KENYA'S ECONOMIC POLICY WITH RESPECT TO THE WORLD COFFEE MARKET

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ABSTRACT

Export earnings from coffee accounted for 22 to 55 per cent of total export earnings for the period 1964-1977 in Kenya. Hence coffee prices determine Kenya's terms of trade and available domestic resources to a very large extent. In 1977, domestic income increased as much as 13.5 per cent due to the coffee price boom.

Coffee prices are not only an important determinant of domestic income changes, but also of the balance of payments. It is estimated that a one per cent change in coffee prices will induce a devaluation effect which is equal to a 0.7 per cent change in the exchange rate. These figures indicate the crucial importance of the world coffee market for the Kenyan economy and show Kenya's interest in accurate predictions of world coffee prices. It is pointed out, however, that reliable forecasts are not at hand, as market conditions are not only influenced by economic factors but also by weather conditions and the storage policy of the main coffee exporters and importers.

International agreements may be seen as a device to stabilise the volatile world coffee market. Even if it is assumed that Kenya is a low-cost producer, the present international coffee quota system is favourable from Kenya's point of view. However, Kenya's situation could be improved still further if international tradable certificates for quotas were to be introduced.

An international buffer stock for coffee which has been under discussion since the middle of 1977 is generally favourable to Kenya. However, much depends on the level of national contributions to the funds. A proposal for calculating the magnitude of national contributions is worked out in this paper. It is questionable whether an international buffer stock for coffee will come into operation in the near future, but the Stabex system will be very favourable for Kenya in the short run.

Kenya's past coffee market policy did not promote the country's growth, income distribution, monetary stability or employment objectives as fully as possible. Future coffee market policy would be much more efficient if a variable export tax were introduced to compensate for the difference between the world market price and the domestic price. The domestic price would be set at a level just to guarantee the fulfilment of the national quota.

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INTRODUCTION

It is widely known that the world coffee market is extremely volatile and has severe effects on the Kenya economy. The aim of this paper is to give an idea of some quantified effects on the Kenyan economy which arise from changes on the world coffee market. After this, a short analysis of the causes of world coffee market fluctuations will be presented, as well as future prospects for the market. Third, policy strategies will be evaluated, starting with the international sphere and including domestic policy activities. Finally, an appraisal of Kenya's coffee marketing policy of the past few years will help to formulate policy recommendations for the future.

THE IMPORTANCE OF THE WORLD COFFEE MARKET FOR THE KENYAN ECONOMY

The importance of coffee production for the Kenyan economy may be highlighted by some global figures. According to Table 1, export earnings from coffee accounted for 22 to 55 per cent of total export earnings for the period 1964 - 1977. This makes coffee the dominant Kenyan export product. Annual changes in coffee export earnings are positive or negative due to changes in world market prices and domestic supply fluctuations, and the state of the coffee market is crucial for the domestic balance of payments situation as well as terms of trade and available domestic resources. Both world prices and domestic supply effects will be analysed in more detail in this paper.

It is obvious from the figures presented in Table 1 that coffee prices determine the terms of trade (export price-index divided by import price-index) to a large extent, due to the high share of total export earnings accounted for by coffee export earnings. However, this is not only an effect which shows up in national statistics, but it also has severe implications for available domestic resources and for domestic welfare. Indeed, it can easily be shown that changes in the GDP at constant prices (growth rate) is a very questionable welfare indicator if the terms of trade vary considerably over time. To show this, we start with the following equation:-

$$(1) \quad y = P\,q - P_\varepsilon\,q_\varepsilon + P_I\,q_I$$

where y = income available

P = price of total final domestic production

q = quantity of total final domestic production

P_ε = export price

q_ε = export quantity

P_I = import price

q_I = import quantity

From (1) follows for changes in GDP with constant p

(2) $dy = p.dq - dp_\varepsilon.q_\varepsilon - P_\varepsilon.dq_\varepsilon + dp_I.q_I + P_I.dq_I$

and for changes in income as a percentage of p.q (GDP)

(3) $$\frac{dy}{p.q} = \frac{dq}{q} - \frac{P_\varepsilon q_\varepsilon}{p.q}\left(\frac{dP_\varepsilon}{P_\varepsilon} + \frac{dq_\varepsilon}{q_\varepsilon}\right) + \frac{P_I\ q_I}{p.q}\left(\frac{dP_I}{P_I} + \frac{dq_I}{q_I}\right)$$

Equation (3) clearly shows that a relative change in the available domestic income is not only due to a relative change in total production ($\frac{dq}{q}$), but also to a change in the terms of trade and the amount of products exported or imported. The relationship between a change in the terms of trade and the corresponding relative change in income can easily be worked out if the quantities are assumed to be constant and only changes in prices are allowed in (3). If we further more assume an equilibrium balance of payments situation in the base period with $P_\varepsilon q_\varepsilon = P_I q_I$ and take into account that export price rises lead to an improvement in the domestic income situation and import price rises to a deterioration, we get

(4) $$\frac{dy}{y} = \frac{P_\varepsilon\ q_\varepsilon}{p.q}\left(\frac{dP_\varepsilon}{P_\varepsilon} - \frac{dP_I}{P_I}\right)$$

and as $\frac{P_\varepsilon}{P_I} = tot$ (tot = terms of trade)

we may write

(5) $$\frac{dv}{y} = \frac{P_\varepsilon\ q_\varepsilon}{p.q}\ \frac{d(tot)}{tot}$$

$\frac{P_\varepsilon q_\varepsilon}{pq}$ is total exports as a percentage of GDP; this came to 35 percent for the first half of 1977 in Kenya. This means that a 10 per cent change in Kenya's terms of trade will lead to a 3.5 per cent change in available domestic income. As coffee export earnings accounted for 19.2 per cent of GDP in the first half of 1977, we can conclude that a 10 per cent change in coffee prices will effect domestic income by 1.92 per cent. However, considering the exorbitant coffee price increases of the past three years (Table 2) coffee prices may change in the future by much more than 10 per cent. There could be a possible change of 50 per cent with a corresponding income change of 9.6 per cent. This clearly demonstrates that future coffee prices may be far more crucial for the well-being of Kenya's people than the growth rate of the GDP. It is not at all unlikely that a considerable growth rate of GDP in the future could be accompanied by negative income changes due to declining coffee prices.

Table 1. Value of Kenyan coffee exports, total exports and GDP at factor cost, 1964 - 1977.

Year	Coffee export value, unroasted[a] Kf'000	Total export value[a] Kf'000	Coffee export value as p.c. of total exp. value	GDP at factor cost in current prices Kf million	Coffee exports as per cent of GDP
1964	15396	47115	32.7	330.9	4.7
1965	14096	47173	29.9	384.7	3.7
1966	18780	58073	32.3	406.6	4.6
1967	15676	53519	29.3	442.0	3.5
1968	12808	57795	22.2	439.31	2.9
1969	16837	63332	26.6	474.63	3.5
1970	22259	71606	31.1	524.40	4.2
1971	19530	73185	26.7	570.1	3.4
1972	24769	90590	27.3	648.5	3.8
1973	35777	122636	29.2	724.9	4.9
1974	38387	162946	23.6	896.3	4.3
1975	35228	168812	20.9	1029.57	3.4
1976	93348	268792	34.7	1253.36	7.4
1977[b]	127590	231748	55.1	664.28[c]	19.2

a. Source: Statistical Abstract and Kenya Statistical Digest.

b. First half year.

c. Provisional.

