

# CHAPTER 1

## BACKGROUND OF THE PROJECT



### I. INTRODUCTION

Due to economic crisis that has occurred for the last 2-3 years, many countries had to face their economic downturn unavoidably. One of corrective ways to recover their economic situations is that they have to increase their export volume, especially for their main products. Among agricultural countries, Thailand is known as one of the biggest rice-exporter country with its core product, the best fragrant rice called "Thai Hom Mali Rice" or "Jasmine Rice". In order to increase its export volume, rice exporters have to improve their product quality and hygiene to cope with international standard such as ISO9000, HACCP, and etc.

### II. THAI RICE INDUSTRY

Thailand has grown rice as a national agricultural product for many years. At first, rice was grown to be consumed in the country. After Indochina war, there are so many Asian people immigrating to Europe, America and other parts of the world; therefore, this was a starting point of the demand of exported rice and other Asian foodstuffs. Nowadays, rice industry influences Thailand's economy because of its high export volume.

The process of rice exporting consists of many parts from farmers to end consumers as shown in the following figure.

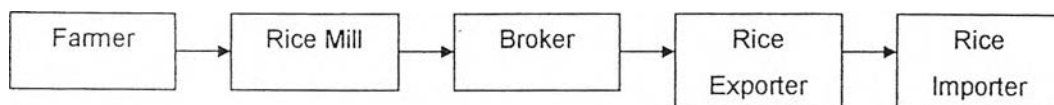


FIGURE 1.1 THE FLOW DIAGRAM OF RICE EXPORTING PROCEDURE.

There are two types of rice export. The first type is the exportation in bulk or commodity which is the majority of the overall export volume. The quality of product is relatively low since rice is directly filled in containers without any packaging. Therefore, the price is lower than the other type. The second type is the exportation in packaging for selling in supermarket. Consequently, the product must be ready to eat and hygienic for consumers; therefore, manufacturers must concern about the quality and safety of product. This type of product tends to become more popular in the export market.

The situation of rice industry after economic crisis is relatively good comparing to other industries. The baht devaluation makes the export volume increase as well as the demand from oversea. However, rice business has dropped since 1999 because the increase of baht valuation and shipment fee (since May) has made the product price become more expensive. Moreover, the unusual change of weather in this year makes rice crop not good as the previous year. Therefore, there will be a very high competition in rice market due to a lot of exporters that have increased for the past two years. In order to stay in the business, every company has to sell its product in a good quality and reasonable price.

### III. RICE EXPORTING

In 1997, Thailand produced about 21 million metric tons (M MT) paddy, which can be converted to about than 13 M MT milled rice. About 60% of this 13 M MT milled rice is for local consumption or processing, another 40% is exported in term of unprocessed rice. However, Thailand still prohibits exportation of paddy. There are several factors to make Thai rice become successful in the world market. Folk from Ministry of Agriculture must continue developing better quality variety, while farmer have to improve their land as well as rice mills improve equipment, and Ministry of Commerce supports and Exporter find new markets.

Rice is one of top foreign currency earner of Thailand with highest net value (ratio of imported raw material or service versus export value). This credit should belong to folk in Department of Foreign Trade, Ministry of Commerce and all hard working exporters. Thailand has been exporting rice since World War II. At that time, Thai rice was considered lower grade comparing to Burmese or Chinese rice. Main markets were in Singapore and Hong Kong for re-exporting to final designations. After W.W.II, Thai exporters attended enlightenment and began to look for new market, cutting out middlemen. Presently, over 30 actual Thai exporters strive to export more rice to more destinations, from New Zealand to Norway, from Japan to U.S.A. Thailand has now been the top world rice reporter over 10 years.

Exporting channels concentrate in 2 ways: break/bulk vessel and containerized vessel. Break/bulk vessels usually carry rice from few hundred MT up to 25,000 MT or more. Rice is transferred from warehouse directly to vessel, storing bag by bag or as loose bulk. Commercial loading ports are Bangkok or Koh Sichang. Standard bag size is 50kgs net weight, polypropylene bag. Other sizes are also available, ranging from 1 MT jumbo bag, 30 KGS bag or 5 KGS bag.

Export by container is becoming more popular. Rice is store in large steel container, 18.5-21.5 MT per container. Whole container then transferred to vessel. Containerized rice is convenience as customer can buy smaller amount with less physical handling. Due to better protection, packing can be more fancy, from 1 lb. bag, 1 kg bag till loose bulk.

