

Determinants of agricultural exports: The case of Cameroon

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Abstract

This paper investigates the determinants of three agricultural exports from Cameroon between 1971/72 and 1995/1996. Export supply functions are specified and estimated for the three export crops chosen: cocoa, coffee and banana. Quantitative estimates obtained from the ordinary least squares (OLS) estimation procedure indicate the following: the response of export supply of all the crops to relative price changes is positive, but fairly significant. This can be attributed to the price constraining nature of the international markets for these commodities. Changes in the nature of the road network positively affect the export supply of cocoa, coffee and banana. More credit to crop exporters has a significant and positive influence on the export supply of all the crops. Equally, rainfall's influence on the growth of the three commodities is positive, but significant only for cocoa and coffee. Finally, structural adjustment dummies show a positive effect on the export supply of crops for policies implemented.

These results point to two conclusions. First, the marginal sensitivity of crops to the relative price changes means that the price incentives are not sufficient to generate desired export supply of agricultural commodities in Cameroon. Second, the significant sensitivity of crops under consideration to the availability of credit to exporters, the improved road networks and the specific policy changes implemented in the framework of the SAP implies that attempts to increase the export supply of agricultural crops in Cameroon should focus on these variables.

1. Introduction

The debate on the determinants of Cameroon's agricultural exports has become more relevant in the context of economic reform coupled with the poor performance of the country's oil sector. In fact, over the past decade, Cameroon, like other countries in sub-Saharan Africa (SSA), has experienced a dramatic decrease in export growth in general, and agricultural exports in particular, causing problems that need to be solved urgently. There are two main, largely opposing, schools of thought explaining the decline in agricultural exports. One stresses factors that are external to the individual country: the slow volume of growth of world primary commodity markets and the deteriorating terms of trade. The other line of thought emphasizes factors that are internal to the country, that is, the domestic policies that have affected export supply adversely.

In brief, the arguments are that the cumulative effect of government's agricultural policies, including the explicit taxation of agricultural exports by marketing boards as well as the relative neglect of the sector in overall development planning, has tilted domestic producer prices downwards and thus reduced export supply. Our preoccupation in this study goes in line with the second argument, since the country has control only over internal factors. Given that the overall success of the agricultural export promotion strategy will depend among other things on what factors constrain export growth and on the responsiveness of producers to changes in price and non-price incentive structures, a better understanding of key variables affecting export performance and the direction and magnitude of the relevant elasticities is desirable. This study, therefore, aims to assess the main determinants of agricultural exports from Cameroon.

Our study deals with three crops: cocoa, coffee and banana. By coffee here we mean robusta coffee; arabica coffee is not taken into consideration because its production as well as its export is negligible compared with robusta coffee. For example, robusta and arabica coffee outputs in tons were, respectively: 87,648 and 17,281 in 1985; 100,883 and 14,139 in 1990; and 49,067 and 3,196 in 1994. Banana was negligible in the export structure of the country from before independence up to 1975, with a contribution to total exports at 1.4%, compared with cocoa 25.4%, coffee 24.1% and cotton 3.1% (BEAC, 1975).

Performance of Cameroon's agricultural sector

Like most developing countries, Cameroon depends on the agricultural sector for non-oil foreign earnings. This sector plays a pivotal role in the economy and exerts important drawing effects on other sectors. Before the beginning of oil exports in 1978,

agriculture accounted for about 30% of the gross domestic product (GDP) and 80% of total exports. With the advent of oil, the share of agriculture in GDP declined to 24% by 1987, before increasing to 27% in 1990, and its contribution to export earnings fell to 53% (MINEFI, 1981, 1993; McMillan, 1998: 7).

Despite this downward trend, the sector still plays a leading role in the economy. About 75% of the active labour force is engaged in agriculture, and 85% of the total population of the country derive their livelihood from it. This strength comes principally from the export crop subsector, which is based on cocoa, coffee, cotton, timber, banana, rubber, palm oil and tobacco. The first three of these crops account for the lion's share of agricultural export earnings. Before 1978, they contributed 65% of total exports and 88% of agricultural export revenue, with 28% for cocoa, 55% for coffee and 5% for cotton. After 1978, their contribution declined slightly, to about 81% of agricultural export earnings, with cocoa contributing 29%, coffee 44% and cotton 8% (Gbetnkom, 1996; BAD/FAD, 1992).

The two decades immediately after independence (1960s and 1970s) experienced considerable growth in production and in earnings from agricultural exports. Between 1965 and 1980, agricultural output grew by 4.2% (World Bank, 1989). However, since 1980, this performance has not only slowed down, but has been highly variable. Although the share of export earnings from agricultural crops remained relatively high compared with the level in the 1970s, it was very low. The collapse of export commodity prices, distorted macroeconomic and agricultural policies prevailing in the environment, world recession, and production bottlenecks acted negatively on output and export performance. During that period, cocoa and coffee output declined at a rate of 1.13 and 4.9% per year, respectively.

However, this picture does not hold for banana export. During the period covered by our analysis (1971/72–1995/96), exports of banana have grown increasingly in terms of production and export earnings. Until the late 1970s its share in total export earnings was not important, but after 1980/81, it moved upward to reach 4.5% in 1994 before coming down to 4.1% in 1995.

Figures A1, A2, A3 and A4 in the Appendix illustrate Cameroon's exports and outputs of cocoa, coffee and banana from 1970/71 to 1995/96. The figures confirm the contrasting evolution between cocoa and coffee on the one hand, and banana on the other. This situation can be explained by two series of factors: the first series is the behaviour of crop prices. While the prices of cocoa and coffee in the international market have been decreasing since 1984, the price of banana has moved favourably during the whole period of the study, as evidenced in Figure A3. The second series of factors is national: an over-valued exchange rate, distorting macroeconomic policies and inappropriate political economy of agricultural pricing since the 1960s (Amin, 1996). These factors are explained below.

Review of government policies in the agricultural sector

Government intervention in agriculture has a long history in Africa, starting in the colonial period. Reasons for intervention have included: raising public revenue, ensuring food supplies, stabilizing farmer incomes and exploiting market power.

Since independence, Cameroon has experienced various agricultural policies, starting from high taxation and direct government intervention in the first two decades after independence (1960s, 1970s) to the macroeconomic, agricultural and other policy reforms of the 1990s.

From 1960 to date, two approaches to agricultural development can be distinguished. The first approach was experienced from independence up to 1987. During this period, government interventions and taxation of the agricultural sector progressively increased, and the sector became the main source of government revenue to finance both public consumption and investment needs. The traditional export crops were targeted for this purpose and farmers received only a small fraction of the nominal world market prices of their export produce, as shown in Table 1. This distorted approach, coupled with external shocks, plunged the agricultural sector and the rest of the economy into a deep economic crisis, which necessitated important reforms not only in agriculture but in the economy as a whole.

The second approach started with the adoption of structural adjustment programmes in 1988 whose basic objectives were to redefine the role of government and reduce government intervention in the economy. In the agricultural sector, many functions formerly handled by government agencies have been liberalized and the role of these agencies has been limited to research, data gathering, quality control and regulatory functions. In 1994, the coffee and cocoa subsector, formerly controlled in terms of price fixing by the government and marketing of the commodities by the monopsonist parastatal National Produce Marketing Board, was liberalized. The producer prices of these crops were partially linked to the world prices and the Board retreated to the role of the “buyer of last resort”, releasing the bulk of trade to private buyers. As a mechanism of stabilization, however, the Board continued up to 1996.

The foregoing description of various agricultural policies during the period under consideration is perceptible in Table 1, which represents an approximate measure of the degree of government intervention in the domestic agricultural export commodity markets. From 1970/71 to 1986/87, export crop farmers received on average 42% and 41% of the world prices of cocoa and coffee, respectively. These percentages are relatively similar to the 36% for coffee and 47% for cocoa obtained by export farmers in Côte d’Ivoire (Trivedi and Akiyama, 1992), but lower than the 59.82% for coffee and 69.95% for cocoa for Ghana’s agricultural export farmers during the same period (Fosu, 1992). After 1987/88, the implementation of the structural adjustment programme (SAP) tended to close the gap between producer prices and international prices and farmers also tended to receive a greater proportion of world prices than they had during the first subperiod (72% and 65% for cocoa and coffee, respectively). This trend was unfortunately interrupted after 1993/94 when the creation of many taxes on the export of these crops reduced the share of international prices received by farmers (44.6% for cocoa and 31% for coffee).

Table 1: Fraction of nominal world market prices received by cocoa and coffee farmers between 1970–1995 (in %)

Years	Cocoa	Coffee	Years	Cocoa	Coffee
1970/71	48.3	49.6	1983/84	38.9	33.0
1971/72	59.2	48.0	1984/85	34.7	29.4
1972/73	56.0	50.4	1985/86	39.5	37.0
1973/74	57.8	52.5	1986/87	55.3	40.2
1974/75	25.4	47.0	1987/88	57.7	67.6
1975/76	37.7	44.0	1988/89	79.4	73.7
1976/77	25.2	38.2	1989/90	96.0	79.4
1977/78	15.2	15.3	1990/91	65.4	52.0
1978/79	27.8	33.0	1991/92	65.6	51.3
1979/80	36.7	36.0	1992/93	66.6	61.0
1980/81	52.2	45.8	1993/94	44.6	31.0
1981/82	51.2	53.6	1994/95	35.3	30.4
1982/83	52.5	39.7	1995/96	58.4	48.0

Source: Computed from ONCC data.

