closing Stock

Year	Closing Stock (B)	(B - $\bar{B}$ )	(B - $\bar{B}$ ) <sup>2</sup>
2060/61	4706	-4665	21762225
2061/62	7898	-1473	2169729
2062/63	8765	-606	367236
2063/64	7144	-2227	4959529
2064/65	6116	-3255	10595025
2065/66	10071	700	490000
2066/67	14475	5104	26050816
2067/68	15794	6423	41254929
Total			107649489

$$\begin{aligned}\sigma_B &= \sqrt{\frac{1}{n-1} \sum (B - \bar{B})^2} \\ &= \sqrt{\frac{1}{8-1} \times 107649489} \\ &= 3921 \text{ (Rs. In Lakhs)}\end{aligned}$$

### 5. Calculation of Correlation Coefficient

Year	Sales(A)	Closing Stock(B)	D <sub>1</sub> =A-31904	D <sub>2</sub> =B-10071	D <sub>1</sub> D <sub>2</sub>	D <sub>1</sub> <sup>2</sup>	D <sub>2</sub> <sup>2</sup>
2060/61	38989	4706	7085	-5365	-38011025	50197225	28783225
2061/62	21939	7898	-9965	-2173	21653945	99301225	4721929
2062/63	18505	8765	-13399	-1306	17499094	179533201	1705636
2063/64	19162	7144	-12742	-2927	37295834	162358564	8567329
2064/65	21389	6116	-10515	-3955	41586825	110565225	15642025
2065/66	31904	10071	0	0	0	0	0
2066/67	33663	14475	1759	4404	7746636	3094081	19395216
2067/68	38740	15794	6836	5723	39122428	46730896	32752729
Total			-30941	-5599	126893737	651780417	111568089

From Pearson's Correlation Co-efficient is given by:

$$\begin{aligned}r_{AB} &= \frac{n \sum d_1 d_2 - \sum d_1 \sum d_2}{\sqrt{n \sum d_1^2 - (\sum d_1)^2} \sqrt{n \sum d_2^2 - (\sum d_2)^2}} \\ &= \frac{8 \times 126893737 - (-30941 \times -5599)}{\sqrt{8 \times 651780417 - (-30941)^2} \sqrt{8 \times 111568089 - (-5599)^2}} \\ &= \frac{841911237}{65244 \times 29346} \\ &= 0.43 \\ (\text{P.E.}) &= 0.6745 \cdot \frac{1-r^2}{\sqrt{n}} \\ &= 0.6745 \times \frac{1-(0.43)^2}{\sqrt{8}} \\ &= 0.6745 \times 0.28 = 0.19\end{aligned}$$

**APPENDIX – II**  
Calculation of Current Assets (*Rs. in lakhs*)

Date	Particular	Amount
2060/61	Debtors and Advance	9967
	Stock	4707
	Bank and Cash	765
	Total	15439
2061/62	Debtors and Advance	9113
	Stock	7899
	Bank and Cash	516
	Total	17528
2062/63	Debtors and Advance	9425
	Stock	8766
	Bank and Cash	651
	Total	18842
2063/64	Debtors and Advance	10972
	Stock	7144
	Bank and Cash	803
	Total	18919
2064/65	Debtors and Advance	11999
	Stock	6116
	Bank and Cash	630
	Deferred Tax Asset	30
	Total	18775
2065/66	Debtors and Advance	14120
	Stock	10072
	Bank and Cash	1106
	Total	25298
2066/67	Debtors and Advance	13617
	Stock	14475
	Bank and Cash	653
	Total	28745
2067/68	Debtors and Advance	15951
	Stock	15794
	Bank and Cash	1117
	Total	32862



**Appendix-III**  
Current Liabilities (*Rs. in Lakhs*)

Year	Amount
2060/61	11901
2061/62	16541
2062/63	18649
2063/64	18222
2064/65	18081
2065/66	24850
2066/67	28429
2067/68	32222

## APPENDIX – IV

### Calculation of Working Capital

*(Rs. in Lakhs)*

<b>Year</b>	<b>Current Assets</b>	<b>Current Liabilities</b>	<b>Working Capital</b>
2060/61	15439	11901	3538
2061/62	17528	16541	987
2062/63	18842	18649	193
2063/64	18919	18222	697
2064/65	18775	18081	694
2065/66	25298	24850	448
2066/67	28745	28429	316
2067/68	32862	32222	640
Total			

