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COCOA PRODUCTION PROSPECT IN TOGO

MICH. STATE UNIV.  
AGR. ECON. DEPT.  
REFERENCE ROOM

PLAN B PAPER

By

Ekoue K. Assiongbon

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## I. INTRODUCTION

### A. BACKGROUND

Cocoa has made an important contribution to economic development in TOGO. Until recently, virtually all of Togo's exports were agriculture, mainly: cocoa and coffee. In 1961, phosphate exports began, and by 1965 became the leading export commodity. Even after the discovery and production of phosphate mineral, agriculture exports, however, continue to provide more than 30 percent of all foreign exchange and to employ about 75 percent of the active population. Cocoa and coffee represent 70 percent of agricultural exports and cocoa alone provided an average of 27 percent of recorded export earnings between 1966 and 1975.

Since 1965, the agriculture sector has been accorded top priority in the national development plan. However, this proclamation has not been fully operationalized. For example, during the Third National Plan for Development (1976-1980), only 20 percent of the total planned investment was intended to finance agriculture. The main objectives in agricultural planning are:

- a) To increase the aggregate agricultural output, through intensification and diversification of food crops, along with rehabilitation and development of traditional export crops such as: cocoa, coffee, and cotton.
- b) To raise the level of income and the standard of living of farmers.
- c) To create regional growth poles in the rural areas in order to reduce the prevailing rate of rural-urban migration.

None of these objectives has been fulfilled. Many studies, however, have been carried out in the agriculture sector, and specific programs have been defined. Cocoa once again has received serious attention among export crops, in the hope that a boost in cocoa production will generate needed foreign exchange. Increasing the production of cocoa will not be easy because of serious problems affecting the industry.

#### B. PROBLEM STATEMENT AND NEED FOR THE STUDY

A recent economic report<sup>1/</sup> estimated that agricultural production had increased in real term by about 3.5 percent per year from 1966 to 1970. Since then growth appears to have slowed, and the proportionate contribution of agriculture in the economy has declined. Marketed production of cocoa significantly decreased. From its level of 42 percent of the total export value in 1970, the proportion of cocoa earnings dropped to only 12 percent in 1974. This overall decline of cocoa share in the total export earnings reflects the increasing contribution of phosphate mineral to total export earnings, but also is effected by the lower export of cocoa. The reasons for the low production lie in the existing low yielding planting materials, infrequent or poor maintenance of the plantation, and the prevailing old stock of trees. The Government of Togo perceived the danger of falling outputs and the low level of management of Togolese cocoa plantations. Swift action was taken, and cocoa rehabilitation program designed. But, implementation has met with very limited success. The cause of falling production and reluctance of farmers to fulfill the cocoa rehabilitation program is related to economic incentives. It is urgent, particularly in an industry of such importance

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<sup>1/</sup>Bilan du deuxieme plan quinquennal 1970-1975.

for the Togolese economy, that some understanding be obtained of the basic forces influencing production and supply of cocoa in Togo.

Getting insight for future policy formulation, requires knowledge of the impact of past policies on economic organization and motivation of peasant farmers. The Togolese government has undertaken studies to increase understanding of the prevailing situation. With World Bank assistance, a study on agricultural pricing policy has been carried out. This study was broad and covered all main export crops in Togo. Relying upon time series data from 1960 to 1973, and using acreage as independent variable for cocoa marketings, the study concluded that cocoa producers in Togo respond to price incentives.

Another study with World Bank assistance, seeks to explain and find ways to remove institutional and social constraints on cocoa production such as: land tenure system and tradition in the cocoa area in Togo. The results of this last study are not yet available.

The present paper, once again attempts to focus on the supply response of cocoa farmers, using production proxies as independent variable to see whether or not prices really effect cocoa farmers' behavior.

### C. OBJECTIVES OF THE STUDY

In this process, the following objectives are sought:

1. To describe and evaluate recent developments in cocoa production in Togo.
2. To conceptualize and build an econometric model based on available data for simulating cocoa supply in the country.
3. To present and discuss the implications of the results and findings of the analysis for policy makers, and for further research.

In the course of the study, the hypothesis that farmers in low-income countries respond quickly to relative price changes, will be tested.



## D. METHODOLOGY AND ANALYTICAL PROCEDURES

## D.1. Analytical Procedures

To test this hypothesis, ideally we should have the estimates of short-run and long-run supply response elasticities.

The supply curve is a powerful tool in economic analysis. It enable us to describe the quantity of product that will be supplied at varying prices and to state how the price of a product will vary with shifts in its demand curve. This study aims at explaining the variations in marketed productions over the period 1960-1979, by means of a simple econometric model using time series data. In an early study, the World Bank constructed a simple explanatory model of cocoa market supply over the period 1960-1973 as follows:

$$Q_T = \frac{a_0 + b_1 P_T + b_2 \text{Age} + b_3 \text{Acreage} + b_4 \frac{P_T - P_G}{cP_T + dP_G}}{P_f}$$

Where:  $Q_T$  = current marketed production (represented by local production + smugglings from Ghana).

$P_T$  = producer price in Togo.

$p_G$  = producer price in Ghana.

$P_f$  = food price index in Togo.

Age = average age of trees.

$P_T - p_G$  = price difference between Togo and Ghana.

$cP_T + dP_G$  = mean expected price or production weighted average of Togolese and Ghanaian prices.

$\frac{P_T - P_G}{cP_T + dP_g}$  = proportional difference in prices between Togo and Ghana.

In the World Bank model, acreage has been used as independent variable, and farmers are assumed to respond to the prevailing current producer prices in each year.

The present study makes use of production a proxy derived by multiplying the estimated yield by the bearing acreage in each year: (Yield \* Acreage). In the case of new planting of cocoa, the annual bearing acreage is obtained by subtracting new plantings in gestation (less than 5 years old) from the total acreage prevailing one year earlier. The reason for this adjustment is that trees produce little or no cocoa until their sixth year.

The model also assumes that the price effect in a given year over outputs, remains residual and still influences production during the following two years. Because of this cumulative price effect, three years moving average price is computed and included into the model as an independent variable. Multiple linear regression has been applied to three different functions similar to the one designed by the World Bank. The first formulation is the same as the World Bank model, but uses data for additional years. The second equation differs from the first by substituting price difference<sup>1</sup> between Togo and Ghana producer prices for proportional<sup>2</sup> producer price difference between both countries. In the third model, production proxies and moving average prices have been used instead of simple acreage and current price.

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<sup>1</sup>Price difference =  $P_T - P_G$  (Producer price in Togo less producer price in Ghana both prices expressed in commensurate units).

<sup>2</sup>Proportional producer price difference =  $\frac{P_T - P_G}{cP_T + dP_G}$

## D.2. Data Sources

Sufficient data is not available for supply analysis of planting. In fact, figures before 1960 which correspond to the advent of the independence of TOGO do not exist. For these reasons, short-run supply response is computed using time series data from 1960 to 1979.

The sources of most data include: Official Togolese Publications, FAO, IMF, BCEAO<sup>1</sup> reports and publications. Part of the data comes from previous studies carried out by the World Bank in TOGO, or by other institutions.

Data used in this study require some reservations with respect to their quality. In fact, it was often noticed that different sources give different estimates. In the case of conflicting figures, the more reasonable appearing series is selected.

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<sup>1</sup>BCEAO = Banque Centrale de l'Afrique de l'Ouest.

IMF International Monetary Funds.

## II. OVERVIEW OF COCOA PRODUCTION IN TOGO

### A. HISTORICAL PERSPECTIVES

Cocoa was introduced in West Africa<sup>1</sup> from the Amazon region of South America by the Portuguese in 1822. Taken to the Gold-Coast<sup>2</sup> in 1887, it was planted in TOGO in 1898, under German administration. The introduction and early promotion of cocoa in West Africa had as its objectives to provide a good and cheap supply for the Colonial Powers, to create a stable market for their processing industries and to provide cash receipts for Colonies.

While R. Oliver and A. Atmore have contended that export crops were spontaneously developed by Africans in order to satisfy their need for European commodities, Henry Brunschwig has rejected this contention, and asserts that farmers in West Africa were forced to plant. Urquhart confirmed Brunschwig's view and states that:

....the Africans did not begin to plant cocoa on their own initiative as happened in the Gold-Coast and Nigeria. It is recorded that a far-seeing French administrator imported cocoa seed and gave it to the African, but they were unwilling to plant it. After much persuasion, however, they planted the seed but such was their resentment at having to do so, that they used to go out at night and pour hot water on it, in the hope of killing it. Nevertheless, some of the seed survived and in due course cocoa became a popular crop. (1955, p. 14)

Cocoa was first exported from TOGO in 1900. Plantings were high after World War II, but declined in the 1960's to the present situation of virtually no plantings.

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<sup>1</sup>Jean Assoumou: Economie du cacao. Editions Universitaires, Jean-Pierre Delarge, 1977.

Economies of Cocoa Production and Marketing, 1973, edited by R.A. Kotey, C. Okali and B. E. Rourke.

The West African Cocoa Story by Raymond W. Bixler. Vantage Press, New York, Washington, Hollywood, 1972.

