

**The Impact of New Technology and New Institutions  
on Cocoa Marketing in West Africa:  
Bulk Transport and Identity Preservation**

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**Abstract**

Bulk handling and identity preservation are two solutions to the coordination problem which plagues cocoa production and trade, and which have emerged as alternatives to state control of markets in exporting countries following liberalization mandated by structural adjustment reforms. Those institutional arrangements will influence the extent of taxation of and incentives to farmers, backward integration by multi-national cocoa processors, rent-seeking along the marketing chain, and quality control problems which have arisen under some of these institutions. This paper assesses the economic impacts of bulk handling, identity preservation and other innovations in West African cocoa marketing. We distinguish seven major types of marketing arrangements with different degrees and combinations of innovation, and compare market outcomes as countries switch from one regime to another. We find that an information technology based trading system for identity-preserved cocoa, or “infostructure,” is likely to complement the recent introduction of bulk transport for cocoa. That system would allow premiums to farmers on some quantities of cocoa for process attributes such as habitat preservation or social development, while larger quantities which receive premiums for only product attributes could be shipped using economical bulk handling in containers.

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# **The Impact of New Technology and New Institutions on Cocoa Marketing in West Africa: Bulk Transport and Identity Preservation**

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## **Executive Summary**

This paper assesses the economic impacts of bulk handling, identity preservation and other innovations in West African cocoa marketing. We distinguish seven major types of marketing arrangements with different degrees and combinations of innovation, and compare market outcomes as countries switch from one regime to another. Substantial additional effort would be needed to quantify these models and measure gains and losses, but some preliminary conclusions are drawn here based on existing evidence and the nature of market structures and institutions identified.

Bulk handling and identity preservation are two different kinds of solutions to the coordination problem which plagues cocoa production and trade. Prior to liberalization, coordination in West Africa was performed by parastatal marketing boards under systems inherited from colonial powers. After liberalization in Nigeria and Cameroon the marketing chain was first chaotic, then fragmented, and eventually new marketing structures emerged, but the quality premiums and marketing relationships which had previously benefited these countries were lost in the transition, eroding the gains in farm income which were a key objective of liberalization.

Bulk handling technology is rapidly being adopted in Cameroon, Cote d'Ivoire and elsewhere, driven by new investment from multinational grain processing firms. Bulk handling is often associated with the construction of "conditioning" or "usage" plants in exporting countries, which sort and dry cocoa beans before loading into containers or ships. It offers economies of scale in transporting, financing and processing the crop, but may increase the market power that multinationals can exercise against exporting countries and their farmers. While this system arose in part as a response to quality problems under chaotic market conditions immediately after liberalization, product quality may decline under this system relative to what was achieved under state trading.

An offsetting new technology is identity preservation, through which farmers' groups and others could offer to sell cocoa grown under specific conditions. Up to now, preserving crop identity had been very expensive for cocoa, where the produce of many farms must be combined for processing. But with new information technology "infostructure" it would be possible to register the attributes of cocoa upon its first purchase in Africa and immediately trade those specific beans in London or New York, so that buyers can for the first time assemble large quantities of premium beans with minimal transaction costs.

Introducing the "infostructure" for identity preservation could make cocoa trade more efficient and more equitable, generating higher and more stable incomes for resource-poor smallholders, and also helping to sustain the biodiversity and afforestation associated with cocoa production systems. One primary objective of this system is to insure that premiums that accrue to quality are to a greater extent captured by farmers. Premiums may then be attributed to

process – such as environmentally friendly production methods or poverty alleviation – in addition to product characteristics. The “infostructure” system used to establish identity preservation may apply to other crops, such as coffee or tea, and economies of scale may be realized if the system can be implemented for a range of products. The information technology may also offer other benefits to rural communities from the satellite connection, such as internet access, improved banking services, and educational opportunities. The warehouse receipt system which must be part of the “infostructure” could also improve access to credit by farmers and traders, permitting greater participation in markets.

Investments needed to implement “infostructure” include computers and telecommunications services for farmer groups or marketing associations in rural areas, as well as training and testing equipment, so that the quality characteristics of specific lots can be identified and registered for trading on a centralized exchange, probably in London. Investment needed to introduce identity preservation can be partially financed by market participants. Some “public good” investments are necessary, however, to develop common grading standards, quality certification, and contract terms along the marketing chain. Public intervention is also likely to be necessary to coordinate activities among private interests, insure food safety and supply chain integrity, and overcome obstacles to investment in rural Africa.

For this system to lead to higher premiums for farmers, marketing strategies in consuming countries will need to “sell” the benefits of particular practices – a strategy which has seen some success for Latin American and African coffee producers cooperating with American and European coffee retailers. That system has involved contracting between plantations or cooperatives, and certification of organic, environment-friendly production methods by independent environmental groups. But contracting costs are high and asymmetric market power is involved in the relationship between farmers and manufacturers, so farmers actually receive only a very small fraction of the premium paid by consumers.

The present study suggests how current trading arrangements for cocoa might be improved, and provides a preliminary analysis of the resulting impacts on poverty alleviation and sustainable growth. The study finds that the introduction of a trading system for identity-preserved cocoa is likely to complement the recent introduction of bulk shipments for cocoa. What is most likely to emerge is a system in which relatively small quantities of identity-preserved cocoa is sold at a premium paid for “process” attributes such as habitat preservation or social development, bundled with “product” attributes such as flavor, color and bean size. Larger quantities of identity-preserved cocoa might fetch a premium reflecting product attributes only.

Cocoa earning a process premium will continue to be shipped in bags with identities specified at the point of first intake (from the farmer) where process attributes can be observed. However, cocoa that earns only a product premium may increasingly have those attributes specified at an industrial “conditioning” plant in the exporting country (e.g. at a railhead or port), where testing and sorting can assure consistency in product attributes outside the farm gate at lower cost than was previously possible. The two kinds of identity-preserved cocoa -- that is, bagged cocoa with specified process and product attributes, and bulk cocoa specifying only origin and product attributes – will fulfill an increasing share of liquor-grade needs for chocolate, confectionery, and perhaps some of the cocoa butter in high-end cosmetics.

Identity preservation, specifying quality at the first-handler (for process attributes) and at an exporter’s conditioning plant (for product attributes), can help raise exporters’ value added in cocoa production. Some of this value added involves market-power rents. Those rents have, in

the past, been shared between exporting governments' parastatal marketing agencies and importing countries processors or manufacturers. Liberalization may have reduced exporters' bargaining power, whereas identity preservation could strengthen it. With identity preservation, a larger portion of whatever rents may be available from imperfect competition could pass through to producers.

Further research is needed to identify exactly what characteristics are most likely to be demanded by cocoa processors and manufacturers, and what level of quality premiums would be paid for these characteristics, but initial public investment is likely to increase market efficiency and benefit both producers and consumers.

## **The Impact of New Technology and New Institutions on Cocoa Marketing in West Africa: Bulk Transport and Identity Preservation**

### **INTRODUCTION**

West African cocoa exporters are reforming their marketing systems, towards a greater role for private traders. From colonial times, West African governments controlled cocoa trade from farm to port, to raise tax revenue and also provide a range of marketing and production services. The parastatal firms involved lost financial and political viability in the 1980s, and it is still not clear what institutions and technologies will or should replace them. Structural adjustment reforms have in the past brought numerous problems related to product quality and market institution evolution.

When Nigeria reformed its parastatal marketing board in 1986, and again when Cameroon reformed in stages in 1991 and 1994, the market's initial responses were described by some as chaotic (Gilbert). At first many agents entered the cocoa trade, but a competitive structure did not last. Now the export trade has become highly concentrated in these countries, with two exporting agents handling over 85% of cocoa exports from Cameroon, and similar but less extreme concentration in Nigeria. Furthermore, the premium which Cameroonian cocoa had historically realized over the LIFFE standard cocoa price, due in part to its distinctive red color, turned into a discount. Either quality has deteriorated in the absence of an effective mechanism to reward farmers for it, or bargaining power in the international cocoa market has shifted after reforms.

Ghana has historically received the highest premium for quality among cocoa exporters, and Cote d'Ivoire, in spite of its large market share, appears also to have maintained premiums for quality in the past. There is fear that these premiums will be lost after the elimination of their parastatals, which is mandated by their ongoing structural adjustment reforms, unless new institutions emerge which insure that quality premiums accrue and are paid to farmers, who largely determine bean quality. There is already evidence that the premiums accruing to these origins have diminished, and fear that not enough has yet been done to prepare for market liberalization.

Determination of cocoa bean quality and of premiums is affected by three interrelated market institutions. Quality characteristics have historically differentiated products by origin, leading to the pattern of nation-specific premiums and discounts characteristic of the cocoa market. Innovations in transportation technologies affect the costs and hence marketing margins in the cocoa trade, and these have changed dramatically, especially in Cameroon since its reform. Changing relationships between exporting and importing agents also affects market structure, and so the sharing of any rents due to market power, especially as processors can backward integrate into exporting countries after reforms.

One recent innovation in the transportation of cocoa from Africa to Europe is bulk shipment and flat storage. Under this system cocoa is shipped loose in holds of grain boats or containers and stored loose, not bagged, in warehouses. This system lowers transportation costs substantially, but does so with scale economies and so allows a few multinational grain processing and

transport firms to dominate the trade. While this system arose in part as a response to quality problems under chaotic market conditions immediately after liberalization, Gilbert argues that this system has also led to deterioration in quality relative to what was found under state trading, especially from Cameroon, and does not reward farmers to maintain quality levels. Rather, it pays only for declining average quality in order to assemble large lots for shipment.