Pricing and marketing of the food crop subsector have been liberalized, as well, but the production and export of banana are still largely controlled by two state enterprises: ASSOBACAM (Cameroon's Association of Banana Growers) and CDC (Cameroon Development Corporation). It is worth noting that given the weight of the export of agricultural products in the entire economy, the reform measures described above met difficulties in effective application.

In 1994 the government created two different direct taxes on the export of cocoa, coffee, banana, cotton and other crops. The first is a deduction on the FOB value of cocoa (at 15%), coffee (at 25%) and banana (at 6500 CFA per ton). The second is a tax on inspection and control of commodities to be exported applied at a rate of 0.95% on the FOB value of the export of the crops. Ostensibly created for a period of one year in 1994 to bail the state out of its liquidity problems (Loi de Finance 1994/1995, Articles 7 and 8), these taxes have not been cancelled to date. At a macroeconomic level, the reforms partially liberalized the trade regime, followed by the devaluation of the CFA franc in January 1994.

Despite the structural adjustment programme reforms, the output and export of agricultural crops have not yet regained a straight and sustained upward growth trend. This suggests that these policy reforms have not fully addressed all the key issues negatively affecting the agricultural export subsector.

The negative effect of the decline of export earnings was amplified by the downward trend of crude oil's world price as from the 1980s, which considerably reduced the oil share in the country's total export earnings. Between 1984 and 1989, oil production declined at a rate of 2% per year (BAD/FAD, 1992). This situation was due to the exhaustion of oil wells and to the insufficient incentive structure to explore new wells. Besides, oil taxation in Cameroon is highly complicated, and does not always favour new foreign companies. Up to now, there is no indicator for new oil wells, and prospecting

activities have been considerably reduced during the last decade. While the government's intention to reform fiscal conditions in order to encourage oil prospecting operations would renew hope in the oil sector, it is worth noting that even if new oil wells were discovered, they would not be workable in less than four or five years. This means that in the short and medium term, the health of Cameroon's economy will rely on export earnings from agricultural commodities since the manufacturing sector is still very weak. This is why particular attention should be paid to the agricultural subsector.

The combined decline of cocoa, coffee and crude oil export earnings was so deep that the slight increase of banana exports could not balance it. This has not only severely hindered the country's ability to service debts and other international obligations, it has also constrained capacity to import the essential technologies and inputs required for the rehabilitation and development of the economy. The inability to service debt hampers the ability to borrow. In a poor country like Cameroon, this leads to the cutting of social services such as health, education and physical infrastructure, which depend largely on imported inputs very often supported by loans. Productive capacity also remains underutilized and unemployment grows because of lack of imported inputs.

Clearly, there is a real problem. With continued slow growth of agricultural export revenue, Cameroon will find it difficult to maintain its recovery and avert a long-term crisis, since its external debt problems are increasing. Any significant improvement over the present situation of export earnings can only be achieved through increased exports, with appropriate price incentive policies for traditional exports and diversification into new commodities. This would require a revival of cocoa and coffee exports, and an increase in production and export of banana. The government is making more effort to promote the export of perennial crops during the successive cocoa and coffee campaigns, and this study intends to provide the necessary information to support policy decisions.

2. The research problem and objectives

There is ample evidence that unfavourable domestic terms of trade for agricultural exports and declining output are the principal contributors to the dismal performance of Cameroon's traditional exports, and that these factors reflect the interaction of inappropriate domestic pricing policies and external shocks. This situation has led the country to a number of macroeconomic imbalances, including budget deficits and balance of payments and debt problems. The low foreign exchange earnings constrain the importation of vital raw materials and this induces the deterioration of the quality of both the social and economic infrastructure. In such a situation, and given that agriculture is the main support of Cameroon's economy, an increase in agricultural exports is expected to contribute significantly to the improvement of most of these imbalances.

The overall success of any strategy to increase these exports will depend, among others, on the knowledge of what factors constrain export growth and the responsiveness of exporters to changes in both price and non-price conditions. Accordingly, a better understanding of the determinants of past performance, and the direction and magnitude of the relevant elasticities, is desirable. This is particularly important considering the exhaustion of oil wells and the fact that the industrial sector of the country is not prosperous. Also, it has been noticed by many coffee and cocoa producer forums that the consumption of these crops is not saturated in the world, contrary to common belief. China and other Asian countries constitute an important source of demand for these products. In summary, the key problem is how to greatly and urgently increase the rate of growth of agricultural crop exports, and to make that growth sustainable.

The understanding of the responsiveness of export supply to changes in price and non-price factors is indispensable in formulating a sound general export policy package. Where export supply responds negatively to prices, price changes cannot bring about an increase in export volume. With conducive policies, agricultural crop production will increase and export earnings will be boosted. The overall objective of the study is therefore to assess empirically the major determinants of cocoa, coffee and banana exports in Cameroon between 1971 and 1995. The choice of these commodities is based on data availability and the importance of the share of each of the products in total agricultural exports and in total non-oil exports.

3. Market structure of commodities under consideration

The disaggregation of products into agricultural and non-agricultural exports results in changes in the market structure. Before the reform, the agricultural export subsector was targeted as a source of government revenue to finance public consumption and investment needs. State agencies like the National Produce Marketing Board for cocoa and coffee, and the Cotton Development Authority, were established to have the monopoly on export trading in these crops. The major functions of the marketing board were:

- Arrangement for purchase and onward export of produce
- Development and rehabilitation of producing areas
- Maintenance of standards for export products
- Allocation of loans, grants and investments
- Supply of produce to local processors
- Stabilization of producer prices through minimum pricing

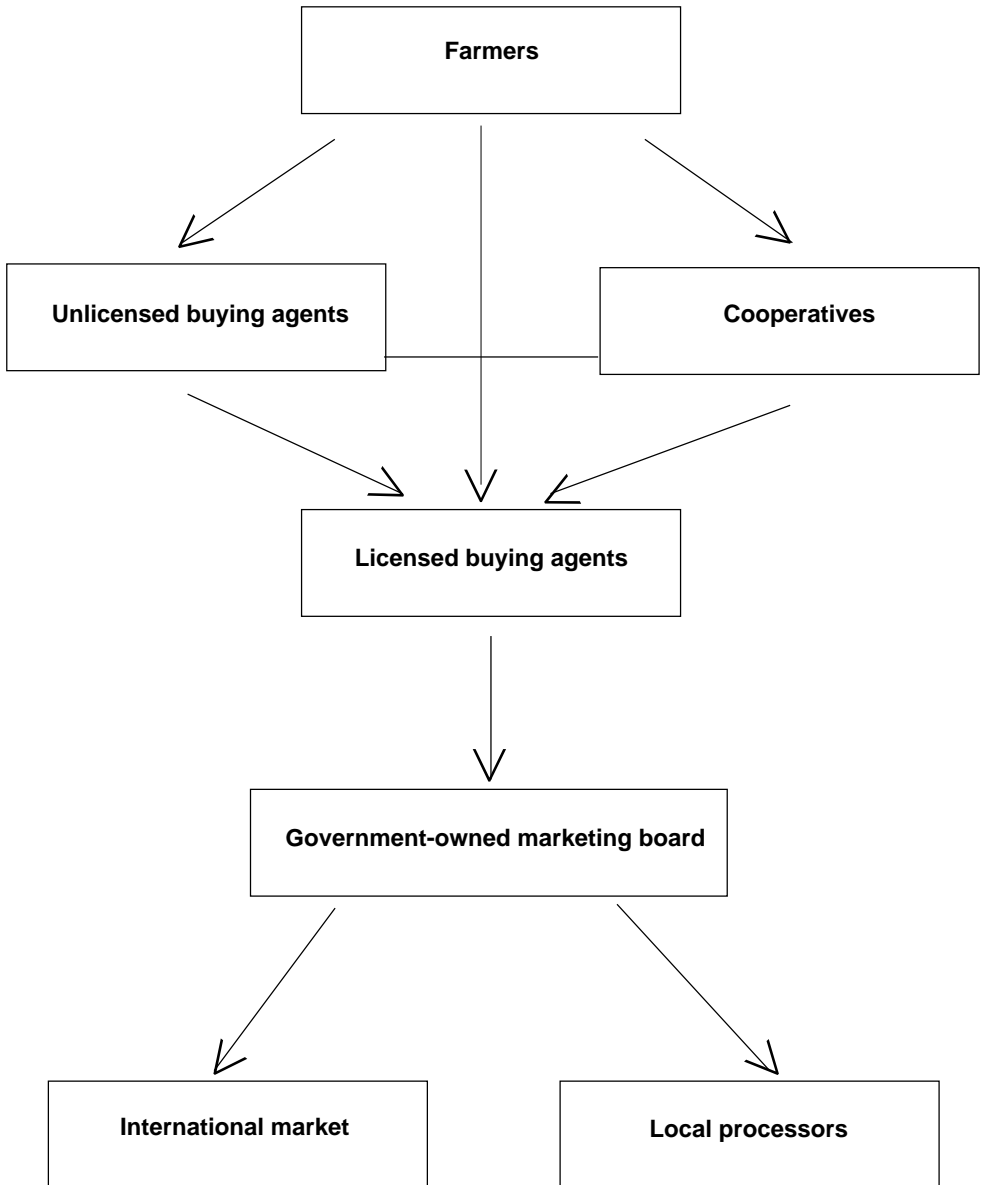
The board acquired produce through licensed buying agents (LBAs) who bought directly from farmers at fixed prices at all approved buying stations. These agents were also in charge of arrangements for produce inspection (in compliance with produce inspection rules) and packaging at standard weights, finance of purchases, provision of suitable storage facilities at buying stations, arrangements for transportation of produce to final destination (ports, local processors), and insurance of produce. They supplied chemicals to farmers to help boost production and improve the quality of produce and hence increase demand. They also acted as intermediaries between the farmers and the government and served as a major channel of information flow. For these functions they received an allowance.