<sup>2</sup>Gold-Coast is the colonial name of Ghana.

Exports reached a peak of 30,000 tons by the year 1970 and then decreased steadily to present level of 17,000 tons in 1979. Wide fluctuations have been observed in the yearly marketed output. Many factors are responsible for the downward trend and the interseasonal fluctuations observed in available supplies.

First, the planting undertaken before independence became mature full bearing trees but have aged initiating diminishing yield. The yield pattern of cocoa trees is described as follows:<sup>1</sup>

Trees up to 7 years old are non bearing.

Trees from 8 to 15 years old are young bearing cocoa.

Trees from 16 to 30 years old are in full bearing.

Trees over 30 years old exhibit declining yield.

Forty-four percent (44%) of cocoa trees in Togo are over 38 years old, and this aged stock of trees implies declining production prospects. In addition, the planted variety: NIAOULI is less productive than the new and precocious variety AMELONADO.

Second, the disease incidence also explains the downward trend and interseasonal fluctuations in the cocoa production. An important consideration in the Togolese cocoa production is the unstable and unknown quantity smuggled from the neighbor country Ghana. This smuggling has been made possible because of the close proximity of the cocoa growing regions of both countries. The World Trade Information Service reported that the largest part of the cocoa-growing area of former German Togoland came under British administration after World War I and has now been incorporated

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<sup>1</sup>Cocoa Production Economic and Botanical Perspective edited by John Simmons, 1976.

into Ghana. This state of nature explains why cocoa is so easily smuggled from Ghana to Togo. Robert G. Franco<sup>1</sup> related that the smuggler, usually a cocoa farmer, but could also be a middleman, seeks to benefit from the difference in cocoa prices between Ghana and its neighboring countries: Togo and Ivory-Coast. This difference in prices arises because of two factors.

First, producer prices have traditionally been set higher in Togo and Ivory-Coast than in Ghana, and second, the smuggler is paid in CFA<sup>2</sup> francs, a convertible currency. The difference in producer prices between Togo and Ghana as shown in the following table is also affected by the gap between the official and the parallel exchange rates.

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<sup>1</sup>The optimal producer price of cocoa in Ghana by G. Robert Franco. *Journal of Development Economics* 8(1981) 77-92.

<sup>2</sup>CFA: (Colonies Francaise d' Afrique). CFA franc is the currency commonly used in some of the former French Colonies. The CFA franc is tied to the French Franc (FF) at the fixed rate of CFA franc 1 = FF .5.

Table 1. COMPARISON OF PRODUCER PRICES<sup>1</sup>

Years	Ivory-Coast CFA francs	Ghana <sup>2</sup> CFA francs	Togo CFA francs
70-71	85	26	93
71-72	85	23	93
72-73	85	29	93
73-74	110	33	95
74-75	175	38	115
75-76	175	29	120
76-77	180	21	130
77-78	250	22	150
78-79	0	31	200

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<sup>1</sup>Source: BCEAO, UMOA  
Banque Centrale de l' Afrique de l' Ouest, Union Monetaire  
de l' Ouest Africain.

Conjoncture economique, fin 1977. #258, Feb. 1978.  
Journal of Development Economics #1 vol. 8 Feb. 1981.  
"The optimal producer price of cocoa in Ghana."

<sup>2</sup>Both prices are expressed in commensurate units. The exchange rate depends upon relative movements in the rate of inflation. It is specified as the ratio of Ghanaian CPI to the Togolese CPI multiplied by the rate of 1958 (base year).

## B. COCOA IN 1975 AND PLANNED EXPANSION IN TOGO

Cocoa is grown chiefly on small land holdings of 2 to 5 hectares in the Litime and Kloto where ecological requirements such as: high humidity, fairly high rainfall and a dry forest area are readily available. The area is bounded by Ghana and by two urban centers: Kpalime and Badou. All suitable lands are already carrying cocoa in varying stage of maturity, but under a low standard of management reflected by the aged stock of trees. A rise in the phosphate earnings as a percentage of total export earning, coupled with a consistent decrease of cocoa exported, were reflected in the composition of export as following:

Table 2. COMPOSITION OF EXPORTS: PERCENT OF VALUE<sup>1</sup>

	1970	1971	1972	1973	1974	1975
Phosphate	25	35	38	46	76	65
Cocoa	42	31	29	26	12	18
Coffee	18	18	21	13	4	6
Cotton	1	2	2	3	2	1

To remedy this proportionate decline of cocoa in the total export earnings, the Government of Togo, with the support of international organizations and aid agencies, has embarked on a project of renovation and rehabilitation of cocoa.

### B.1. Descriptive Evaluation of Cocoa Program in Togo

Poor maintenance and unsatisfactory anti-capsid treatment during the immediate post colonial period, have led to prematurely senile plantations.

<sup>1</sup>Source: Rapport d' evaluation du projet en cours. 1<sup>ER</sup> Juillet 1974-30 Juin 1980 et preparation d' un second projet 1980-1985. Ministere du developpement. SRCC



There is a need to bring back plantations into good health with proper care. The regeneration program designed by the government consist of:

- controlling and rehabilitating the existing plantations,
- replanting 4,400 hectares of cocoa with selected materials which are more productive and precocious than the prevailing old variety: Niaouli.

The project which will be implemented over a five and half year period, includes: improved input supply to farmers, credit to producers, and road improvement in the cocoa area. Farmer groups will produce planting materials in village nurseries. The national agency SRCC or Societe nationale pour la Renovation et le Developpement de la Cacaoyere et de la Cafeiere Togolaise, created in 1971, will ensure the necessary supply of hybrid cocoa pods, and supervise activities at the farmer level. The research institute: IFCC or Institut Francais pour le Cafe, le Cacao et les autres plantes stimulantes, established in 1967, will provide planting materials to SRCC. Marketing facilities are provided by the marketing board OPAT or (Office des Produits Agricoles du Togo). The project also finances applied research for the production of improved planting materials. It provides funds to study and evaluate the program, and to examine and prepare a follow-up project.

#### B.1.1. Project Evaluation

The government program to encourage cocoa production through rehabilitation and replanting, is justified on several grounds.

First, cocoa production is economically profitable. The estimated rate of return or discount rate which makes the incremental cash flow equal zero, is 14%. This value computed in the World Bank appraisal report increases with a rise in prices.

Second, the project will continue to generate public revenues represented by substantial tax receipts received by the Government on the marketed commodity. This revenue will help to increase agricultures contribution to capital formation. As a result, Togo's development prospects will improve.

The Ministry of Agriculture estimates that the financial surplus to the marketing board OPAT will decrease from US \$52 millions in 1977 to around US \$2.8 millions by 1985, in the absence of the Cocoa and Coffee Project.<sup>1</sup> The net foreign exchange earnings induced by the project is estimated to rise to about US \$10 millions annually (in constant 1978 dollar) by 1993, and thereafter to remain at about this level.

Finally, the argument of comparative advantage is a valid one to justify maintain the program. The World Bank recently attempted to rank cocoa producing countries according to their relative comparative advantage. The methodology used, involves the estimates of DRC/SER ratios, where DRC represents the Domestic Resource Cost of foreign exchange earned or saved by the activity in question in each country, and SER represents the Shadow Exchange Rate or shadow price of foreign exchange. The results of the study, while inconclusive, involved some appealing findings.

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<sup>1</sup>Cocoa is grown in the same region as coffee. Both commodities are by far the most important, and assembled together under the same project: Cocoa/Coffee planting Project.

Table 3. ORIGINAL ESTIMATES OF DRC/SER RATIOS, MAJOR COCOA-PRODUCING COUNTRIES

<u>Country</u>	<u>Plantation Production</u>	<u>Peasant Production</u>
GHANA	0.241	0.725
TOGO	0.245	0.356
NIGERIA	0.271	1.528
IVORY-COAST	0.347	1.084
CAMEROON	0.347	
INDONESIA	0.576	
BRAZIL		0.892

Source: World Bank estimates resulted from tables in the Appendix.

The figures in the table above show that in considering the estimates of DRC/SER ratios, the ranking in descending order are: For Plantation Production: GHANA, TOGO, NIGERIA, IVORY-COAST, CAMEROON, and INDONESIA. For Peasant Production, TOGO is ranked first, followed GHANA, BRAZIL, IVORY-COAST, and NIGERIA.

While the rankings are inconsistent in the four following countries: Togo, Ghana, Nigeria, and Ivory-Coast where both peasant and plantation productions exist, a relative comparative advantage in cocoa production in Togo cannot be rejected.

### C. CURRENT AND POTENTIAL SUPPLY-DEMAND RELATIONSHIPS

Consumed mainly in industrialized countries, cocoa is produced only in certain tropical developing countries. Given this geographical concentration of production and consumption, and the international interdependency in the commodity, Togo cannot be discussed in isolation. This section analyses the recent and potential development in the

international situation of cocoa, as far as production and prices are concerned, and provide a background against which future movements in Togo's cocoa exports may be projected.

