

Potential value added products from Trinidad and Tobago cocoa

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Abstract

This paper provides a brief overview on the range of potential value added products that can be made from cocoa and cocoa by-products both during the primary processing stage as well as with secondary processing. Value added processing of cocoa and cocoa by-products in Trinidad and Tobago could significantly increase the income generating capacity of the industry. In addition to unrefined and refined chocolate and cocoa butter, cocoa wastes such as the pod husks, pulp and by-products from cocoa butter can be commercially processed to produce a variety of value added products. These include poultry and livestock feed, fertilisers and mulches, food products and soap. By making additional use of the cocoa bean and use of the residue of the cocoa manufacturing process, these products can be processed and marketed locally, providing employment and income for rural communities in addition to the food industry. Any product made from Trinidad and Tobago cocoa beans should live up to the exclusive reputation that Trinidad and Tobago has in the international cocoa market and must not detract from it. This is a fundamental consideration in the development of any value added product.

Introduction

The idea of adding value to cocoa and its by-products in cocoa producing countries has often met with much debate. One school of thought states that producing countries should only focus on producing high quality cocoa for export in the most efficient manner possible and leave any further processing to be done at the traditional countries of export e.g. Europe and United States of America etc. The main premise for this argument is that any local value added production will distract from the local cocoa production task at hand and will potentially divert valuable cocoa production to less lucrative local enterprises.

The other school of thought states that there are potentially lucrative local markets for a wide range of value added products made from otherwise discarded primary cocoa processing by-products and lower grade fermented and dried cocoa beans. Some argue that these markets can be explored and developed by cocoa farmers themselves at the cottage industry level and there is long term potential for an established secondary cocoa processing industry. This parallel processing can utilise both lower grade beans and

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dedicated local first grade cocoa bean production to create a range of value added products for local and regional consumption.

Success stories of such ventures exist in Brazil, Nigeria, Ghana, Côte d'Ivoire and similar products are being developed in St. Lucia. These can serve as investigative models for considering a local thrust in this area but caution must be exercised against losing existing lucrative assured markets to less lucrative by-products.

Definition of terms

Cacao and Cocoa

It is useful to clarify the terms “cacao” and “cocoa”.

Cacao: - is essentially the botanical name and refers to the tree, the pods and the unfermented beans from the pods.

Cocoa: - refers to the manufactured product - the powder sold for drinking of manufacturing purposes, but recently it has also been frequently used to describe the fermented beans in bulk.

Options during Primary Processing for Adding Value to Cocoa By -Products

The main by-products of cocoa are cocoa meal (fragments of bean), cocoa bean shells, cocoa pod husks and mucilage. Locally nothing is done to add value to these by-products from primary processing but a range of value added uses exist. The following section briefly examines some production possibilities.

Cocoa Pod Husk (CPH), Cocoa beans and Shells

Cocoa meal, cocoa bean shells and pod husks all have nutritive value and can be considered as animal feed materials but their use is severely restricted by the theobromine content which is toxic to livestock. Dried fresh CPH can be fed to cattle up to 7 kg per day without toxic effects and up to 2 kg per day to pigs without toxic symptoms. Up to 0.8 kg of cocoa shells (a good source of vitamin D) are acceptable to cows but they are more dangerous to pigs and poultry. Cocoa products can be rendered harmless if the theobromine is removed by cooking in water for 1½ hours, filtering and drying. Up to 25% of the treated product can be included in rations for pigs without reduction in weight gain or feed efficiency (Sobamiwa, 1996).

It should be noted that animals fed on a CPH diet tend to consume more water than normal due to a high sodium (Na⁺) content and the fact that the adsorption of water in the small intestines is proportional to the rate of sodium chloride (NaCl) adsorption. Additionally, animals fed on a CPH diet tend to have a leaner body for marketing. In chickens, if the diet of CPH exceeds 10%, laying hens produce darker yolks, while broilers obtain larger gizzards, both of which are preferred in most countries (Sobamiwa, 1996).