Sometimes the LBAs extended their services to farmers through other agents (cooperatives, unlicensed buying agents). This category of agents was mostly located in villages or rural areas nearer to the farmers. Their activities were financed by the LBAs. The marketing channel before the reform is illustrated in Figure 1.

This regulated marketing system generated a number of problems:

- Fixing of prices that were significantly lower than world prices, thus leading to reduced production.
- Delayed payments by marketing board to LBAs.
- Delayed evacuation and marketing of products.
- Increased unavailability of production inputs.

Figure 1: The marketing channel of cocoa and coffee before the SAP



The problems and shortcomings of the regulated marketing system and mainly the need to conform to the principles of the SAP led to the liberalization of many functions of the National Produce Marketing Board (ONCPB) after 1988 with the consequence that the producer prices of cocoa and coffee were partially linked to the world prices. The ONCPB was replaced by the Office Nationale du Cacao et du Café (ONCC) in 1991.

Since the liberalization of the board's functions, the cocoa and coffee markets have been characterized by the operation of private individual exporters who are registered as licensed agents at the Ministry of Trade and Industry. Most of the agents who operated in the government-controlled market are still operating now, but with different linkages and modified functions. The exporters buy mostly from licensed buying agents, whose functions remain the same as in the pre-SAP era, with one major difference. That is, the exporter can now buy from the unlicensed buying agents and even directly from farmers. In this situation, the exporter will have to carry out the duties of the LBAs (standardization, grading, packaging) before such produce becomes exportable.

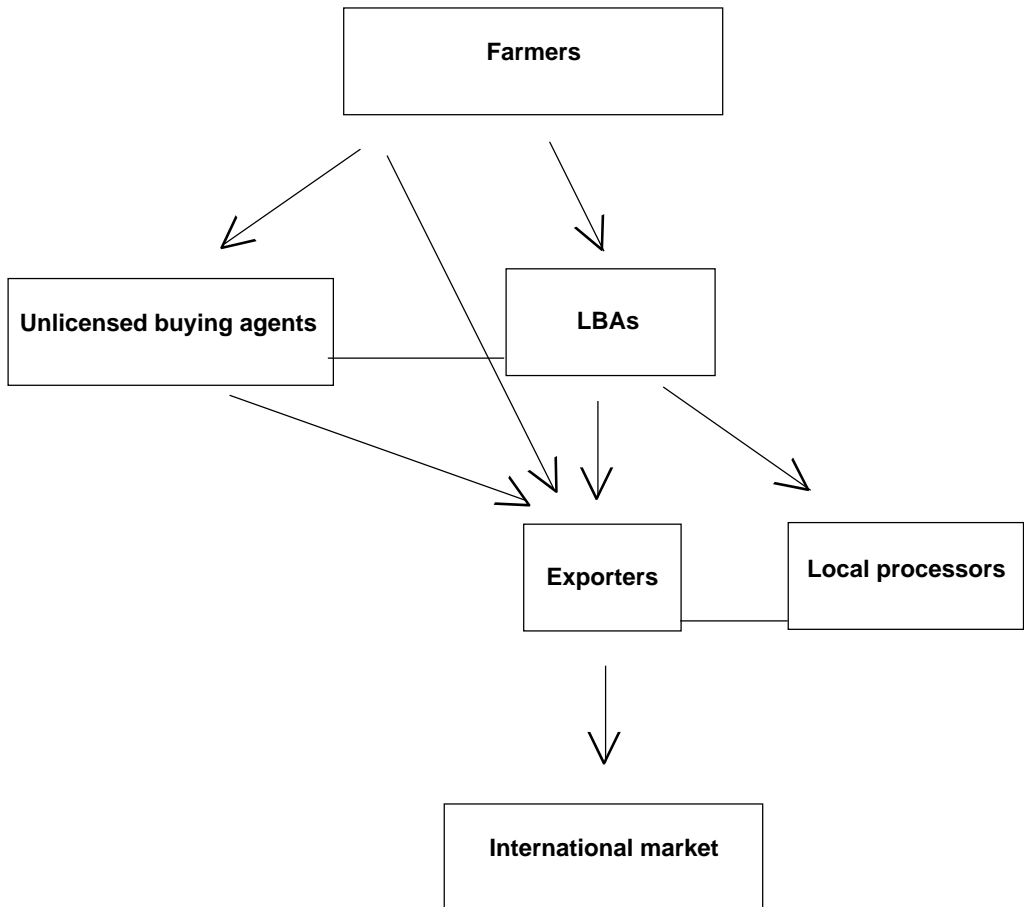
Another difference is that unlike in the pre-SAP era, when local processors bought only from marketing boards, they now buy from exporters and LBAs. They cannot buy from farmers and unlicensed buying agents because of the need to grade and standardize the produce.

However, even though there is no legal restriction preventing an exporter from buying directly from farmers under the deregulated system, the bulk of the exporter's purchases is still through the LBAs. This is because the LBAs often have regional associations that do not allow exporters to buy directly from farmers because they may underprice the LBAs. (In 1995, the barrier put up by Noun Division's Association of LBAs in the region negatively affected producer prices and farmers went on strike, asking for free entrance of exporters in the division.) Also, the economy of transaction costs demands that the exporters who need large quantities within a very short time should prefer to deal with a few LBAs who can supply large quantities rather than numerous small-scale producers (Adubi and Okonmadewa, 1997). Finally, the LBAs still perform some functions that may be very difficult for high exporters to achieve. They extend credit and supply inputs to farmers during the off-season, which are paid back in kind during the produce season. This credit is given on the basis of familiarity without any form of security, and if a foreign exporter ventures into this type of operation the risk of default can be very high.

The cocoa and coffee marketing channel in the SAP era is represented in Figure 2. It is worth noting that local processors purchase a negligible quantity of cocoa and coffee. A very small fraction of cocoa output goes to some local industries (CHOCOCAM, SIC-CACAO) for transformation into cocoa butter and chocolate, part of which is also exported. But we are concerned with the export of cocoa beans, which is a homogeneous product. Over the study period about 76% of all cocoa produced was exported (Figure A1 in the Appendix).

The international marketing of cocoa has been under the auspices of the International Cocoa Organization (ICCO) established in 1973 (information in this paragraph has been obtained from the website of the ICCO). The ICCO was established to administer the first International Cocoa Agreement (ICCA) signed in 1972. Its aim was to stabilize a

Figure 2: The marketing channel of cocoa and coffee after th SAP



usually volatile cocoa market on the basis of an agreed price range. Initially the instruments for achieving price stability consisted of an export quota scheme and a buffer stock with a maximum capacity of 250,000 tons of cocoa beans. This was signed to absorb production in excess of the quotas. During the first two agreements, market forces kept prices above the agreement range and therefore no cocoa was purchased for the buffer stock. In the 1980 agreement, the quota system was abandoned (higher prices had made it worthless) and price regulation was based directly on buffer stocks. By 1982, 100,000 tons of cocoa had been purchased for the buffer stock and its finances were depleted. In 1988, a further 150,000 tons of cocoa were purchased, thus reaching the buffer stock's capacity of 250,000 tons. This led to the suspension of all price stabilization measures as members had problems paying levies. The agreement reached in 1986 was extended to 1993, but the extension excluded the price stabilization measures. The stocks that had been constituted

were gradually liquidated, a process that was completed in 1998. In an attempt to deal with the problem of market imbalance in the medium and long term, and in particular the problem of structural over-production in the 1993 ICCA, exporting members undertook to abide by a production management plan designed to achieve a lasting solution between production and consumption (Article 29 of the 1993 ICCA). This was to meet the ICCO's overall objective of obtaining a balance between supply and demand for cocoa in the world market, at prices remunerative to producers and acceptable to consumers.

Coffee output and exports are illustrated in Figure A2 in the Appendix. For some years, the exported quantity exceeded output, which can be explained by stock holdings. Over the study period, about 94% of the robusta coffee output was exported. There are a few small factories that transform an insignificant part of the coffee output for local consumption, one of which is the UCCAO.

In the international context, coffee exports were sometimes constrained by the quota system of the International Coffee Organization (ICO), which sets quotas so as to supply the international market with an amount of coffee that would secure the price. Quotas were first imposed in 1963 and remained until 1972. They took effect again from October 1980 until March 1986, and in October 1987 they were reimposed again, remaining until July 1989 when the ICO ceased to exist (Bohman and Jarvis, 1998).