Working Capital = Current Assets – Current Liabilities

**Appendix– V**  
Calculation of Cost of Goods Sold

*(Rs. In Lakhs)*

<b>Date</b>	<b>Particular</b>	<b>Amount</b>
2060/61	Opening Stock	6881
	Purchase	29825
	Closing Stock	4706
	Cost of Goods Sold	32000
2061/62	Opening Stock	4706
	Purchase	17884
	Closing Stock	7898
	Cost of Goods Sold	14692
2062/63	Opening Stock	7898
	Purchase	12797
	Closing Stock	8765
	Cost of Goods Sold	11930
2063/64	Opening Stock	8765
	Purchase	10082
	Closing Stock	7144
	Cost of Goods Sold	11703
2064/65	Opening Stock	7144
	Purchase	13172
	Closing Stock	6116
	Cost of Goods Sold	14200
2065/66	Opening Stock	6116
	Purchase	25467
	Closing Stock	10057
	Cost of Goods Sold	21526
2066/67	Opening Stock	10057
	Purchase	24635
	Closing Stock	14457
	Cost of Goods Sold	20235
2067/68	Opening Stock	14457
	Purchase	27488
	Closing Stock	15782
	Cost of Goods Sold	20235

Cost of Goods Sold = Opening Stock + Purchase – Closing Stock

## APPENDIX – VI

### Calculation of Average Stock

*(Rs. in Lakhs)*

Year	Opening Stock	Closing Stock	Average Stock
2060/61	6881	4706	5794
2061/62	4706	7898	6302
2062/63	7898	8765	8331
2063/64	8765	7144	7954
2064/65	7144	6116	6630
2065/66	6116	10057	8086
2066/67	10057	14457	12257
2067/68	14457	15782	15119

$$\text{Average Stock} = \frac{\text{Opening stock} + \text{Closing stock}}{2}$$

## APPENDIX – VII

Calculation of Mean Stock and working capital

Year	Closing Stock (A)	Working Capital (B)
2060/61	4706	
2061/62	7898	987
2062/63	8765	193
2063/64	7144	697
2064/65	6116	694
2065/66	10057	448
2066/67	14457	316
2067/68	15794	640
Total	74969	3975

This calculation shows mean stock and working capital of STC. The data showed that the working capital in the year 2060/61 is very high than rest years. So, the year 2060/61 is treated as outliers and used only 7 years data for this calculation.

$$N = 8$$

$$\bar{A} = \frac{\sum A}{N}$$

$$= \frac{74969}{8}$$

$$= 9371$$

$$\bar{B} = \frac{\sum B}{N}$$

$$= \frac{3975}{7}$$

$$= 567$$

Calculation of Standard Deviation of W/C

Year	B	(B - $\bar{B}$ )	(B - $\bar{B}$ ) <sup>2</sup>
2061/62	987	420	176400
2062/63	193	374	139876
2063/64	697	-130	16900
2064/65	694	-127	16129
2065/66	448	119	14161
2066/67	316	251	63001
2067/68	640	-73	5329
Total	7513	834	431796

$$\sum(B - \bar{B})^2 = 431796$$

$$\sigma_B = \sqrt{\frac{1}{n-1} \sum(B - \bar{B})^2}$$

$$= \sqrt{\frac{1}{6} 431796}$$

$$= 268 \text{ (Rs. in 'Lakhs)}$$

Calculation of Correlation Coefficient between Closing Stock and Working Capital

Year	Stock (X)	W/C (y)	D <sub>1</sub> =X-6116	D <sub>2</sub> =Y-693	D <sub>1</sub> <sup>2</sup>	D <sub>2</sub> <sup>2</sup>	D <sub>1</sub> D <sub>2</sub>
2061/62	7898	987	1782	294	3175524	86436	523908
2062/63	8765	192	2649	-501	7017201	251001	-1327149
2063/64	7144	696	1028	3	1056784	9	3084
2064/65	6116	693	0	0	0	0	0
2065/66	10071	448	3955	-245	15642025	60025	-968975
2066/67	14475	315	8359	-378	69872881	142884	-3159702
2067/68	15794	640	9678	-53	93663684	2809	-512934
Total	70263	3331	27451	-880	96764415	543164	-5441768

$$R_{xy} = \frac{n \sum d_1 d_2 - \sum d_1 \sum d_2}{\sqrt{n \sum d_1^2 - (\sum d_1)^2} \sqrt{n \sum d_2^2 - (\sum d_2)^2}}$$

$$\begin{aligned}
&= \frac{7 \times -5441768 - 27451 \times -880}{\sqrt{7 \times 96764415 - (27451)^2} \sqrt{7 \times 543164 - (-880)^2}} \\
&= \frac{-38092376 - (-24156880)}{\sqrt{677350905 - 753557401} \sqrt{3802148 - (-774400)}} \\
&= \frac{-13935496}{-8729 \times 1740} \\
&= 0.91
\end{aligned}$$

So there is positive relationship between working capital and stock.

$$\begin{aligned}
(PE_r) &= 0.6745 \cdot \frac{1-r^2}{\sqrt{n}} \\
&= 0.6745 \times \frac{1-(0.91)^2}{\sqrt{8}} \\
&= 0.04 \\
r &> 6 \times PE_r
\end{aligned}$$

So there is strong relationship between working capital and closing stock.