Cocoa pod husk and cocoa beans shells have relatively high potassium contents and may be used to manufacture fertilisers or composts. Cocoa pods husks can be used as a compost or mulch if left to rot in the fields on cocoa estates where they recycle nutrients back into the soil as manure and also serve as a breeding ground for midges. Midges are the chief pollinators of cocoa and increasing the amount of midges enhances pollination efficiency and ultimately pod yields (Freire *et al.*, 1996).

Cocoa pod husks may also be burnt and the ash used to manufacture a potassium containing fertiliser. In parts of West Africa CPH is burnt and the ash used as a source of potassium carbonate for the manufacture of soft soap.

Waste cocoa beans and cocoa bean shells can be used as a source of theobromine which is then either used directly in medicinal preparations or converted to caffeine. However, these products might have difficulty competing in price with synthetic theobromine and caffeine.

Cocoa bean shells when used as mulch contains approximately 2.5% nitrogen, 1% phosphate and 3% potash as well as a natural gum that is activated when watered. This enables the cocoa shell mulch to slow soil moisture loss through evaporation as well as retarding weed growth. The texture of the cocoa shell also deters slugs and snails to help prevent plant damage (VitaSoil, 2003).

Cocoa pods

The possibility of using cocoa pods as a cheap source of pectin has been investigated. Pectin is a gel forming material, which frequently occurs in fruits and has many applications in the food, pharmaceutical and textile industries. The husks of immature cocoa pods are found to contain 25 to 30 % crude pectin (dry weight basis) and mature pod husks 6 to 12 % pectin. Freshly harvested pods must be processed immediately after removal of the cocoa beans to prevent deterioration of the pectin. Sun drying the CPH before extraction of the pectin reduces both the yield and gelling power of the pectin. The costs of transportation of pod husks and oven drying needs to be investigated to ensure that this could be an economically viable proposition (Freire *et al.*, 1996).

Pulp/Juice

Pectin is also present in cocoa pulp and juice and in many cocoa producing countries spin-off industries have been created utilizing the pulp and juice of cocoa. In Brazil, research work initiated by the Cocoa Research Centre of CEPLAC, Ilheus, Bahia use the juice which is extracted by pressing the beans just before they are fermented to produce a range of jams and jellies. The pulp and juice is also fermented to give a good quality wine and liqueur. Cocoa sweatings have also been used to provide alcohol, vinegar and other products. Success in this area relies on proper harvesting protocol and removal of any diseased beans before pressing. Also the area where pressing is done must be clean for hygienic extraction of the juice and pulp. This is often very difficult to achieve on a large scale but is feasible. Recent analysis of cocoa sweatings before and after fermentation indicated that alcohol/vinegar production might be economically feasible.

However efficiency in pod breaking, which is largely a manual operation must be improved (Freire *et al.*, 1996).

Unfermented cotyledon

The unfermented cotyledon has limited food use but can be ground and pressed or passed through an expeller to extract cocoa butter. Cocoa butter has a range of commercial uses in the food, cosmetic and pharmaceutical industries. It is the most valuable product that can be extracted from the cocoa bean and accounts for up to 55% of mass of the bean. The press cake from unfermented beans can be used as a feedstock but may be too bitter and unpalatable to some animals. The press cake is also used as manure.