Table 2 demonstrates the effect of coffee price changes on income. In carrying out the calculations we applied formula (5) above. However, for the weights $\frac{p_\varepsilon q_\varepsilon}{pq}$ we took the mean of two periods. The figures indicate that the effect of a change in the terms of trade on real income may be more important than the change in GDP at constant prices. This holds true especially for 1976 and the first half of 1977.

In 1976, Kenya's economy achieved a per capita growth rate of 1.7 per cent. However, real income per capita increased by 8.8 per cent due to a favourable change in coffee prices. Even more remarkable is the figure for 1977 which gives a 13.5 per cent change in per capita income due to the coffee price boom.

Given the present domestic coffee market policy, any world market price change for coffee effects the income distribution between the agricultural sector and the rest of the economy. A 10 per cent decline in world market prices for coffee would lead to an income transfer of K£ 17.425 millions in favour of domestic agriculture if the government were to guarantee 1977 coffee prices. This would account for about 5 per cent of gross farm revenue in 1977.[1]

Due to high coffee prices in the past two years, Kenya has been able to improve her balance of payments position. In this paper we shall explore the effect of coffee price changes on the equilibrium exchange rate. Information about this relationship is very important in designing an adequate policy strategy for the future. If, for example, falling coffee prices are expected and consequently a depreciation of the domestic currency, present world market prices quoted in Kenya shillings cannot serve as a guideline for evaluating different policy alternatives. In particular, world market prices may be misleading in setting domestic agricultural product prices.

The relationship between the rate of change of world market prices for coffee ($\frac{da}{a}$) and the necessary exchange rate adjustment is given in equation (6) and the proof in Appendix One.

$$(6)\quad \frac{dr}{r} = -\frac{da}{a}\,\frac{1+\varepsilon^{c} - 0.19\eta}{\varepsilon^{S} - \varepsilon^{D}}$$

where $\frac{dr}{r}$ = rate of change of the exchange rate

$\frac{da}{a}$ = rate of change of world market prices

ε^{S} = domestic export supply elasticity

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1. Gross farm revenue from coffee for 1977 is estimated at K£'000 174,250 and total gross farm revenue at K£'000 362,719 (Kenya Statistical Digest, Sept. 1977).

η = domestic income elasticity of import demand

ε^D = domestic price elasticity of import demand.

Equation (6) clearly shows that in the normal case with $1+\varepsilon^S > 0.19\,\eta$ a negative change in coffee prices will result in a devaluation effect and vice versa. The necessary rate of adjustment due to a change in the coffee price will be higher

- the smaller the supply elasticity ε^S
- the smaller the price elasticity of import demand ε^D
- the smaller the income elasticity of import demand η.

Unfortunately, no accurate values for the crucial parameters are available. However, a quantification of the relationship may be given by applying the parameters estimated for the World Bank model of the Kenyan economy.[2] From these parameters we obtain:

$$\varepsilon^S = 0.5$$

$$\varepsilon^D = -0.25 \text{ or } -0.5$$

$$\eta = 0.86.$$

Substituting these values in equation (6) results in:

(7) $\frac{dr}{r} = -0.98\ \frac{da}{a}$ or

(8) $\frac{dr}{r} = -0.74\ \frac{da}{a}$

Equations (7) and (8) clearly indicate that coffee price changes may lead to an urgent need for exchange rate adjustment. Of course, the equations do not determine the actual exchange rate adjustment required due to a change in the coffee price as other instruments may be applied to solve the balance of payments problem. However, the equations may clarify the crucial importance of future world coffee prices for Kenya's balance of payments policy. In summary, we may conclude that Kenya's future economic policy depends to a very large extent on future coffee prices. In the following section an insight in coffee market prospects will be given.

PROSPECTS OF THE WORLD COFFEE MARKET

It is well known that Kenya's coffee is of higher quality than the average supply on the world market. However, due to the high elasticity of substitution between the different qualities of coffee, a close relationship

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2. World Bank, Kenya into the Second Decade, World Bank Country Economic Report, Baltimore, 1975, pp. 102 and 120.

Table 2. Coffee prices and the effect of price changes on domestic income.

Year	Price KSh./r_g^c	% change	impact on income as % of GDP
1964	7.31		
1965	7.34	0.4	0.02
1966	6.9	-6.0	-0.2
1967	6.2	-10.5	-0.4
1968	6.8	10.4	0.3
1969	6.6	-2.9	-0.09
1970	8.3	25.4	1.0
1971	6.9	-16.5	-0.6
1972	7.8	13.3	0.5
1973	9.5	21.2	0.9
1974	10.7	12.7	0.6
1975	10.4	-2.9	-0.1
1976	24.1	131.9	7.1
1977[a]	48.5	101.6	13.5

a) Source: Kenya Statistical Digest.

b. First half year.

exists between Kenya's export prices and the average coffee price on the New York market. We have calculated the coefficient of determination for Kenya's coffee export prices and the average price for the period 1960 to 1976 and found a r^2 of 0.94, which indicates a very close relationship. Consequently, if we want to estimate Kenya's future coffee export prices we must start with a prediction of the future development of the world coffee market.

Considering the production figures first (Table 3) the annual fluctuations are much more important than any long-term trend. This especially holds true for the period after 1960. As the coefficient of determination (r^2) indicates a value of 0.55 for the total period from 1947 to 1976 and of 0.002 for 1960 to 1976, very little of the production changes can be explained by the trend factor.

To generate some aggregated information about the instability of the time series, some instability coefficients were calculated. These are:

$$(9)\quad NSE = \frac{\sqrt{\sum_{t=1}^{n} e_t^2}}{n} : \bar{X}$$

$$(10)\quad SW = \frac{\sum_{t=2}^{n} S_t}{n-1}$$

$$(11)\quad NSES = NSE \times SW$$

$$(12)\quad ACC = \frac{\sum_{t=2}^{n} \left| \frac{e_t - e_{t-1}}{Max\,(x_t, x_{t-1})} \right|}{n-1}$$

where NSE = normalised standard error

SW = switching factor

NSES = NSE (switched)

AAC = average annual percentage rate of change

e_t^2 = squared residual in period t

n = the number of years used to construct the trend

$\bar{X}$ = the average value of the variable over the period as a whole

S_t = 1 if the residual changes sign from t-1 to t, and 0 if the residual does not change sign.

Table 3. World coffee production, consumption, storage, changes in storage and prices, 1947 - 1977.

Year[a]	Production[b]	Consumption[b]	Storage[b]	Changes in storage	Price[c]
1947	35568	35414	15357	154	69.9
1948	34618	39200	15511	-4582	71.1
1949	40492	41394	10929	- 902	79.3
1950	37615	39509	10027	-1894	111.5
1951	38164	39707	8133	-1543	120.0
1952	38530	40502	6541	-1972	117.4
1953	41513	41175	5273	338	124.0
1954	43996	43114	5611	882	157.0
1955	42357	37707	6493	4650	122.9
1956	50348	45253	11196	5095	126.8
1957	45532	47179	16517	-1647	121.2
1958	55196	46221	14956	8975	115.3
1959	61818	48844	23846	12974	93.0
1960	78754	55003	36870	23751	88.5
1961	65694	57089	60940	8605	87.1
1962	72058	59115	66534	12943	82.8
1963	67404	61910	72448	5494	79.5
1964	70998	63311	70655	7687	97.5
1965	50613	60135	78342	-9522	97.4
1966	81604	64300	69543	7304	96.4
1967	60577	66084	87450	-5507	88.9
1968	68612	72885	81943	-4273	88.2
1969	61068	70582	77670	-9814	86.3
1970	66362	71243	67856	-4881	117.4
1971	58291	73072	62975	-14781	109.0
1972	71834	73946	48194	-2112	112.6
1973	76611	78429	46082	-1818	141.6
1974	62459	75311	44264	-12852	160.9
1975	81082	75083	31412	5999	158.7
1976	73645		37411		277.8
1977	61483				245.3
1978	70370				

a. Years pertain to crop years (October/September) starting with 1946/47 and ending in 1977/78.

b. World production, consumption and storage figures are given in thousand bags of 60 kgs each.

c. Prices are given as average spot quotations (NY.) of four types of coffee in US cents per pound.