## APPENDIX – VIII

Calculation of Mean Standard Deviation and Coefficient of Variation of Actual Sales and Targeted Sales

<b>Year</b>	<b>Targeted</b>	<b>Actual</b>
2060/61	42379	38989
2061/62	24379	21939
2062/63	20335	18505
2063/64	21775	19162
2064/65	24585	21389
2065/66	32226	31904
2066/67	34704	33663
2067/68	40778	38740
<b>Total</b>	241161	224291

$$\begin{aligned}\bar{A} &= \frac{\sum A}{N} \\ &= \frac{241161}{8} \\ &= 30145.12\end{aligned}$$

$$\begin{aligned}\bar{I} &= \frac{\sum I}{N} \\ &= \frac{224291}{8} \\ &= 28036.37\end{aligned}$$

Where,  
A = Targeted  
I = Actual



### Calculation of Standard Deviation of Targeted and Actual Sales

Year	Targeted(A)	Actual(I)	(A- $\bar{A}$ )	(I- $\bar{I}$ )	(A - $\bar{A}$ ) <sup>2</sup>	(I- $\bar{I}$ ) <sup>2</sup>
60/61	42379	38989	12234	10953	149670756	119968209
61/62	24379	21939	-5766	-6097	33246756	37173409
62/63	20335	18505	-9810	-9531	96236100	90839961
63/64	21775	19162	-8370	-8874	70056900	78747876
64/65	24585	21389	-5560	-6647	30913600	44182609
65/66	32226	31904	2081	3868	4330561	14961424
66/67	34704	33663	4559	5627	20784481	31663129
67/68	40778	38740	10633	10704	113060689	114575616
Total	241161	224291	1	3	518299843	532112233

$$\begin{aligned}\sigma_A &= \sqrt{\frac{1}{n-1} \sum (A - \bar{A})^2} \\ &= \sqrt{\frac{1}{8-1} \times 518299843} \\ &= 8604\end{aligned}$$

$$\begin{aligned}\sigma_I &= \sqrt{\frac{1}{n-1} \sum (I - \bar{I})^2} \\ &= \sqrt{\frac{1}{8-1} \times 532112233} \\ &= 8718\end{aligned}$$

Calculation of Correlation Coefficient between Target and Actual Sales

Year	Target (A)	Actual (I)	$d_1=A-24585$	$d_2=I-21389$	$d_1^2$	$d_2^2$	$d_1d_2$
60/62	42379	38989	17794	17600	316626436	309760000	313174400
61/62	24379	21939	-206	550	42436	302500	-113300
62/63	20335	18505	-4250	-2884	18062500	8317456	12257000
63/64	21775	19162	-2810	-2227	7896100	4959529	6257870
64/65	24585	21389	0	0	0	0	0
65/66	32226	31904	7641	10515	58384881	110565225	80345115
66/67	34704	33663	10119	12274	102394161	150651076	124200606
67/68	40778	38740	16193	17351	262213249	301057201	280964743
Total			$\sum d_1$ =44481	$\sum d_2$ =53179	$\sum d_1^2$ =765619763	$\sum d_2^2$ =885612987	$\sum d_1d_2$ =817086434

$$r_{AI} = \frac{n\sum d_1d_2 - \sum d_1\sum d_2}{\sqrt{n\sum d_1^2 - (\sum d_1)^2} \sqrt{n\sum d_2^2 - (\sum d_2)^2}}$$

$$= \frac{8 \times 817086434 - 44481 \times 53179}{\sqrt{8 \times 765619763 - (44481)^2} \sqrt{8 \times 885612987 - (53179)^2}}$$

$$= \frac{4171236373}{64392 \times 65244}$$

$$= 0.99$$

$$(PE_r) = 0.6745 \cdot \frac{1-r^2}{\sqrt{n}}$$

$$= 0.6745 \times \frac{1-(0.99)^2}{\sqrt{8}}$$

$$= 0.047$$

$$r > 6 \times PE_r$$

***So there is strong relationship between targeted sales and actual performance.***