An innovation proposed to alter the balance of market power and to maintain rewards for quality to farmers is identity preservation. Preserving the identity of cocoa at a level of aggregation below the country of origin has been difficult up to now, due to the very small output of each farm, the very large size of processing units, and the use of national marketing structures to establish and enforce quality standards. (In contrast, for coffee and tea, each farm's output is larger relative to processors' batch size, so local origins and even individual plantations have more often been marketed individually.) But modern telecomputing offers, for the first time, the possibility of tracking bags of cocoa from the point of first sale – often a farmers' or marketing association (such as cooperatives) – to the processor's factory gate. At the cooperative the farmer's cocoa would be graded, sealed in bags, electronically tagged and entered into a database enabling the bags to be bought and sold repeatedly, without losing whatever qualities were identified at the point of first intake.

The “infostructure” necessary for identity preservation consists of computers in cooperatives, and sealing and tagging devices for the bags, plus telecommunications services to a centralized market on which the differentiated cocoa can be bought and sold. What this infostructure makes possible is a wide range of product differentiation. Differentiation can be based on product attributes (often the result of better farm practices) or process attributes (such as methods that promote forest biodiversity). With new infostructure, product differentiation can be established earlier in the marketing chain, and whatever premiums consumers may be willing to pay for each attribute can be passed on more directly to the farmers and cooperative that can provide those attributes at least cost.

Identity preservation is not necessarily incompatible with bulk transport, if the identity in question corresponds to sufficiently large lots. This “bulk identity” can be established under another innovation emerging in West Africa, namely the “usage” system in which conditioning stations near the port test and sort beans in order to assemble large lots of beans (including higher quality lots) which can be shipped using bulk cocoa transportation methods. In this context, value added focuses on product attributes which can be observed in the beans, rather than process attributes which require observing the farm. But some container loads of beans could be identified and sold at premiums (or discounts) on world markets, thus capturing some benefits of identity preservation and product differentiation within the exporting country. Cote d'Ivoire's large market share helps to ensure that economies of scale in this system can be realized, but grading systems and appropriate incentives to farmers will be needed to ensure an adequate supply of sufficiently high quality beans.

The demand for quality, and the interplay between product differentiation and the new balance of market power under altered markets structures of these systems, will determine the returns realized by smallholder farmers and the foreign exchange earnings of exporting countries. It will also determine the ability of this system to deliver quality cocoa beans as well as other

characteristics the market may demand. The objective of this study is to delineate carefully this perspective on cocoa trade market structure, product differentiation and the determination of premiums along the marketing chain. An approach to assessing quantitatively these linkages is proposed, and preliminary lessons are drawn from this model of evolving market structure and innovation in distribution technology.

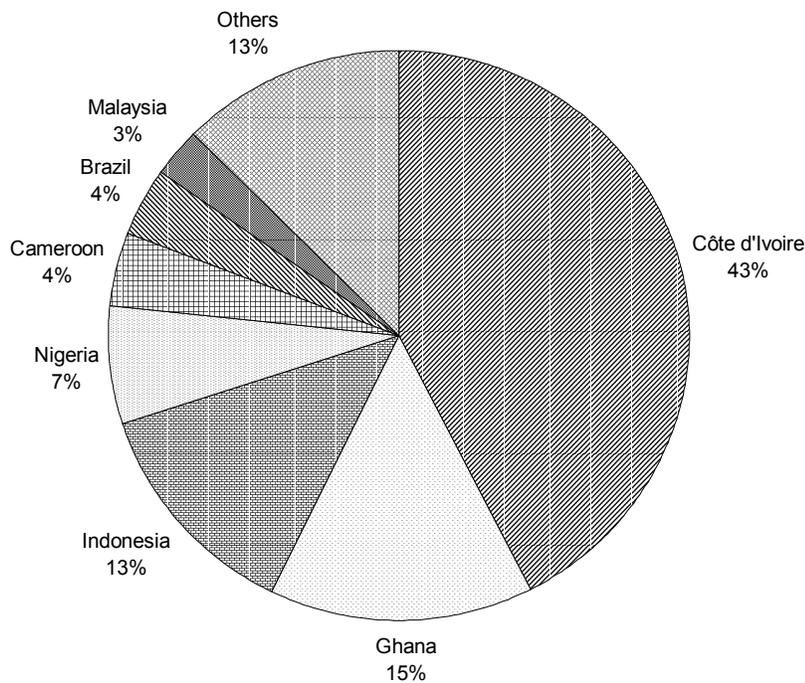
## BACKGROUND

World cocoa trade is worth US\$3 billion annually and has grown at around 5 percent per year. It is thus among the world's highest-value agricultural commodities, with the most rapid demand growth. Since the crop is produced almost exclusively by smallholder farmers in the humid tropics, for sale to high-income consumers in cooler climates, cocoa markets represent a major channel through which Europeans and North Americans can promote poverty alleviation and environmental sustainability in tropical forest areas.

### Cocoa production: geographic concentration and production cycles

Cocoa production is characterized by a very high degree of geographic concentration. Virtually all tropical forest zones are ecologically suited to cocoa production, but only a few locations offer farmers the combination of resources and incentives needed to invest in cocoa trees. The current geographic pattern of production is illustrated in Figure 1.

**Figure 1. Geographic concentration of cocoa production, 1999/2000**

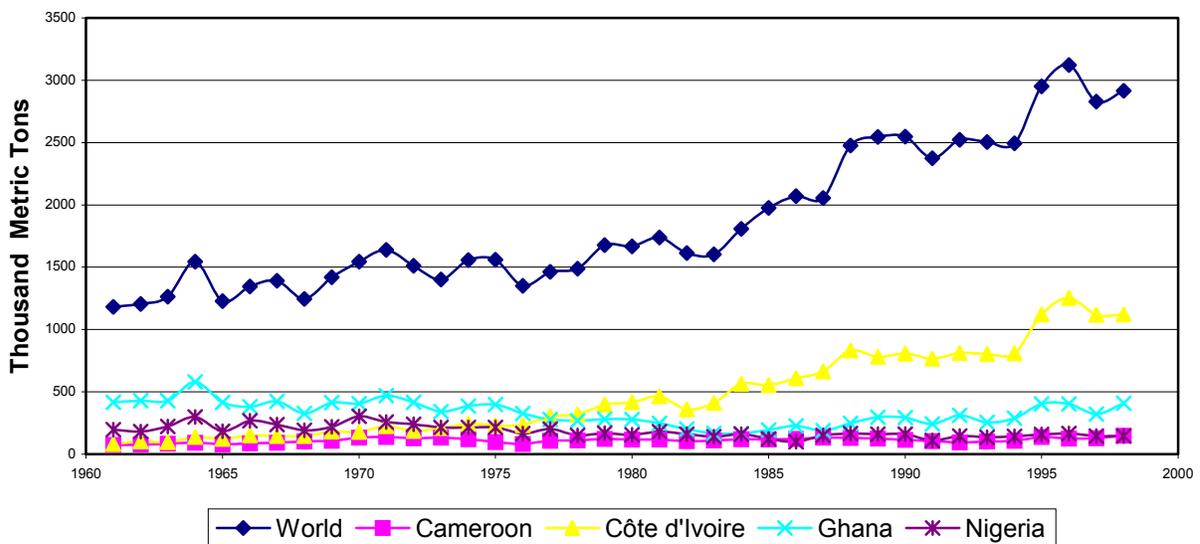


**Source: LMC International (2000).**

As shown in Figure 1, West Africa now accounts for over 70 percent of production, but it has not always been so. Cocoa production occurred almost exclusively in the Americas through the 19<sup>th</sup> century. African production began in the 1900s, rose to half of world production by 1920 and kept rising to three-quarters of world production by 1970 (Dand 1999, page 61). During this period African production grew faster than American production through area expansion. This seventy-year trend was broken in the 1970s, when production fell in Ghana and Nigeria, increased in Brazil and began in Malaysia and later in Indonesia, so that Africa's share fell back to half of world production in the 1980s. In the 1990s, however, growth was restored in West Africa, production in Brazil fell sharply with a major disease outbreak, and expansion stopped in Asia, leading to the pattern observed today.

Figure 2 shows the evolution of West African and World cocoa production since 1961. It shows the strong recent growth of production in Cote d'Ivoire, following growth in world production. Similar, if less rapid growth is observed for Ghana, while production in Nigeria and Cameroon have stagnated. World production also shows the variability characteristic of cocoa production and trade.

**Figure 2. Cocoa Bean Production**



**Source: FAO, AGROSTAT database (2000).**

Ruf (1995) attributes much of the variation in production location to long cycles of area expansion into virgin forest when prices are high and governments support forest clearing, which then leads to low prices as the cocoa trees mature and marginal costs fall. During the period of low prices, farmers stop planting new trees and may cut back on maintenance of existing trees, so production eventually falls. Demand growth may restore high prices, but entering new forests can be more attractive than replanting old cocoa trees, driving the expansion of cocoa into new areas and new countries. Events in the 1990s could signal the end of this historical cycle, however, due to more limited opportunities for clearing new forest (if only for political reasons), and greater opportunities for raising yields on existing plantations by replanting with new varieties, and increasing input use to control disease and boost growth.