C.1. World cocoa prospect: outlook for 1980's

Production and consumption of cocoa have nearly doubled since World War II. A marked change in the rate of growth has taken place during the 1970's, and production has risen slowly from an average of 1.49 million tons over the season 1970/71 to an average of 1.66 million tons in 1980/81.

World cocoa beans production forecast\* is favorable for the 1980's and the major increase of the global production will come from: Ivory-Coast, Brazil, and Malaysia. These countries have expansionary programs. In the Ivory-Coast, a great deal of new plantings is already in place, and will come into full bearing and reach full productivity during this decade. Brazil, through replanting, rehabilitation, and expansion, is expected to reach a projected growth of 700,000 tons from its current 300,000 tons level by 1993. Malaysia experiencing higher growth rate, has the potential to expand output over 100,000 tons by 1990. The outlook for Ghana and Nigeria, stands out in sharp contrast to the more favorable outlook for the countries above. Ghana and Nigeria respectively the largest and the second producer in the World, have now fallen to third and fourth place.

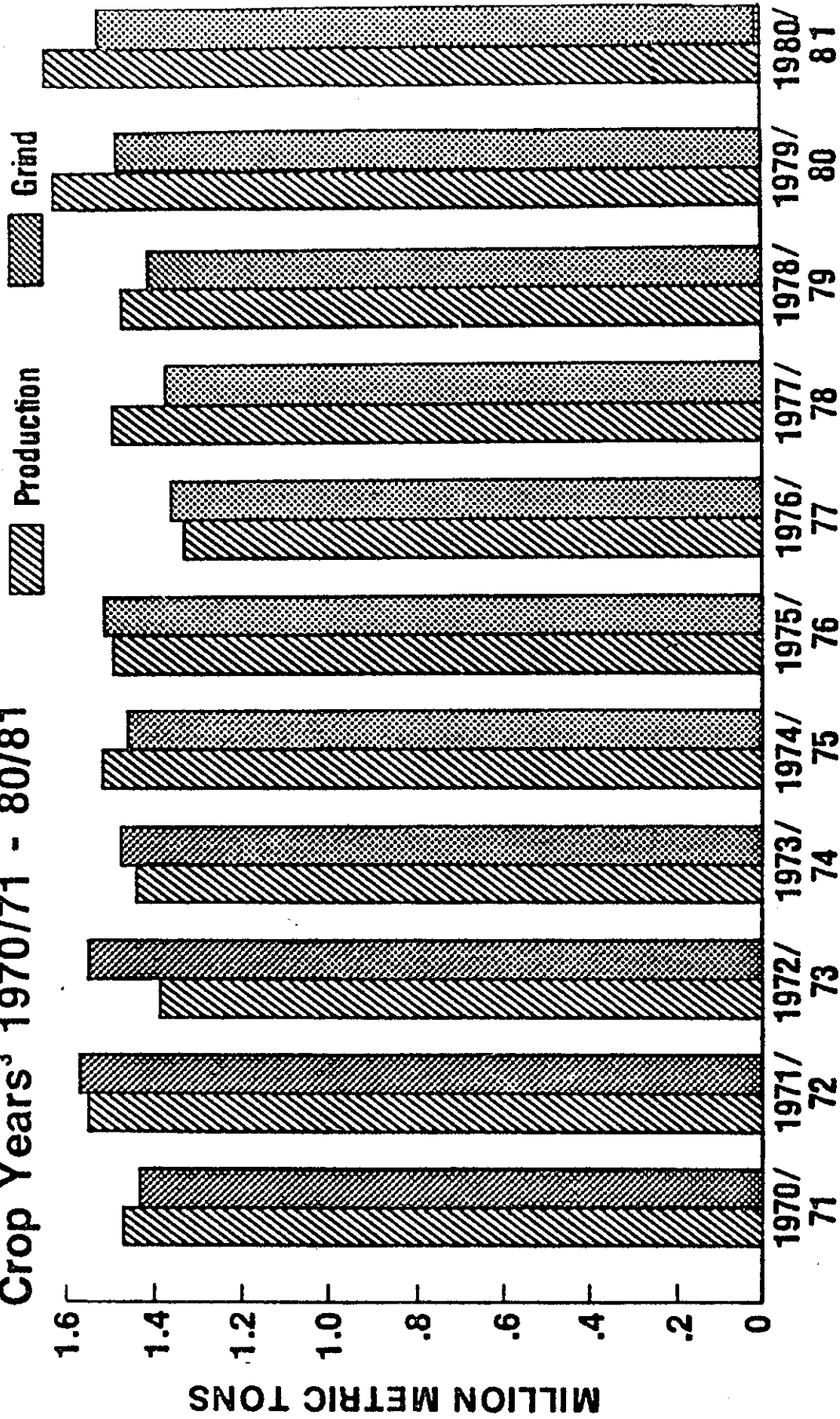
For both countries, declining production prospects are projected for the coming decade. Cameroon and Ecuador seem to have limited potential to expand their productions.

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\*COCOA Foreign Agriculture Circular U.S. Department of Agriculture.  
Record World Cocoa Bean Crop Forecast for 1981/82. Oct. 1981.  
Jan. 1980.  
Feb. 1980.

# Cocoa Beans - World Production<sup>1</sup> and Grind<sup>2</sup>

Crop Years<sup>3</sup> 1970/71 - 80/81



<sup>1</sup> Net after adjusting for one percent loss in weight

<sup>2</sup> Calendar year grind, refers to last year of crop year

<sup>3</sup> October-September

FIGURE 1

It appears that only Ivory-Coast, Brazil and Malaysia will make the difference in the World's cocoa production during the coming decade.

On the demand side, the presence of cocoa substitutes and extenders, coupled with the poor economic outlook of many major consuming countries, will keep the increasing consumption of cocoa behind production.

Demand and supply of cocoa will largely depend on price levels. The projected world prices for the coming decade are still high enough to represent an incentive for producing nations. The trend of prices projected by the World Bank, is given in the following table.

Table 4.

<u>Year</u>	<u>Price U.S. cent a Kg.</u>
	<u>Actual</u>
1975	125
1976	205
1977	379
1978	340
1979	327
	<u>Projected</u>
1980	352
1981	363
1982	380
1985	384
1990	350

Source: World Bank price forecasts, January 1980.  
Agricultural commodities projection 1980-1990.  
Commodity Trade and Price Trends.

## C.2. International Cocoa Agreement

Since World War II a main issue on cocoa has been price and income stabilization. During this period, several meetings have been called to look into the cocoa price crisis, and to examine what measures should be taken to facilitate stable market conditions. Earlier negotiation conferences failed. A three-year International Cocoa Agreement negotiated and ratified in 1972, came into force in October 1, 1973. Since then, the International Cocoa Agreement of ICCA was renewed for three year period, and the second agreement signed in 1975, remained operational until March 1980. A third ICCA negotiated in Geneva in November 1980 is running into difficulties. The U.S. Foreign Agriculture Circular reported that the leading producer: Ivory-Coast, and the largest consumer: the United States, refused to participate at these negotiations. Togo and Gabon, both minor producers decided not to be a party to the new pact.

The ICCA was implemented on August 1, 1981. The International Cocoa Organization Council or ICCO approved an extension of the second ICCA to March 31, 1982, to permit Governments to deposit instruments of ratification, acceptance and approval for the new and third ICCA.

### C.2.1. Operations of ICCA

The basic objectives of the Agreement are to prevent excessive cocoa price fluctuations, and to help stabilize and increase the export earnings from cocoa of producing countries, while taking account of the interests of consumers in importing countries as well. The ICCA has not been really operational. The U.S. Foreign Agriculture Circular

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Source: U.S. Department of Agriculture. Foreign Agricultural Service. FOREIGN AGRICULTURE CIRCULAR COCOA Feb. 1980, Jan. 1980, Nov. 1980.

reports that "World cocoa prices have recently been supported by the action of the Ivory-Coast to withhold sales and store cocoa until prices reach a level more favorable for marketing."

### C.3. World Demand for Togolese Cocoa and Production Potential

Under the second ICCA, an export quota of 20,500 tons was assigned to TOGO, with a provision for increase to 23,000 tons. So far, this export quota has borne a true relation to the production capacity of the country, and no cocoa has been stored. The performance of the second ICCA coupled with the current trend towards overproduction, caused problems for third ICCA negotiations. In this condition, the current export quota for Togo is assumed to remain the same for the coming decade. Under this assumption, the supply prospect does not seem to meet the export quota. In fact, the production and export availability are projected to reach 20,700 tons in 1993, as shown in the following table drawn from the Cocoa-Coffee Development Project II.

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Source: Foreign Agriculture Circular. U.S. Department of Agriculture. Foreign Agricultural Service. Washington, DC. Different Publications: 1980, 1981.

World Bank Report No. 2408-T0 June 1979.



Table 5.

