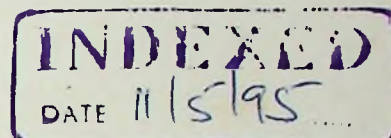


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THE EFFECTS OF PRICING AND MARKETING LIBERALISATION
POLICIES ON UGANDA'S COFFEE INDUSTRY

BY



NANYEENYA WILLIAM NTEGE

A THESIS SUBMITTED TO THE FACULTY OF AGRICULTURE AND
FORESTRY IN PARTIAL FULFILLMENT FOR THE AWARD OF A
DEGREE OF MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS
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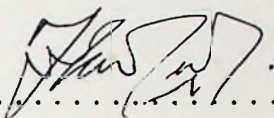
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DECLARATION

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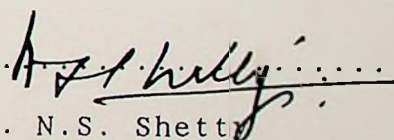
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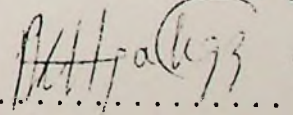
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Date.....17/12/94.....

(iii)

Dedicated to my father the late Stanley Kabwege Lubwama Mukasa, my mother Allen Nakigudde Mukasa of Namagoma Busiro and my sons Brian Lubwama Kasolo and Bill Kiyimba Musisi.

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ABSTRACT

THE EFFECTS OF PRICING AND MARKETING LIBERALISATION POLICIES ON UGANDA'S COFFEE INDUSTRY

By

Nanyeenya William Ntege

In 1981, the Government of Uganda adopted Structural Adjustment Programmes and has since pursued a series of comprehensive macroeconomic stabilisation and sectoral liberalisation policies. Targeting the coffee sub-sector were institutional reforms and liberalisation policies geared towards achieving extreme efficiency by creating more incentives for production, export and private investment in the industry. This study set out to investigate the effects of the liberalisation policy reforms on farmers supply response, participation and efficiency of various actors in the industry as well as competitiveness of coffee production and export.

Econometric modelling using time series data on production and yields for the period 1970-93 was used to evaluate farmers' supply response by use of price elasticities. Capacity utilisation, farmers' share of export proceeds, producer price to cost of production ratio and share of procurement by various marketing organisations were used to show processing and marketing efficiency. Gross margin analysis and Policy Analysis Matrix were the techniques used to assess competitiveness at farm and export levels respectively.

The findings of the study revealed that pre and during liberalisation short-run output supply elasticities (SRE) were statistically the same at 0.205 for Robusta

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(x)

coffee whereas the latter at 0.644 was significantly higher than the former at 0.465 for Arabica coffee. Corresponding long-run elasticities(LRE) were 0.509 for Robusta and 0.722 and 0.988 for Arabica coffee. Short-run yield supply elasticities were not statistically different before and after liberalisation at 0.218 and 0.225 for Robusta and Arabica respectively. Corresponding long-run elasticities were 0.267 and 0.673. Results of the study reveal that in 1989/90 both private and union hullers had average capacity utilisation of 38.66 percent. In 1993/94 unions had 39.9 percent compared to 104 percent for private factories. Similarly, participation of private exporters in Robusta and Arabica trade increased from 25.8 and 1.03 percent in 1992 to 49.2 and 12.6 percent respectively, in 1993. Conversely, union participation dropped from 16.1 to 11.7 percent for Robusta coffee and 82.5 to 46.6 percent for Arabica coffee between the years 1991 and 1993. Likewise, CBM/CMBL's participation in both Robusta and Arabica coffee trade remarkably declined from 100 percent in 1990 to 39 and 40 percent respectively, in 1993 following the dismantling of CMB's export monopoly. In 1990 gross margins for unimproved Robusta and Arabica coffee were shillings 19600 and 43500, respectively compared to 8135, 41600 and 113140 for maize, beans and matooke, respectively. In 1993 corresponding figures were 127000 and 222682 compared to 139330, 137300 and 362810, respectively. Gross margins for improved Robusta and Arabica were shillings 360144 and 401653. Farmer's share of Robusta and Arabica export proceeds also increased from 27 and 22 percent in 1989 to 55 and 47 percent in 1993.

(xi)

A similar trend was observed for the percentage of Robusta and Arabica coffee producer price to their costs of production which rose from 28 and 27.5 percent in 1989 to 92 and 143 percent, respectively.

Robusta and Arabica coffee Indices of Competitiveness changed from 1.05 and 1.17 in 1989 to 0.66 and 0.59 in 1993 respectively. Similarly, corresponding Net Financial Benefit ratios rose from 0.98 and 0.89 to 1.17 and 1.36 respectively during the same period.