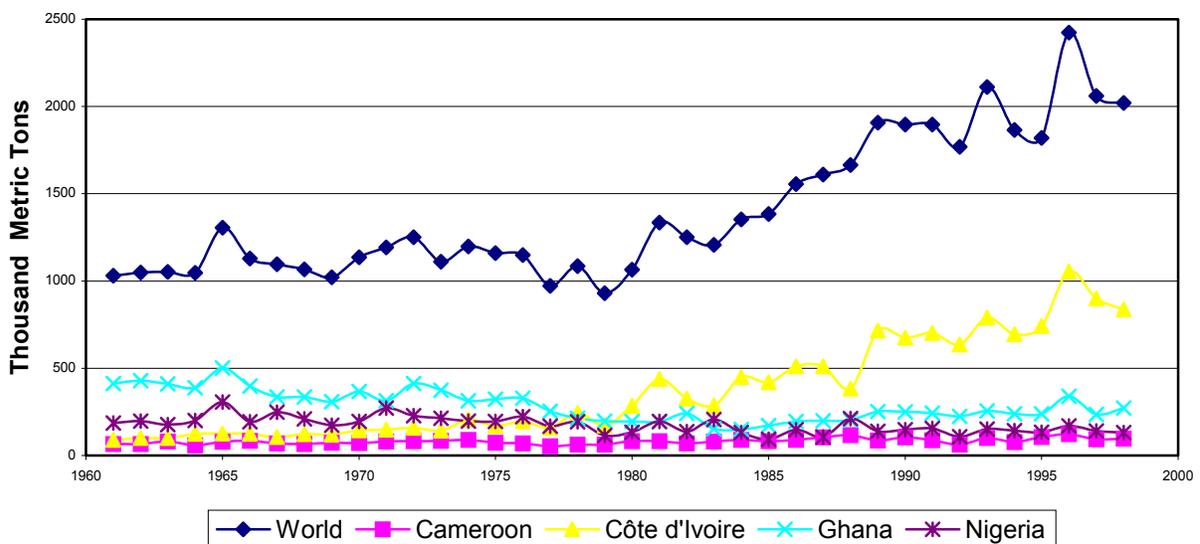
As is the case for other tree crops, and following from the dynamics of adjustment by farmers described by Ruf, supply is price inelastic, and more so in the short run than long run. Estimates of short run price elasticities of supply are on the order of 0.2, while long run elasticities are somewhat larger at about 0.6 (Stryker; Bulif; Hattink, Heerink and Thijssen; Abdulai and Rieder). This inelastic supply response contributes to variability in cocoa markets, since adjustments to market conditions are slow. It also afforded parastatals and now private agents the opportunity to tax farmers or extract rents, since farmers will respond little to reductions in their returns in the short run. As will become important later, quality may be more responsive to price, since labor intensive activities on the farm are required to maintain high quality beans.

The question of how technical change can raise yields and break the cycle of area expansion is being addressed by Sanders, among others, through research supported by USAID/AFR/SD as part of the Sustainable Tree Crops Initiative. In the present paper we focus on the incentives being offered for these changes, through marketing arrangements that could sustain farmers' investment in and stewardship of existing plantation areas.

### International Trade

Since cocoa consumption and processing are largely in developed countries, while production is in tropical developing countries, bean export trends closely resemble production patterns. Figure 3 presents cocoa bean exports for the world and West African countries since 1961. This graph shows the substantial growth in cocoa bean trade since 1980, as well as its volatility. It also shows Cote d'Ivoire and to a lesser extent Ghana, benefiting from this growth in trade, while export levels for Cameroon and Nigeria have remained relatively constant, as did their production levels.

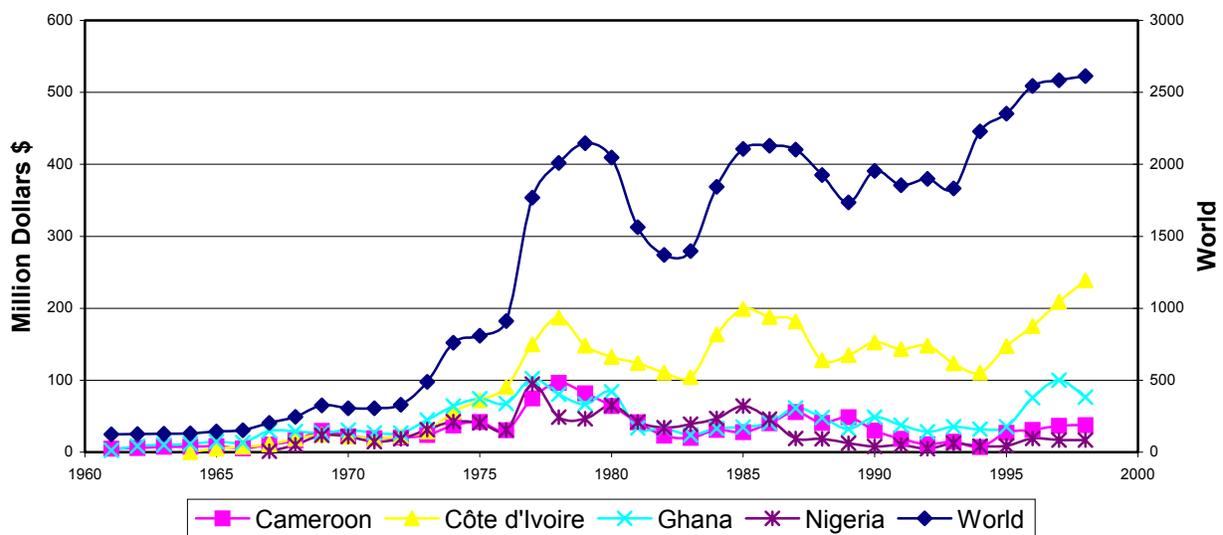
**Figure 3. Cocoa Bean Exports - Quantity**



Source: FAO, AGROSTAT database (2000).

Since processing takes place largely in importing countries, West African exports of processed cocoa products – butter, paste and powder – are only a fraction of world trade in these products. Figure 4 presents world and West Africa trade in cocoa products (note that the scale for world trade is five times of that for each of the West African countries). These data show an increase in processing capacity in Cote d’Ivoire in the late 1970s, and again after 1995. Similar attempts at increased capacity in Cameroon, Nigeria and Ghana in the late 1970s did not lead to sustained product exports, but Ghana shows an increase in processing after 1995, as well. Processed products from West Africa are believed to be lower quality than those produced in Europe or North America, and sell at a substantial discount (Dand). Often the lower quality beans are used by local processors rather than being exported.

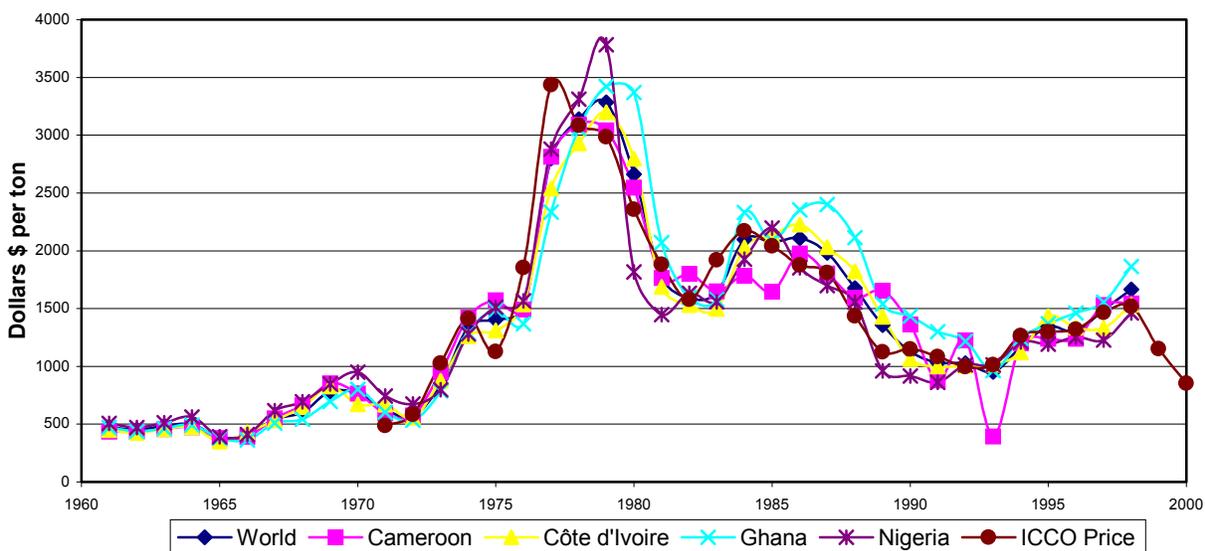
**Figure 4. Cocoa Product Exports - Value**



**Source: FAO, AGROSTAT database (2000).**

Both quantity and world price have been volatile in international markets. Figure 5 presents export unit values for world trade (as a proxy for average world prices) and for Cameroon, Cote d’Ivoire, Ghana and Nigeria. The ICCO Annual Average of Daily cocoa prices is also shown on this graph to demonstrated that export unit values and market prices move together very closely. This graph shows cocoa prices peak in the early 1970s when other commodity prices increased as well, followed by the substantial price growth until 1981, fueled by worldwide inflation. After rising again in the mid 1980s, international cocoa prices fell to very low levels in the 1990s. The ICCO price shows the very low prices now being experienced in cocoa markets. While national differentials are small relative to average world prices, and West African origin prices follow world prices closely, the premium to Ghana, for example, is evident from this data, as are the problems in quality suffered in Cameroon and Nigeria after their reforms, resulting in diminished premiums.