TOGO

## COCOA-COFFEE DEVELOPMENT PROJECT II

Togo: Cocoa Production 1975/78 and Projection to 1994 ('000 MT)

Year <sup>1</sup>	Marketed Production (w/o Projects) <sup>2</sup>	Net incr. First Project	Net incr. Second Project	Combined Effect Projects 1&2	Projected Production & Exports
(Actual)					
1975	14.6				
1976	17.8				
1977	14.1				
1978	16.0	..		..	
1979	NA	..		..	
av. 60-78	17.0				17.0
(Projected)					
	<u>Base</u>				
1980	17.0	(.1)	--	(.1)	16.9
1981	17.0	(.1)	(.1)	(.2)	16.8
1982	17.0	..	(.2)	(.2)	16.8
1983	17.0	.1	(.3)	(.2)	16.8
1984	17.0	.4	(.4)	-	17.0
1985	17.0	.6	(.5)	.1	17.1
1986	17.0	.9	(.3)	.6	17.6
1987	17.0	1.1	..	1.1	18.1
1988	17.0	1.2	.5	1.7	18.7
1989	17.0	1.3	1.0	2.3	19.3
1990	17.0	1.3	1.6	2.9	19.9
1991	17.0	1.3	2.0	3.3	20.3
1992	17.0	1.3	2.2	3.5	20.5
1993	17.0	1.3	2.4	3.7	20.7
1994	17.0	1.3	2.4	3.7	20.7

<sup>1</sup>Marketing season Oct.-Sept. ending year shown.

<sup>2</sup>Base estimate assumes (a) continuation of anti-capsid campaign; (b) adequate labor and incentives to continue present (fairly low level of exploitation and sporadic renewal of old trees; (c) neutral assumption with regard to smuggling from Ghana, i.e., past average cross-border component of Togolese marketed production, possibly about 4,000 t (if Togo average yields are only 300 kg), is maintained. Absence of factors (a) and (b) could result in fall in domestic yields of up to 100 kg/ha, or 30 percent, say 4,000 t again.

.. Negligible (less than 0.05).

### III. OVERVIEW OF COCOA POLICY IN TOGO

The preceding section supports the Cocoa Project with emphasis upon profit deriving from its fulfillment. The degree to which the Project can succeed depends on the production incentives faced by farmers. For this specific reason, a closer look of marketing policy might give us some insight into government policy and its impact on the supply of cocoa in TOGO. Before dealing with past price policy and its implications on the market, the next section gives us an idea of institutional policy in TOGO.

#### A. INSTITUTIONAL POLICY

In the immediate post colonial period, no institution has been established to provide cocoa farmers with technical assistance. The regional development agency: SORAD or Societe Regionale d' Aménagement et de Developpement, established in each economic Region in 1965 managed in the Plateaux Region, cocoa and coffee promotion. Its performance was unsatisfactory. Serious efforts to improve cocoa production in Togo began in 1967 with the establishment of a research institute: IFCC or Institut Francais pour le Cafe, le Cacao et les Autres Plantes Stimulantes. Later on in 1969, a capsid pest and Swollen-Shoot Virus Disease (SSVD) control was successfully initiated. During the SSVD eradication campaign, about 2,500 hectares have been cleared in the Kloto area. This result encouraged the Government to design and start in 1971, the rehabilitation program, and then in 1975, the first Cocoa-Coffee Development Project. The institute in charge to carry out the project is the national cocoa and coffee agency: SRCC.

In summary, there was neglect by the young Government toward Cocoa and Coffee during the immediate post colonial period. This lack in

supporting farmers during the early 1960 may strongly affect behavior, attitude and motivation of producers.

## B. PRICING POLICY

Allowing food production and marketing to be guided by market forces, the Government through a parastatal agency OPAT (Office des Produits Agricoles du Togo) has been setting price for Cocoa, coffee and other cash crops. The Marketing Board: OPAT was set up on June 22, 1964 with the expressed purpose of fulfilling six specific objectives;

- (i) To stabilize producer prices for export cash crops.
- (ii) To control the purchase of produce from producers.
- (iii) To export and to sell commodities in their best condition and standard of quality.
- (iv) To help by all means to improve production and development of industries of these commodities.
- (v) To develop and maintain rural roads.
- (vi) To supply commercial loans at fairly low interest rates.

Achieving these objectives requires policy interventions which may create price distortions.

According to Bale and Lutz<sup>1</sup>, there are obviously three ways in which government intervention can effect market incentives in agriculture;

- First there are economic policies that are neutral with respect to the opportunity cost of agricultural production.
- Second, there are those where agricultural production is overvalued (price support policies).

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<sup>1</sup>Agricultural Price Distortions: An International Comparison, Bale and Lutz, American Journal of Agricultural Economics: Vol. 63, #1, Feb. 1981.

-- Finally, there are policies through which agricultural production is undervalued (export taxation policies).

The cocoa pricing policies in Togo fall into the third category. A closer look at producer prices set from 1964 to 1979, indicates that producer prices have always been set low relative to FOB export prices as shown in the following table 6.

The question is then: how do price interventions affect farmers' incentive and cocoa supply in TOGO?

The distortions arising from public intervention and international trade have been documented on numerous occasions. The resulting effects are always diffused regardless of whether they assume the form of income supports, supply control or barrier to trade. International trade theory suggests that the optimum trade policy for a small open economy under certainty is free trade. Any distortion of domestic relative prices away from the international terms of trade results in a social welfare loss in that country.

M. Bale and E. Lutz, in their article that discusses the effects of price distortions in agriculture, demonstrated that in developing countries where commodities are often taxed through price intervention measures, agricultural output is significantly smaller than what it would be in the absence of distortions.<sup>1</sup>

Olatunbosum, D. and Olayide, S. in their study entitled "Output-Income effects of Agricultural Export Pricing Strategy in NIGERIA: The Case of Cocoa." have concluded that the prevailing marketing board's

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<sup>1</sup>Agricultural Price Distortions: An International Comparison, Bale and Lutz, American Journal of Agricultural Economics: Vol. 63, #1, Feb. 1981.

Table 6.

<u>Year</u>	<u>Producer Price</u>	<u>Marketing and Distribution Costs</u>	<u>F.O.B. Lome Price</u>	<u>C.F.I. Le Havre Price</u>
1964-1965	70	-	97.4	-
1965-1966	40	-	98.5	-
1966-1967	55	13.6	136.9	-
1967-1968	70	14.5	162.0	-
1968-1969	80	14.6	218.8	-
1969-1970	88	15.1	200.7	-
1970-1971	93	15.6	155.8	-
1971-1972	93	15.6	151.1	-
1972-1973	93	15.2	202.7	244.0
1973-1974	95	16.4	357.8	413.5
1974-1975	115	17.1	299.3	331.5
1975-1976	120	17.7	403.3	415.5
1976-1977	130	-	672.4	998.0
1977-1978	150	-	731*	771.4
1978-1979	200	-	642*	660.0*

\*World Bank price data/forecasts for 1978 and 1979.

- Figures not available.

Data Sources: World Bank: Appraisal Report No. 2408-T0.  
 Agricultural Pricing Study: Report No. 2781-T0.  
 SRCC: Annual Reports.

stabilization policy has a negative effect on the farmers' incentive to increase production.

A knowledge of cocoa farmers' price response pattern in TOGO will be useful in testing the adequacy of the assertions above which are similar to the assumptions stated in the World Bank study. The next section is confined to an econometric analysis of supply response related to cocoa in TOGO. It theoretically formulates and statistically estimates short-term supply response of farmers to price incentive, and measures the magnitude of different coefficients and elasticities.

## IV. ECONOMETRIC MODELING FOR SHORT-RUN SUPPLY RESPONSE

## A. MODEL SPECIFICATION

In the literature, several factors characterize research in cocoa supply response. These attributes related to the use of economic theory, choice of estimation methods and data, focused on analysis of the structural variables presumed to describe the behavior of supply and prices. Cocoa production decisions depend on long-run and short-run influences. In the long-run, new plantings occur. The short-run effects may only induce farmers to change the level of maintenance of mature trees, and then modify the output level in response to price changes. Other factors such as: weather disease control, plant varieties, good management and available resource also can effect the level of output.

Merrill J. Bateman<sup>1</sup> has proposed four supply models related to four different ways in which farmers react to economic variables during the planting decision. Two of these models are 'Stock adjustment model,' one is an 'Adaptative expectation model,' and the fourth is a 'Liquidity model.'

The liquidity model assumes that the lack of funds necessary for investment may negatively affect the future output even if high prices prevail in the future. Relevant variables to include

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<sup>1</sup>Bateman, Merrill J. Supply Relations for Perennial Crops in the Less-Developed Areas. Subsistence Agriculture and Economic Development, Edited by Clifton J. Wharton, Jr., Chicago Aldine Publisher, 1969.

in this model are: last period's incomes and expected future prices.

The adaptative expectation model uses distributed lag, and implies that producers consider past prices as well as current prices in making forecast for future prices which affect the planted acreage.

The stock adjustment model argues that prices influence farmers investment decision where land is already under cultivation.

The purpose of this part of the study, is to develop an econometric model which could be used to stimulate Togolese cocoa supply. The model should include variables which affect long-term supply prospects and also focus on forces that cause short-run deviations in outputs. However, a crucial problem encountered in the model building for cocoa supply in Togo, is the lack of information and sufficient data relevant for applying the model described above. Such a limitation in the available data leads us to restrict the models to a short-term supply response of farmers to price incentives. The model used stems in part from the World Bank attempt to quantify the more important factors affecting short-term cocoa supply in Togo. Two features distinguish this study from the earlier one carried out by the World Bank. First, the period involved is longer: twenty years instead of fourteen. Second, proxies for local production have been used and defined as estimated yield times the acreage for a given year.