#### IV. GENERAL INFORMATION OF RICE

Rice (*Oryza sativa* L.) is a kind of short living plant related to grass. Normal life span is 3-7 months depending on variety and climate. Rice is not water plant but substantial water is required for planting.

Rice is harvested from field in form of paddy. Paddy is a complete seed of rice; one grain of paddy contains one rice kernel. Each paddy consists of many layers. Outermost layer is rice shell called husk. Husk consist of 2 interlocked half shells, each protects one half side of paddy. Husk consisted mostly of silica and cellulose. Next layers are all called bran layers. Each layer is of very thin bran film. Bran is mainly fiber, vitamin B, protein and fat, the most nutritious part of rice. At the base of each grain is embryo which will grow to actual new plant. The innermost part is rice kernel, mainly consisting of starch. Rice starch mainly contains 2 type of starches, amylose and amylopectin. Mixture of these 2 starches determines cooking texture of rice.

Rice is a very nutritious grain, especially brown rice. It has high fiber, vitamin B, carbohydrate, protein etc. It has no gluten, so it is non-allergic. In ancient time, people healthily dined on steamed brown rice alone. There are 3 main varieties of rice in the world, Indica (long grain), Japonica (round grain) and Javanica (medium grain). Indica rice concentrates in the warm climate belt, from Indochina, Thailand, India, Pakistan, Brazil and Southern U.S.A. Japonica is mostly grown in cold climate countries, Japan, Korea, northern China and California. Javanica is only grown in Indonesia.

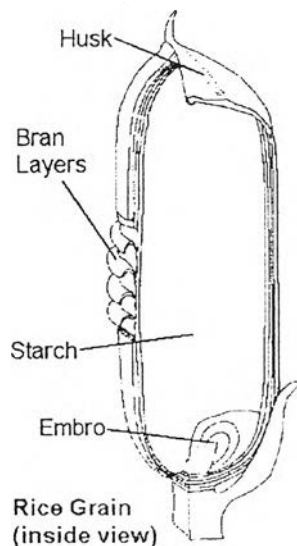


FIGURE 1.2 RICE KERNEL DETAIL (SOURCE: [WWW.THERICE.ORG](http://WWW.THERICE.ORG))

## V. RICE PROCESSING

### 5.1 Rice Process in Thai Rice Mill

Farmers always store and sell rice in paddy form because rice can be kept longer, some time over 1 years. The largest Thai industry in term of number of factory is rice milling. There are over 20,000 rice mills of various sizes. Smaller ones mill 10-20 MT paddy per days. Larger ones are 100-200 MT paddy per day with the largest one of few thousand MT paddy per day. White rice, glutinous rice and fragrant rice are milled similarly. Parboiled rice is gelatinized rice milled from cooked paddy. Method of cooking paddy is few hundred years technique but quite complicated and will not be described here. Rice milling is a century old art. Following is a popular process in Thai rice mill.

1. Cleaning. Dried paddy passes through ventilating sieve cleaner to remove large foreign matter like hay, straw, large stone, tree stump, snail shell and energetic drink bottle.
2. Husking. Cleaned paddy passes through husker. Husker can be of 2 stone disks or 2 rubber rollers running against each other at different speed. When paddy passed through, husk will be rubbed out from paddy, leaving brown rice and husk. Husk will then be separated using ventilation.
3. Paddy separator. In order to lessen brokerage in husking process, husker will not hard pressed to rub away all husk, so there will be some paddy mixed in brown rice. Brown rice will pass through paddy separator. Traditional name of this separator is "German Sieve", no body know about the reason behind this name but assumed that the design must be from German. Paddy separator will separate paddy from brown rice, using difference in gravity and surface friction. Separated paddy will return to husker, leaving pure brown rice. Paddy separator will determine the total through put speed of whole rice mill.
4. Milling. This process is where the word rice mill come from. Brown rice passes through different miller, typically is 2-3 passes, depending on milling degree required. Miller is made of cylinder stone rotate against rubber bars. Bran will be rubbed out from rice and sucked by air ventilation.
5. Grading. Milled rice will be mixture of different sizes grains, whole grain, head rice, broken, coursed by breakage during husking and milling. Sizes are separated by sieve grader. Thai rice mills usually use flat bed sieve and rotary sieve. Difference sizes of rice are stored separately in 100kgs jute bags, ready for warehousing or delivery.