**Figure 5. Cocoa Bean Export Unit Values**



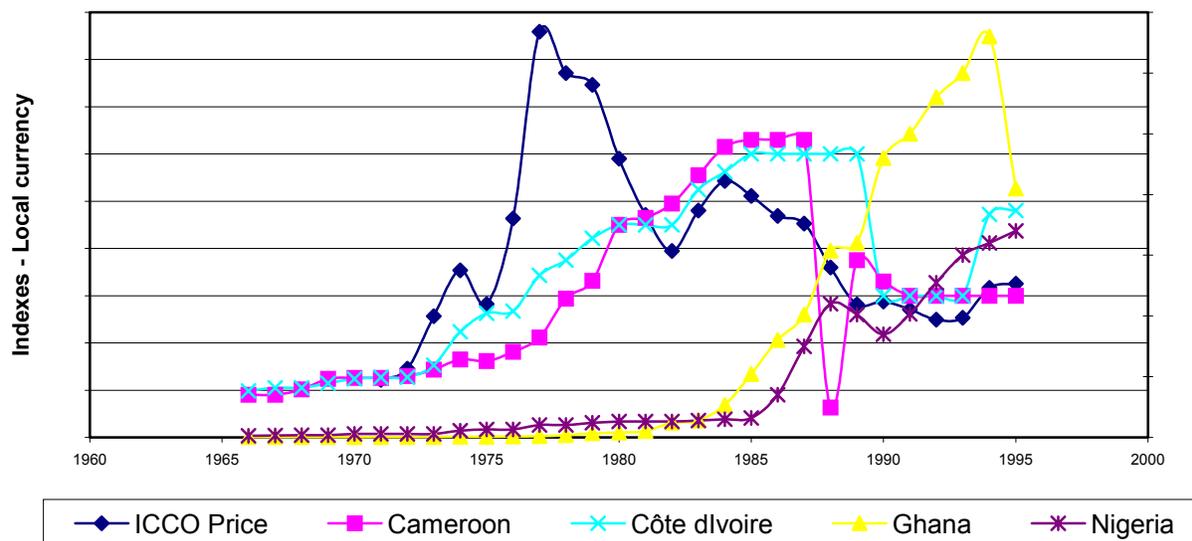
Source: FAO, AGROSTAT database (2000).

### Stabilization

Governments in West Africa have sought to insulate farmers from this volatility in world markets. Farm gate prices have been set by policy at fixed levels announced well before harvest (though varying over time), with the hope of stabilizing prices received by farmers. Figure 6 presents indices of nominal cocoa producer prices in local currency for West African countries along with the ICCO price from Figure 5. It shows that local prices were largely disconnected from world prices in the short run by that government policy, implemented by parastatals. The run-ups in prices in Ghana and Nigeria in the late 1980s reflect exchange rate and macroeconomic difficulties that structural adjustment programs addressed (and which led to reforms of their parastatals). Since the CFA was tied to the French franc, producer prices in local currencies for Cameroon and Cote d'Ivoire do not show currency difficulties, although the devaluation of the CFA in 1994 is apparent for Cote d'Ivoire (Cogneau and Collange). The Cameroon series does show the effect of structural adjustment reforms, however.

Figure 6 demonstrates the failure of parastatals to stabilize farm gate prices for smallholder cocoa producers. It also shows the importance of macroeconomic policies and inflation in adding difficulty to the stabilization problem faced by West African governments.

**Figure 6. Cocoa Bean Producer Prices**



**Source: FAO, AGROSTAT database (2000).**

In addition to setting farm gate prices, the West African parastatals have participated in futures markets, selling forward their anticipated crops, in order to reduce the budgetary risks of their operations and lock in guaranteed levels for both farm prices and export earnings. These agencies have often sold their crops well into the future, accounting for more long term contracts in cocoa future's markets than are found for other commodities (Gilbert, 1997). One motivation for that was to earn a forward premium, while not needing to incur storage costs for crops not yet harvested. After reforms of parastatals exporting country agents are unlikely to engage in the same level of activity on future's markets. Certainly farmers, and probably exporting marketers in West Africa are unlikely to have access to the knowledge and information necessary to trade on the commodity exchanges. ECOWAS is in the process of trying to establish a West African commodity exchange to provide this service more accessibly to those agents to address these problems (OTAfricaLine). This ongoing effort will be unlikely to succeed unless market information linkages are enhanced, as under the "infostructure" model.

In the absence of government price policy and access to future's markets, farmers will need to resort to saving strategies to stabilize their consumption/ utility over time. Low prices, and so low incomes, make this strategy more difficult for West African small holder cocoa producers. Immature financial institutions of rural West Africa make this strategy more costly, as well.

Storage is another mechanism for stabilizing commodity markets. In the case of cocoa, stocks have generally been held more in consuming countries than in exporting countries because the drier climate of temperate consuming countries is more favorable for storage (Dand). Storage in West Africa as a consequence is more costly, and so is likely to decline after reforms when parastatals do not manage stocks as part of their marketing activities.

West African governments have also participated in international efforts to stabilize and raise cocoa prices. The International Cocoa Organization (ICCO) held stocks intended to stabilize world prices, with stocking rules based on trigger price bands within which world prices were to be maintained (Chalmin). Export limitations were not agreed upon, however, in the several International Cocoa Agreements. The efforts under the International Cocoa Agreements were largely ineffective in manipulating world prices, so in 1993 the ICCO abandoned stockholding in favor of production management policies (Maizels, Bacon and Mavrotas). The production trends of Figure 1 show little evidence that this new agreement has been effective in limiting supplies in order to raise or stabilize cocoa prices.

### **Parastatals**

Parastatal marketing boards in West African cocoa trade encompass two distinct systems of exporting country marketing management inherited from colonial powers (Dand; Gilbert, 1997). In former French colonies, including Cameroon and Cote d'Ivoire, the "caisse" system supervises private traders and exporters, setting official export prices, farm gate prices and internal marketing margins, and controlling volume traded without taking ownership of the products it controls. In the "marketing board" system found in Ghana and formerly in Nigeria, former British colonies, the board operates as a monopoly-monopsony (the sole buyer and seller of cocoa beans), replacing private agents. In both cases, price determination and several other functions are either provided by or controlled by the parastatal agency. These include:

- Setting and stabilizing farm gate prices
- Setting and stabilizing export prices and/or quantities traded
- Controlling internal distribution costs and margins
- Stabilizing foreign exchange earning and prices by engaging in future's market transactions
- Extracting rents and foreign exchange from the domestic cocoa trade
- Maintaining and enforcing quality standards
- Subsidizing or providing inputs to production (fertilizer, tools)
- Managing disease control, introduction of hybrid varieties and other public goods associated with cocoa production
- Financing of internal trade
- Providing and funding extension and research services

Reform and elimination of these parastatal agencies allows pricing and quantities traded to revert to market determination. As recent experience has shown, these agencies may be replaced by market institutions which fail to provide key public goods such as quality standards, research and extension (Bloomfield and Lass), and which allow private firms to exercise a high degree of market power unchecked by the social objectives of parastatals. Thus efficiency does not follow from liberalization alone, but requires the complementary development of new public and private institutions.

As shown earlier, parastatals have tried to insulate farmers from world price risks, and have generally been active participants in forward markets. These operations may have facilitated risk reduction for farmers in a manner unlikely to be afforded to them in the absence of the parastatals. Problems with macroeconomic policies, and so adjusting farm gate prices in the face

of rapid inflation, have complicated the task of the parastatals, and have contributed to the increasingly excessive taxation of farmers and the need for structural adjustment reforms.

### **Marketing margins**

Marketing margins for cocoa beans between the first-handler in Africa and the processor's factory gate in Europe or North America are on the order of US\$500 per ton, or typically half the factory-gate price (ICCO). These relatively large marketing costs reflect the difficulty of managing transactions along the storage and transport chain, where it is difficult to monitor the quality of beans and the performance of trading partners. The large margin may also reflect market power, exercised by processors or exporting-country governments.

Marketing margins between first handler and processor have include taxation by exporting country governments, handled by the way in which parastatal marketing boards establish farm gate prices and the prices at which they sell their exports. As noted above, the parastatals have market power in both transactions, and the greater is the product differentiation of their exports, the greater is that market power. While taxation lowers returns to small holder farmers, it can restrict quantity and so raise prices for cocoa beans. The levels of taxes applied, estimated to have been as high as 50% in Nigeria and 70% in Ghana (Panagariya and Schiff), and recently about 30% in Cote d'Ivoire and Ghana (Yilmaz), may well be excessive.

The substantial literature on optimal taxation by cocoa exporters (Newbery) suggests that the export taxes applied may not be at optimal levels, but are not far off in some analysts' judgments, and require taking into account this product differentiation by origin (Yilmaz; Panagariya and Schiff). Other have suggested in the past, but no empirical studies have shown, that chocolate manufacturers and processors may have held countervailing market power, sharing any rents with the exporting countries (UNCTAD Secretariat).

### **Bulk cocoa**

Cocoa has historically been shipped and stored in 62.5 kilogram bags (Dand). Under the bulk cocoa system, cocoa is shipped loose, either in the hold of a modified grain ship at half (more accurately, 55%) the cost of shipping bags, or loose in containers, yielding an intermediate but substantial reduction in transportation costs for smaller lots (about 25% reduction in cost - Gilbert 1997). Both bulk cocoa systems require assembly and shipment of much larger quantities, and since the cocoa is not bagged, "flat storage" of loose beans in warehouses in consuming countries is required.

This system has evolved in conjunction with integration of large, concentrated processors who can handle the larger quantities. Two multi-national firms, Cargill and ADM, now own substantial processing capacity in Europe and have ties with the two exporting firms in Cameroon (Gilbert, 1997) who dominate that export market. Therefore, the introduction of bulk cocoa, and liberalization, have also led to a substantial shift in the balance of market power between cocoa exporters and processors – the consumers of cocoa beans. Under the bulk cocoa system, and with parastatals giving up their monopoly positions, all market power likely rests with the multi-national processors. Hence, bulk cocoa is facilitating shifts in market power rents from exporting countries to multi-national processors. Under this new market structure,

premiums will most likely accrue to the processors, and so premiums may not be paid to farmers for quality.