It was concluded that the liberalisation policies have on the whole had a positive impact on the coffee industry.

It was recommended that:

- i) The liberalisation policies and the managed float exchange rate policy be upheld.
- ii) Aggressive campaigns for adoption of improved technologies be mounted by concerted efforts of Ministries and Organisations involved in the industry.
- iii) Union processors consider the idea of renting idle processing capacity to private processors.

CHAPTER I

1.0 INTRODUCTION

1.1 Uganda's Economy

Agriculture is the dominant sector in the Ugandan economy. It accounts for over 90 per cent of exports, 54 per cent of GDP and about 80 per cent of employment. At the time of independence in 1962 Uganda had one of the most promising economies in Sub-saharan Africa. Export earnings from textiles, copper, and its traditional export crops namely coffee, tea, tobacco and cotton could finance her imports and still result into current account surplus (World Bank, 1988; Bibangambah, 1989).

The positive trends in economic development that characterised the 1960s were adversely reversed when the military took over political power in 1971. The declaration of the economic war with its ambitious programme of putting the entire economy in the hands of Ugandans led to nationalising of over 60 percent of the enterprises owned by foreigners who had managerial and technical skills. Notably the expulsion of Asians resulted into drastic capital flight that spelled out serious internal economic shocks that severely affected agriculture, industry and the services sectors.

Further, Government pursued inept economic policies like persistent borrowing from the central bank, over-taxation of the agricultural sector by administratively fixing low producer prices for traditional export crops, maintaining an overvalued and fixed exchange rate, and direct export taxation. External shocks like the oil cartels of the 1970s, the economic embargo on Uganda's exports and the worsening terms of trade between producers of finished goods in the developed world and those of primary agricultural commodities further aggravated the situation. Besides, during the 1970s much of Uganda's physical infrastructure was destroyed, inflation rose by about 74 per cent per annum, and prices of consumer goods increased four times faster than those of agricultural products. By 1980 producer prices of agricultural exports were 10 per cent of their 1970 levels in real terms while those of non-controlled agricultural products were only 15 per cent lower than their 1970 levels. Black marketeering and informal border trade (smuggling) of both consumer and agricultural exports especially coffee ensued. In addition, farmers shifted their resources from agricultural exports to non-controlled agricultural commodities like bananas, beans and maize among others whose prices were traditionally liberalised to be determined by market forces.

Production of export crops sharply declined from 253000 tons to 140000 tons, 476000 bales to 22000 bales, 23000 tons to 1500 tons and 5000 to 400 tons respectively for coffee, cotton, tea and tobacco between the years 1969/70 and 1980/81. At the macro level, the shift from exports to home goods meant that the Government revenue base could no longer sustain imports.

1.1.1 Macroeconomic Reforms and Rehabilitation

In order to salvage the economy, Government in the mid-1981 initiated the Economic Recovery Programme (ERP) supported by IMF and World Bank so as to stabilise the economy and restore economic growth through fiscal and monetary restraint, exchange rate devaluation, trade liberalisation and price decontrol.

The programme was, however, adversely affected by the civil war of 1980-85. Coffee production and procurement from major growing areas in central and western Uganda was severely affected. Also the flow of funds from external sources had heavily declined. The NRM Government which took office in 1986, relaunched the programme in May 1987 with a specific short and medium term development strategy of revitalising production of export crops by enhancing incentives to farmers.

1.2 The Coffee Sub-Sector

Uganda produces two coffee varieties of commercial importance; Robusta coffee (*Coffea canephora*) and Arabica coffee (*Coffea arabica*). The former is indigenous to Uganda and still grows wild in some forests in Central and Western parts of the country. Early planters who were non-Africans had favoured Arabica brought from the present day Malawi but were failed by pest and disease attacks at low altitudes and by 1920 much of it had been replaced by Robusta. Uganda's world share of coffee exports stands at 15 per cent, 0.3 per cent and 4 per cent respectively for Robusta, Arabica and overall. Robusta accounts for about 94 per cent of Uganda's exports and it occupies 204900 hectares of the total 233600 hectares that both coffees occupy(UCDA, 1993). Robusta production is concentrated in the lake crescent region to the north and west of lake victoria (see fig.1) and is sun-dried and dry processed. Arabica coffee on the other hand is largely grown on the slopes of mount Elgon in the districts of Mbale and Kapchorwa where it is wet processed and prepared as wet processed mild Arabicas (Wugars). It is also grown in scattered locations in north west and western Uganda where it undergoes dry processing to produce dry Uganda Arabica(Drugars).