Sources: For production, consumption and prices, information was given by Prof. Goreux of the World Bank. For storage data, see: Streeten and Elson, 1971, p.18.

The indexes NSE and AAC were introduced by B.F. Massel (1964). While the NSE index measures instability over the period of the trend taken as a whole, the AAC index measures annual changes within the trend period. Large values for both indexes indicate relatively high levels of instability.

The switching factor SW was introduced by G.F. Soutar (1977). It is used to modify the NSE index to take account of the intra-period fluctuations. The switching factor shows how many times the variable crossed the trend line and hence is an indication of intra-period instability.

In addition to these indices, the coefficient of determination is presented in Table 4. A high coefficient of determination means that a large part of the annual changes in the variable are explainable with the help of the trend factor. The smaller the coefficient, the larger are the fluctuations around the trend.

Table 4. Instability indexes of world coffee production, consumption and prices, 1960 - 1976.

Index	Production	Consumption[a]	Prices
NSE	0.12	0.03	0.27
SW	0.59	[illegible]	0.5
NSES	0.07	0.011	0.135
ACC	0.18	0.032	0.16
r^2 of trend	0.002	0.92	0.58

a. For the period 1960 to 1975.

Table 4 shows clearly that the consumption variable is the most stable of the three selected variables. A large part of the annual changes in world consumption can be explained by the long-term trend. Just the opposite holds true for the production figures. An R^2 of 0.002 indicates that only 0.2 per cent of the variations in production are due to the trend factor. This implies a high instability which is also supported by all other instability indexes. As a consequence of a relatively stable consumption trend and a relatively unstable pattern of production, world market prices also show a high degree of instability. The main question to be answered is whether the instability of production and prices can be explained in economic terms and, above all, whether accurate forecasts can be made.

It is extremely difficult to explain the variation in coffee production over time for a number of reasons. The production time series contains four distinctive components:

1. A two-year cycle (see for example B.E. Rourke, 1970, R. Edwards 1977 and R. Edwards and A. Parikh, 1976)
2. A long-term cycle of approximately twenty years
3. A long-term trend factor indicating changes in the comparative advantages of coffee production
4. A random element due to weather factors.

Unfortunately, the weather factor very often overlaps with all the other factors. Thus, it is nearly impossible to make accurate forecasts of world production. One additional factor makes the prediction of world prices even more difficult, which is that annual fluctuations in prices are less determined by discrepancies between current production and current demand than by the storage policies of exporting and importing nations. This can easily be verified by the data given in Table 3. There are periods of nearly stable prices with broad fluctuations in production and consumption. A major price change will only occur if there is a continuous increase or decrease in stocks over some years. From 1961 to 1969, annual production was greater than annual consumption. Hence, prices were fairly stable quite independently of current production. As stocks were released from 1967 on, market prices reacted much more sensitively to production fluctuations. Yet even the large production deficits in 1974, 1977 and possibly in 1978 could have been completely compensated by a release of stocks which would have held market prices constant. This clearly shows the importance of storage policies in determining market prices. However, it seems impossible to predict storage policies accurately. Policy activities in this area are fairly discretionary and are very much influenced by expectations about the future development of the market.

The main holders of coffee stocks are Brazil, as the principal exporter, and the U.S. as the principal importer. The storage policy of these two countries may be seen as the most crucial factor in determining short-term price variations. Only if Kenya were to have some influence on or at least insight into the storage policies of these countries, could the accuracy of short-term domestic planning data be improved. This problem will be mentioned below in the discussion of an international buffer stock for coffee.

The quantification of the other components in the time series of production is not as difficult. There are reliable estimations of supply and

demand elasticity at hand (S. Singh, J. de Vries, J.C.L. Hulley, and P. Yeung, 1977, R. Edwards and A. Parikh 1976). However, in using the estimated magnitudes of supply and demand elasticities for projection purposes it must be remembered that market prices are not equal to producer prices, as some countries impose export levies (H.J. Stuckmeyer, 1977) which can be progressive.

Projections of world supply and demand for coffee have been made by a world bank team (S. Singh et al. 1977). Their figures are presented in Table 5.

Table 5. Projections of world coffee production and consumption

Year	Production (million bags)	Consumption (million bags)
1979	84.7	80.6
1980	88.2	83.9
1981	90.3	86.7
1982	94.4	89.4
1983	99.1	92.4
1984	103.8	95.9
1985	107.5	99.6
1986	107.9	103.0
1991	107.9	111.6

Source: S. Singh et al. (1977) p. 44.

Of course these forecasts cannot take into consideration annual changes in weather conditions. However, they estimate the most likely level of production and consumption for the coming years. In spite of the large production deficit in the period from 1976 to 1978, production will most probably surpass consumption in all the years for which forecasts have been made. Of course this will not necessarily lead to an immediate drop in prices as there may be some building up of stocks for a period of time. However, it should be noted that there will be a strong tendency for prices to fall in the years ahead. According to the forecast of the World Bank, real coffee prices[3] will be about the same in the early 1980s as they were in the first years of the 1970s. In making these projections, supply and demand fluctuations were estimated from historical data. However, as it seems there has been a remarkable shift in consumer taste away from coffee in favour of tea, it may happen that even the prices predicted will be too high to equate supply and demand. The price projections, therefore, may be quite optimistic from the producers' point of view.

As the prospects for the world coffee market do not look favourable from the Kenyan point of view, we shall explore the possibilities for international arrangements which might mitigate the economic problems arising from market conditions.

KENYA'S INTEREST IN AN INTERNATIONAL COFFEE MARKET STABILISATION SCHEME

As the world coffee market is very volatile and at the same time very important for some less developed countries, there is an obvious need for some international stabilisation scheme. In the following section we shall discuss the role of the International Coffee Agreement (ICA), the possibilities for an international buffer stock for coffee which is at the moment the subject of official discussion, and the Stabex-system.

The International Coffee Agreement

The international Coffee Agreement, including major importers as well as exporters, was signed in 1962. The last agreement was settled in December 1975, came into effect 1 October 1976, and is supposed to cover a period of six years. The chief objective of this Agreement was and is price support, rather than price stabilisation (P.Streeten and D. Elson, 1971, p.20). This can only be achieved by imposing quotas on exports to traditional markets in North America and Western Europe, the so-called Annex A countries. Exports to new markets, the so-called Annex B countries, chiefly in Eastern Europe and the underdeveloped countries, are free from quotas. The main outline of the Agreement has not changed through the three negotiations which have taken place up to now. The only new introduction was a revision of the basic quotas which are assigned to each country and the grouping of the importing countries under Annex A and Annex B.

It follows from the objectives of the Agreement that it is mainly in favour of exporting, rather than importing nations. If, nevertheless, the importing nations joined in the Agreement — and indeed their active support of the Agreement is essential for its viability — this may be seen as the result of successful negotiations carried out by the exporting nations and good will on the part of the importing nations, who accepted the Agreement as a form of international aid.