Gilbert has argued that this system is ill equipped to maintain quality, and that a declining average quality product is supplied under this system. He argues that the decline in cocoa from Cameroon and its lost premium are largely due to the introduction of the bulk cocoa system. Sorting and testing by processors might alleviate the quality problem for chocolate manufacturers to some extent, but with quality premiums accruing to those processors, and only if quality beans are still produced at the farm.

### **Identity preservation**

New information technology to identify beans and facilitate trade in identity-preserved lots could substantially reduce transaction costs and shift market-power rents, and hence raise and stabilize prices received by farmers for standard cocoa beans. It could also open up markets for production practices and cocoa-bean attributes that have been impossible to trade up to now.

The innovation being considered in this study is the registration and tagging of sealed lots, and the trading of those lots based on their registered identity. Trade in identity-preserved lots is made possible by the use of a computer and modem in the exporting country to imprint a tag that is incorporated into the physical lot, and then send the information on that tag to a central market where that lot can be traded. Updated information about that lot can be reported to the central market at any time, and the lot can be traded repeatedly without re-inspection since the lot is sealed.

Sealed lots may be stored and transported in bags or in containers. Identity-preservation for cocoa in bags is likely to apply to lots that are registered at the point of first handling (typically a farmers' cooperative), where onward transport will be in small trucks. Registering bagged cocoa is likely to be most valuable for "process" attributes such as the environmental benefits of using certain techniques, or the social benefits of supporting farmer groups, that are most easily observed close to the production site. Registering bagged cocoa may also be valuable for some "product" attributes such as uniform flavor that are possible to predict only from observing the production process. It could also permit establishment of an *appellation contrôlée* system in which premiums accrue to specific locations, although some argue that there isn't enough location specific heterogeneity in cocoa beans to make this distinction profitable.

Infostructure also establishes a verification process so that consumers who are willing to pay premiums for environmental quality or poverty alleviation are sure that farmers benefit from those premiums. The "infostructure" system used to establish identity preservation may apply to other crops, such as coffee or tea, and economies of scale may be realized if the system can be implemented for a range of products. The information technology may also offer other benefits to rural communities from the satellite connection, such as internet access, improved banking services, and educational opportunities. The warehouse receipt system which must be part of the "infostructure" could also improve access to credit by farmers and traders, permitting greater participation in markets.

A somewhat less ambitious undertaking is already being pursued by the ICCO with support from the Common Fund for Commodities and the World Bank (ICCO, 1999). The ICCO, in order to improve domestic cocoa marketing arrangements in West Africa after parastatals are eliminated, is investigating warehouse receipts. This documentation would permit financing and trading of cocoa based on the receipts, without the cocoa beans physically needing to be handled. In addition to lowering financing costs, this would ensure contractual integrity – an area where there were problems following liberalization in Cameroon and Nigeria (Natural Resources Institute). It would also facilitate storage in West African warehouses. The “infostructure” alternative adds identity preservation and the modem link-up to future’s markets, allowing greater information flow and wider trading of beans electronically.

Increasingly, cocoa is now being shipped in bulk to reduce handling costs. Identity preservation could apply to cocoa in containers, and doing so is likely to be most valuable for “product” attributes such as grain size, moisture and damage which are suitable for automated sorting and conditioning, so quality can be assured on shipment from a conditioning plant at a railhead or port facility. Particularly in Cote d’Ivoire, such “usage” facilities have arisen to provide uniform beans for export despite a mixed intake. The output of particular conditioning plants (or lots from a single plant) could be registered and traded for its observable product characteristics, even when farm-level practices are not known.

Table 1 summarizes the difference between the current and identity-preserved system. In the current system, quality “hurdles” are imposed as a set of minimum specifications at various stages of the marketing chain, with a pre-specified schedule of discounts/premia for lower/higher quality. The testing of whether a given shipment meets a given minimum specification can be done at any location along the chain, with varying degrees of effectiveness. For example, the Ghanaian system has been known for the effectiveness of screening at the first handler, whereas the Cote d’Ivoire system was known for effectiveness of screening at the point of export. Among importers, the U.S. flatly rejects shipments which fail to meet FDA specifications, whereas in the EU entry of low-quality beans is allowed, but occurs at lower prices.

**Table 1. Current and innovative marketing channels**

	Current system	ID-Preserved system
First handler (coop or traitant)	Minimum specifications + scheduled discounts/premia	Registration of specs. (bags) + trading to set discount/premium
Wholesaler (transp. or usinage)		Registration of specs. (bulk) + trading to set discount/premium
Exporter (bags or bulk)	Minimum specifications + scheduled discounts/premia	Confirmation of identity + trading to set disc./prem.
Importer	Minimum specifications + scheduled discounts/premia	Confirmation of identity + trading to set disc./prem.
Processor	Blending to produce consistent powders & butters	Blending of known identities
Manufacturer	Blending to produce consistent chocolates etc.	Marketing based on identity

A key feature of the current system is that quality premia for individual lots are based on a pre-specified schedule of discounts or supplements payable after a shipment's beans are sampled and tested (Dand). As a result, there is a very limited "market for quality" through which demand meets supply for specific product or process attributes. The major channel through which processors can now express their demand for cocoa beans of different types is on the basis of origin and time of shipment. Thus it is only if the entire country of origin succeeds in reliably delivering above-average cocoa that any of its farmers (or previously, its government) can earn a premium. In the identity-preserved system, the actual specifications of a shipment are registered and the lot is offered for sale, with the discount/premium for that lot being market-determined. As the lot travels through the marketing chain its premium may rise or fall, as new information is obtained. In this way, the marketing system offers competitive price discovery for cocoa *characteristics*, as well as for cocoa itself.

### **Government policy: rent-seeking, quality control and backward integration**

Government policy towards cocoa marketing involves three main inter-related problems: rent-seeking (the temptation for marketing agents to extract rents from advantageous market positions, such as monopoly or monopsony), quality control (the need for agents to observe and enforce standards early in the marketing chain, since it is difficult to observe or remedy later in the chain), and backward integration (the opportunity for multinational firms to translate economies of scale in transport and finance into exclusive contracting arrangements, through which foreigners can extract rents which would otherwise accrue to domestic agents).

*First, the rent-seeking problem.* When agents with market power exist, they will collect rents due solely to their advantageous position in the market. When private agents hold market power, markets are inefficient and rents accrue due to the extent of that market power. One justification for parastatal marketing boards is to prevent the exercise of market power by private agents, and use of the market power toward social goals rather than private profit. Parastatal marketing boards who are monopsonistic buyers of cocoa beans from farmers and monopolistic seller's of beans on world markets have market power, and can potentially collect rents from the domestic or world market. Controlling prices at the farm gate and port can achieve similar ends, although with potentially different distributional implications. The literature on optimal export taxes has argued that cocoa exporting countries, because products are differentiated by national origin and there are only a few, concentrated suppliers, can and should restrict exports and collect rents from international markets to maximize national welfare (Yilmaz; Panagariya and Schiff). This objective could be reached either by parastatal control of export quantities, or by government imposition of export taxes.

The optimal-tax concept suggests that taxing exports can raise national income. A more subtle concept, that of time-consistency, suggests that these potential gains are illusory. A time-consistency problem arises whenever production decisions involve irreversible sunk costs (e.g. planting trees), whereas the government's decision to impose taxes can be changed at any time. Since cocoa production is characterized by high fixed or sunk costs (the farmer's initial investment in trees, which can be productive for 40 or more years), relative to marginal costs (the farmer's recurrent use of fertilizer, pesticides and labor needed for each year's harvest), cocoa is particularly susceptible to time-consistency problems: trees will be planted and well-tended only to the extent that cocoa farmers believe their government will not raise taxes in the future. This

provides a strong argument for governments to make irreversible commitments to low taxes, since even the possibility of tax increases will inhibit production. Another way to consider the problem is in terms of price response and supply elasticities. At the very lowest prices, farmers may be willing only to harvest beans from existing but poorly-tended trees. Slightly higher prices will induce better care of trees, and only the highest prices are enough to induce new plantings. So in the aggregate over many producers with trees of different ages, the short-run elasticity of supply is much lower than the long-run elasticity (Stryker; Bulif; Hattink, Heerink and Thijssen; Abdulai and Rieder). Thus governments setting taxes (or a monopsonist setting prices) is always faced with the temptation to capture short-run “rents” on standing trees by imposing high taxes (or offering low prices), because the effects of this on production will not be felt for several years. McMillan and Masters (2000) demonstrates that this situation, in common with all tree crops, can and does lead to a low-growth “trap” of high taxes and low levels of investment, which can be remedied only by the development of a credible commitment mechanism by which government and crop buyers can promise to cover farmers’ sunk costs for new plantings in the future. Reliable contracts for identity-preserved beans can help provide such a mechanism, by increasing transparency in price formation and raising farmers’ confidence in the market.

*Second, the quality-control problem.* The value of cocoa beans depends primarily on farmers’ production practices. To maintain quality, farmers must harvest only mature pods and cut them off the tree carefully to avoid damaging either the tree or the pods, then wait for the pods to age, open them carefully to avoid damaging the beans, let the beans ferment, then dry them slowly in the sun and pack them cleanly. Each step must be timed in accordance with the weather and condition of the beans. Large-scale plantations typically fail to deliver high-quality beans, since it is difficult to observe whether a hired worker has made his or her best effort to maintain quality. Countries with laissez-faire marketing systems, where beans are traded freely after harvest, also typically deliver lower-quality beans, since it is difficult to observe whether a large lot of beans is of uniformly high quality (Dand). The highest-value beans come from countries where smallholder producers deliver to a marketing system which imposes strict standards at the point of first handling, and then keeps higher-quality beans carefully segregated. Laissez-faire policies allow marketing agents to mix high- and low-quality beans, allowing bad beans to drive out good ones (Gilbert, 1997). This discourages farmers from investing in quality, so average quality declines, leading to lower prices and eventually lower quantities produced. Grading standards and minimum quality requirement might combat this problem, but the large traders and processors may be satisfied with providing “fair fermented” beans at low cost rather than better quality beans at higher cost. What is likely to emerge is a large “average quality” market complemented by a much smaller market where high quality is maintained.