The quota system was undermined by non-members of the ICO, who were not constrained by the agreement. Imports from these countries did not require certificates of origin. For example, investigations revealed that Uganda and Tanzania exported through the Port of Mombasa in Kenya, which was a non-member (Bates, 1997). Other African countries could increase their market shares beyond those allowed by their quotas by exporting under the certificates of origin of member countries that could not reach their quotas.

The situation for Cameroon was different. Cameroon often exported less than the quota accorded by the ICO. For the nine years of the ICO quota covered by our study period, Cameroon exported less than its quota seven times. For example, Cameroon's quotas and exports, respectively, of robusta coffee were: 1980/81, 82,380 tons and 73,743 tons; 1984/85, 87,900 tons and 72,282 tons; and 1988/89, 79,740 tons and 78,230 tons. It is important to note that the quantity of arabica coffee produced by Cameroon was so small that it was not included in the ICO quota. Cameroon therefore sold its arabica coffee freely on both member and nonmember markets. This study looks only at the export supply of robusta coffee.

It is also worth noting that cocoa and coffee smuggling in or out of Cameroon has never been a problem as in Ghana and other West African countries. Apart from Nigeria, none of Cameroon's neighbours is a serious exporter of cocoa or coffee. But the main cocoa and coffee producing regions in Cameroon are very far away from the Nigerian border. This is a natural impediment to smuggling between the two countries.

With respect to banana, the national market structure has been changing since 1960. Over this period, the increasing importance of banana as both a food crop and a non-traditional export led to the creation of the Banana Organization of Cameroon (OCB) in 1968. This state enterprise was in charge of introducing new banana varieties, guiding the small producers and defending the interests of Cameroonian producers; it also had

the monopoly on trading. During the period 1970–1985, banana production improved slightly, but this trend was reversed after 1986 as both production and exports dwindled. This declining performance led to the dissolution of the OCB by a presidential decree on 15 July 1987. The same year, another parastatal, the Cameroon Association of Banana Growers (ASSOBACAM), was created.

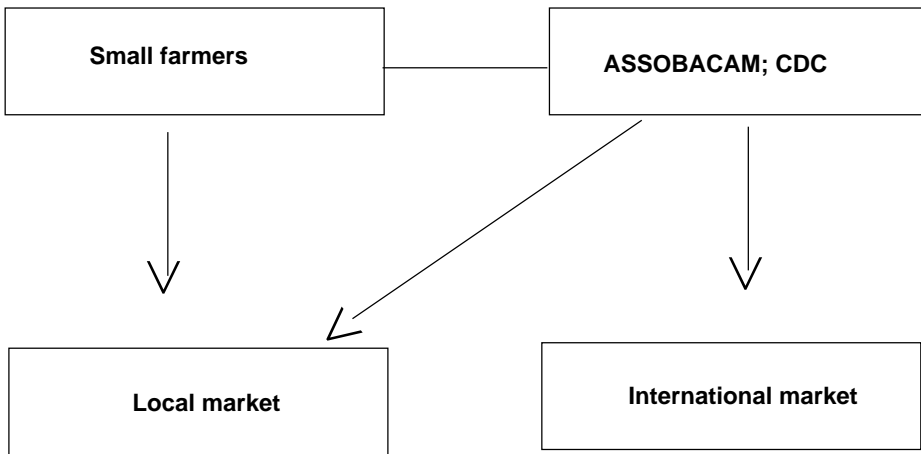
World marketing of banana is dominated by the long-running dispute (“the Banana War”) between the European Union (EU) and the United States and some Latin American countries. Since 1990, the EU has been the leading world importer of banana with about 3.7 million tons, followed by the US (2.85 million tons) and Japan (757,000 tons). According to the accords of the Lomé Convention linking African, Caribbean and Pacific (ACP) countries to the EU, the ACP banana exports still have preferential access (duty free) to the EU market under conditions intended to enable the ACP states to become more competitive both in their traditional markets and in other markets of the Union.

The US protested against this regime and announced retaliatory trade restrictions on a number of EU market products. So, the EU’s banana regime was examined by a World Trade Organization panel at the request of the US and a number of other countries. Following the panel ruling, the European Commission made a series of changes to the regime. As of July 1993 banana exports to the EU market are constrained by the quota system. The share of the Dollar Zone bananas is up to 2.7 million tons with 20% duty per ton. Beyond this volume, a prohibitive duty is imposed. The share coming from the ACP countries is around 857,700 tons (Marchés Tropicaux, 1184; 1999). These changes did not satisfy the Latin American producers.

Globally, this banana war negatively affects small producers like Cameroon, which often produces more than its allotted quantity. For example, Cameroon’s quotas and production, respectively, were: 162,500 tons and 180,000 tons in 1995 and 162,500 tons and 250,000 tons in 1996. This situation will be even more difficult if the end of the war is favourable to the Latin American producers. In this event, the EU market will be completely liberalized. Given the cost competitive advantage of the production of bananas in the Dollar Zone, ACP bananas will be driven out of the market. For example, the cost of a ton of banana is US\$245 in Latin America and US\$333 in ACP countries (Charles, 1996). This cost is even higher in Cameroon (US\$354) and the Caribbean (US\$548) (Charles, 1996).

In Cameroon, the export of banana is largely controlled by two parastatals, the Cameroon Association of Banana Growers (ASSOBACAM) and the Cameroon Development Corporation (CDC). Small farmers supply only the local market.

The local and foreign markets are therefore distinct in terms of suppliers. The fact that banana production exceeded exports in 1995/96 by more than 81,000 tons can be justified by the quota system. It also suggests that some of the banana companies do turn to the local market. This is especially the case since no stock holdings are possible for banana (a perishable crop). Also, some of the banana from the small farmers might be reaching the export market, as banana export exceeds production in some years. Figure A3 in the Appendix shows that for almost the whole study period, banana production nearly equalled export. The marketing channel of banana is shown in Figure 3.

Figure 3: The banana marketing channel

It is important to note that most Cameroon banana is exported to the European Union.

4. A selective literature review

Over the past few decades, exports of agricultural products have played a pivotal role in the economic growth of many developing countries. However, the economic crisis of the mid-1980s disrupted the positive trend of foreign exchange earnings derived from these crops. In this respect, policies to increase these earnings have often been used as instruments to deal with debt, balance of payments, budget deficits and import capacity difficulties and to recover sustainable economic growth. Our study is in line with this preoccupation and this section surveys some theoretical and empirical issues relevant to these core questions.

Theoretical aspects

The increasing popularity of the policy of openness to the external world—or more specifically the impact of international trade on the development process—has led to numerous theoretical and empirical studies. Though the direction of causality between economic growth and export earnings remains controversial, there is a relatively strong positive correlation between export and real income growth across the SSA countries (Svedberg, 1991). Export orientation has been credited for the phenomenal economic transformations of the East Asian economies over the last thirty years or so, as well as for more recent remarkable economic successes in other regions, such as Chile (Elbadawi, 1998). Balassa (1990) and Edwards (1993) postulated that there was agreement among a large segment of the economics profession that countries that have relied on outward-oriented development strategies have done better over the medium and long run than the inward-looking ones. For an agriculture based economy like Cameroon's, an outward-oriented development strategy implies development of the traditional agricultural exports and diversification into non-traditional exports of different price elasticities. To fulfill this preoccupation, however, active policies aimed at boosting export performance are necessary. In this respect it becomes important to determine and measure the factors that condition a country's exports.

For most developing countries, exports essentially comprise primary agricultural products. The terms of trade of these products in the world market after World War II created an atmosphere of export pessimism that characterized the thinking of most influential development economists and policy makers in the developing nations. According to the pioneers of that pessimist school of thought, the absorptive capacity of foreign markets was too low to accommodate imports from developing countries on a sufficient scale as these nations accelerated their development. Therefore, export

pessimism explicitly meant “elasticity” pessimism. Other arguments supporting this way of thinking were related to the fact that the export performance of developing countries (growth rate of world trade in primary products) depended on the growth rate of industrial production in the developed countries.

Other authors have shown that such stable relationships (which suggest the exclusive dominance of demand in determining trade performance) do not characterize the export experience of developing countries in the postwar period. Rather, it should be explained by domestic incentives (or supply) more than by external (or demand) conditions. However, the economic crisis of the 1980s, the sluggish world economy and the continuing depression of primary product prices revived export pessimism.

The foregoing demonstration is reasonable in the case of developing countries taken as a group, but it carries far less intuitive appeal in the case of an individual country. According to Thomas and Nash (1991), it is less likely that the price elasticity of demand for the primary exports for any individual economy will be less than 1. Consequently, when a single country that is not a dominant supplier increases its agricultural exports, these may be absorbed with no measurable fall in the market price and the country will increase its export earnings. So, a small supplier of primary products in the world market faces an infinitely elastic foreign demand for the crops it produces, and for which changes in foreign demand influence exports only through changes in world prices. In this respect, the increase of exports of primary agricultural commodities becomes the main focus for most non-oil developing countries and a way of assuring a harmonious transition towards industrialization.

Empirical review

The agricultural export supply responsiveness is so important that numerous empirical studies have focused on this question over the last two decades or so. The virtually unanimous conclusion of the studies that have investigated the determinants of export supply of agricultural commodities is that exports in least developed countries (LDCs) are more responsive to price variables (Balassa, 1990; Tshibaka,1997; Gerrard et al., 1994). Price factors are therefore crucial in stimulating agricultural exports.