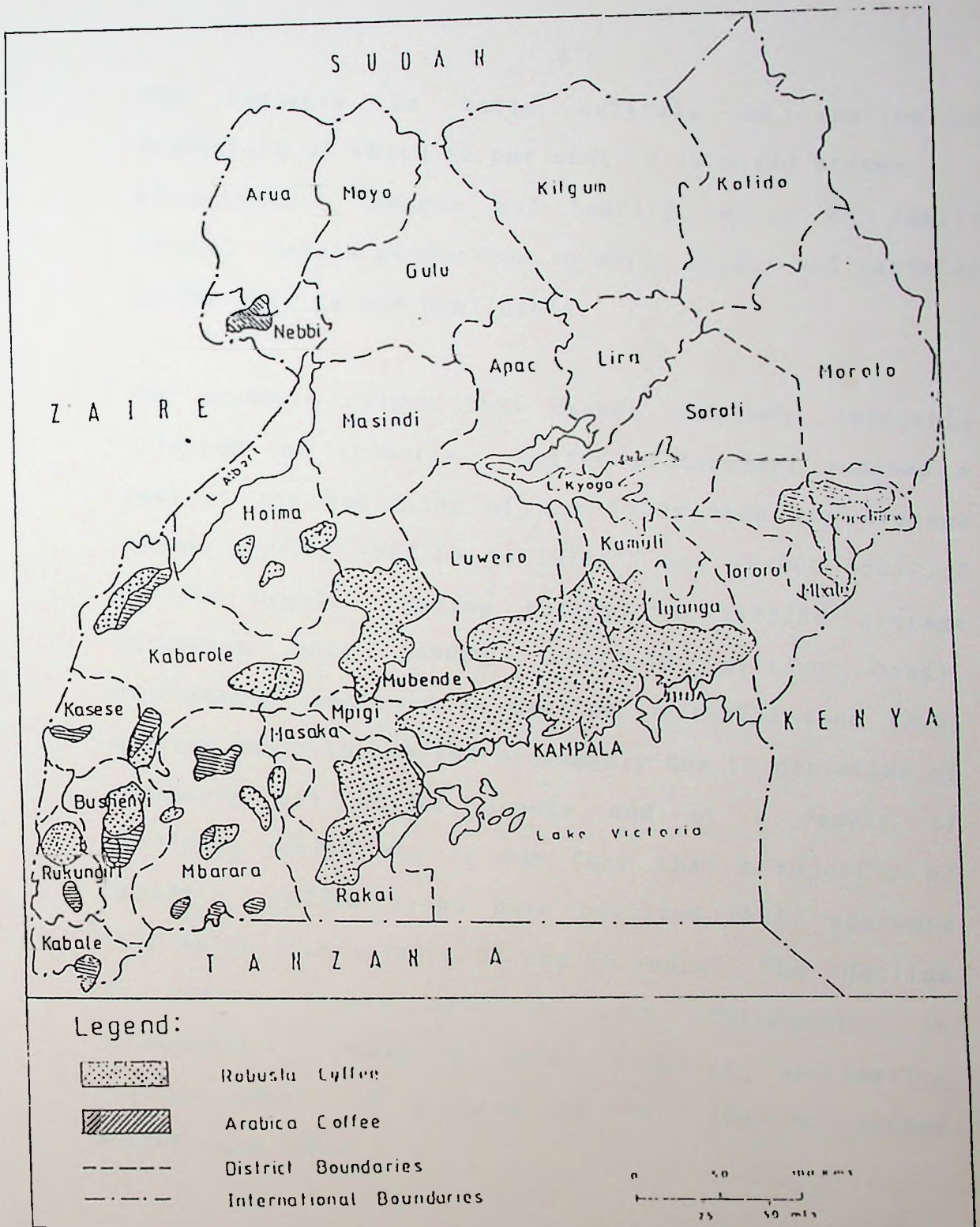


Fig 1: A map of Uganda Showing Major Coffee Producing Areas

The industry is based entirely on smallholder production of which 80 per cent is in mixed stands often with bananas and heavily relies on family labour. Estate production in which Asians had taken an active role is now negligible.