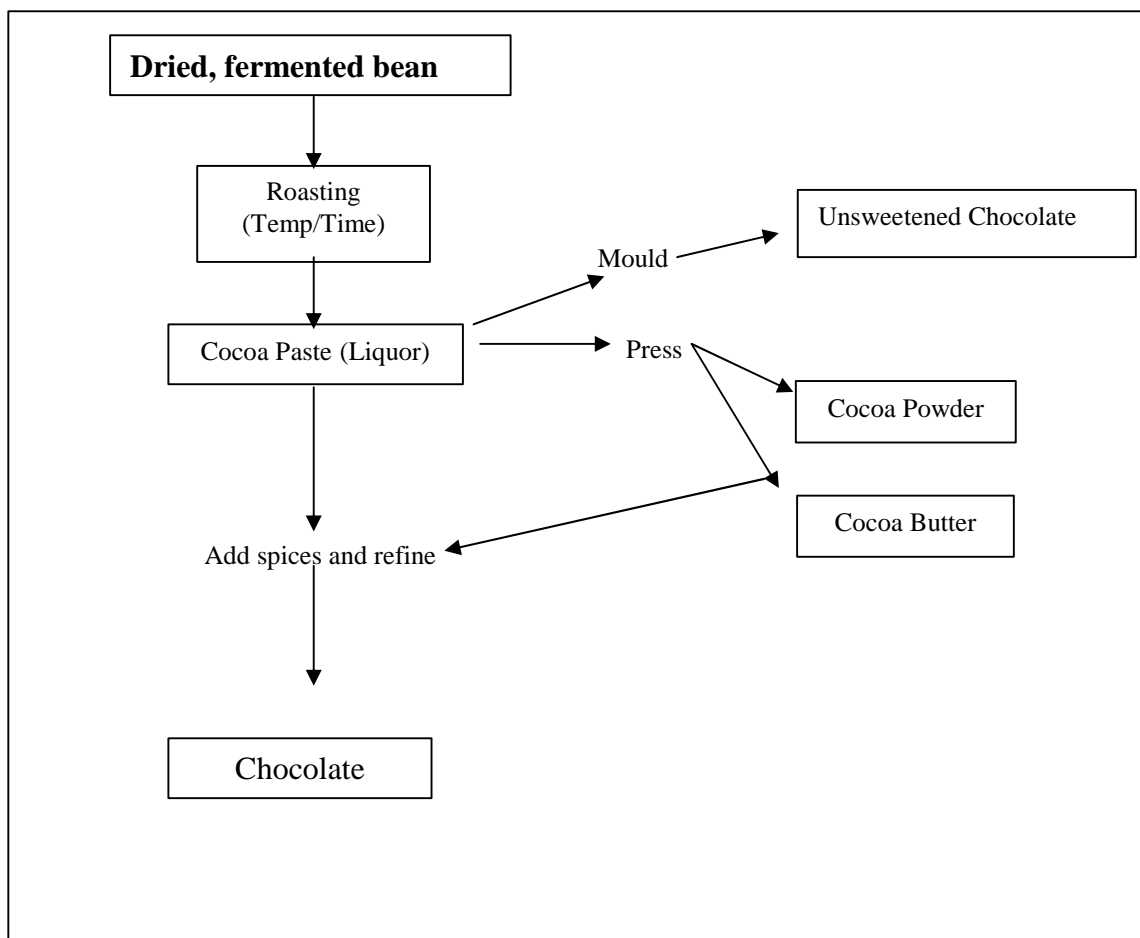
Options After Primary Processing for Adding Value to Cocoa

Fermented cotyledon

The fermented cotyledon offers the widest range of value added uses for the cocoa bean.

The dried, fermented cocoa bean is the main ingredient used in the manufacture of chocolate. It is also used to make several products of interest to the confectionery and cosmetic industries, such as cocoa butter and cocoa powder. See Figure 1.

Figure 1. Secondary Cocoa Processing



Un-Refined Local Chocolate

Locally, the processing of dried fermented cocoa is largely limited to the production of the local chocolate, commonly called 'Creole Chocolate'. This is basically a crude form of the pure unsweetened (bitter) chocolate, which is used to make a beverage.

The production of the local chocolate is typically done at the household level using basic utensils that can be found in a kitchen, for example, iron pots and gas stoves to roast the beans and hand operated mills for grinding the beans. Spices such as cinnamon, nutmeg, Bay leaf (*Syzygium polyanthum*) (Wight) Waplers and Tonka beans (*Dipteryx odorata*) are added either during or after the grinding process. The mixture is shaped into balls, sticks or blocks. The end product is grated and boiled to make a chocolate beverage.

