## CHAPTER TWO: Fundamental of Cocoa Industry

### 2.1 What is cocoa?

Cocoa bean, the essential ingredient of chocolate, is the seed of a small tree known botanically as Thebroma cacao *Linaues*. The cocoa tree is treated as a living organism that produces a unique natural product consumed in large quantities by human population (Cook,1984).

Cocoa was native to South American tropical rain forest where it has been cultivated for more than one thousand years. The cocoa tree has been commercially cultivated for more than a century and remains as a crop and source of livelihood for relative small -scale growers of farmers.

Today, it is cultivated in plantation throughout much of the humid or wet tropics. The expansive plantation style of growing cocoa blossomed after Europeans contacted the New World in the sixteenth and seventeenth centuries, leading to cocoa becoming a pen-tropical cash crop. In the modern times, massive areas of tropical wet forest has been cleared or thinned to grow cocoa in Latin America, West, Malaysia, Indonesia and Asia Pacific countries.

### 2.2 Cocoa processing

Chocolate has two major distinguishing characteristics: its flavor and its texture. Although many different flavors of chocolate exist, all must be free from objectionable taste. A primary feature of the chocolate is that it must be solid at room temperature of 20° -25° C and yet melt rapidly in the mouth at 37° C giving a liquid, which appears smooth to the tongue (Bendrops, 1998).

The cocoa tree produces pod containing a pulp and the raw beans. The outer pod is removed together with some of the pulp and the beans are fermented. This enable chemical compounds to develop inside the beans, which are the precursors of the flavor in the final chocolate. Poor control at this stage can result

in poor quality cocoa produce. For example when beans are accidentally contaminated with smoke from a faulty dryer, the resulting cocoa will be unusable.

Upon the arrival in the cocoa processing plant, the cocoa beans are cleaned to remove metal and stones and other extraneous material, which might contaminate the product. Further flavor development is subsequently obtained by roasting the beans. The cocoa shell round the outside of the bean is removed by a winnowing action. The roasted products then are ground into a very fine mass.

**2.3 Cocoa, the raw material**

Cocoa is usually classified into three types: Criollo, Forastero and Trinitario. Most of the world's cocoa is derived from Forastero tree and this cocoa is termed as bulk cocoa in the trade (Wood and Loss, 1985).

For chocolate manufacturers, the colour of the cotyledan or the nibs is the main difference between Criollo and Forastero cocoas. Chocolate made from Criollo beans is light brown color quite like milk chocolate, and has a pleasant flavour. However, Criollo cocoa is more vulnerable to pests and diseases. 95 percent of the world cocoa crops are from Forastero trees. The Forastero type is the most common, although not usually the highest yielding. However in the last couple of decades, new hybrid material has been extensively planted in West Africa. The Trinitario type has a strong chocolate flavor of the Forastero but they have in addition some ancillary flavors. The Trinitatio is regarded as the superior cocoa of the highest quality. They continue to be grown in some areas, but in limited quantity.

**2.4 Sources of the cocoa bean**

There are three main growing areas: West Africa, South East Asia and South America. These areas produced 95 percent of the world cocoa's supplies. The

five largest producing countries are Ivory Coast, Ghana, Indonesia, Brazil and Malaysia (Young, 1999).

Ghana has the conditions where the indigenous farmers established small firms of a couple hectares on the land, which they cleared from forest, leaving a few big trees to give some shade to the cocoa trees. Satisfactory fermented Forastero cocoa grown in Ghana has heavy chocolate flavor. Due to the climate, it is comparatively easy to dry cocoa in the sun, produce uniform and full flavor cocoa. The crops demand a premium on the world market price. The premium of 50 to 80 sterling pound per tonne is the norm in the cocoa trade.Ivory Coast is the world largest cocoa producer. The cocoa is virtually grown by smallholders. Most of the planting material is vigorous and earlier bearing hybrids of Forastero cocoa. In Ivory Coast, cocoa is badly prepared due to poor internal grading system. The cocoa has lower yield as compared to Ghana source. The lower demand resulted in lower price, only 20 to 40 sterling pounds per tonne premium against the market price.

Malaysia and Indonesia produce about 20 % of the world cocoa production. The cocoa consists of virtually all selected hybrids from the upper Amazon Forastero and Trinitario types. Cocoa is grown by small holders and in large estates. Cocoa produced is low in cocoa flavor and high in acidity. The price of Malaysia cocoa is about 100 to 110 per tonne sterling pound discount. Indonesia offer 150-160 sterling pound per tonne as the cocoa is badly handle. Although the cocoa quality is poorer, the harder cocoa butter which is highly demanded by the market. Quality of cocoa is highly dependence on the type of cocoa planted, type of hybrid, soil and climate of producing countries, and the post harvest handling. Thus, different areas produce different type of cocoa.

## 2.5 Process Technology

Cocoa beans constitute the raw material for production of cocoa mass, cocoa powder and cocoa butter. Cocoa flavor is associated with the type and the degree of roasting. Different type of roasting procedure produced different type of flavor ( Beckett,1994).

Bean roasting is view as the traditional ways producing chocolate. However bean roasting has several disadvantages. Heating of unwanted cocoa shells require extra energy by 15 percent. Bean roasting also results in fat migration. These can reduce the yield, hence the profits.

Nibs roasting could overcome the above shortcomings. Nibs roasting provide more uniform roasting. As with bean roasting, the possibility of roasting under high humidity means high microbial standards can be achieved. Special treatment such as adding inverts sugar to poorer quality of cocoa bean to upgrade the quality of the bean. Mass roasting ensures a uniformity of heat transfer. Since the generation of flavor, type of the reaction and influencing factors during roasting are very complex. In recent years, the development of new techniques has given the manufacturer a wide choice of methods to perform roasting. It is essential for each manufacturer to select one method, which give a competitive advantage over their competitors.

## 2.6 The cocoa products

Cocoa mass

All types of cocoa mass differ in bean blend, fineness, fat content and microbiological condition. Having a number of different types of cocoa beans of known quality can reduce the differences. Strict control of processes needs both experience and expertise that exist in most large cocoa bean processing

companies. However, buying behavior of the clients demand customization creates room for small cocoa processor that focus on the niche markets.

Cocoa butter

The fat extracted from cocoa mass is called cocoa butter. The hardness of the fat in room temperature, the melting and solidification behavior make the quality of the cocoa butter different from source to other source. Cocoa butter is usually treated as a commodity. The cocoa butter price is quoted in cocoa bean equivalent or the ratio point. Normally cocoa butter captures 2.2 to 2.8 ratio points.

Cocoa powder

Cocoa powder may be made from cocoa mass prepared from cocoa bean alone or alkalized cocoa mass. The existence of the two separate processes produced hundreds type of cocoa powder. The alkalizing process creates many different colors. The food industry uses mostly low fats cocoa powder in wide range of colors. With its extensive range of colors, cocoa powder is a much sought after ingredient, which can be used in many ways in food industry, For example, the production of coating compound, filling compound, cake mix and drinking powder requires cocoa powder.

The color, flavor and microbiological status are the prime quality criteria's. Microbiological standards has become more stringent due to more health conscious customer, especially for cocoa powder used in manufacturing processes that do not apply any more heat treatment.