Until recently, West African producers succeeded in maintaining the world’s highest quality by using colonial-era marketing boards to enforce standards and maintain segregation. This helped maintain the region’s dominance of world markets. Liberalization is widely perceived to have led to a deterioration of average quality and a corresponding decline in relative price, in a classic market failure caused by information asymmetry between sellers (who know what they are selling) and buyers (for whom it would be costly to find out) (Akerlof, 1970). But Cote d’Ivoire’s liberalization has been associated with a new way to achieve high quality: the *usinage* system, in which mixed lots of cocoa beans are sorted and dried (if necessary) at the

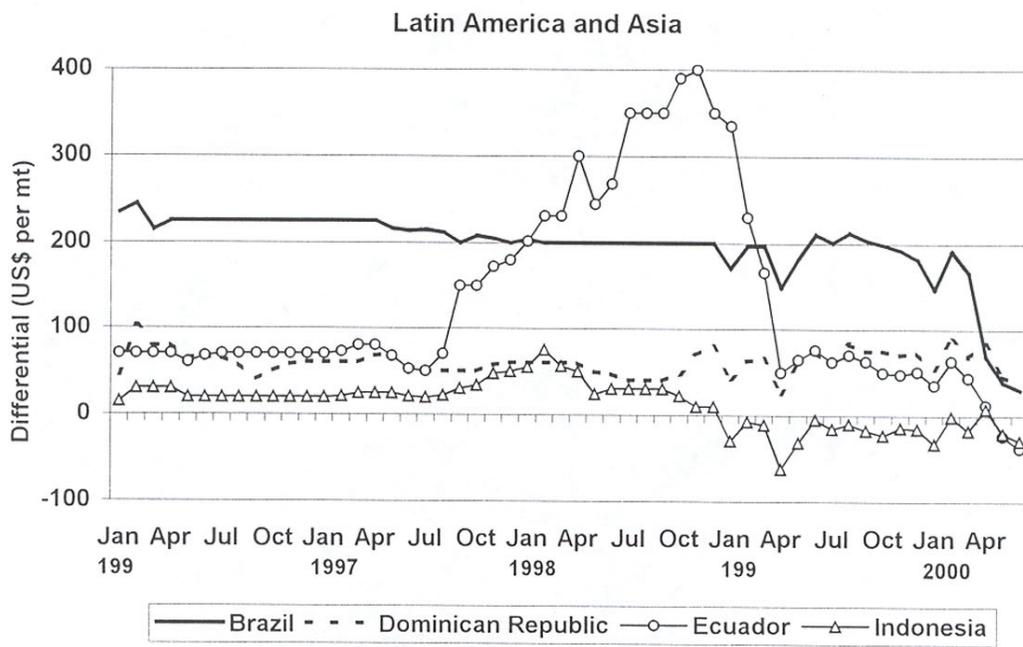
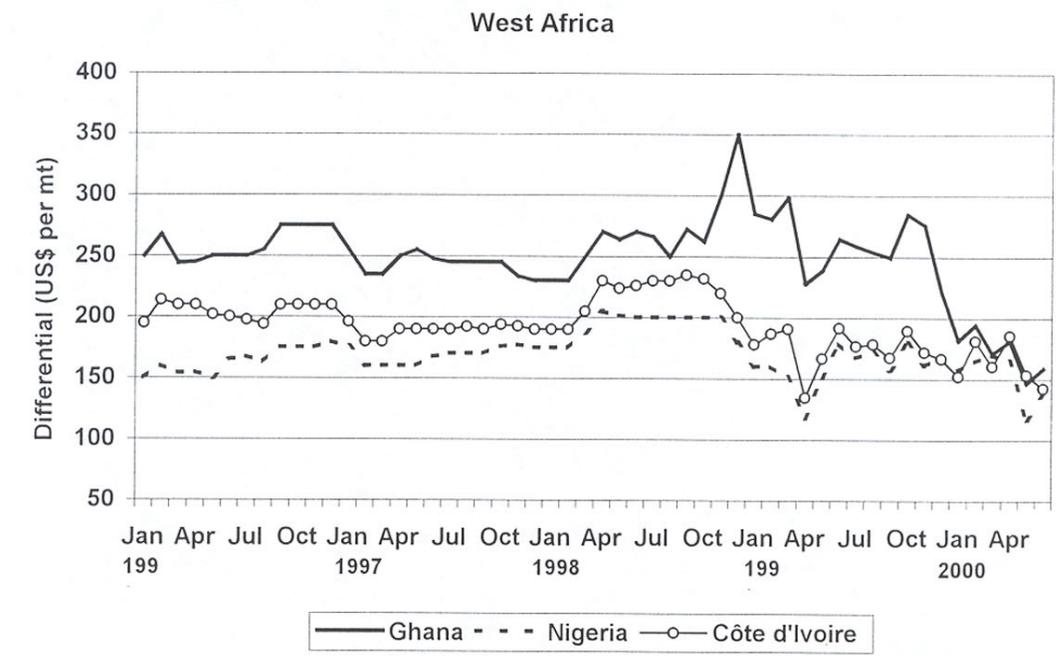
transshipment point. This innovation, which has made Cote d'Ivoire cocoa more consistent, along with innovations among processors to handle lower-quality beans, and perhaps also a deterioration in Ghanaian quality, have all helped to eliminate the quality premium traditionally paid for Ghanaian over Cote d'Ivoire cocoa. (See Figure 7 from LMC for more current cocoa bean world price differentials by origin.)

*Third, the problem of backward integration.* Liberalization and privatization of parastatals alters market structure. This changes how private firms operate, changing particularly the degree to which firms can exercise market power. The optimal size of multinational firms that trade and process cocoa is very large, relative to the size of cocoa farms and farmer cooperatives, because of scale economies in international finance, ocean transport and processing facilities. These scale economies allow an individual firm to dominate the purchasing of cocoa from a given country, potentially exercising a very high degree of market power through backward integration from the port up to the farm gate through exclusive contracts with purchasing agents. Exporting countries' parastatals have historically blocked backward integration and imposed countervailing market power.

Recently both technical change (particularly innovations in bulk shipment) and policy reform (elimination of parastatals) have facilitated processors' backward integration into exporting countries, and increased the potential for market power to be exercised against exporting countries and their farmers. In Cameroon and Nigeria, a high degree of market power is already available to multinationals through their export agents. Governments would need to enforce "anti-trust" policies to maintain a competitive market despite scale economies, but in Africa such competition policy is almost totally absent. Given the practical difficulty of regulation, a more effective way for African countries to promote market efficiency may be technological innovations that increase competition and offset market power. A key example would be the "infostructure" of identity preservation, which could dramatically reduce the optimal scale of transactions and segment the market into highly differentiated products, with competitive trading for each variety or attribute.

In the case of coffee, small segments of the market have backward integrated all the way from retailer to cooperative or plantation. This system permits the retailer to market process attributes associated with environment friendly production methods and to charge consumers premiums for those attributes. Contracting shares the rents to process or product attributes among farmers and retailers. High contracting costs and asymmetric market power have led to low premiums to farmers. This variant on the infostructure system might be more difficult to implement for cocoa, where smallholder farmers are more difficult to assemble to provide sufficient quantities under contract.

**Diagram 4: Physical Price Differentials for the Major Origins Over the New York Terminal Market 2<sup>nd</sup> Position Price**



July, 00

**Source: LMC International, *Commodity Bulletin* (July, 2000).**

## PRODUCT DIFFERENTIATION AND MARKET PERFORMANCE

Product differentiation involves specification and marketing a type of good with specific attributes within a broader class of products. In cocoa, for example, quality is now delineated by categories “fair fermented” (the standard grade traded on futures market exchanges like LIFFE) and “good fermented”, a better quality product (Dand). The higher quality product will command a higher price to the extent that consumers (or processors for cocoa beans) are willing to pay for the attributes of the differentiated product. Premiums can be observed for better quality cocoa, which surpasses this standard, and discounts are applied to products that fail to meet European or U.S. standards. Products may be differentiated to widely varying degrees based on a variety of attributes. In addition to premiums or discounts for these categories, trading houses in Europe have sold cocoa powder in many varieties, or as many differentiated products, and at varying prices. Measurable and testable quality is a logical basis for differentiating products, but not the only one. As noted above for both coffee and cocoa, process attributes such as environmentally friendly production methods can be, and are, used to differentiate products if they can be sold to consumers at a premium.

According to Dand, chocolate manufacturers did not in the past divulge their specifications for quality in order not to pay substantial premiums. Instead, a system evolved where premiums and discounts accrued to origin (countries) based on the quality on average delivered from that exporter. That quality is largely determined by farmer practices – the method of harvesting beans from pods, fermentation methods, and drying processes. These are labor-intensive activities that may receive inadequate attention if farmers receive insufficient rewards for their time (Gilbert, 1997). Product differentiation of this sort by national origin enabled some exporters to extract premiums, facilitated by the parastatal marketing boards who maintained quality standards and controlled trade volume. Critical steps in differentiating product included both establishing grades and standards at a national level – either farm or port, and controlling the volume and quality of products exported.