5.2 Process of Rice Exporters (Upgraded-rice processing)

Rice processing of rice exporters is generally used to improve quality of rice before exporting to other countries. Up-graded rice processing refers to methods that make rice from rice mills cleaner and more hygienic for consumers. The flow diagram of these processes is illustrated in the following figure.

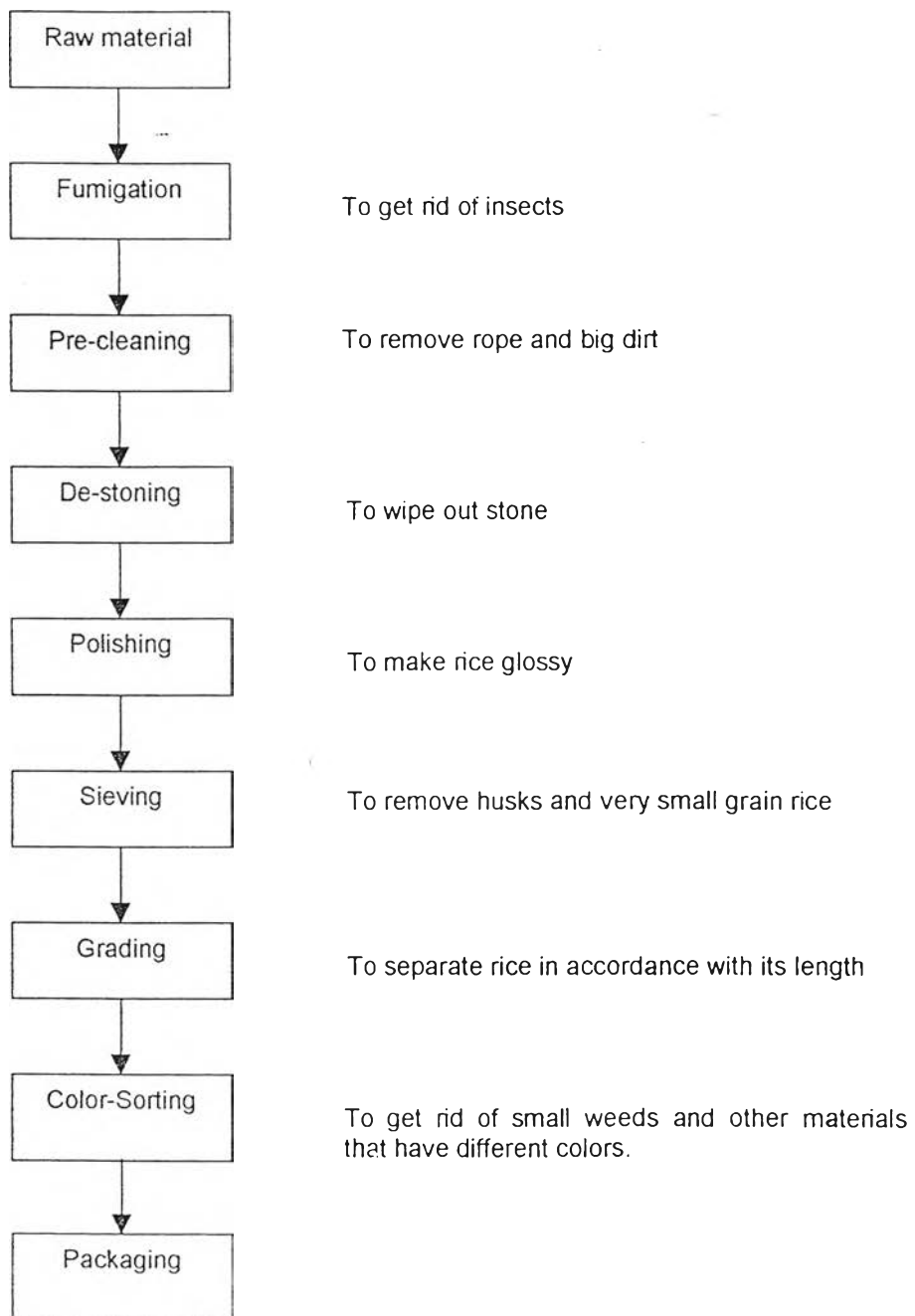


FIGURE 1.3 THE FLOW DIAGRAM OF UP-GRADED RICE PROCESSING PROCESS.