The economic crises that Uganda underwent adversely affected the industry. Coffee procurement reached a peak at the beginning of the 1970s when the average volume between 1968/69 to 1974/75 was 194000 tons (3.2 million bags). During 1982/83 to 1985/86 average purchases were 149000 tons (2.48 million bags). Procurement continued to decline to 120755 tons (2.01 million bags) in 1992/93 presumably due to depletion of virtually all coffee stocks and as a result of declining yields due to the fact that a majority of Uganda's coffee trees have outlived their economic life which lies between 35 and 70 years. The decline in coffee supply resulted into overcapacity in processing. Uganda's total capacity utilisation average about 35 percent by the 1989/90 coffee season. (see table 1)

Table 1 : Processing Factories, Hullers and Capacity Utilisation, 1988-89

Zone	Factory(N ⁰)	Hullers(N ⁰)	Capacity Util.(%)
Central	244	463	35
Western	49	70	34
Eastern	14	45	44
National Total	307	578	35

Source: World Bank Report on Agriculture, 1993

In addition, despite favourable soil and climatic conditions actual Robusta yields do not exceed 600 kg/Ha of clean coffee, which is 75 to 80 percent of the expected yields with low input usage. Arabica yields are on the other hand are about 450 Kg/Ha which is 60 to 75 percent expected under reasonable smallholder management.

1.2.1 Coffee Marketing and Pricing

Prior to 1958 African coffee farmers had exclusively been allocated a function of coffee growing with processing and overseas marketing earmarked for Asians and the British respectively. Before the establishment

of a Coffee Marketing Board(CMB), coffee was being sold by public auction at Kampala and Nairobi for Robusta and Arabica respectively by both private exporters and cooperative Unions. CMB, set up in 1964 was given the export monopoly of dry processed coffee and to impose controls over wet processed coffee. Farmers were required to sell their coffee at Government determined prices which were often lower than the cost of production and would hence not benefit even during booms of international coffee prices - CMB was turned into a fiscal agent for generating Government revenue. For example farmers' share of the world price was 60 per cent and 20 per cent respectively for 1971 and 1977. Also in 1984/85 fiscal year coffee export tax as a share of the recurrent budget was 65 per cent. Coffee, however, still remained the main export even as production incentives were declining largely due to the collapse of other exports and not because coffee exports were on the increase. In 1970, it accounted for 50 per cent of Uganda's exports and during the period of political instability and macroeconomic uncertainty (1985-87) its share rose to 95 per cent. Coffee production is predominantly Robusta that can endure long periods of poor husbandry once established. And moreover, it is a perennial crop that faces low

marginal production costs, heavily relying on family labour, grown in association with major subsistence crops and with a simple processing procedure.

1.2.2 The Coffee Sub-sector Reforms and Liberalisation

Government in 1990/91 coffee season initiated the sectoral policy for institutional reforms. It included among others trade liberalisation, restructuring of marketing boards, rehabilitation of cooperative Unions, and strengthening of agricultural research and extension so as to enhance Government policy of replacing the existing Robusta trees with clonal coffee and adoption of improved practices by Arabica farmers. The CMB Act was repealed and subsequently CMB was transformed into a limited company-CMBL and Government permitted competition with CMBL in the coffee export market. Four large cooperative unions namely Masaka, Bugisu, Banyankole Kweterana and Busoga entered the trade. The foreign exchange system was liberalised in June 1990 so that exporters could gain access to a realistic market price for their foreign exchange earnings and become more competitive in international markets. In July 1991, the regulatory functions of CMB were shifted to Uganda Coffee Development Authority(UCDA), two additional cooperative

unions and eight private firms were allowed to engage in the export trade.

The Government price announced in 1991 of Uganda Shillings 210 and 470 per kilogramme for Robusta and Arabica coffee respectively were roughly equal to their marginal production costs.

The coffee producer farm-gate price was completely liberalised in March 1992 to be solely determined by market forces. Since December 1993, exporters were allowed to use the most cost effective means of transport thereby breaking Uganda Railway's monopoly.

The export tax which was a major contributor to Government revenue accounting for 30 percent in 1982/83 and 67 per cent in 1985/86 was finally removed in June 1992 so as to increase producer incentives and as a reaction to the declining price performance of coffee on the world market. Also, the implicit taxation of 15 to 20 percent formerly imposed on the industry as a result of the condition by exporters to exchange their proceeds at the official exchange rate was eliminated when the foreign exchange market was liberalised and exporters allowed to exchange their proceeds at the bureau exchange rate in September 1992. Government

only maintained the function of announcing indicative minimum prices.

1.3 Statement of the Problem

With the liberalisation policy framework in place the administration of producer prices as well as processing and marketing margins has been discontinued. Export proceeds can now be exchanged at bureau foreign exchange rates, exporters were allowed to use the most competitive export channel and route, margins received at different stages in marketing are no longer fixed by Government, private firms and cooperative Unions can engage in export trade and producer prices are market determined. Elimination of the marketing monopoly and Government policy induced distortions is expected to result into positive response from farmers, private firms and cooperative Unions.