Chamberlin’s model of product differentiation allows us to analyze the market effects of product differentiation, and in principle estimate the premiums or discounts which would accrue to specific differentiated products. A system of demand equations, one for each differentiated product, is required by this method. Product attributes are reflected in the parameters of those demand curves, as is the extent of substitution among products. In this case the seller of a differentiated product has a monopoly in his specific product, and sets marginal revenue (from the slope of the demand curve for the product he sells) rather than a homogeneous market price equal to marginal cost. Marginal cost may well vary by differentiated product, as differentiation is likely to be a costly activity. In this situation sellers realize mark-ups over marginal cost, hence premiums, which depend on the demand for their specific, differentiated product and the cost to establish that degree of differentiation. Thus, market power is created by the differentiation, and premiums reflect the extent of that market power as well as the consumer’s willingness to pay for the differentiated product attributes. The extent of substitutability among products determines responsiveness of demand to price, affecting marginal revenue, and so the mark-up over cost and the extent of market power exercised. Highly substitutable products offer little market power and small rents, whereas distant substitutes and products with inelastic demand offer more market power and greater mark-ups.

In the case of cocoa bean trade prior to liberalization, differentiation and hence premiums were established by national origin. Hence, models that examined this market, including models that attempted to assess optimal export taxes (Yilmaz; Panagariya and Schiff), would specify demands for the product from each origin, typically utilizing an Armington specification.

Post liberalization analysis requires demand curves for the products as differentiated by the system that evolves. Since some systems have never existed, at least for the cocoa trade, these demand curves cannot be econometrically estimated from historical data. Estimates of demand parameters must be “guessed” by examining analogous markets. Hence, trade in rain-forest friendly coffee may give insights into the extent of premiums that may accrue to process differentiated cocoa. Differences in these markets – the closeness of coffee beans to both farmers and ultimate consumers differs markedly from the case of cocoa, where chocolate manufacturers transform beans, combining it with milk, sugar and other products. Nevertheless, premiums for coffee at the retail and farm level give some insight into both what might arise for cocoa, and how rents are shared between retailers and farmers.

Since coffee also is available in more varieties, and is perceived as a more heterogeneous good than cocoa beans, evaluation of premiums and attributing them to process versus taste is problematic. For most coffee varieties sold on the internet, it is difficult to attribute a premium to process. In the case of Starbucks, the cleanest example of this phenomenon, Mexican Shade tree coffee receives a 30% premium (\$3.00/lb.) at the retail level over a comparable house blend (Bowen). This premium is due to rain-forest friendly organic production methods, and possibly also the taste of this coffee. Farmers in the plantation providing this coffee receive 40% above average Mexican farm prices (approximately \$0.40, based on dated FAO Mexican producer price data), a small share of the retail premium. Cocoa premiums would likely be lower if production methods are not organic, and if taste is “average quality.” This example also highlights the contractual ties between retailer and cooperative, and that marketing strategy by the retailer involves the ties to the cooperative – in many cases photos of the cooperative were readily accessible on this point of sale.

The different marketing systems that may evolve post reform in West Africa will involve substantially differing degrees of product differentiation. The advantage of bulk cocoa lies in low transportation costs, not in its ability to differentiate products, since large shipments must be assembled and shipped. Container lots are likely to be more easily differentiated than the larger lots in holds of grain boats. Hence the “usage” system is likely to ship in containers in order to try to achieve some degree of differentiation.

The “infrastructure” technology permits the greatest degree of differentiation, and can be implemented as early as the first handler in the market (cooperative level). Experience with market premiums and systems of exporters suggests that establishing grades early in the marketing chain better preserves quality, hence facilitates differentiation on this basis. That is also consistent with the technology which suggests that the crucial steps to maintaining quality are carried out on the farm. In addition, this system allows process attributes to differentiate products, if they are identified and somehow certified by that system.

Infostructure permits in a low cost way a much greater extent of product differentiation than is now the case. The optimal mix of differentiated products depends on that cost, and on the demand for differentiation by processors, chocolate manufacturers and consumers. Much of cocoa is now used in a non-differentiated manner, such as in recipes for processed foods. Moreover, manufacturers have learned to cope with the quality levels delivered under the current system, which only achieves some differentiation based on national origin. But a small market would likely arise, as bulk cocoa sidesteps the European cocoa trading houses and if markets comparable to those found for specialty coffee expand.

Interestingly, uniform size has played an important role in differentiating cocoa beans, presumably because uniform size works better with grinding technology utilized by processors. Hence, one aspect of differentiation which is readily accomplished by the usage system is sorting of beans at conditioning stations by size. Sorting by size is also something that may be done mechanically by processors. Hence, sorting may be a technology that complements bulk cocoa, permitting lower transport costs at the expense of paying for sorting. Which of these strategies is more profitable depends on the expense and effectiveness of the alternative sorting methods.

Information is key to selling differentiated products. When the premium characteristic is asymmetrically observed, it will not be provided at all unless a quality-assurance mechanism is in place, depending on market structure. Thus quality is highest where it is controlled at the point of first handling where it is can most closely be observed. Consumers will only pay for attributes which have been measured, verified or certified in some manner. In the case of coffee, certification by independent environmental groups is used to maintain accurate, reliable information for consumers. Grades and standards regulations maintained by governments are also “public goods” which maintain this information flow.

When the market for the premium product is imperfectly competitive, as suggested by the monopolistic competition model, there are market-power rents that can be shifted among market participants. For example, the premium for Cameroon’s red color may have been extracted by Cameroon’s marketing board, but then surrendered to the processors when Cameroon liberalized. In the case of Ghana, quality control has included both checks at the farm gate and port, as well as the sorting and discarding of poor quality beans. The reduction in quantity as a result of this sorting and discarding complements the market power enhancement from maintaining high quality, since a monopolist must restrict quantity to raise price.

Market integration affects who exercises the greatest degree of market power. In the case of parastatal managed systems, where government agencies integrate markets from farm to port, market power is also exercised – as a monopsonist at the farm and as a monopolist at the port. When parastatals are eliminated, and multi-nationals integrate in the market, then market power is (potentially) exercised at different points along the marketing chain. In the case of bulk cocoa, processors may have some degree of monopsony power with their exporting agents who buy from traders in the exporting country, and also monopoly power over chocolate manufacturers. The “infostructure” system as proposed presumes no integration nor the exercise of market power, with the possible exception of cooperatives, who by differentiating their product gained a degree of market power. The contracting model, taken from coffee involves a highly integrated

market, albeit for only a small segment of the market, with market power over that segment (only).

### **Models of cocoa marketing institutional arrangements**

Table 2 presents several cases, or “models” of cocoa trade corresponding with the various alternative marketing institutions that may evolve or existed in the past. Bold boxes in a column show potential market integration of that system, and the extent of product differentiation as well as where market power lies is indicated for each system.

The “caisse” system of former French colonies is distinct from the “marketing board” system of British colonies in that the former is a less integrated system while the latter is more integrated, and so can control quality and differentiate earlier in the marketing chain. This is consistent with higher premiums and greater perception of quality for Ghana than Cameroon or Cote d’Ivoire. (The case of Cameroon is complicated by its distinctive red color, an obvious and effective differentiation method.) In both of these cases market power lies with the government.

Post reform chaos corresponds with fragmented and competitive markets. There is little product differentiation, and moreover, poor quality control throughout that system. The bulk cocoa system also exhibits little product differentiation, and is reputed to afford poor quality control. Integration by processors, and so concentration among exporting agents has resulted in market power resting in the hands of a few multi-nationals rather than for parastatals. Transport cost is lowest in this system, and differentiation may be accomplished by processors in consuming countries via sorting.

The “infostructure” or identity preservation model affords the highest possible degree of product differentiation, but with very limited market power bestowed on cooperatives who have differentiated products to sell. The extent of cooperative power depends on how many cooperatives participate in the system, and so the scarcity of the product attributes they sell relative to demand for those attributes. The coffee model, a variant on this, can achieve the same degree of product differentiation. Integration from farm to chocolate manufacturer likely creates a bi-lateral monopoly between the manufacturer and cooperative under which any rents to quality are shared. Either of these models is likely to only serve a small fraction of the cocoa market, given the small extent to which the market seems to demand high quality, differentiated products now. Many uses of cocoa – such as in processed foods -- have their needs adequately met by “standard quality” cocoa.

The “usage” system differentiates product at the port – a practice which has achieved some quality premiums in the past, but not to the extent of systems which control for quality at the farm. Hence, this is labeled as achieving “medium” product differentiation. The potential for ties to develop between processors and conditioning stations means that market power arrangements of this system could be similar to those found under the bulk cocoa system, with a few multi-national processors exercising market power. There may be an advantage in that sorting is less expensive, and quality control more effective at the port, than at the processor in the consuming country utilizing mechanized sorting. Size is likely easier to differentiate by processor sorting than other quality characteristics.

**Table 2. Models of Market Integration and Quality Determination**

	Parastatals		Post Reform		Identity Preservation Options		
	<i>Caisse</i>	<i>Marketing Board</i>	<i>Chaos</i>	<i>Bulk</i>	<i>Infostructure</i>	<i>Contracting (Coffee)</i>	<i>Usage</i>
<b>FARMER</b> Determines quantity and quality mix of cocoa bean production	Regulation of private agents, quality controls at port	Public Monoply-monopsony quality controls at farm gate and port			Quality control at first handler	Quality control at first handler	
<b>COOPERATIVE</b> Organizes and buys beans from farmers – first handler							
<b>TRADER</b> Transports beans to ports							
<b>EXPORTER</b> Sells to international market							
<i>Exporting country border</i>	Bags	Bags	Bags	Bulk - containers or grain transport	Sealed bags	Sealed bags	Bulk - containers, quality control at port
<b>IMPORTER</b> Ocean transport, trading houses				Market integrated from exporter to processor			
<b>PROCESSOR</b> Grinds beans into liquor, butter and powder							
<b>CHOCOLATE MANUFACTURER</b> Demands quality variety						Marketing strategy sells farm process or product characteristics	
<b>Product Differentiation</b>	at port, medium	at farm and port, high	low	low	at farm, high	at farm, high	at port, medium
<b>Market Power, Integration</b>	Government at farm and port	Government at farm and port		Processor	Cooperative	Manufacturer, Cooperative	Processor?