Raw materials of the process came from rice mills; thus, the methods involve getting rid of unexpected materials such as rope, husk and etc and dividing rice into different sizes of grains. Most machines operate on the basis of mechanics without such a very sophisticated method. Moreover, there is no method that changes rice's characteristics and adds other materials or admixtures into rice. In fact, the process is about cleaning rice to make it ready for consumers, and separating its grain size in accordance with customers' requirement.

## **VI. THE CASE COMPANY: ABC COMPANY LIMITED**

Thailand is known as an agricultural country whose agricultural products such as rice, fruit and other foodstuffs are very famous and tasty. Therefore, this can lead to the market growth and competitiveness of food exporters and agricultural industry in Thailand. ABC Company Limited is a rice exporter company established in 1977 by ABC Group Co., Ltd. At that time, ABC Group had run business about selling construction material and decided to diversify its business to an agricultural market. At first, the management intended to run a business of exporting tapioca throughout the world. ABC can be separated into two major parts which are head office and plant. For the first 20 years, the company had produced and packaged rice in an old manufacturing style with high labour intensity. Subsequently, it has recently decided to move its plant to a new one with require less labour intensity and using more machinery which can reduce the number of worker from 400 to 60. With new plant the company expected to increase production capacity which will lead to lower production cost with expand market size and value.

### **6.1 Company's Product**

Company's product is rice that has many kinds of paddy seeds. Therefore, the company has a variety of products depending on their kinds, for example, Jasmine Scented rice, Glutinous rice, White rice and Cargo rice. Moreover, the products can be classified by the size of rice grain into three grades of rice consisting of Broken rice A1 Super ( $\approx 3.0$  mm.), Broken rice ( $\approx 4.0$  mm.) and full-grained rice ( $\approx 7.0$  mm.). According to the production lines, we can summarize the product range as followings.

- • Line A: This production line produces only Jasmine Scented rice with long grain size, mostly more than 6.0 mm.
- Line B: This line is used to produce Broken rice. Due to the range of material length, products from this line can be categorized to three groups as follows.
  - Broken rice A1 Super ( $\approx 3.0$  mm. or less)
  - Broken rice A1 Special (from 3.0 to 4.5 mm.)
  - Broken rice A1 Special (from 3.0 to 5.25 mm.)

- Line C: The products from this line are mixed rice, which can be produced by mixing two kinds of rice, Jasmine Scented rice and White rice, with the proportion of 2 to 1 respectively.
- Line D: This line produces Glutinous rice and the other kinds of rice that is not commonly produced.

In summary, all products from the rice processing process can be listed as illustrated in the following table.

| Line A   | Line B  | Line C   | Line D   |
|--|---|--|--|
| <ul style="list-style-type: none"> <li>▪ Jasmine Scented rice</li> </ul> | <ul style="list-style-type: none"> <li>▪ Broken rice (&lt;3.0mm.)</li> <li>▪ Broken rice (3.0-4.5 mm.)</li> <li>▪ Broken rice (3.0-5.25 mm.)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Mixed rice</li> </ul> | <ul style="list-style-type: none"> <li>▪ Glutinous rice</li> <li>▪ Others</li> </ul> |

**TABLE 1.1 LIST OF COMPANY'S PRODUCTS.**

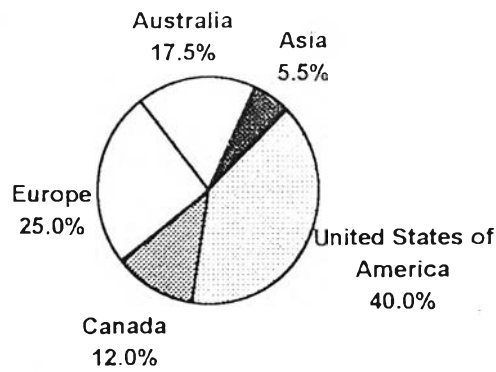
Besides, the products also vary from the appearance and weight of packaging. The appearance or picture of packaging depends upon customers' design. In addition, rice bags are made of polyethelene and other attached stuffs such as barcode, coin, and strip of cloth etc are made to order. The weighing system is measured in two units, which are kilogram and pound. The weights of rice bags are shown in Table 1.2. Therefore, customers can choose available types of product and packaging to meet their satisfaction.