While unsweetened chocolate is an acquired taste, it has local appeal and has the potential to be marketed as an indigenous product to the tourist market in Tobago especially. The process to make the product is relatively straightforward, but without key pieces of automated equipment the process becomes labour intensive. Very often the quality of the raw materials and the texture, size and weight of the end product varies. Processors often have little or no knowledge of basic food handling techniques or food processing techniques. These issues need to be addressed to improve the quality and consistency of the product (Sukha and Mujaffar, 2002).

Chocolate Manufacturing

Chocolate refers to the product obtained when unsweetened cocoa liquor is mixed with sugar, cocoa butter and spices and refined and tempered. There are many factors which will affect the quality of chocolate obtained, for example, the quality and type of beans used and the processing parameters at each stage.

Worldwide, the processing of cocoa beans is generally carried out on a large scale using sophisticated equipment. At the Cocoa Research Unit, UWI, preliminary work is being carried out on the processing of cocoa beans into chocolate. This was made possible by first acquiring small-scale laboratory cocoa processing equipment to explore the process at the bench-scale level. Once the process technology is developed, the major limitation to chocolate processing locally would be the availability of medium scale equipment. One option would be to design and build the equipment locally. Another option can be to enter into an exclusive contract processing arrangement with an established dark or gourmet chocolate producer capable of handling small batches of beans. This latter option is most feasible and would overcome the prohibitive startup costs and stringent quality criteria in setting up a chocolate manufacturing plant locally. Also this arrangement would allow low risk testing of the local market for such a product (Sukha and Mujaffar, 2002).

Cocoa Powder and Cocoa Butter Production

Cocoa Powder and Cocoa Butter are obtained when the cocoa liquor is pressed or expelled under high pressure, the cocoa butter is expressed as a liquid and the remaining cake is pulverised to give cocoa powder. Machinery for these processes can either be purchased from abroad or constructed locally depending on cost and efficiency of the extraction process (Sukha and Mujaffar, 2002).

Cocoa butter has a range of commercial uses in the food, cosmetic and pharmaceutical industries. In the cosmetic industry it is used directly as a skin toner and moisturiser, or indirectly as a base for other cosmetics. Recently it has been used in sunscreens and “anti-aging” creams. In the pharmaceutical industry it is used as a base for many medicinal creams and lotions since it melts at skin temperature.

A new range of pharmaceutical uses and benefits has recently been discovered for the cocoa bean and chocolate. Recent research has shown that cocoa beans contain beneficial antioxidant properties. Also it has been shown that cocoa flavanols, similar to those found in wine, stimulate the processing of Nitric Oxide in the body which greatly reduces the incidence of high blood pressure (Warner, 2002).

Summary considerations

The processing of cocoa into value added products can be addressed at different levels:

1. At the primary processing level with a range of value added by-products from otherwise discarded material
2. At the secondary processing level with the production of local cocoa bars/sticks (unrefined chocolate)
3. Production of cocoa butter (from fermented and unfermented beans) and cocoa powder
4. Chocolate making (locally or by contract)

The feasibility of each option can be explored by examining case studies where these products have been manufactured. In addition the following considerations should be considered:

1. Source and availability of beans for processing
2. Product and Process Development
3. Product testing, quality control, product specifications
4. Potential markets
5. Design and building equipment locally

Conclusion

This paper covered some of the major value added products as well as other miscellaneous products that can be produced from cocoa. There are a large number of potential value added products that can be made from cocoa beans directly and from the by-products of primary and secondary processing. By making additional use of cocoa beans and residues of cocoa production, these options can provide employment and

income for rural communities and give rise to potential new spin off food industries. This potential can be tapped, but any product made from Trinidad and Tobago cocoa beans must be of the highest quality in keeping with the exclusive reputation that Trinidad and Tobago has in the international cocoa market. This coupled with the economic feasibility of any such enterprise are paramount considerations governing any value added product development.

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