## IMPACTS OF REFORM

By quantitatively implementing each of the “models” of cocoa trade in Table 2, the premiums which would accrue to farmers for quality, the costs of taxation of farmers, and the foreign exchange revenues of exporting countries could be estimated. Rents which accrue to agents with market power could also be assessed in such models.

That implementation would require cost information for each of the steps along this marketing chain under each model. It would also require demand systems along the lines of the Chamberlin model discussed above. The greatest difficulty in implementing the demand system, as noted earlier, would be in setting parameters under models where there has not been trade, as would be the case for the newest post reform systems.

Where there is market power, especially in cases where that power is held by private firms, or where bilateral monopoly is present, would require game theoretic methods, which will not necessarily yield unique solutions. Market outcomes under imperfect competition require assessment of how firms take into account actions of their rivals – our models of this interaction are still rather simplistic and inaccurate. But approaches do exist which would give insight into likely magnitudes of rents, and limits on the range of rents could be established.

Such a model would need to assume a pattern of product differentiation. For the first two cases – caisse and marketing board – models of demand by national origin could be borrowed from earlier work. In the chaos and bulk cocoa models, no differentiation would be assumed. For the identity preserved system, some classification of cocoa by quality would need to be explicitly assumed. An example of such a system of classifications is the following:

- (1) “eco-cocoa” that has process attributes and is likely to have those attributes certified with the cocoa in bags from specific producer groups,
- (2) “liquor-quality cocoa” that has product attributes governing flavor and may have those attributes certified at a conditioning plant for delivery in bulk,
- (3) “butter-quality cocoa” that has minimal qualities except uniform bean size and damage that would affect butter rather than liquor, and
- (4) “standard cocoa,” that would have to be sorted on delivery to the US or Europe as is most current cocoa.

To project price impacts and premiums, a useful starting assumption is the small country case, but with differentiated products. That is, a country’s actions (export levels) would not affect the LIFFE “standard cocoa” price, but would affect a country’s premium or discount relative to that price, reflecting quality differences. Recent failed attempts by Cote d’Ivoire to alter the world price of cocoa by withholding exports (Gilbert, 1999) support this assumption. Marketing margins, taxes and quality premiums would alter farm gate and export prices relative to this standard price.

While creating such a quantitative model is a longer term undertaking not feasible in the time frame of this paper, knowledge about these market structure assumptions and about how such models behave allows us to characterize the likely economic impacts under each of the models specified in Table 2.

In the parastatal cases of Table 2, the government lowers prices for farmers and raises export prices. Lower farm prices and quality controls limit supply. Ghana's marketing board approach appears to have been better at both limiting supply and simultaneously raising quality. One result from this case is evidence that at relatively low prices farmers will deliver high quality products if grades and standards are effectively applied. Those are more effectively applied if closer to the farm. This outcome leads to lower farm income, collecting effective tax revenue, and should raise export revenue to the extent that governments get export taxes right. The parastatal is capturing any rents as effective export taxes, the difference between the high export price it achieves and the low farm price it pays. In each of the subsequent cases, parastatal control can be replaced by border taxes to achieve similar ends. In Cote d'Ivoire, results are complicated by high, regulated internal marketing margins which should fall after liberalization, also improving farm income.

Under the post reform chaos scenario, markets are modeled as competitive, but without quality controls. Thus, quality deteriorates, and unless border taxes are applied, exports expand, and both drive down premiums to that market. Export revenue and farm income both appear to suffer, due mostly to quality deterioration (as in the Cameroon case), but the farm income effect could be an improvement if an export tax is not applied, or is significantly diminished.

In the bulk cocoa scenario product differentiation, quality and farm prices are low, as are transactions costs. Market power is with processors, who would work to lower export prices and farm prices. Rents would accrue to the processor, who would also gain from low transport costs. Farm income would likely be lowest under this scenario, and national export earnings would also fall.

In the "infostructure" case cooperatives that participate in the system would see higher prices, while segments of the market which did not would likely see lower prices – as under chaos or bulk cocoa. The greater is participation in the system, the less scarce is differentiated cocoa, and so the smaller is the premium. A balance would need to be achieved between the costs of this system, the level of participation and the premiums achieved. There are likely economies of scale in services of providing information about lots under the system, so that costs could decline as participation increased, as well.

Outcomes under the coffee model would also depend on the size of the market for high quality or rain-forest friendly cocoa. Rents would in this case be shared between the retailer and the cooperative, and the Starbucks case suggests that the portion of rents accruing to the farmer is only a fraction of final product mark-ups. As for infostructure, this model would apply to only a segment of the market, with prices likely falling (slightly) in the remainder of the market where only average quality was demanded. This scenario could coexist with several alternative models, though.

The usinage system permits several market structure alternatives. If it involves integration with processors, the outcome will be much like bulk cocoa, except that the processor would incur somewhat higher transport costs while achieving greater differentiation, with premiums accruing

to the processor. Farm level outcomes would likely be similar to the *caisse* system, since quality control is at the port.

Critical factors determining farm revenue are the extent to which a border tax replaces existing taxation via controlled farm prices and the extent to which farmers realize some of the benefits from premiums to quality. The latter outcome is more likely to apply when quality control is closer to the farm gate and differentiation is high. Chaos and bulk cocoa promise the poorest results for smallholder cocoa farmers.

Export revenue depends on the extent to which countries apply export taxes and so raise their prices. It also depends on the premiums received due to maintenance of high quality (by national origin or to farmers), and on the extent of backward integration and so the extent to which processors can capture premiums and rents to quality or market position.

These differing marketing institutions will deliver high quality cocoa to the segment of the market demanding that quality to varying degrees. The “marketing board” approach found in Ghana performed better in this respect than did the “*caisse*” system of Cote d’Ivoire. Bulk cocoa promises the greatest difficulties in delivering quality unless complemented by another model. The “*usage*” model emerging in Cote d’Ivoire is likely to duplicate or exceed performance from the “*caisse*” system if grades and standards can be enforced and incentives are in place to ensure quality beans from the farmers. The “*infrastructure*” model is likely to deliver the highest quality, but will most likely complement another system depending on its cost to implement.

Stabilization is an objective of the parastatal models which is not likely to be achieved under the alternative marketing chain models. Both the fixing of producer prices and activity of parastatals on future’s markets is unlikely to be replaced by private institutions. The “*infrastructure*” model does offer the possibility of allowing cooperatives to hedge by selling their crops forward, and the link to information technology may facilitate the information flow necessary to permit that to be done effectively. Prices of farmers are likely to be more closely linked to volatile world market prices than they have been in the past, however.

## CONCLUSION

As structural adjustment programs have led to the elimination of parastatal agencies and reform of cocoa trade in West African exporting countries, new marketing institutions have needed to emerge to replace services provided by those parastatals. New technologies in the transportation, sorting and storage of cocoa beans have influenced, and will continue to influence the evolution of those marketing institutions.

Bulk cocoa and flat storage promise low transportation costs, and are likely to become increasingly important. Problems with concentration and backward integration – these technologies are implemented by a few multi-national processors – have led to concentrated marketing systems and a shift in market power from exporting country governments to those multi-national processors. This system is also better at providing average quality cocoa only, and problems of deteriorating quality have emerged in markets where this system is being

implemented. The “usinage” system in Cote d’Ivoire promises to address to some extent this quality problem, but it establishes standards at the port rather than at the farm gate, where they are more likely to be effective in maintaining high quality exports.

The bulk cocoa and “usinage” systems are likely to leave a market niche for delivery of higher quality cocoa, including cocoa embodying process attributes such as poverty alleviation of small holder farmers and encouragement of rain forest friendly production methods. Identity preservation is possible as early as the first handler in the market (the cooperative), and would need to be accompanied by information technology to facilitate marketing of product and process attributes of cocoa beans bagged in sealed lots. This system is likely to serve only a segment of the market where higher quality cocoa is demanded, since much of cocoa processing and consumption needs are now met by average quality cocoa. It is most likely to complement the bulk handling methods which incur lower transactions costs.

The “usinage” system is an attempt to take advantage of both of these innovations, selling larger quantities of higher quality product, with sorting at the port to ensure quality. This system can increase value added in exporting countries, but that depends on the degree of backward integration between the conditioning stations and multi-national processors.

Marketing system evolution is needed since marketing services were provided by parastatal agencies prior to liberalization. Quality control and other public goods will not necessarily be provided by private agents in liberalized markets, and so the risk of quality deterioration following reforms is substantial. Governments must establish grades and standards, procedures to enforce those standards, methods to certify quality, and contract terms to complement the emergence of these new marketing institutions.

Returns to farmers and exporting country revenue depend not only on the extent to which quality premiums accrue to farmers or to national origin, but also to the exercise of market power. These new marketing institutions have been accompanied by important shifts in the exercise of market power, from exporting country governments to multi-national firms. Marketing system innovations, such as the “infostructure model” can combat this shift to a degree, and increase the bargaining power and hence returns to farmers in more competitive market structures. Policy and public investment are needed following reforms to support such innovations and protect farmers from anti-competitive practices.

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