Given the theoretical outline, the next section is the estimation of the parameters of the short-term supply response.



The problems under consideration are those of describing the short-run supply function for cocoa in Togo. The quantity-price relation required can best be measure by using annual data. Three characteristics of the environment in which the commodity is supplied need to be emphasized. First, the presence of marketing board OPAT in Togo, has led to a separation of world price from producer price, and therefore, implies a change in the structure of price expectation.

Second, the effectiveness of smuggling coming from the neighboring country GHANA which was the largest producer of cocoa in the world, must be taken into account because of its influence on marketed production in Togo.

Third, cocoa and food production are assumed to be competing activities for the utilization of limited resources such as land and labor. In fact, the cocoa area in Togo has traditionally been a net food importer from other regions. Since food crop prices have exhibited a rising trend over the 1970's, and the increase in cash crop prices have not always kept up with trends in food crop prices, farmers are diverting labor from cocoa to food crops, to assure a food supply for home consumption, and to benefit from higher food crop prices.

Another important characteristic of cocoa industry in Togo, has to do with the use of the production. All the cocoa produced is exported. There is no scope for farmer's own consumption or for local transformation by domestic plants.

## B. VARIABLES USED

The array of variables considered in the model will now be discussed both in terms of their construction and possible sources of error they

may contain. The variables hypothesized to influence the marketed production of cocoa in Togo are: the acreage and age of plantations, the producer prices of cocoa and food in both countries: Togo and Ghana.

#### B.1. Dependent Variable

The quantity exported: the quantity locally produced plus smuggling from Ghana is taken as the dependent variable, and named: COCOQEXP. There is no record for smugglings. The data available is on the quantity exported, made up of domestic production and unknown smuggling from Ghana. These data have been collected from 1960. No direct measure exists for the local production.

#### B.2. Independent Variables

##### B.2.1. Acreage

Reliable statistics on annual acreages exist for the period 1960-1979. Acreage here represents the bearing acreage and is defined as: total acreage less replanting of less than 5 years old. In fact, replantings occurred under the first project, and figures were recorded. But, it is assumed that "Six Years Old" is the age at which cocoa trees first begin to bear, and to give significant increase in yield.

##### B.2.2. Yield

This variable represents the average yield of cocoa plantation. Figures collected from different sources are very scattered, and require many reservation on their quality. The unreliability of these estimates explains why more use of the production proxy defined as:  $\text{yield} \times \text{Acreage}$  (yield times Acreage), has not been made to define the relationship between planting and market supply which is also affected by smuggling.

Smuggling figures are given in the study by G. R. Franco. This estimation collected from Ghana official is global and does not precise the proportion going into Togo. Since the Ivory-Coast is also one of the adjoining French territory into which cocoa is smuggled, the global estimates available could not be used in this study.

#### B.2.3. Age

This is the average age of cocoa trees, in year. Data is available for the period under study.

#### B.2.4. Producer Prices

Togo producer prices in CFA francs are the official prices paid to producers. The price, established 3 months before the first harvest, prevails until the second harvest ends. Price series which began in 1960 are published in various annual report of OPAT, BCEAO, and SRCC with general agreement on the figures. Ghana producer prices expressed in Cedis, (local currency) are collected from official publications.

To express Togolese and Ghanaian producer prices in a common unit of foreign exchange for comparison purpose, relative purchasing power parity with a base year 1958 = 100 has been used as follows:<sup>1</sup>

$$\text{TOGOPPC} = \text{TOGOPPF}_j * \text{CPIT}_j / \text{CPIG}_j * (\text{CFA/Cedis})_{1958}$$

where:  $(\text{CFA/Cedis})_{1958}$  represent the real exchange rate of CFA and Cedis expressed in U.S. \$ in 1958.

TOGOPPC = Togo Producer Price expressed in Cedis.

TOGOPPF = Togo Producer Price expressed in CFA francs.

CPIT = Consumer Price Index in Togo.

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<sup>1</sup>Bhagwati, J., ed., 1974, Illegal transactions in international trade: Theory and Measurements (North-Holland. Amsterdam).

CPIG = Consumer Price Index in Ghana.

$j = 1958, 1959, 1960, \dots, 1978, 1979.$

This method of estimation has been used, because: from 1973 to 1978, Ghanaian government has initiated a series of 15 exchange rate adjustments which brought the Cedis down to:  $\text{¢1} = \text{US\$ } 0.3636$ , from its first rate of  $\text{¢1} = \text{US\$ } 0.8686$  in 1973.

This conversion has made possible the computation of the differences between producer prices in both countries. Two differences have been computed: Simple difference between Togo and Ghana producer prices or DIFFERENCE, and proportional difference mean, estimated as follows:

$$\text{PRODIFMEAN} = \frac{\text{TOGOPPC} - \text{GHANARPPC}}{a \text{ TOGOPPC} + b \text{ GHANARPPC}}$$

where

$$a = .4$$

$$b = .6$$

TOGOPPC = Togo producer price in Cedis.

GHANARPPC = Ghana real producer price in Cedis.

B.2.5. Moving Average Price: MOVINAVP

This variable is computed as a three years moving average of the real producer price in Togo. A cumulative price effect on output is assumed because, short-run variation of production within the constraints set by the available stock of trees may derive from the level of farm maintenance. For example, in years where relatively low producer prices could not cover costs of production, farmers stop weeding and harvesting. If, in the following year, higher price leading to higher return prevails, the output of this year, will somehow be affected by previous years care or maintenance.

$$\text{MOVINAVP} = \frac{\text{TOGORPPF}_1 + \text{TOGORPPF}_2 + \text{TOGORPPF}_3}{3}$$

### C. RATIONALE OF THE EMPIRICAL APPROACH

Data is not enough for supply analysis of planting. A trial method of combining variable is adopted. Following the World Bank model, the form of equation fitted in linear. The equation with no serial correlation that gives the best fit to data, with respect to the coefficient of multiple determination and of significance of the parameter as measured by t-test is selected as the lead equation for prediction purposes.

The basic response functions are specified by:

$$(1) \dots \text{COCOQEXP} = f(\text{TOGORPPF}, \text{PRODIFMEAN}, \text{AGE}, \text{ACREAGE}, \dots)$$

$$(2) \dots \text{COCOQEXP} = f(\text{TOGORPPF}, \text{DIFFERENCE}, \text{AGE}, \text{ACREAGE}, \dots)$$

$$(3) \dots \text{COCOQEXP} = f(\text{MOVINAP}, \text{PRODIFMEAN}, \text{AGE}, \text{TOQP}, \dots)$$

Where: COCOQEXP or marketed production in Togo equals domestic production PLUS smuggling from Ghana. (Local production + smuggling).

TOQP is the production proxy of cocoa in Togo. This estimate, lower than the one for COCOQEXP which involves TOQP and smuggling from Ghana, is given by estimated yield times acreage. (YIELD \* ACREAGE).

TOGORPPF = Producer price in Togo (CFA francs).

PRODIFMEAN = Proportional price difference between Togo and Ghana.

MOVINAVP = 3-year moving average of current producer price in Togo.

The first and second equations state that the quantity of cocoa exported in any one year, is a function of real producer price in Togo, of the price difference between both countries and also depend on the age of trees and the bearing acreage.

The third equation assumes that the moving average price shape farmers' response. Ordinary least-squares estimates of the coefficients

of the variable were obtained for each equation, under the assumption that the error terms are randomly distributed.

The estimates are summarized in the following table 7.

#### D. EMPIRICAL ESTIMATES OF THE SUPPLY FUNCTIONS

The signs in each of the three equations conform with a priori expectations. Production and smuggling respond in a positive manner to price. Both response are inelastic. Equation 3 has the highest price elasticity. The negative sign for the coefficient of variable: AGE, is expected and confirm the declining production prospect of aged stock of trees. In general, the independent variables are significant. However, low t-statistic for price variables in noticed. This is to be expected and raises some questions about the appropriate of price ratios obtained by deflating cocoa prices by food crop price indexes. There is no evidence of serial correlation in equations 1 and 2. In equation 3, autocorrelation is rejected. The coefficient of multiple determination R-square ranges from .68 to 86. The standard error of regression is realatively low, and hence supports the reliability of the coefficients.

##### D.1. Performance of the Model

All the goodness of fit statistics mentioned above: fairly high R-square, relatively low standard error, and absence of autocorrelation as shown by the Durbin-Watson statistics, indicate that the ordinary least square method of estimation is appropriate to the model.

##### D.1.1. Comparison with Previous Study

In its approach, the World Bank related current marketed production of cocoa to real current producer prices in Togo, to the price differential between both countries, to the bearing acreage, and age of trees.

Table 7.