The need for a producers' agreement on the world coffee market is obvious if one considers whether an individual producer could raise its revenue by restricting supply unilaterally. The answer can be given with the help of the following formula (for the proof see Appendix Two):-

$$(13) \qquad \varepsilon_1^D = \frac{\varepsilon^D - \frac{q_n^s}{q} \cdot \varepsilon_n^s}{\frac{q_1^s}{q}}$$

where ε_1^D = price elasticity of demand facing country 1

ε^D = price elasticity of world market demand

ε_n^s = price elasticity of supply of all countries other than 1

q^s = total world market supply

q_1^s = world market supply of country 1

q_n^s = world market supply of all countries other than 1.

According to equation (13) the relationship between a one percentage change in the supply of country 1 ($\frac{1}{\varepsilon_1^D}$) depends on world demand elasticity, the supply elasticities of all other competing suppliers and the market shares. It is well known that only with $|\varepsilon_1^D| < 1$ could a country increase its revenue by restricting supply. However, such a situation only pertains if the individual market share is larger than $|\varepsilon^D|$. The difference between the market share and the price elasticity of demand will be higher the greater the supply elasticity of the competing suppliers.

The price elasticity of world market demand at the pre-boom price level is around -0.2 (see S. Singh et al., 1977, p.38). Brazil is the only country with a market share above 0.2, namely about 0.3. However, even this large market share would not allow Brazil to manipulate prices upwards. According to the estimates of supply elasticities carried out by a World Bank team, such a policy could only

Table 6. Price elasticities of coffee supply by regions.

Region or Country	Elasticity of supply with respect to price		
	short term (lag 1 year)	long term (lag 7 years)	long term full adoption
Brazil	0.20	0.44	0.66
Colombia	0.03	0.18	0.40
Other South America	0.06	0.46	10.70
America & Carribbean	0.03	0.14	0.77
Africa	0.12	0.44	1.87
Asia	0.10	0.43	3.01

Source: S. Singh et al. (1977) p.31.

have a limited effect. A necessary condition for the success of such a policy is a supply elasticity of competing suppliers below 0.14, which may only hold true in the short run.

Facing a world market price elasticity of demand far below 1, it is not surprising that all coffee producing nations are interested in restricting supply. Clearly, by doing this total revenue may be increased. However, this may not necessarily be true in the case of an individual country. This depends completely on the distribution of quotas, and hence the national supply restriction, as well as the rise in world market prices. For an evaluation of these effects see Appendix Three.

Up to now national quotas have corresponded to past export levels. However, such a procedure favours large and mature producer countries (Gwyer, 1972, p.467), as opposed to countries whose industries are immature and just embarking on a period of rapid growth. The costs to the producer nations of restricting supplies is distributed quite arbitrarily, as the different national opportunity costs of restricting national supplies are not taken into account. Those countries which have already achieved an optimal level of domestic production do not have to bear any costs with the establishment of the quota system.

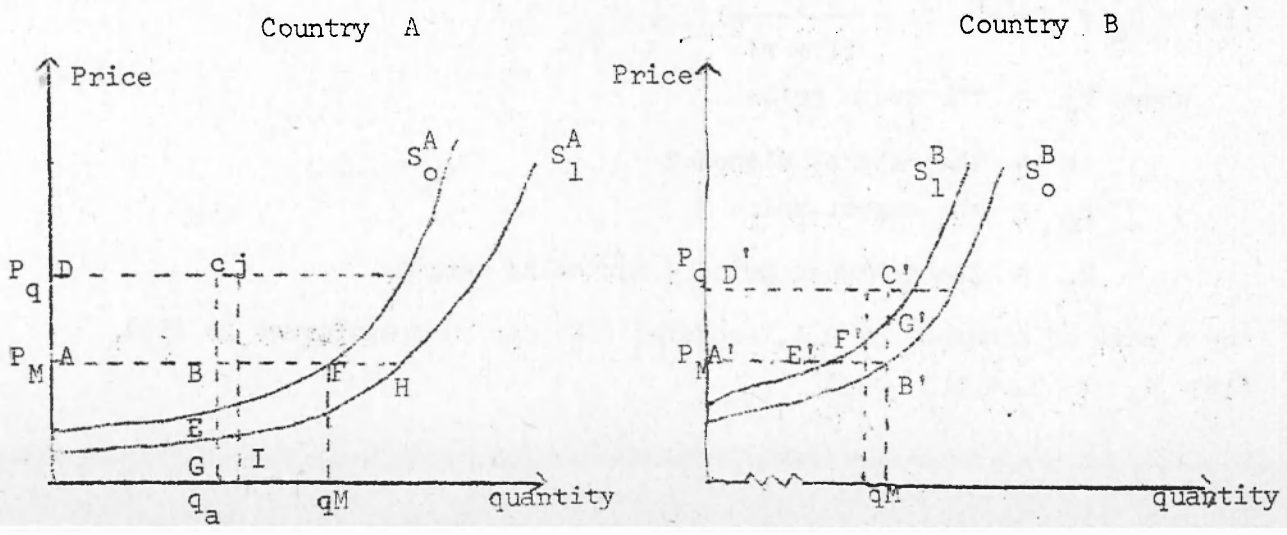
The newer coffee producing nations, such as Kenya, which are still expanding production should oppose the present quota system, as should the importing nations. We stated above that the coffee importing nations obviously accept the International Coffee Agreement as a vehicle for foreign aid. However, this does not say that this form of agreement is seen as the most efficient possible. As the production pattern of the past is frozen, coffee is not produced with minimal average cost. The less developed countries would receive a higher net transfer of aid via the Agreement if they were to allow a change in the production pattern in favour of the most efficient producers. As a cartel in an industry normally results in the closing of the least efficient firms and a pooling of profit, the same should hold true for the ICA. As it seems quite unrealistic to expect to find a quota system with which all countries will be equally satisfied, a tendency to break the rules of the agreement will be a permanent danger, especially in periods of declining world market prices. This is testified by the breakdown of the agreement in 1972 (Wassermann, 1973). A modification of the present quota system should be advocated which could be along the lines presented here.

Starting with national quotas based on past production performance, an international trade of quota certificates among producing nations should be allowed. To make sure that certificates go from less efficient to more efficient producers, the transfer should be agreed upon by the International Coffee Board. As criteria for evaluating the efficiency of production, the Board could consider the relationship between domestic and world coffee prices and the willingness of the individual producers of the country buying the certificate to expand production. This implies that coffee producing nations would restrict domestic supply by imposing in export tax on coffee. If, for example, the export tax is relatively high and nevertheless the country tends to fill its initial quota, this indicates that the country is a low-cost coffee producer. It will be shown below that a domestic restriction of supply via an export tax on coffee may be very desirable from the national point of view.

A comparison of the present and the revised quota system will be drawn. Let us assume that the marginal cost curves for coffee production in two countries are shaped as indicated in Figure 1. It is assumed that in the past we had the supply curve S_o^A of country A and S_o^B of country B. As country A is assumed to be a new coffee producer, it only produces the quantity q_a with market prices P_M. Country B, however, has a mature coffee industry and produces an optimal quantity q_M with given market prices p_M. Country A would like to expand coffee production up to q_M in the future, even with given prices and given opportunity costs.

Now, assume that a quota system is introduced. A constant level of production would allow for a price increase up to Pq due to the upward shift in the demand curve. The two countries may decide to accept past production performance as the basis for national quotas. This would result in the following situation, as compared with a non-quota systems.

Figure 1. The Quota System and National Gains



Country A would gain an amount of income equal to ABCD and would lose EFB. If there were a downward shift of the supply curve due to a change in opportunity costs, the loss component could be even higher, in the figure GHB. This clearly shows that new producer countries may lose from a quota system if national quotas correspond to past production performance and if the national pattern of production performance in the past was suboptimal. The situation of country B, however, is favourable. Due to the quota system, an additional income of A' B' C' D', or of A' E' C' G' D' in the case of an upward shift of the supply curve, is earned.