Studies of international trade flows regularly concentrate on the formulation and estimation of demand relationships for imports and exports. Supply relationships have typically been handled by assumption, the usual practice being to assume that the export and import supply price elasticities facing any individual country are infinite. As noted above, while this assumption may apply in the case of the world supply of imports to a single country, it is less plausible when applied to the supply of exports of an individual country. This means that unless idle capacity exists in the export sector, or more generally, unless export production is subject to constant or increasing returns to scale, it is unlikely that an increase in the world demand for a country’s exports can be satisfied without any increase in the producer’s price (at least in the short run). This situation has motivated us to initiate the present work in the context of Cameroon.

Empirical works on the determinants of export growth of agricultural products have

taken different approaches. These are studies that have used various models to explain the causality or the dynamic adjustment between the behaviour of some exogenous and endogenous variables, and the export growth in an economy or in a group of countries. They can be divided into two categories. The first comprises studies that have modelled export supply of agricultural commodities in Cameroon, and the second deals with works done out of the country.

In Cameroon, there are two studies of agricultural export behaviour: Amin (1996) and Tshibaka (1997). Amin estimates the effects of exchange rate policies on prices of export crops and on Cameroon's agricultural export competitiveness. After calculating the nominal protection coefficient (NPC) and the nominal protection rates (NPR) for the crops considered (cocoa, coffee), and estimating the real exchange rate (RER) and the extent of the over-valuation, Amin reached the following conclusions: the agricultural sector is heavily taxed through a high level of intervention and over-valuation. The levels of real over-valuation are quite high, up to 77%, and estimates show that a 10% depreciation of RER stimulates about 1.0% increase of cocoa relative to the price of tradeables. Amin also specified three agricultural export models related to cocoa (X_{co}), coffee (X_{cf}) and aggregate agricultural export (X_{ax}). The cocoa model was as follows:

$$X_{co} = X(X_{co-1}, P_{co} / P_n, P_{co} / P_{na}, Y_{tp}) \quad (1)$$

where P_{co} is the price of cocoa export, P_n the price of non-tradeable, P_{na} the price of non-agricultural products, and Y_{tp} a weighted income of major Cameroon trading partners.

Amin extended the same specification to other products, and the results from the OLS estimation showed that overall the variables were not statistically significant at the 5% level, although they had the right signs. The response of cocoa and coffee to foreign income was fairly elastic for cocoa and fairly inelastic for coffee.

For a better performance of the agricultural sector and the economy as a whole, the author recommended the removal of government interventions and an examination of the question of depreciation of the RER. This last point should include looking at major agricultural constraints, particularly the factors that have reduced agricultural exports. Our study comes to fulfill this preoccupation.

The second study (Tshibaka, 1998) addresses the effects of external shocks and domestic sectoral and macroeconomic policies on the structure of price incentives of major agricultural export commodities and their repercussions on output and producer income. It concludes that during the period 1971–1993, Cameroon's export commodities faced a very unfavourable world market environment as their real world terms of trade declined at an average rate of 3.1% per year. The domestic sectoral and commodity specific policies that prevailed during this period were also detrimental to the export crop subsector. Finally, the real exchange rate decreased at an average annual rate of 3.9%, suggesting an appreciation of the CFA franc. The analysis has also shown that external factors have been the leading cause of the observed fall in the overall level of export earnings and real producer income in Cameroon.

In contrast to the preceding orientation, our work intends to combine price and non-

price factors to explain the behaviour of agricultural export crops. This question is relevant in that it allows us to know the influence of each factor in explaining the changes in exports. The quantitative measurements will permit us to establish where government leverage is likely to be greatest in order to reverse the downward trend of agricultural export earnings observed during the last decade. To our knowledge this type of study has not yet been undertaken in Cameroon.

Out of Cameroon, many studies have investigated the performance of the agricultural sector generally and that of export crops in particular during the last two and a half decades. In Ghana, Uganda and Nigeria, quantitative measurements have been undertaken on agricultural export performance (Fosu, 1992; Adubi and Okunmadewa, 1996; Kwanashie et al., 1997). In most of these works, the model proposed allows for the estimation of a long-run response function for exports. This approach is based on a linear regression form:

$$X_t = X(X_{t-1}, Q_t, W_t, P_x/P_f, P_x/P_n, Y_t, U_t) \quad (2)$$

where X_t denotes the export volume of the crop under consideration, Q_t the productive capacity of the crop industry and W_t the weather. P_x/P_f denotes the crop producer price relative to the food price, and P_x/P_n the crop price relative to the non-agricultural price. Y_t is the trade weighted income of the county's trading partners and U_t a stochastic error term satisfying the normal classical regression assumptions.

Before estimating the aggregate and individual agricultural export supply, Fosu (1992) noted that the real exchange rate (RER) of a domestic currency does not influence the economy's agricultural exports directly; instead, it influences agricultural exports through its effects on the incentive structure. In total, four agricultural export functions were estimated using the ordinary least squares method. First is an aggregate real agricultural export function, followed by cocoa, coffee and sheanut export equations. At the 5% level, the lagged export variable turned out to be the only significant variable in the aggregate model. The cocoa base capacity (Q_t), cocoa to food price ratio (P_x/P_f) and the trend term are statistically significant. The coffee to food price ratio and the foreign income are significant, but the negative sign of the response of the latter implies that contrary to expectation, an increase in foreign income tends to precipitate falls in the volume of coffee and cocoa exports. A 10% increase in Y_t tends to generate a 13.73% fall in the volume of coffee exports in Ghana.

With respect to real exchange rate, the inelasticity of agricultural export response to changes in this variable implies that large changes may be needed to stimulate increases in agricultural exports. In contrast to findings by Amin (1996), this author concluded that relying only on changes in the RER to stimulate increased agricultural exports is not feasible. For example, a 10% depreciation (appreciation) of the RER stimulates a 1.8% and 4.42% increase (decrease) in cocoa and coffee export volumes, respectively. Therefore, there is a need to complement RER policy with non-price policies to improve the farm level infrastructure for efficient handling of agriculture export commodities, and to enhance export procedures. With respect to Nigeria, Uganda and other countries, Adubi

and Okunmadewa (1996), Kyle and Swinnen (1994), Donges and Riedel (1977), Elbadawi (1998), and Kwanashie et al. (1997) showed large significant influence of RER on agricultural exports. But the first authors demonstrated that the exchange rate's volatility has a stronger negative effect on exports in Nigeria.

Lukonga (1994) examined the factors underlying the past performance of Nigeria's non-oil exports. OLS estimation procedures were used to obtain estimates for three commodities, cocoa, palm kernel and rubber. Cocoa yielded statistically significant price elasticities with the expected sign, indicating that the commodity responds positively to changes in relative prices. Overall, the results provided evidence of and support for the usefulness of pricing policy in eliciting export supply, denoted a weak relationship between agricultural output and export trends, supported the view that domestic market conditions strongly influenced export behaviour, and denoted poor performance with regard to lagged exports. This last finding, supported by Mundlak and Larson (1992), contrasts markedly with the results of many other recent works on agricultural exports. Islam and Subramanian (1989) emphasize the relatively insignificant role of price compared with non-price factors in explaining export supply. In Côte d'Ivoire, Trivedi and Akiyama's (1992) findings in evaluating pricing policies for perennial crops vary across commodities. While coffee is highly sensitive to price factors, cocoa is less price sensitive.

Many studies found the income elasticity of demand to be low for agricultural exports. Islam and Subramanian (1989) stress that for tropical traditional commodities, the income and price elasticities of demand are low and almost certainly less than unity. Ghura and Grennes (1994), however, found that primary exports are responsive to world real income. According to these authors, the impact of a 1% increase in OECD real income growth is to increase primary export demand by 1.6%, implying that a world recession has the potential to disrupt export growth, thus lowering economic growth in SSA. This view is supported by other works (Love, 1982; Donges and Riedel, 1977; Balassa, 1990).

A number of studies also analysed the International Coffee Organization (ICO) impact on world coffee quantities and prices. In this line, Bates (1997) found that under the ICO quota system, price levels and export earnings were higher than without quotas. While the quota system had a stabilizing effect on world prices, it reduced real export earnings for most small exporting countries, and large producers gained. Most small economies gained only in terms of reduced variability of export income. Unlike Bates (1997), Bohman and Jarvis (1998) reached the conclusion that the ICO quota for Brazil lowered the domestic price of coffee and harmed farmers in Brazil. The quota required this country to reduce its exports, thus moving farmers down their supply curve.

Finally, there is a series of relevant studies dealing with exports, although not necessarily agricultural exports, that it is important to review. These works start with the motivation of assessing two crucial empirical issues involved in the debate on the role of international trade: Is export performance responsive to government's promotional efforts? Is a lack of demand the ultimate obstacle to the expansion of manufactured and agricultural exports in LDCs? Although both questions have been extensively discussed in the literature, few attempts have been made to assess them empirically.