## RESULTS

	World Bank <u>ESTIMATES</u>	Equation 1 <u>ESTIMATES</u>	Equation 2 <u>ESTIMATES</u>	Equation 3 <u>ESTIMATES</u>
Constant	-194695.8	-167.616	-221.676	12.464
t-value	(2.2)	(4.36)	(4.3)	(3.08)
TOGORPPF	39.6	0.089455	0.070554	
t-value	(1.0)	(1.38)	(1.14)	
Elasticities	0.17	0.34	0.26	
PRODIFMEAN	6893.5	0.879148		5.35856
t-value	(0.4)	(0.14)		(1.36)
Elasticities	0.34	0.08		0.49
MOVINAVP				0.0784027
t-value				(3.1)
Elasticities				0.26
DIFFERENCE			0.0006009	
t-value			(1.37)	
Elasticities			0.07	
TOQP				0.0000033
t-value				(6.65)
AGE	-1333.9	-0.91535	-1.66214	-1.6749
t-value	(1.0)	(1.87)	(2.52)	(4.81)
ACREAGE	6.4	0.005445	0.007475	
t-value	(1.9)	(4.59)	(4.13)	
R-SQUARE	0.77	0.67	0.70	0.86
STANDARD ERROR	-	3.67	3.46	2.38
DURBIN-WATSON	-	1.23	1.49	2.10

The equation estimated over the period 1959/60 - 1972/73, gave only two significant coefficients: the intercept, and the acreage coefficient. The remaining coefficients were not significant.

The standard error of regression was not mentioned. However, 77% of the variability was explained by the independent variables.

The same equation applied in this study for the period 1960-1979, gave lower R-square: .68 but three significant coefficients. The reliability of price variable coefficients is still suspected as shown by low t-statistics. In no case did wrong signs appear.

Equation 2 which introduces price difference:  $P_T - P_G$  instead of proportional price difference is better fitted compared to equation 1. ( $R_2^2 = .70$  greater than  $R_1^2 = .68$ ).

However, looking at R-square, both equations 1 and 2 perform less well than the World Bank estimated equation.

The third equation which introduces production proxies, jointly with the 3-years moving average price, performs better and gives the highest R-square ( $R^2 = .86$ ), and the lowest standard error: ( $SE_3 = 2.38$ ,  $SE_2 = 3.46$ ,  $SE_1 = 3.67$ ). No autocorrelation is apparent and all t-values of variables in the equation improve. None of the equations include a variable weather. Short-run output is very sensitive to climatic conditions. For this reason, improvement of the model could be obtained by considering the variable weather. Lack of information on such a variable makes its use impossible.

#### D.2. Elasticities

The price elasticity of supply defined as the ratio of the percentage change in quantity supplied to the percentage change in price, is a very useful and important tool for policy analysis.



For a linear relationship such as:

$$Q = a + b_1 + b_2p,$$

the supply elasticity is given by:

$$E = \frac{dQ}{dP} \cdot \frac{P}{Q} = b \frac{P}{Q}$$

where  $Q$  is the production,

$p$  is the price,

$Q$  and  $p$  are the mean values of production and price.

An increase of the numerator or decrease in the denominator, increase the numerical value of the elasticity.

The price elasticity estimates for the four equations are shown in the following table.

Table 8. ESTIMATED ELASTICITIES OF COCOA SUPPLY (short-run)

<u>Equation</u>	<u>Elasticities to TOGORPPF</u>	<u>Elasticities to PRODIFMEAN</u>	<u>Elasticities to DIFFERENCE</u>	<u>Elasticities to MOVINAVP</u>
1. OLS	.34	.08	-	-
2. OLS	.26	-	.07	-
3. OLS	-	.49	-	.26
World Bank OLS	.17	.34	-	-

It can be observed from the table that the short-run price elasticities computed are all low. The response is also different in each equation. The low price elasticities are to be expected in the short-run, when account is taken of the long gestation and the long life which characterize tree crops.

## V. SUMMARY OF FINDINGS, POLICY IMPLICATIONS AND SUGGESTIONS FOR FURTHER STUDIES

The findings from this study, as well as in the early one carried out by the World Bank, confirm that cocoa farmers in Togo respond to price incentives. Consequently, any government policy toward this commodity should take into account Togolese farmers' ability to supply cocoa in response to price offered to them.

### A. POLICY ANALYSIS

#### A.1. Basic Theory

The regeneration of cocoa plantation is intended to generate foreign exchange earnings, and to provide government substantial revenues.

If maximizing economic efficiency is the first concern of the government, export taxes should not occur, and then, farmer price in this condition should equate world market prices. On the other hand, if the government intends to maximize its revenue through export taxation, then a relatively lower producer prices as compared to the world cocoa market price will be achieved. This intervention will result to a smaller production.

Lowering producer price could also be accomplished with the expressed purpose of controlling overall production subject to international restrictions. This argument does not hold for the Togolese cocoa of which world market share of 1 percent is too small to influence world price.

#### A.1.1. Alternative Pricing Policies for Cocoa in Togo

This analysis assumes that the supply curve of cocoa in Togo is known.  $P_w$  represents world price.  $P_T$  is the producer price in Togo.  $Q_1$  and  $Q_2$  are production under alternative policies.

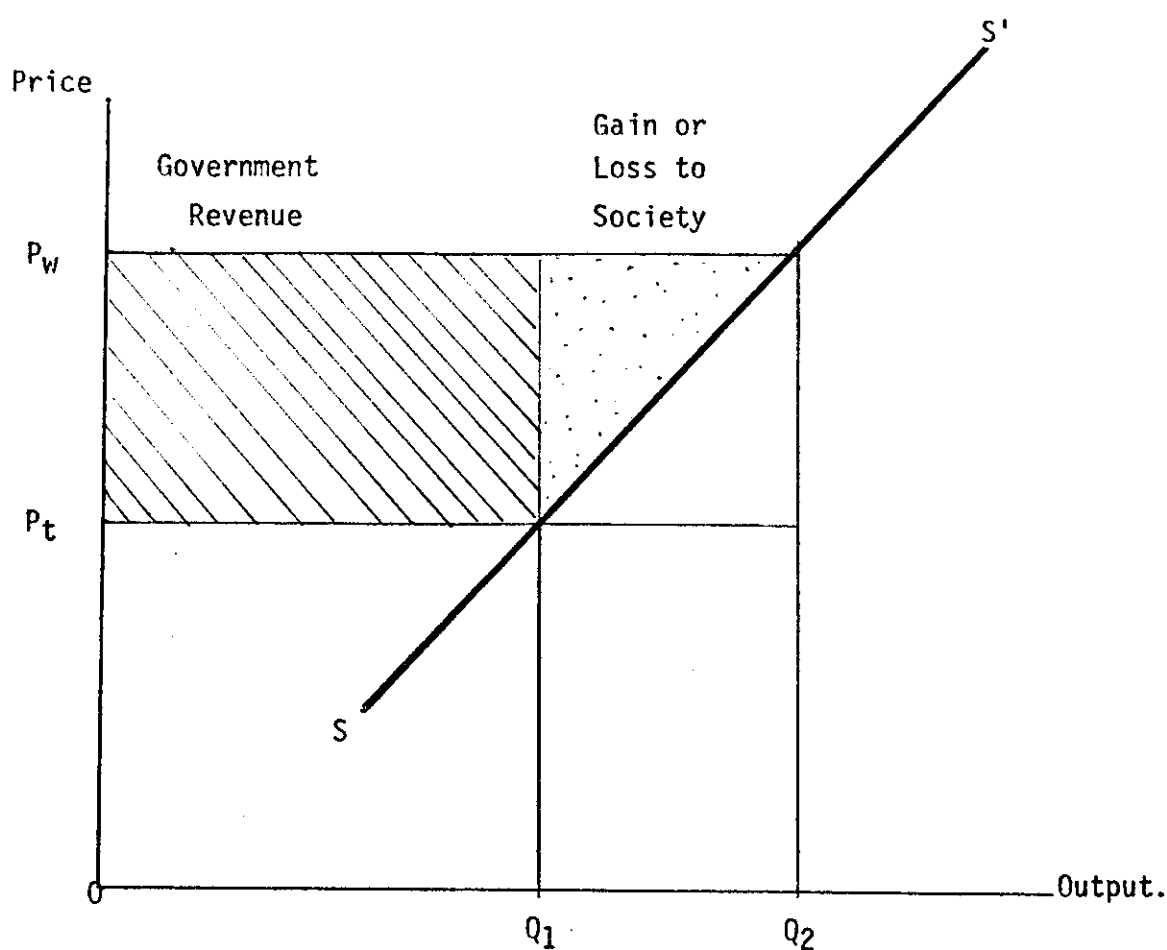


FIGURE 2

$Q_1$  and  $Q_2$  are produced and exported. Under economic efficiency policy, quantity  $Q_2$  is produced and exported. World price  $P_w$  is the same as the producer price, and the dotted area represents the gain for the society.

Under government revenue maximizing policy, the government withdraws income from farmer by imposing a tax and lowering producer price. This engenders disincentive effects on production response and then leads to a smaller output  $Q_1$ .

In this case government revenue is represented by the shaded area, and the society as a whole loses the dotted area (welfare loss).