Due to the divergence in national benefits, the national shadow prices for an additional quota of one unit differ. If country A could increase the amount of production by one unit, the additional income would be equal to the area GIJC which is equal to the shadow price of the quota. If, however, country B were to lose one unit of quota the income forgone would be equal to the area F'G'C'. This clearly shows that the allocation of quotas is suboptimal. Total costs of producing nations could be decreased by a reallocation of quotas. This would contribute to an increase in the net aid received from importing nations.

This comparison holds true for the present quota system. The introduction of tradeable quota certificates, however, might allow a change in the production pattern, thus mitigating the most serious disadvantage of the present quota system which lies in the freezing of the production pattern to the disadvantage of immature coffee producer nations. Of course, this does not say that the problems arising from the distribution of the original national quotas will be abolished. However, the disadvantages of poorly allocated quotas will be smaller.

It may be interesting to give some idea of the price a country might pay for one additional unit of quota. The price may be calculated with the help of the formula below. A simple proof is given in Appendix Four.

$$(14)\quad P_B = \frac{1+r}{r}\left(1 - \frac{1}{(1+r)^5}\right) \cdot \tfrac{1}{2}\,(P_E - P_P)$$

where P_B = the quota price

r = the rate of discount

P_E = the export price

P_P = the producer price + marketing margin.

For a rate of discount of 0.1, equation (14) can be transformed to (15).

$$(15)\quad P_B = 2.08\,(P_E - P_P)$$

As the difference between P_E and P_I is determined by the export tax, we can write

(16) $P_B = 2.08 (1 - \alpha) P_E$

where $1 - \alpha$ is the export tax as a percentage of P_E

For $1 - \alpha = 0.15$ as in Kenya, (16) results in

(17) $P_B = 0.3 P_E$

For countries which were only just able to fill their allocated quotas at the present price level, the price they would be willing to pay for additional units of quota would be zero. They should asell quota shares at any price above zero.

Up to now we discussed the International Coffee Agreement as a means of price support. Whilst this is the chief objective, the Agreement tries to stabilise the market as well. It is of great interest from the Kenyan point of view whether the Agreement will fulfill this stabilising function in the near future.

The most recent Agreement provides for the introduction of export quotas if the price level of 1975 cannot be maintained otherwise (Singh et al., 1977, p.48). However, it is very unlikely that market prices will fall below this level in the near future (one to two years). Indeed, a large drop in prices from the 1977 level would be possible without bringing the ICA into function. As there is widespread awareness that the ICA does more aim to support prices than to stabilise them, and may not even be a suitable agreement for the purpose of stabilising prices, an international buffer stock for coffee is under discussion. In the following section we try to analyse effects of an international buffer stock from Kenya's point of view.

Kenya's Interest in an International Buffer Stock for Coffee.

The following questions will be discussed:

(a) Will stabilisation of world market prices stabilise Kenya's export earnings as well?
(b) How will the stabilisation of world market prices affect the size of Kenya's export earnings over time?
(c) What indicators could serve as criteria for a country's willingness to pay for the functions of the international scheme?

In answering the first question we have to compare the fluctuations in export earnings with an international buffer stock and without one. If the buffer stock succeeds in stabilising world market prices, fluctuations in

domestic export earnings are given by

$$(18)\quad \frac{dR_i}{R_i} = \frac{da_i}{a_i}$$

where R_i = export earnings of country i

$\frac{da_i}{a_i}$ = the autonomous supply fluctuation caused by weather conditions in country i

Under free market conditions export earnings would fluctuate as given in (19) (For proof see Appendix Five).

$$(19)\quad \frac{dR_i}{R_i} = -\frac{da}{a}\,\frac{1+\varepsilon_i^s}{\varepsilon^s - \varepsilon^D} + \frac{da_i}{a_i}$$

where $\frac{da}{a}$ = autonomous supply fluctuation on the world market caused by weather conditions

ε_i^s = price elasticity of supply in country i

ε^s = price elasticity of supply on the world market

ε^D = price elasticity of demand on the world market.

Whether an international buffer stock for coffee will lead to the stabilisation of Kenya's coffee export earnings depends on the following relation:

$$(20)\quad \frac{dq_i}{q_i} \gtrless -\frac{da}{a}\,\frac{1+\varepsilon_i^s}{\varepsilon^s - \varepsilon^D} + \frac{da_i}{a_i}$$

If the left hand side is greater than the right hand side no stabilisation effect will occur. However, this will never happen if fluctuations on the world market and domestic fluctuations are inversely correlated. If $\frac{da}{a} \gtrless 0$ and also $\frac{da_i}{a_i} \gtrless 0$ a necessary condition for a stabilisation effect is:-

$$(21)\quad \frac{da}{a}\,\frac{1+\varepsilon_i^s}{\varepsilon^s - \varepsilon^D} > 2\,\frac{da_i}{a_i}$$

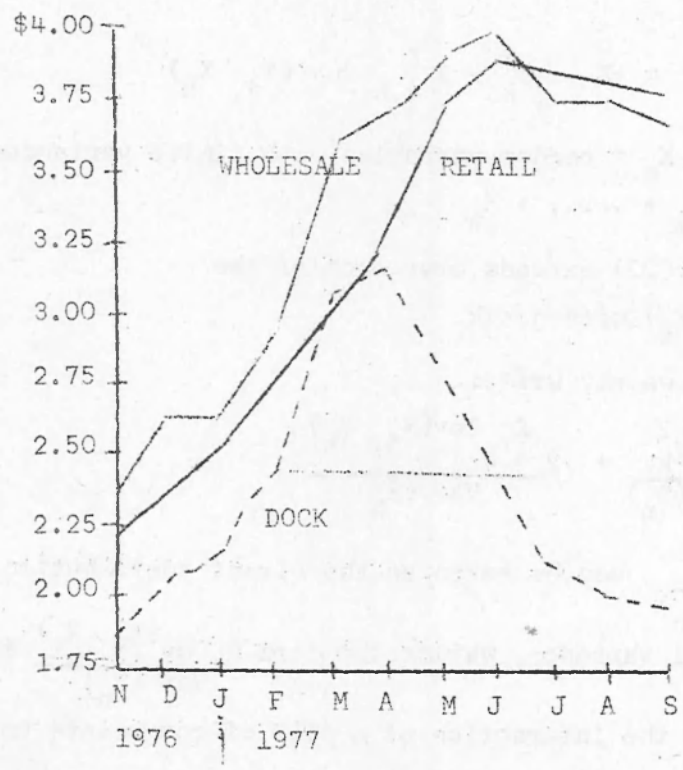
As the variance for world production is considerably higher than the variance for Kenyan coffee production (see below for the data), it may be concluded that $\frac{da}{a} > \frac{da_i}{a_i}$. The magnitude of the coefficient $\frac{1+\varepsilon_i^s}{\varepsilon^s - \varepsilon^D}$ may be checked with the data presented in Table 6 for supply elasticities and for $\varepsilon^D = -0.2$. This results in a value much greater than 1, clearly leading to the conclusion that an international buffer stock for coffee will help to stabilize Kenya's coffee export earnings.

A similar definite statement can be given to the second question raised above: It is very likely that the Kenya's coffee export earnings over time will be higher with a buffer stock than without one. This conclusion can be proved by two lines of argument. First, it is well-known that coffee producers do not receive the full price which coffee consumers have to pay. However, the marketing margin as a difference between the consumers' expenditure and the producers' revenue is sensitive to producer price fluctuations. Normally, the margin goes up if producer prices fall, and vice versa. A proof for this statement is given in Appendix Six.