The evidence surveyed in a sample of 12 developing countries¹ with respect to manufactured exports provides answers to the first question raised above. Economic

policy does appear to be effective in stimulating export expansion and diversification in LDCs (Donges and Riedel, 1977). When market parameters are distorted, as they often are in developing countries, the government must take the initiative to provide proper incentives if the gains from trade are to be realized (Ghura and Grennes, 1994; Love, 1982; Kyle and Swinnen, 1994; Goldstein and Khan, 1978; Browne, 1982). These results are confirmed in Nigeria in the case of agricultural exports between 1970 and 1990. During this period, the restrictive policies of the government adversely affected the export performance of agricultural products (Lukonga, 1994). The pervasive interventions of governments in LDCs either directly or indirectly through import protection have been recognized to be the most important constraint to the expansion of exports in general and agricultural exports in particular (Bohman and Jarvis, 1998; Njinkeu, 1996; Sahn and Van Frausum, 1994; Clements and Sjaastad, 1984).

It is owing to the indirect effects that the performance of many highly protected economies has been uninspiring. They have responded very poorly to the shocks of recent years (wide fluctuations in commodity markets, the two oil-price shocks, high real rate of interest, etc.) (Clements and Sjaastad, 1984). The estimates by these authors of the proportion of protection paid by exporters indicate that between 50 and 60% of nominal protection in Chile, Uruguay and Argentina is shifted onto exporters. For El Salvador, Australia and Brazil, the figure rises to 70% and to over 90% in the case of Colombia. In the context of Cameroon, Njinkeu (1996) demonstrated that from the shift parameter, 27% and 64% of the burden of trade policy is borne by the country's exportable sector in the short and long run, respectively. According to him, the poor performance of the agricultural sector during the last two decades is partly explained by the implicit tax resulting from protection of import-substituting sectors. The same results are found in Bond (1985), Love (1982), Svedberg (1991), and Islam and Subramanian (1989), but the study of Bond (1985) dealing with groups of non-oil developing countries emphasizes the importance of foreign demand for agricultural exports.

As was the case with those studies treating agricultural export supply in Cameroon, the works reviewed above still differ from ours.

5. Methodology

This study, as discussed earlier, assesses the determinants of Cameroon's agricultural export crops. Export supply functions are specified and estimated for the three export crops chosen for this study: cocoa, coffee and banana.

Model specification and explanation of variables

The export supply models for the various crops are modelled following from Goldstein and Khan (1978), Bond (1985), Islam and Subramanian (1989), and Lukonga (1994).

Coffee

The export supply function of coffee is specified implicitly as follows:

$$X_t^s = f(RPP_{t-3}, RPX_t, XC_t, RNF_t, X_{t-1}^s, RD_t, DTD_t, DPF_t, DICA_t) \quad (3)$$

Where:

- XS = is export supply measured in tons
- RPP = the ratio of the producer price to the domestic price index
- RPX = the ratio of the export price to the producer price
- XC = agricultural export credit
- RNF = average annual rainfall in millimetres
- RD = classified road network
- DTD = dummy variable for deregulation of both domestic and export marketing activities, which takes the value of 0 for years prior to deregulation and 1 for years thereafter
- DPF = dummy variable for abandonment of producer price fixing, which takes the value of 0 for period of price fixing, and 1 afterwards
- DICA = dummy variable for ICA quotas that takes the value of 0 for years when quotas were not in force and 1 for years of ICA quotas

RPP tries to model the behaviour of the coffee farmers. It is given as the ratio of the producer price (in local currency) to a measure of the domestic price index, which is proxied here by the consumer price index (CPI). This domestic price index is intended to

reflect changes in the cost of producing the export crop. If this cost increases in relation to what the farmer gets for selling the crop, the profitability of producing the export crop will fall. Also, given that the resources used in the production of export crops can equally be used for other purposes, the relative profitability of producing export crops falls with an increase in domestic prices. This relative price term is lagged thrice to reflect the lag in adjustment of export supply to changes in producer prices. The three lags indicate the three-year gestation period for coffee. Lukonga (1994) did a similar specification, though lagging prices by only one period. We expect a positive relationship between export supply and the relative producer price variable. It is possible that delayed payments to farmers acted as a disincentive to production. Unfortunately, we do not have data to include this in our empirical analysis.

The second price variable (*RPX*) measures the behaviour of exporters. It is expressed as a ratio of the export price and what is paid to farmers (the producer price). The price paid to producers represents a cost to exporters. If this cost increases in relation to the export price, it becomes less profitable to export. If it is the export price that increases more than the producer price, more will be put on the market. We expect a positive coefficient.

In this coffee export supply model, we treat both relative price terms as exogenous. First, the price received by farmers for their coffee was fixed by the state. Second, Cameroon's share in the world market of coffee is not sufficiently large to influence world prices. As mentioned above, Cameroon maintained an average of about 2.8% (*FAO Trade Yearbooks*) of the world coffee market and is therefore a price-taker, so the "small country" assumption holds for Cameroon's coffee exports.

Export credits (*XC*) are understood to be an important variable explaining export supply. Nearing the end of each crop season, special credits are put at the disposal of exporters to enable them to buy the coffee and cocoa crop from the farmers. This has been an important component of government policy to promote the export of primary products. The credits were essentially loans given on preferential terms. Even though export credits represented about 1.7% of GDP (on average), they were believed to be quite useful. It should equally be noted that there was an opportunity cost for these preferential loans, as other sectors of the economy were deprived of such privileges. The coefficient of *XC* is expected to be positive because the larger the magnitude of credits disbursed, the greater the possibility of increased export volume.

The road infrastructure variable (*RD*) tries to measure the effect the "classified" road network has on the performance of agricultural exports. In Cameroon, the government divides the road network into classified and non-classified. The classified network is made of both paved and unpaved roads. The government pays more attention to these roads, and even the unpaved are practicable for a larger part of the year. An increase in the network of classified roads should have a positive effect on crop transportation to the port of exit. We expect a positive relationship in that more classified roads should facilitate export supply. It should be noted, however, that the road network does vary every year, but the poor state of the network makes us believe that even small changes can affect export supply.

Agriculture in Cameroon is essentially rainfed (*RNF*), especially in the southern part

of the country where the crops considered in this study are cultivated. Apart from crops like banana and pineapples, which are irrigated during the dry season, low production has partly been associated with drought years. Export supply is then expected to be positively influenced by rainfall.

A one-period lag of export supply (X_{t-1}) has been included as a regressor in the export supply function. This assumes some lags in export supply adjustment (Goldstein and Khan, 1978; Lukonga, 1994). A positive coefficient is expected.

We use two dummy variables to assess the impact of the Marketing Board on the export supply of coffee and cocoa. The first dummy variable (DTD) is meant to capture the effect of the deregulation of domestic and export marketing activities in the cocoa and coffee subsectors in 1990. The second dummy (DPF) tries to capture the impact of the abandonment of the fixing of producer prices in 1994 by government institutions. These policy changes were under the general framework of the structural adjustment programme (SAP) adopted by Cameroon in 1988. They were both intended to liberalize trade in these crops so as to increase output and export, and equally to allow a better remuneration for those involved in the subsectors, especially farmers. Both DTD and DPF are expected to positively influence export supply.

Another dummy variable ($DICA$) is also included to capture the effect of the International Coffee Agreement (ICA) quota regime, which constrained coffee export with the objective of stabilizing coffee prices. As mentioned above, ICA quotas started in 1963 and ended in 1989, with suspensions in 1972 and 1987. The ICA dummy is expected to have a negative coefficient showing how the quotas constrained Cameroon's exports.

The dummy variables as introduced in Equation 3 are intended to capture only shifts in the intercept of the function. But since there is no strong reason for assuming only a shift in the intercept and no slope change, we introduce dummy interaction terms to allow for a shift in the slope of the coffee export supply function as well. Three interactive terms formed by combining the relative price variables with the dummies are tried: $RPP*DTD$, $RPP*DPF$ and $RPX*DICA$. The first two terms link the relative producer price with two dummies that largely reflect the internal coffee subsector. The third term links the relative export price with the international coffee market dummy.

Cocoa

The export supply model for cocoa is specified as follows:

$$X_t^s = f(RPP_{t-3}, RPX_t, XC_t, RNF_t, X_{t-1}^s, RD_t, DTD_t, DPF_t, DICCA_t) \quad (4)$$

where:

$DICCA$ = dummy variable for ICCA buffer stocks, which takes the value of 0 for years when buffer stocks were not constituted and 1 for years of buffer stocks

The other variables apply as above.

As under the coffee model, the relative price terms for cocoa are expected to have similar effects on the export supply of cocoa. *RPP* is lagged three periods to take care of export supply adjustments to producer prices, depending on the gestation period of the cocoa, which is three years. Here, we equally make the “small country” assumption, as Cameroon’s cocoa exports were not large enough to influence world prices, with an average market share of about 5.5% (*FAO Trade Yearbooks*). The relative price variables are therefore treated as exogenous in the cocoa model.

The International Cocoa Agreement dummy (*ICCA*) tries to capture the effects of the buffer stocks constituted by the International Cocoa Organization (ICCO) in its attempt to stabilize cocoa prices. This dummy is used because we have not been able to get data on the actual buffer stocks. This implies that the dummy will certainly not tell the whole story. The ICCO started buying cocoa from members to constitute the buffer stock in 1980/81. This went on until 1987/88. The buffer stock did not constrain export supply of cocoa, as was the case with the ICA coffee quotas. Any excess supply in the market was bought by the ICCO. We therefore expect a positive relationship between the dummy and the export supply of cocoa.