## A.2. Government Intervention and Cocoa Industry in Togo.

Research into the extend and effects of government market interventions within the cocoa sector in Togo revealed that export taxation policy has been practiced for the purpose of maximizing government revenue. The Nominal Protection Coefficients: (NPC) or the ratio of the domestic price to its border price have been computed for the period 1967-1976 and give the following results.

Table 9.            NOMINAL PROTECTION COEFFICIENTS (NPC)\*

2nd Year	COCOA (CFA/Kg)			
	Producer Price	Marketing and Distribution Costs	F.O.B. Lome Price	NPC <sup>1</sup>
1967	55	13.6	123.94	.50
1968	70	14.5	147.11	.53
1969	80	14.6	202.78	.43
1970	88	15.1	225.40	.42
1971	93	15.6	167.16	.61
1972	93	15.6	151.06	.69
1973	93	15.2	202.73	.50
1974	95	16.4	357.78	.28
1975	115	17.1	299.28	.41
1976	120	17.7	403.32	.31
			<u>Average</u>	.47

Source: World Bank Report No. 2781-T0.

$$^1 \text{Nominal protection coefficient: NPC} = \frac{\text{Producer Price}}{\text{F.O.B. Lome Price} - \text{Marketing and Distribution Costs}}$$

By manipulating producer prices consistently below the world price, the government is imposing an export tax on cocoa. This prevailing policy, may engendre serious disincentive effects on production response.

While a number of criticisms against the revenue maximizing policy could be addressed to the Togolese government, it is also relevant to consider arguments in favor of such a policy.

For example: Helleiner G. K. in studying "The Fiscal Role of Marketing Board in Nigerian Economic Development," contended that a primary justification of the existence of marketing board is the collection of revenue for economic development.

Some economists in the recent years have considered that income distribution could be achieved through export taxation devices.

Another argument to support the export taxation policy has to do with the national need of maximizing agricultural capital formation. Because of the low marginal propensity to save among individual producers, more weight has been given to the saving force of the government to achieve and speed up the maximization of agricultural capital formation.

Free trade theory rejects all these arguments in support of the export taxation policy because of the disincentive effects underlying this policy of income withdrawals. Unfortunately, many less Developed Countries (LDCs) have adopted restrictive trade policies, to reduce the effects of the world price uncertainty on their domestic economies.

### A.3. Findings and Policy Implications

The estimated functions support the hypothesis that cocoa farmers in Togo react to price. From this evidence, a few general conclusions appear justified.

1. Market intervention to raise producer price is required.

This does not mean that price increase alone will solve the prevailing problem of lack of response from cocoa farmer in Togo. In fact, the low price elasticities obtained suggest that any form of pricing policy directed to increase cocoa price only will be inefficient mean to fulfill cocoa regeneration program. It is then obvious that market intervention should be carried out along with other measures in order to achieve the objectives of the cocoa project.

2. As long as cocoa replanting program is concerned, a high cash investment is involved and the project remains unattractive for poor farmers, unless large enough cash and input subsidies to offset the cost of replanting and foregone earnings are available.

#### A.4. Suggestions for Further Studies

The econometric model constructed to explain the supply of cocoa in Togo, is somehow limited. In the model, the marketed outputs were influenced by producer prices, and by price difference between Togo and Ghana. There are several problems involved in this presentation.

First, the analytical gains from estimating such a model have not been so much in achieving higher predictive power in the equations. The reason for this is that some factors affecting cocoa supply in the short-run such as: rainfall, humidity, diseases, etc., have not been taken into account because of lack of information on their figures.

The second and more important problem concerns smuggling. In fact, smuggling from Ghana is subject to some restrictions difficult to cope with in this study.

Law enforcement barrier against smuggling exists, and the Ghanaian government has been intensifying surveillance of the Togo-Ghana border, to eliminate these unofficial exports. The model used does not disclose this significant variable which also affects the smuggling response to the price difference. Any action by the Ghanaian government against smuggling could lower the quantity of outputs smuggled and reduce the estimated response coefficients.

Finally, the model itself does not deal adequately with economic determinants of replanting decisions of cocoa farmers in Togo.

A good production prospect will derive from the knowledge of the farmers' voluntary participation in the cocoa regeneration program. A linear programming approach, using survey data would be appropriate, and more fruitful in increasing the predictive power of the model. In fact cocoa farmer in Togo face long term investment decision. Because most of the trees enter the phase of declining yield, two related decisions have to be made:

- when, and how much of the existing old trees should be replaced?
- how to replace the revenue foregone, and to solve traditional financial management problem over the gestation period called for under the replacement policy?

Even if the answers to those questions have already been established in the appraisal report and economic studies of the cocoa project, they unfortunately do not reflect the view of the peasant farmer who still has considerable choice to act consistent with his goals. Therefore, a focus on the farmer; on what he does and can do according to various policy measures, input and cash subsidies, assistance for up-rooting old

trees, etc., must be considered. Such information can provide a valuable input for cocoa supply analysis.



## VI. CONCLUSION

Togo is not a significant factor in the World cocoa market. But its exports accounting for only 1 percent of World product, play vital role in economic growth and the welfare of rural populations. With regard to the Togolese situation, several observations can be made. First, the production and export of cocoa appear to be profitable, given the quotas in existence. The quota is not really restrictive given the actual level of the Togolese production, and the potential production of this commodity. The analysis shows that cocoa farmers respond to relative price changes. The existence of export taxes imposed by the government, while adding to the tax revenues, effects the profitability of the program, because of the resulting disincentive effect on production of cocoa. This study suggests that pricing policies take into account the ability of farmers to adjust the supply according to the prices offered to them.

This study raises a number of research questions. First the model used is not very powerful in dealing with production prospects. The alternative to this model is one dealing with the problem of decision making under different pricing policies. The problem formulated will be a relatively simple dynamic programming problem which will require survey data for estimation.

Table 10.

COCOQEXP	RAW DATA										YIELD	YEAR
	ACREAGE	AGE	TOPPF	FPIIO	GHANAPPC	GHANACPI	TOGOPPC	YIELD				
8.8	34119	18.56	100	100	202	104	593	185	1960			
12.6	34881	19.59	95	100	202	110	595	200	1961			
11.8	35234	20.42	65	100	202	120	445	200	1962			
13.9	35587	21.25	63	100	202	126	446	225	1963			
17.3	35940	22.07	70	100	202	141	562	250	1964			
15.0	36293	22.90	70	100	202	181	722	220	1965			
17.6	36646	23.73	40	100	149	190	433	277	1966			
18.0	36999	24.56	55	104	150	178	536	280	1967			
19.7	37352	25.38	70	101	243	196	774	280	1968			
22.0	37702	26.21	80	102	261	207	930	280	1969			
23.0	38058	27.04	88	108	296	214	1003	282	1970			
30.5	38411	27.87	93	113	299	225	1060	383	1971			
29.0	38511	28.82	93	120	301	270	1198	381	1972			
28.2	38611	29.77	94	129	375	282	1166	378	1973			
18.6	39123	30.17	95	145	431	334	1240	330	1974			
16.5	38911	31.92	115	172	551	432	1551	325	1975			
16.2	38564	32.70	120	192	588	675	2414	350	1976			
17.9	38239	33.50	130	235	735	146	4616	347	1977			
15.5	37919	34.10	150	236	1335	253	9174	380	1978			
17.0	37666	35.01	200	253	2666	3905	17278	402	1979			

Source: SRCC Data, World Bank Data: Report No. 2781-T0 and Report No. 2408-T0  
 IMF Publication  
 FAO Production  
 TOGO Statistics  
 GHANA Statistics

Table 11. COCOA PRODUCTION PROJECTIONS (t)

	py1	py2	py3	py4	py5	py6	py7	py8	py9	py10	py11	py12	py13	py14	....
600 ha	-	-	-	18	60	180	300	360	450	450	450	450	450	450	....
700 ha	-	-	-	-	20	70	210	350	420	525	525	525	525	525	....
800 ha	-	-	-	-	-	25	80	240	400	480	600	600	600	600	....
900 ha	-	-	-	-	-	-	27	90	270	450	540	675	675	675	....
1000 ha	-	-	-	-	-	-	-	30	100	300	500	600	750	750	....
Production Total (t)	-	-	-	18	80	275	617	1070	1640	2205	2615	2850	3000	3000	....
Production foregone (t)	(90)	(195)	(315)	(450)	(600)	(600)	(600)	(600)	(600)	(600)	(600)	(600)	(600)	(600)	....
Production incremental (t)	(90)	(195)	(315)	(432)	(520)	(325)	17	470	1040	1605	2015	2250	2400	2400	....