As rises in producer prices are passed on to the consumer more quickly than declines in producer prices, fluctuating in producer prices result in a higher marketing margin. By stabilising prices the margin could be decreased and hence the earnings of exporting nations would be increased over time as a percentage of consumer expenditure.

This argument is in line with the development of wholesale, retail and dock prices since April 1977 (see Figure 2). Dock prices have been declining sharply since April 1977 and a small price fall at the wholesale and retail level first appeared in June/July 1977.

Figure 2: Development of coffee prices at different levels of the marketing channel.



Sources: U.S. Bureau of Labour Statistics and International Coffee Organisation, quoted in Newsweek, November 1977, p.43.

A second reason why an international buffer stock should increase Kenya's coffee export earnings over time can be given by comparing the relative changes in export earnings with fluctuating quantities and prices (Koester, 1978). This leads to the conclusion that for normally behaved supply and demand functions, the negative percentage change in revenue with declining prices will be greater than the positive percentage change in revenue with increased prices. Hence the average revenue would be higher with stabilised prices.

The viability of any international organisation depends to a large extent on the willingness of member countries to make financial contributions. For this reason the distribution of financial obligations should be worked out very carefully. It seems most reasonable to formulate a ratio of distribution which the national contributions correspond closely to the national benefits. However, it may be difficult to derive generally acceptable criteria for evaluating national benefits. We propose that those countries stand to gain the most from an international buffer stock whose production caused the most the fluctuations in quantity of coffee on the world market.

B.E. Rourke (1970), following Feller's proposal, tried to break down the total variance in world coffee production to the variance of component parts. The following equation is postulated for total variance (Rourke, 1970, p.198):-

$$(22) \quad \text{Var}(S_n) = \sum_{k=1}^{n} \sigma_k^2 + 2 \sum_{j,k} \text{Cov}(X_j, X_k)$$

where $X_j, \ldots, X_n$ = random variables with finite variances $\sigma_1^2, \ldots \sigma_n^2$

$S_n = X_1 + \ldots + X_n$

The last sum of (22) extends over each of the $\binom{n}{2}$ pairs (X_j, X_k) with $j < k$.

Instead of (22) we may write:

$$(23) \quad 1 = \frac{\sum_{k=1}^{n} \sigma_k^2}{\text{Var}(S_n)} + 2 \frac{\sum_{j,k} \text{Cov}(X_j, X_k)}{\text{Var}(S_n)}$$

The term $\frac{\sigma_k^2}{\text{Var}(S_n)}$ may be taken as the direct contribution of individual components to total variance, whilst the term $\frac{2\Sigma\text{Cov}(X_j, X_k)}{\text{Var}(S_n)}$ may be taken as the contribution of the interaction of a pair of components to total variability (Rourke, 1970, p. 199).

Rourke carried out calculations for the period 1946/47 to 1966/67 and found that Brazil contributed 86 per cent to the total fluctuation in world production. We calculated the direct contribution of Brazil and Kenya to fluctuations in world production and found values of 73 per cent for Brazil and 0.4 per cent for Kenya for the past 8 years. These figures, however, do not indicate that Brazil should pay 73 per cent and Kenya 0.4 per cent of the funds needed to finance an international buffer stock. If the importing nations also contribute money to help finance the buffer stock then Kenya should only pay 0.4 per cent of the total amount paid by exporting nations.

Up to now, there is no general agreement on the organisation of an international buffer stock for coffee. Thus it is doubtful whether Kenya's coffee export earnings will be stabilised in this way in the near future. Therefore, we must ask whether Kenya may expect some benefit from the stabex system.

The Importance of the Stabex System

The Stabex System is a system for stabilising export earnings of ACP (African, Caribbean, Pacific) products (for details see FES, 1976). As Kenya is one of the ACP countries and coffee is a product which is covered we may ask whether this agreement can provide a stabilisation of Kenya's coffee export earnings.

A country may ask for a financial transfer from the European Economic Community if the export earnings from a certain product, i.e. coffee, account for at least 7.5 per cent of the total value of that country's exports and if the earnings from exports to the Community (general case) or to all other countries (special case) of the product considered falls at least 7.5 per cent below the reference level. The reference level is equal to the average export earnings obtained during the four years preceding the year of application. The difference between the reference level and the actual earnings constitutes the basis for the transfer of funds. The amount transferred does not carry any interest rate and should be repaid within five years. However, repayments are only necessary if the unit value of the exports rises higher than the reference unit value and the quantity actually exported to the Community is at least equal to the quantity of reference.

It is very likely that Kenya's actual export earnings from coffee in 1978 will be lower than the average for the preceding four years. Indeed, this may even be true for the years 1978 to 1981, as the reference level is influenced by the extremely high export earnings in 1976 and 1977. Furthermore,

it is quite probably that during the five years after the first financial transfer in favour of Kenya, the conditions will not be met for a repayment of the loan. This means that Kenya has a good chance of getting a loan from the European Economic Community, and this may turn out to be the most effective way to cope with the problem of falling coffee export earnings. However, the Community only makes these loans if resources are available and it is possible that other coffee exporting countries will apply for loans from the same limited resources.

CONSEQUENCES FOR KENYA'S COFFEE MARKET POLICY

Recommendations for improvements in Kenya's coffee market policy will be outlined in this section, but first a short appraisal of Kenya's past coffee market policy will be made. Up until 17 June 1977, Kenya did not have an export tax on coffee (see USDA, 1977, p.4). At that time the government imposed a tax on all coffee sold at the Nairobi coffee auction at a rate of 15 per cent of the sale price above K£ 1000 per metric ton. On coffee sold for export, but not at the Nairobi auction, the duty is K£ 300 per ton or 10 per cent of the f.o.b. value, which ever is greater. Because there was no export tax until the middle of 1977, average gross on-farm prices for coffee went up from Shs 778/92 per 100 kg in 1972 to Shs 4,100/00 per 100 kg in the first and second quarter of 1977. This means that farm prices increased by 526 per cent within this period (see Kenya Statistical Digest, September 1977, p.18) and coffee producers received a high windfall profit. It may be questioned whether such a large coffee price increase was beneficial from the macroeconomic and social point of view.

The coffee pricing policy in the past allowed coffee producers an increase in revenue of K£ 260.372 million within the period from 1972 to 1977 (Kenya Statistical Digest, September 1977, p.17). The 1976 revenue was about three times as much as the 1975 revenue, and 1977 brought a further increase of about 70 per cent over 1976. This development went against some important social and economic objectives. It is well known, for example, that coffee is only produced in certain areas and that the present structure of production has been very much influenced by a governmental ban on new planting in the past (Westlake, 1973, p.1). Old established coffee producers were already favoured by the restriction on new planting in the period prior to 1972. Coffee producers on average are among the relatively well-off farmers. Hence the exorbitant coffee price increases obviously ran against the objective of a more equitably distribution of income within agriculture. In other words, market forces worked against the achievement of the postulated income distribution objective.

It is even possible that the consequences of past policy will be to increase poverty in the rural areas in the future. It is well known that Kenya's coffee industry has up to now been very labour intensive as compared to that of other countries (Smith and Brown, 1974), but this may change as a consequence of the large price increase, the large gain in liquidity, higher wage rates and a process of substituting capital for labour. If this happens future employment objectives will be difficult to obtain due to past coffee market policies.

Furthermore, there is some evidence that the high price increase for coffee has contributed to the overall rate of inflation, thus violating the objective of monetary stability. Needless to say, in the past a high rate of inflation has worked to lower the living standards of the unemployed and the working poor. As the salaries for civil servants have not been able to keep up with the salary increases outside the government sector, not only are the conditions for poorly paid civil servants worsened, but also the quality of the personnel decreases.