The other variables in the cocoa export supply model play the same roles as in the coffee model. Cocoa and coffee are the main export crops in Cameroon and the government has usually applied similar policies to the two crops. This is the case for the following variables: *XC*, *DTD*, *DPF*, *RD* and *RNF*. We equally introduce dummy interactive terms to allow for shifts of the slope of the cocoa export supply function as was done above for coffee.

Banana

The export supply model for banana is specified as follows:

$$X_t^s = f(RPX_{t-1}, X_{t-1}^s, RD_t, XC_t, RNF_t, DRES_t, DBM) \quad (5)$$

where,

DRES = dummy variable for the restructuring of the banana subsector. It takes the value of 0 before restructuring and 1 thereafter.

DBM = dummy variable representing years of the quota system imposed on ACP bananas entering the European Union. It takes the value of 0 before the institution of the quota and 1 thereafter.

All the other variables are defined as above.

The relative price term is lagged by one period, indicating that export supply takes one year to respond to any increases in export price. That is a year’s gestation period for banana. The “small country” assumption also applies to the export of banana; Cameroon’s share of the market according to FAO statistics is just around 1%, implying that Cameroon cannot influence the export price of banana, which is thus treated as an exogenous variable.

The first dummy variable (*DRES*) is expected to pick up restructuring of the banana subsector in 1988. This involved the dissolution of the parastatal OCB, which hitherto oversaw both production and especially export marketing activities of Cameroonian banana. This restructuring, which removed the state monopoly in the subsector, raised output from 37,974 tons in 1988 to 250,000 tons in 1996. We thus expect a positive coefficient for restructuring.

The other dummy (*DBM*) variable in the banana export supply function tries to take into consideration the functioning of the international banana market. Starting from 1993, ACP countries (including Cameroon), were allotted export quotas to their traditional banana market, which is the European Union. This followed the decision of the Council of the European Community to institute a single system of importing banana in place of the 12 different import regimes that had existed before. Non-ACP banana (especially that from Latin America) also had quotas, but had to pay a duty, unlike the ACP countries. We expect this variable to have a negative effect on export supply since Cameroon was forced to export less than its export capacity. For instance, Cameroon's quota in 1995 was 162,500 tons, while the exportable output was 186,500.

The effect of the other variables on export supply of banana is the same as for cocoa and coffee. The following interactive terms are introduced so to allow for shift in the slope of the banana export supply function: *RPX*DRES* and *RPX*DBM*.

Estimation technique

In this subsection, we examine the time series characteristics of the variables to be modelled, testing for stationarity and cointegration of the variables in all the equations under consideration.

Unit root tests

We need to know the underlying process that generates our time series variables: that is, whether the variables are stationary or non-stationary. Non-stationary variables might lead to spurious regressions. In this case the results may suggest statistically significant relationships between the variables in the model, when in fact this is just evidence of contemporaneous correlation. We have used the Augmented Dickey–Fuller (ADF) and the Phillips–Perron (PP) tests to examine our variables for the presence of a unit root.

The ADF test assumes that the data generating process is autoregressive to the first order. This is done so that the autocorrelation in the error term does not bias the test. The ADF includes first-difference lags in such a way that the error term is distributed as a white noise. The test is formulated as follows:

$$\Delta y_t = \alpha + \rho y_{t-1} + \sum \gamma_j \Delta y_{t-j} + \varepsilon_t \quad (6)$$

A unit root test implies testing the significance of P against the null that $P = 0$.

The Phillips–Perron (PP) test on its part addresses the problem of the unknown structure of the data generating process under the null hypothesis by adjusting the t-statistic for the potential omitted variable bias ex post. The PP test is formulated as follows:

$$\Delta y = \beta + \rho y_{t-1} + \mu_t \quad (7)$$

To test for a unit root, Equation 7 is estimated by OLS and the t-statistic of P is corrected for serial correlation. If the results of the unit root tests show that the variables are not stationary in their levels, we proceed with a cointegration analysis.

Cointegration analysis

In a regression involving non-stationary variables, spuriousness can only be avoided if a stationary cointegrating relationship is established between the variables. Therefore, if two or more variables can be linked together to form an equilibrium relationship spanning the long run, then even though the variables themselves may contain stochastic trends, they will nevertheless move closer over time and the difference between them will be stable. To test for cointegration in this paper, we run our regressions and use the ADF and the PP unit roots test to test for the stationarity of the residuals. If the residuals are stationary, then we conclude for cointegration of series used in the model (Adam, 1993; Perman, 1989).

Sources of data

The data used in this study came from various sources. The main data source was the Department of Statistics and National Accounts. Information was obtained from the following documents the Department publishes:

- Cameroon in Figures
- Annual Statistical Reports
- National Accounts documents

Other sources included the Cocoa and Coffee Board (which holds the archives of the defunct National Produce Marketing Board), the Departments of Statistics and Agricultural Surveys of the Ministry of Agriculture, and ASSOBACAM (data on banana). The National Meteorological Department provided information on the weather. Supplementary data were obtained from publications of the Bank of Central African States (BEAC), the World Bank, the International Monetary Fund, *FAO Trade Yearbooks* and the UNCTAD *Monthly Bulletin of Trade Statistics*.

6. Empirical results

The presentation begins with the results of the unit root tests and includes the cointegration tests and the regressions.

Unit root test results

Table 2 reports the results of the ADF and the PP tests for the order of integration of our variables.

Table 2: Unit root test statistics

Variables	Levels		First difference	
	ADF	PP	ADF	PP
$\log(X_{cc}^s)$	-1.1488	-2.5930	-3.6517	-8.7668
$\log(X_{cf}^s)$	-2.6336	-4.3443	-4.9999	————
$\log(X_{bn}^s)$	-1.4193	-0.7676	-3.4709	-3.1008
$\log(RPP_{cc})$	-0.9930	-0.9901	-3.2851	-3.9593
$\log(RPP_{cf})$	-1.9329	-1.8425	-3.1106	-3.7306
$\log(RPX_{cc})$	-1.5225	-1.7264	-3.6844	-5.8765
$\log(RPX_{cf})$	-2.2563	-2.4160	-4.2812	-4.0793
$\log(RPX_{bn})$	-2.3771	-1.9637	-5.1700	-4.8126
$\log(RNF_{cc})$	-4.5223	-4.3703	————	————
$\log(RNF_{cf})$	-3.4864	-4.0473	————	————
$\log(RNF_{bn})$	-4.7941	-4.5594	————	————
$\log(XC)$	-1.8832	-1.7027	-3.0877	-2.7075
$\log(RD)$	-4.5512	-7.0538	————	————

Note: The subscripts cc, cf and bn refer to cocoa, coffee and banana, respectively. The variables are as defined in the equations above. The critical values at the 1.5 and 10% levels are: ADF (-3.7497, -2.9969, -2.6381) and PP (-3.7343, -2.9907, -2.6348).

After comparing the ADF and PP statistics in Table 2 with the Mackinnon critical values provided by the *Eviews* econometric package, we came out with the following conclusions concerning the unit root tests. Most of the variables are not stationary in their levels, implying the non-rejection of the null hypothesis of non-stationarity. But they all become stationary in their first differences. This means that they have only a single unit root. A number of variables (X_{cp}^s , RNF_{cc} , RFN_{cp} , RFN_{bn} , RD) are stationary in their levels. We cannot therefore specify the export supply models in their levels without the risk of obtaining spurious regressions unless they are cointegrated. It is therefore necessary to carry out a cointegration test.

Cointegration test results

As described above, we ran our regressions and tested the residuals for the presence of unit roots. The results as presented in Table 3 for the export supply functions of the three crops reject the null hypothesis of no cointegration. The ADF and PP statistics presented in Table 3 are significant for all the crops.

Table 3: Results of cointegration tests

Crop	ADF	PP
Cocoa	-4.2708	-3.9280
Coffee	-4.7685	-5.9261
Banana	-4.0620	-6.1015

Regression results

We used the ordinary least squares estimation procedure to obtain the export supply determinants of the three crops under study: coffee, cocoa and banana. The results of these estimates are presented in Table 4.

These results meet our expectations in terms of their signs, as all of them have the expected signs. This is not the case with their levels of significance. The dummy interactive terms, which were introduced in the functions to allow for slope shifts, were not significant and made the results worse.

The relative price terms have the right signs for all the crops. The producer price appears to be important in determining export supply, as its coefficient is significant in both the cocoa and coffee supply functions. In contrast, the relative export price has no significant effect on the export supply of the two crops. This implies that it is what farmers get for their crops, and not exporters, that determines the amount of each crop that is exported. Cocoa and coffee export supply responds to changes in relative producer prices, with a lag of three years.