Source: World Bank Staff Appraisal Report No. 2408-T0 June 4, 1979.  
 (t) = tons  
 py = project year

Table 12. EXPORT VALUE OF COCOA BEANS AND PRODUCTS, SELECTED COUNTRIES, AND SHARE IN WORLD TOTALS AND IN NATIONAL EXPORT EARNINGS

Country	Value			Percentage share in world total			Percentage share in country's export earnings		
	1957-61	1967-71	1973	1957-61	1967-71	1973	1957-61	1967-71	1973
<b>Brazil</b>									
Beans	68.7	70.1	88.5	12.5	8.6	7.7	5.2	3.0	1.4
Products	25.9	29.8	55.0	4.7	3.7	4.8	2.0	1.3	0.9
Subtotal	94.6	99.9	143.5	17.2	12.2	12.5	7.2	4.3	2.3
<b>Cameroon</b>									
Beans	35.3	49.6	79.8	6.3	6.1	7.0	35.3	24.5	22.7
Products	4.4	15.6	19.8	0.8	1.9	1.7	4.4	7.7	5.6
Subtotal	39.7	65.2	99.6	7.2	8.0	8.7	39.7	32.2	28.3
<b>Dominican Republic</b>									
Beans	13.6	35.4	19.5	2.5	1.9	1.7	9.1	8.0	4.4
Products	7.4	0.4	3.5	1.3	-	0.3	4.9	0.2	0.8
Subtotal	21.0	15.8	23.0	3.8	1.9	2.0	14.0	8.2	5.2
<b>Ecuador</b>									
Beans	19.6	26.9	27.2	3.6	3.3	2.4	14.5	12.8	4.9
Products	-	2.6	7.7	-	0.3	0.7	-	1.2	1.4
Subtotal	19.6	29.5	34.9	3.6	3.6	3.0	14.5	14.1	6.3
<b>Ghana</b>									
Beans	177.9	198.6	339.8	32.4	24.3	29.7	65.2	60.5	57.9
Products	2.2	28.2	35.2	0.4	3.5	3.1	0.8	8.6	6.0
Subtotal	180.1	226.8	375.0	32.8	27.8	32.8	66.0	69.1	63.9
<b>Ivory Coast</b>									
Beans	36.6	81.8	124.7	6.7	10.0	10.9	24.4	19.2	14.6
Products	-	18.0	34.5	-	2.2	3.0	-	4.2	4.0
Subtotal	36.6	99.8	159.2	6.7	12.2	13.9	24.4	23.4	18.6
<b>Mexico</b>									
Beans	2.2	3.1 <sup>2</sup>	5.5	0.4	0.4	0.5	0.3	0.2	0.2
Products	0.2	3.0 <sup>2</sup>	6.4	-	0.4	0.6	-	0.2	0.3
Subtotal	2.4	6.1	11.9	0.4	0.7	1.1	0.3	0.4	0.5
<b>Nigeria</b>									
Beans	90.4	166.4	170.8	16.5	20.4	14.9	21.0	16.0	5.1
Products	-	15.6	31.2	-	1.9	2.7	-	1.5	0.9
Subtotal	90.4	182.0	202.0	16.5	22.3	17.6	21.0	17.5	6.0

Table 12. EXPORT VALUE OF COCOA BEANS AND PRODUCTS, SELECTED COUNTRIES, AND SHARE IN WORLD TOTALS AND IN NATIONAL EXPORT EARNINGS (continued)

Country	Value		Percentage share in world total		Percentage share in country's export earnings		
	1957-61 <sup>1</sup>	1967-71 <sup>1</sup>	1957-61 <sup>1</sup>	1967-71 <sup>1</sup>	1957-61 <sup>1</sup>	1967-71 <sup>1</sup>	1973
Papua New Guinea							
Beans	2.8	15.1 <sup>2</sup>	14.8	1.9	8.5	16.1	2.9
Products	-	-	-	-	-	-	-
Subtotal <sup>1</sup>	2.8	15.1	14.8	1.9	8.5	16.1	2.9
Togo							
Beans	4.9	14.6	16.0	1.8	31.0	33.2	26.2
Products	-	-	-	-	-	-	-
Subtotal	4.9	14.6	16.0	1.8	31.0	33.2	26.2
Other Countries							
Beans	55.8	60.4	63.4	7.4	n.a.	n.a.	n.a.
Products	1.4	0.8	-	0.1	n.a.	n.a.	n.a.
Subtotal	57.2	61.2	63.4	7.5	n.a.	n.a.	n.a.
Total, all above countries							
Beans	507.8	702.0	950.0	86.0	n.a.	n.a.	n.a.
Products	41.5	114.0	193.3	14.0	n.a.	n.a.	n.a.
TOTAL	549.2	816.0	1,143.3	100.0	n.a.	n.a.	n.a.

- Nil or negligible.

n.a. Not available.

NOTE: Figures may not add to totals because of rounding

<sup>1</sup>Annual average for period.

<sup>2</sup>Four-year average, 1967-70

Source: FAO, Cocoa Statistics (January issues 1967, 1969, 1975); U.N., Yearbook of International Trade Statistics (New York, 1961), and Monthly Bulletin of Statistics (New York, various issues); FAO, Trade Yearbook (Rome, 1973).

Table 13. TOGO: EXPORT VALUES, F.O.B. (US\$ million)

<u>Year</u>	<u>Cocoa</u>	<u>Coffee</u>	<u>Phosphates</u>	<u>Total Export of Goods</u>	<u>(as % of total exports) Cocoa &amp; Coffee</u>	<u>Phosphates</u>
1961-70 (av)	9.4	6.4	9.2	32.1	49.4	28.5
1970	22.8	9.6	13.4	54.7	59.2	24.5
1972	14.8	10.3	19.0	69.9	35.9	27.2
1974	22.2	8.2	143.3	214.8	14.2	66.7
1976	17.4	16.7	54.6	153.1	22.2	35.7
1978*	37.7	11.7	92.4	210.0	23.5	44.0

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\*Forecast.

Source: World Bank. Report No. 2408-T0, June 4, 1979.

Table 14. ESTIMATED RANGE OF DRC/SER RATIOS FOR PLANTATION COCOA PRODUCTION, VARIOUS COUNTRIES.

<u>Country</u>	<u>Range of DRC/SER Ratios</u>			
	<u>At 50 cents a pound</u>	<u>At 55 cents a pound</u>	<u>At 60 cents a pound</u>	<u>At 65 cents a pound</u>
GHANA	0.245-0.299	0.219-0.268	0.198-0.242	0.181-0.221
TOGO	0.253-0.309	0.223-0.272	0.198-0.242	0.179-0.218
NIGERIA	0.276-0.338	0.246-0.301	0.223-0.273	0.203-0.249
IVORY-COAST	0.314-0.384	0.279-0.341	0.250-0.306	0.228-0.278
CAMEROON	0.358-0.438	0.315-0.385	0.281-0.344	0.253-0.309
INDONESIA	0.435-0.710			

Source: World Bank estimates.

Table 15. COMPUTED DRCs AND RELATED MEASURES OF COMPARATIVE ADVANTAGE IN 1972 FOR MAJOR COCOA-PRODUCING COUNTRIES, USING THE AVERAGE WORLD SPOT PRICE FOR 1972

<u>Country</u>	<u>Shadow Price</u>			<u>Market Price*</u>		
	<u>DRC</u>	<u>Foreign exchange ratio (SER)</u>	<u>DRC/SER</u>	<u>DRC</u>	<u>FX</u>	<u>DRC/FX</u>
NIGERIA	1.2078	0.79	1.528	1.6517	0.66	2.50
GHANA	1.1607	1.60	0.725	1.9187	1.156	1.659
BRAZIL	6.0880	6.825	0.892	7.009	5.940	1.178
IVORY-COAST	318.3223	293.5	1.084	445.46	230.2	1.935
TOGO	108.4659	304.0	0.356	333.97	230.2	1.450

\*The average price of cocoa for 1972 was \$705.47 a metric ton (FOA, Cocoa statistics) (Rome, October, 1973).

Source: World Bank estimates.

Table 16. ESTIMATED RATIOS OF DRC TO SER (AND TO FX) FOR COCOA PRODUCTION

Countries with World Bank cocoa projects*	Excluding road programs				Excluding road programs				Totals
	New		Total		New		Total		
	Planting	Rehabilitation	Replanting	Sample	Planting	Rehabilitation	Replanting	Sample	
GHANA	-	0.192 (0.266)	0.298 (0.412)	0.241 (0.333)	-	-	-	-	-
TOGO	-	-	-	0.245 (0.323)	-	-	-	-	0.265 (0.350)
NIGERIA	0.267 (0.320)	-	0.275 (0.329)	0.271 (0.324)	-	-	-	-	0.275 (0.329)
IVORY-COAST	0.340 (0.388)	0.311 (0.397)	-	0.307 (0.391)	-	-	-	-	-
CAMEROON	0.269 (0.368)	0.408 (0.557)	-	0.347 (0.474)	0.286 (0.391)	0.442 (0.603)	-	-	0.373 (0.510)
INDONESIA	-	-	-	0.576 (0.576)	0.526 (0.526)	-	-	-	-

- Not applicable or not available.

NOTES: Figures in parentheses are ratios of domestic resource costs (DRC) to actual foreign exchange rates (FX).  
Figures in brackets represent domestic factor costs excluded for new planting and replanting components.

\* Except INDONESIA.

Source: World Bank data. Appendix B: A Comparative Analysis of Cocoa Production in Selected Countries.  
World Bank Staff Occasional paper, No. 22  
Shamsher Singh, Jos de Vries  
John C. L. Hulley, and Patrick Yeung



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