It might be argued that all these disadvantages are justified in light of the high overall economic growth rate from coffee earnings, but this does not seem to be correct. If we accept the marginal capital output ratio applied by the World Bank team for the Kenyan economy which was 0.97 for agriculture-oriented growth (World Bank, 1975, p.137), the growth rate of GDP at constant 1972 prices should have been about 7 per cent during 1977, given proper investment of the coffee windfall gains. As the actual growth rate which should have been much higher than 7 per cent was actually lower (about 6 per cent), this implies the inadequate allocation of additional coffee earnings in the past.

As a consequence of the shortcomings of past Kenyan coffee market policy, it is proposed to stabilise producers' revenue from coffee by imposing an export tax. This tax should aim at stabilising that producer price which guarantees the fulfilment of the national quota. Thus the tax would be variable as export prices are variable. Any possible windfall gain or loss would be given to the society as a whole, and not only to one small, relatively well-off part of the community. This export tax for coffee could help improve Kenya's bargaining power in renegotiating new quotas. Kenya should try to introduce tradeable certificates for quotas on an international level. Kenya should also support the initiation of an international buffer stock, but should insist on making only a marginal financial contribution.

APPENDIX ONE: THE RELATIONSHIP BETWEEN COFFEE PRICE CHANGES AND EXCHANGE RATE ADJUSTMENT

The analysis starts with the definition of the balance of goods and services. We have:

(1) $B = P_E q_E - P_I q_I$

where B = balance

P_E = export price

q_E = export quantity

P_I = import price

q_I = import quantity.

From (1) we get for changes in B:-

(2) $dB = dp_E q_E + P_E.dq_E - dp_I q_I - P_I.dq_I$

It is hypothesised that dB ought to be zero and in the initial period the value of exports is equal to the value of imports, i.e. :-

(3) $dB = 0$

(4) $P_E q_E = P_I q_I$

Therefore, we get from (2)

(5) $\frac{dP_E}{P_E} + \frac{dq_E}{q_E} = \frac{dP_I}{P_I} + \frac{dq_I}{q_I}$

Equation (5) states that the rate of change of the export value ought to be equal to the rate of change of the import value if there is not to be an additional strain on foreign currency holdings. Domestic export prices may change due to an autonomous change in world coffee market prices and an adjustment of the exchange rate, while import prices are assumed to change only with the adjustment of the exchange rate.

Therefore, we obtain:-

(6) $\frac{dP_E}{P_E} = \alpha.\frac{da}{a} + \frac{dr}{r}$

where $\frac{da}{a}$ = the rate of change of world coffee prices

α = coffee export value as a percentage of total export earnings which was 0.55 in 1977

$\frac{dr}{r}$ = the rate of change of the exchange rate.

Equation (6) can only hold true if world market demand for Kenya's export products is completely price elastic. This may be a realistic assumption for a small country such as Kenya.

For changes in import prices, we postulate:-

$$(7)\quad \frac{dP_I}{P_I} = \frac{dr}{r}$$

Again, equation (7) is based on the small-country assumption.

Due to autonomous and manipulated changes in export and import prices, there will be changes in export and import quantities as well. These changes are determined by the following equations:-

$$(8)\quad \frac{dq_E}{q_E} = \varepsilon^S . \frac{dP_E}{P_E}$$

where ε^S = price elasticity of domestic export supply

$$(9)\quad \frac{dq_I}{q_I} = \varepsilon^D . \frac{dP_I}{P_I} + \eta . \frac{dy}{y}$$

where ε^D = price elasticity of domestic import demand

η = income elasticity of domestic import demand

$\frac{dy}{y}$ = rate of change in domestic income due to a one per cent change in world coffee market prices.

Whilst equation (8) states that export quantities only change due to export price changes, equation (9) takes into consideration that coffee price changes have a direct effect on domestic income and hence on import demand. In the text we showed the relationship between coffee price changes and domestic income.

We obtained:-

$$(10)\quad \frac{dy}{y} = 0.19 . \frac{da}{a}$$

Solving this set of equations we get:-

$$(11)\quad \frac{dr}{r} = -0.55 \frac{da}{a} . \frac{1+\varepsilon^S - 0.19\eta}{\varepsilon^S - \varepsilon^D}$$

APPENDIX TWO: THE RELATIONSHIP BETWEEN PRICE ELASTICITIES OF DEMAND FACING INDIVIDUAL COUNTRIES AND THE TOTAL MARKET DEMAND

The notation is:-

q^S = total market supply

q_1^S = market supply of country 1

q_n^S = market supply of all countries other than 1

q^D = total market demand

ε^D = price elasticity of total market demand

ε_n^S = price elasticity of supply of all countries other than 1

ε_1^D = price elasticity of demand facing country 1.

For total market supply the following equation holds:-

(1) $$q^S = q_1^S + q_n^S$$

From (1) follows:-

(2) $$\frac{dq^S}{q^S} = \frac{q_1^S}{q^S} \cdot \frac{dq_1^S}{q_1^S} + \frac{q_n^S}{q^S} \cdot \frac{dq_n^S}{q_n^S}$$

The market clearance condition is:-

(3) $$\frac{dq^S}{q^S} = \frac{dq^D}{q^D}$$

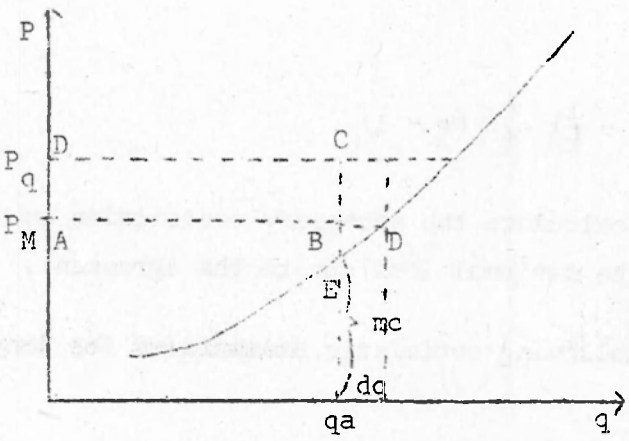
From (2) and (3), and taking into account the definitions for the relevant elasticities, we obtain:-

(4) $$\varepsilon^D = \frac{q_1^S}{q^S} \cdot \varepsilon_1^D + \frac{q_n^S}{q^S} \cdot \varepsilon_n^S$$

This results for ε_1^D in:-

(5) $$\varepsilon_1^D = \frac{\varepsilon^D - \frac{q_n^S}{q^S} \cdot \varepsilon_n^S}{\frac{q_1^S}{q^S}}$$

APPENDIX THREE: THE QUOTA SYSTEM EVALUATED FROM THE POINT OF VIEW OF AN IMMATURE COFFEE PRODUCING NATION



A quota system is favourable from the national point of view of an immature coffee producing nations if the loss (l_i) BED is smaller than the gain (g_i) ABCD. For the gain we may write:

$$(1)\quad g_i = q_i p \cdot \frac{1}{\varepsilon^D} \cdot \frac{d\Sigma q_i^s}{\Sigma q_i^s}$$

where g_i = gain of country i

q_i = present production of country i

P = present world market price

ε^D = price elasticity of world market demand

$\frac{d\Sigma q_i^s}{\Sigma q_i^s}$ = percentage restriction of world market supply due to the quota system.

For the loss we may write:-

$$(2)\quad l_i = \tfrac{1}{2} \cdot dq_i(p-mc)$$

where l_i = loss of country i

dq_i = potential production increase of country i

mc = marginal cost of country i.