| Weight per bag (Kg.) | Weight per bag (Lb.) |
|----------------------|----------------------|
| 5 kg.                | 10 lb.               |
| 10 kg.               | 20 lb.               |
| 25 kg.               | 25 lb.               |
| 50 kg.               | 50 lb.               |

**TABLE 1.2 PACKING WEIGHT OF RICE BAGS.**

## 6.2 Company's Markets

The company's markets are all over the world. Since its products are not sold in commodities that generally are exported in relatively low quality product, it is in the market that require good, clean, hygienic and tasty products. Therefore, company's customers are importers who want high quality products and mostly based in Europe, America, Canada and Australia. Nevertheless, the company also has customers in other parts of the world such as Asian and South Africa. The proportion of exported volume according to customer's countries is shown in Figure 1.4.



**FIGURE 1.4 MARKET SEGMENTS OF ABC CO., LTD. IN 1998**

Most company's customers are Chinese refugees scattering in Europe, America and other countries around the world. However, they can be separated into three groups as follows.

- i. Distributors: Distributors are importers that want to distribute goods over their countries. Thus, they require almost all range of products in very high volume.
- ii. Supermarkets: Customers who run supermarkets are another important customer group of the company. Their customers generally are people who would like to cook and eat rice in their own kitchens. From that reason, their appropriate product should be packed in relatively small size such as 5 kg or 5lb.
- iii. Restaurants: Restaurants always cook rice in very large amount so this kind of customers frequently order in large packaging size; for instance, in 25 or 50 kg bags.

### **6.3 Organization Structure**

Since the company is still on the way to develop itself from family business style to become more systematic, there is no formal organisation structure of the company. Nevertheless, we can draw organisation chart from the information of its departments and their relationship as shown in Figure 1.5 and 1.6.



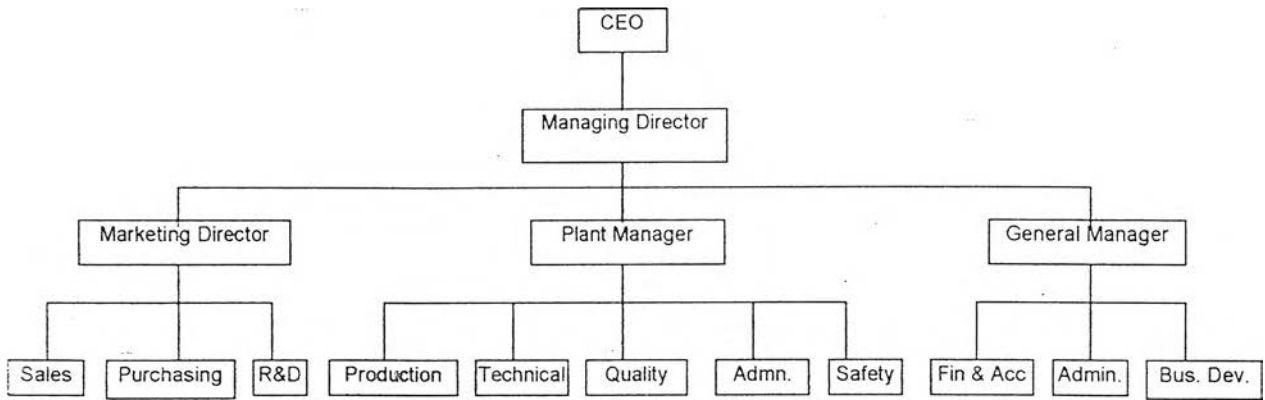


FIGURE 1.5 THE ORGANISATION CHART OF ABC Co., LTD.