Table 4: Export supply functions of the different crops (quantity exported as the dependent variable)

Variables	Cocoa	Coffee	Banana
Constant	3.01** (2.65)	2.33 (0.91)	8.60** (2.67)
Log(RPP ₍₋₃₎)	0.48* (3.02)	0.62** (2.59)	-----
Log(RPX)	0.14 (1.69)	0.32 (1.54)	-----
Log(RPX ₍₋₁₎)	-----	-----	0.43*** (1.79)
Log(RD)	0.19*** (1.97)	0.42** (2.38)	0.32 (1.39)
Log(XC)	0.73*** (1.80)	(0.32)* (3.16)	0.20* (1.88)
Log(X ₍₋₁₎)	0.12 (0.72)	0.19 (1.01)	0.59* (3.73)
log(RNF)	0.18*** (1.90)	0.24*** (1.89)	0.21 (1.38)
DTD	0.40*** (1.99)	0.44*** (1.99)	-----
DPF	0.13 (1.03)	-0.25 (-0.75)	-----
DRES	-----	-----	0.37* (3.08)
DICCA	0.25** (2.80)	-----	-----
DICA	-----	-0.13 (-1.64)	-----
DBM	-----	-----	-0.22 (-1.43)
R-squared	0.74	0.72	0.94
Adj. R-squared	0.66	0.58	0.92
LM Statistic	1.41	1.26	1.31
F- statistic	6.44*	4.45**	39.36*

Note: t-statistics are in parentheses. *, ** and *** imply significance at the 1, 5 and 10% levels, respectively.

The first and second lags did not produce the expected results despite the fact that harvested output can also depend on fertilizing, care and the scrutiny of harvesting procedure. Banana export supply responds significantly to changes in the relative export prices,² but with a one-year lag. The price elasticities of all the crops are less than unity, implying a limited response of export supply to relative price changes, which can be attributed to the price constraining nature of the international markets for these crops. The roles of the International Coffee Organization, International Cocoa Organization and the ACP–EU conventions for coffee, cocoa and banana, respectively, reduced the role of the price mechanism in determining prices in these markets. Lukonga (1994) obtained more significant estimates for cocoa and rubber in Nigeria, though the coefficient of palm kernel was non-significant and negative.

The variable representing the influence of the road network on export supply (*RD*) has the expected sign for all the crops but is significant only for cocoa and coffee. Cocoa and coffee are cultivated in the hinterland where the road infrastructure is poorly developed. In the rainy season, this poses a serious problem to the transport of these products to the port of exit in Douala. Any improvement in the road network (increase in the number of classified roads) therefore has a positive effect on the export supply of these crops. In contrast, most banana plantations are less than 100 kms from Douala and most of the roads around this area are paved. This may explain why changes in the nature of the road network do not significantly affect the export supply of banana. But as the drive to increase the output of this crop continues, more plantations will have to be opened far from Douala. This implies that the state of the road network will become an important factor for banana as well.

Export credits appear to have a significant and positive influence on the export supply of all the crops, although with inelastic coefficients, underscoring the importance of export credits to export supply. This variable might not play a similar role today with the liberalization of the banking sector, since exporters of these agricultural crops no longer benefit from loans on preferential terms from government institutions. But it is not ruled out that most of the exporters still negotiate for loans on good terms since most of their borrowing is for a short term, normally less than a year.

The elasticity of lagged exports has the expected sign, but is significant only for banana. This implies a low degree of dynamic adjustment of lagged export to export supply of cocoa and coffee. Following from Goldstein and Khan (1978), we obtain the average time lag for adjustments of exports to changes in the independent variables³ as 1.14, 1.23 and 2.44 years for cocoa, coffee and banana, respectively. Lukonga (1994: 14) obtained 1.38 years for cocoa and 1.61 for palm kernel in Nigeria.

Cocoa and coffee depend almost entirely on rainfall (*RNF*) for their growth. This is not the same situation with banana, where the big firms use more sophisticated means (many use computers) to monitor the level of water in the soil. They dig trenches to enable the soil to release excess water and use giant pumps for irrigation when the water level in the soil is low (especially in the dry season). It is therefore not surprising that while cocoa and coffee are significantly influenced by rainfall, banana production is not.

Three dummy variables represent specific policy changes implemented in the framework of the structural adjustment programme. The dummy for the deregulation

(*DTD*) of domestic and export marketing of cocoa and coffee is significant. This is not the same result for the dummy representing abandonment of producer price fixing (*DPF*). None of the coefficients are significant for cocoa and coffee. This can be attributed to the fact that our study includes only three years (1994 to 1996) of market-determined prices. During this period, the system was still not well understood by market participants after the many years of price imposition by the government. The dummy for the restructuring of the banana subsector (*DRES*) is significant at the 1% level. This implies that the restructuring had very far-reaching effects on production and consequently banana export. The expected removal of export taxes on coffee, cocoa and banana will add more impetus to the export performance of these crops. Fosu (1992), using *SAP* as an overall dummy, found it significant for coffee, but not for cocoa and sheanut. Using a similar method, Lukonga (1994) found significant results for cocoa and rubber in Nigeria, but not for palm kernel.

The functioning of the international markets of cocoa, coffee and banana has been measured by dummies: *DICCA*, *DICA* and *DBM*. The International Cocoa Agreement dummy had a positive and significant effect on cocoa export. This is understood in that the agreement led to the purchase of excess cocoa so as to prevent prices from falling below an agreed level. It did not constrain export supply. Members bore the cost of the buffer stock, however, as they had to be levied for the stock to be constituted. The International Coffee Agreement dummy, by contrast, is negative and not significant; we were expecting a significant relationship since the agreement imposed an export quota on all of its members, thus directly constraining export supply. This should have been even more true for Cameroon, which regularly exported more than its quota to the member market and also exported to the non-member markets but still had reasonable stocks at the end of the season. The dummy for the Cameroon banana export quota to the EU has the expected negative sign, but is not significant. This is despite the fact that Cameroon has been exporting less than its capacity to the EU, the main market.

Generally, the models performed well, especially as all but one of the coefficients had the expected signs. However, in terms of coefficient significance, some of our expectations were not met. The adjusted coefficients of determination show that the variables included succeeded in explaining at least 58% (adjusted R-squared) of the variation in export supply. This coefficient for banana was quite high (92%). Amin (1996) had an adjusted R-squared of 0.29 for cocoa and 0.19 for coffee in Cameroon. Our model therefore offers a better explanation of export supply in Cameroon. The F-statistics for the overall significance of the regressions are also significant. To test for serial correlation, we used the Breusch-Godfrey Lagrange Multiplier (LM) test (Maddala, 1988: 206–7) instead of the Durbin–Watson (DW) test. This is because the DW test is not applicable if explanatory variables contain lagged dependent variables, as is the case in this study. Also, the DW test is a test only for first-order serial correlation. The LM test is a general test, which overcomes all these obstacles. The LM statistics as given in Table 4 show that the null hypothesis of serial correlation has been rejected (judging from the probability values provided by *Eviews*), as none of the statistics are significantly different from zero.

7. Conclusion

This study attempted to assess the determinants of export supply of three agricultural crops in Cameroon: cocoa, coffee and banana. The rationale is that Cameroon, as a price-taker in the market of these crops, has only one way of increasing its export revenue and this is by increasing export supply. The results show that producer prices and not export prices are quite important in driving the export supply of cocoa and coffee. It is only for banana that export prices are important (especially because of no producer prices). An improvement of the road infrastructure will have a positive effect on export supply. Equally, more credit to crop exporters will facilitate the purchase of the crops from the farmers and thus increase exports. The SAP dummies show a positive effect for the policies implemented: market deregulation, restructuring of productive activities and market-determined prices. Export supply is also driven by natural factors like rainfall in the case of cocoa and coffee.

The implications of this study are that any attempts to improve the export supply of agricultural crops in Cameroon should focus on the following: letting the farmers get a satisfactory reward for their efforts; making more credit available to exporters (this will increasingly be at the personal initiative of the exporters since the government is disengaging from the sector, and should not be too difficult since these are short-term loans); improving the road network so as to facilitate the transportation of crops to the port of exit; and continuing the liberalization of the agricultural export subsector.

As the export crops subsector gets completely liberalized, and the constraints of the international market are removed, prices are expected to play a more important role. Regarding the banana market in particular, Cameroon is at the moment already producing more than the quota allotted in the protected EU market. If the banana war leads to a loss of the privileges enjoyed by ACP countries on the EU market, then given the present situation, Cameroon banana will not be able to compete with that from Latin America, which is produced at a much lower cost (US\$245 per ton against US\$354 per ton for Cameroonian banana). The priority now seems to be to find ways to reduce the cost of banana production so as to be competitive. This should permit Cameroon to conquer new markets or to compete effectively in the traditional market (the EU) in case the banana war opens up this market for Latin American banana.

The implications are that the market prospects for banana are quite limited, despite its better prospects in terms of prices compared with those of cocoa and coffee. Cameroon is already producing more than its quota to the EU, and the present high cost of production does not facilitate the conquering of new markets. Cameroon therefore may still have to rely on cocoa and coffee in the short and medium term for the essential part of its agricultural export revenue.

Notes

1. See the complete list in Donges and Riedel (1977).
2. Banana exporters are equally the producers—the reason there is no producer price in the banana function. This is discussed in Section 5.
3. The average time lag is calculated as $(1-\beta)^{-1}$, where β is the elasticity of lagged export supply (Goldstein and Khan, 1978: 277)

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Appendix

Figure A1: Cocoa output and export in tons

Figure A2: Coffee output and export in tons

Figure A3: Banana output and export in tons

Figure A4: Evolution of international prices of cocoa, coffee and banana

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