If we write $\frac{P}{mc} = r$ and take into account the definition of the domestic supply elasticity ε_i^s we derive from (2):-

$$(3)\quad l_i = 0.5\ p\ (1 - \tfrac{1}{r}) \cdot \varepsilon_i^s \cdot q_i\ (r - 1)$$

A country would be indifferent to a quota system if the gain were equal to the loss. If we set equation (1) and (3) equal, we obtain:-

$$(4)\quad q_i\, p\, \frac{1}{\varepsilon^D}\ \frac{d\,\Sigma q_i^s}{\Sigma q_i^s} = 0.5\, p\,(1 - \frac{1}{r})\ .\ \varepsilon_i^s . q_i\ (r - 1)$$

or

$$(5)\qquad \frac{d\,\Sigma q_i^s}{\Sigma q_i^s} = \varepsilon^D .\ 0.5\ (1 - \frac{1}{r})\ \varepsilon_i^s .\ (r - 1)$$

Equation (5) allows us to calculate the necessary restriction in world market supply to compensate for the national loss due to the agreement.

If we make the following optimistic assumptions for Kenya:-

$$\varepsilon^D = -0.2$$

$$\varepsilon^S = 0.5$$

$$r = 1.3$$

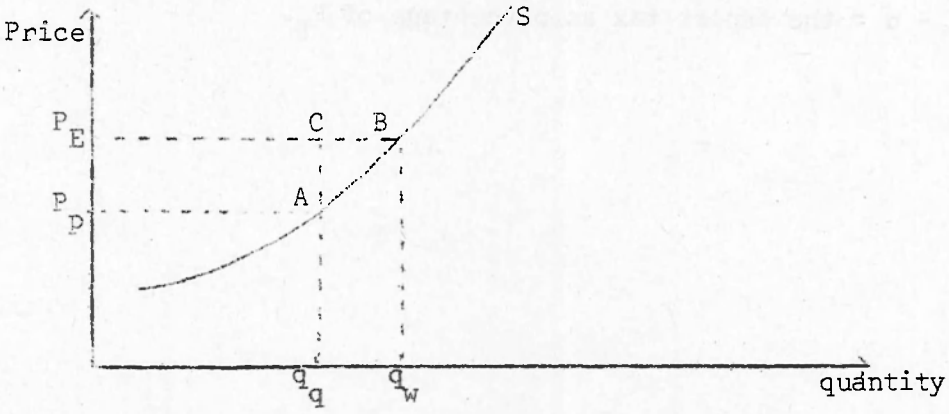
this results in

$$\frac{d\,\Sigma q_i^s}{\Sigma q_i^s} = 0.003$$

If present prices were 30 per cent above marginal cost and the domestic supply elasticity were 0.5, the quota system would be favourable from the national point of view if the restriction in world market supply is greater than 0.3 per cent. This clearly shows that from Kenya's point of view the quota system is most likely to be favourable.

APPENDIX FOUR: CALCULATION OF THE QUOTA PRICE

It is assumed that domestic production is restricted by imposing an export tax. The method of calculation will be clarified with the help of the following graph.



With the given domestic supply curve and the given national quota q_q the domestic producer price has to be p_p whilst the export price is p_E. The country under consideration would like to expand production to q_w. By doing this an additional income of ABC could be earned. The country would be willing to pay for an increase in its quota up to the amount of income earned per additional unit of production. The total additional income ABC in one period could be:

(1) $\Delta y = \frac{1}{2} (P_E - P_P) \Delta q$

where Δy = total additional income in one period

P_E = export price

P_p = producer price

Δq = production increase wanted.

From (1) we derive the additional income per unit of production increase:-

(2) $\frac{\Delta y}{\Delta q} = \frac{1}{2} (P_E - P_P)$

Equation (2) gives the additional income which could be earned in all coming periods. The quota price the country would be willing to pay is equal to the present value of additional future income. Hence the time horizon is of some importance; as the quota system is renewed every six years a time horizon of four to five years seems to be reasonable. Therefore, we get for the quota price:-

(3) $P_B = \frac{1 + r}{r} \left(1 - \frac{1}{(1 + r)^5}\right) \cdot \frac{1}{2} (P_E - P_P)$

where P_B = the quota price

r = rate of discount

As it is assumed that the difference between the export and producer price is given by the export tax, we may write:-

$$(4)\quad P_B = \frac{1+r}{r}\left(1 - \frac{1}{(1+r)^5}\right) \cdot \tfrac{1}{2}\,(1-\alpha)\,P_E$$

where $1 - \alpha$ = the export tax as percentage of P_E.

APPENDIX FIVE: COMPARISON OF EXPORT EARNING FLUCTUATIONS WITH AND WITHOUT AN INTERNATIONAL BUFFER STOCK

We start with the definition for export earnings of country i:-

(1) $R_i = q_i^S \cdot P$

where R_i = export earnings of country i

q_i^S = export supply of country i

P = export price = world market price.

Furthermore, we hypothise:-

(2) $q_i^S = q_i^S (P, a_i)$

(3) $q^S = q^S (P, a)$

(4) $q^D = q^D (P)$

where q^S = world market supply

a_i = autonomous change in supply of country i

a = autonomous change in world market supply

q^D = world market demand.

Solving this set of equations results in:-

(5) $$\frac{dR_i}{R_i} = - \frac{da}{a} \frac{1+\varepsilon_i^S}{\varepsilon^S - \varepsilon^D} + \frac{da_i}{a_i}$$

where ε_i^S = price elasticity of supply in country i

ε^S = price elasticity of supply on the world market

ε^D = price elasticity of demand on the world market.

Equation (5) gives information about the fluctuation of export earnings under free market conditions. To derive an expression for the fluctuation of export earnings with a stabilised market, we start from the following set of equations:-

(6) $R_i = P \cdot q_i^S$

(7) $q_i^S = q_i^S (a)$

(8) $P = \overline{P}$

The solution to this set of equations with respect to $\frac{dR_i}{R_i}$ is:-

(9) $$\frac{dR_i}{R_i} = \frac{dq_i^S}{q_i^S}$$

APPENDIX SIX: THE RELEVANCE OF FLUCTUATING PRODUCER PRICES FOR THE SIZE OF THE MARKETING MARGIN

It is assumed that coffee is sold in an oligopolistic market which allows us to consider prices or quantities as policy parameters. We shall show the consumer prices set by marketing firms based on varying producer prices.

We start with the following equation of definition:-

(1) $R_N = q.m$

where R_N = net revenue

q = quantity bought and sold

m = marketing margin per unit.

Assume that the marketing firm wishes to maximise profit, this includes maximising net revenue with invariant costs. To derive the conditions for maximisation, we have to differentiate (1) with respect to q. This results in:-

(2) $\frac{dR_N}{dq} = m + q\,\frac{dm}{dq}$

As a change in the margin m implies the same change in the consumer price, with given producer prices, we can write:-

(3) $dm = dP_c$

where P_c = consumer price.

Equation (3) inverted into (2) gives:

(4) $\frac{dP_c}{dq} \cdot \frac{q}{P_c} = -\frac{m}{P_c}$

or

(5) $\varepsilon = \frac{P_c}{m}$

where ε = consumer price elasticity of demand.

Equation (5) gives the condition for profit maximisation. The relationship between consumer price and margin per unit should be equal to the price elasticity of demand at the consumer level. As it is well-known that the absolute magnitude of the price elasticity declines with falling prices, equation (5) implies that the margin will be higher with lower producer and consumer price levels. This may help to explain the downward rigidity of consumer prices.

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