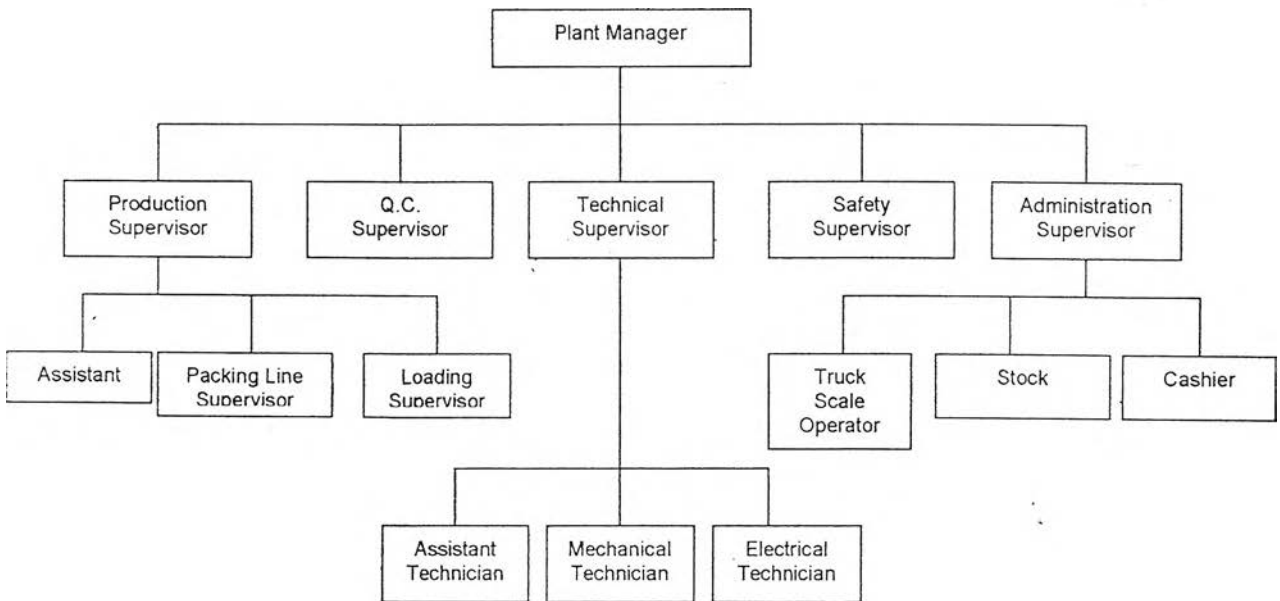


FIGURE 1.6 THE ORGANISATION CHART OF THE FACTORY.

## **VII. LITERATURE SURVEYS**

### **Codex Alimentarius Commission, 1993**

This report presents the guidelines for application of HACCP system more than the principle of HACCP system because it provides general guidance for practical application. This report came from the twenty-sixth session of the CODEX committee on food hygiene at Washington D.C., 1-5 March 1993.

### **SIWAPORN SIWAVECH, 1999**

This book introduces all aspects of the sanitary in a food factory. It describe the good manufacturing practice in factory; for example, plant layout, equipment, water improvement and etc. Moreover, it includes HACCP, and occupational health and safety management system for system approach.

### **NATIONAL FOOD INSTITUTE AND BIOTEC, 1999**

There are two books from National Food Institute of Thailand and BiOTEC that involve with HACCP, "HACCP for food industry" and "The application of HACCP in food products".

HACCP for food industry explains about the HACCP system including the history of HACCP, and the twelve steps of application HACCP in details. In the application of HACCP in food products, it shows the example and methods in implementing HACCP to different food industries; for instance, seafood, can, and fish sauce.

### **SUPAWAN PONGPATTANAWUT, 1996**

This thesis presents the application of HACCP in process of bottled drinking water manufacturing in order to improve final product quality. The study focuses on the hazard analysis rather than implementation of HACCP system. Moreover, it includes the sanitation of workers and working area. However, this is a quite good example of the study of application of HACCP in Thailand.

### **THAI RICE STANDARD, 1997**

This book presents the standard of exported rice in accordance with the notification of ministry of commerce. Furthermore, it defines the meaning of the terminology in this rice standard. Moreover, this book includes the method for determination of the admixture of other rice varieties in Thai Hom Mali Rice, which is the main product of the case factory.

## **VIII. OBJECTIVES, SCOPE AND BENEFITS OF THE STUDY**

### **7.1 Objective**

To develop HACCP system in an up-graded rice factory.

### **7.2 Scopes of the study**

1. Consideration on an up-graded rice processing from a case factory
2. Use HACCP standard in accordance with the CODEX committee on food hygiene.
3. Biological, Chemical and Physical hazards are considered for hazard analysis.

### **7.3 Steps of the study**

1. Literature Survey
2. Study product and production process of a case factory
3. Construct product description and flow diagram
4. Conduct hazard analysis and Identify critical control point
5. Create HACCP system and verification procedure
6. Implementation, Conclusion and Evaluation
7. Prepare final report