1.4 Significance of the Study

Despite its present poor price performance on the world market and the current diversification policy on non-traditional agricultural exports (NTAE), coffee still remains Uganda's dominant export currently contributing 64 per cent to export proceeds and is expected to maintain this position for the next decade or so.

After the collapse of the International Coffee Agreement(ICA) in July 1989, Uganda's chances of increasing foreign exchange earnings from coffee exports heavily rely on increasing its output, quality and competitiveness.

Sector specific liberalisation policies are meant to improve the dividends received by the different players involved in coffee production, processing and marketing. In addition export competitiveness of Uganda's coffee depends on production and marketing costs, sector and economy-wide policies.

Price reforms are targeted to enhance efficiency at different stages in coffee production and marketing. There is therefore need to examine the effects of the liberalisation policies on the farmer's supply response, participation and efficiency of the private sector and the cooperative movement in the marketing and processing of coffee. In order to assess potential for sustained export promotion, analysis of its competitiveness from the producer's and exporter's view points were deemed necessary.

1.5 Objectives of the Study

The overall objective of the study is to investigate whether the liberalisation of prices and removal of distortions in marketing and processing margins has affected the viability, profitability, and export competitiveness of Uganda's coffee and has provided incentives to stimulate coffee production and exports. This study sets out to empirically assess the farmers supply response, examine the participation and efficiency of the private sector and the cooperative Unions in marketing and processing of coffee, determine the relative profitability of coffee vis-a-vis its competing crops at the farm-level and assess its export competitiveness.

1.5.1 Specific Objectives

- i) to examine the farmer's supply response in light of the liberalisation policies,
- ii) to examine the participation and efficiency of private firms and cooperative Unions in the processing and marketing of coffee as a result of liberalisation policies,
- iii) to determine the impact of liberalisation policies on farm-level profitability of coffee with respect to competing crops namely Matooke, beans and maize,

- iv) to examine the impact of liberalisation on export competitiveness (private profitability) of Uganda's coffee.

1.6 Hypotheses Tested

The null hypotheses tested are:

- i) farmers will not respond positively to the improved production incentive structure as a result of liberalisation,
- ii) removal of price distortions in the coffee industry will not improve its farm-level relative profitability with respect to its competing crops,
- iii) removal of margin distortions in the industry will not make coffee production and trade more competitive and profitable. Cooperative unions and the private firms will therefore not improve their efficiency and increase their participation in domestic and external trade,
- iv) the liberalisation policies that have been implemented will not lead to reduction in distortions and hence the export competitiveness of coffee will not be enhanced.

This study was also guided by the following assumptions.

- a. Coffee farmers are rational profit maximisers who react to price increases by increasing output,
- b. There is sufficient information about improved investment opportunities in the coffee industry that is capable of attracting more of the private sector in coffee domestic and export trade,
- c. Although coffee prices may not necessarily move faster than those of competing crops the perennial nature of the crop and its low input demand makes coffee production more attractive than its annual competing crops based on profitability,
- d. Removal of the fixed and overvalued exchange rate would make coffee exports become competitive.

CHAPTER II

2.0 LITERATURE REVIEW

2.1 The Role of Pricing and Marketing Policies in Agricultural Development

Farmers' subsistence needs and farm output prices are key decision factors in allocation of their scarce resources and choice of production technology. With respect to cash crops, relative prices play an important role in allocation of resources among cash crops, other cash earning activities, home goods and leisure (Dean, 1965). Being a dominant sector in most of the developing economies, agriculture has been subjected to various forms of Government intervention in order to ensure mobilisation of resources for industrialization which is often identified as the engine of growth. Farm output prices are generally recognised as having three main functions in the economic system; to allocate farm resources, to distribute incomes and to encourage or retard investment and capital formation in agriculture (Mellor, 1968; Makonnen, 1990; Ellis, 1992;). These functions are described as the signals, incentives and instruments for the allocation of resources and incomes (Streeten, 1987 p.11 as cited in Ellis, 1992 p.67).

The marketing policy is often targeted to achieve two major goals; transmission of price signals between consumers and producers and the physical transmission of the commodities from points of production to points of purchase.

Before the mid-1980s when many countries started adopting structural adjustment programmes; the major objectives of Government marketing intervention were being presented as; to protect farmers and consumers from parasitic traders, to stabilise farmer's incomes, to increase agricultural production and promote exports, to produce raw materials for local industries, to improve quality and minimum standards and to increase Government revenue (Bibangambah(1989), Makonnen(1990), and Ellis(1992). According to Bibangambah (1989), in Uganda the original objectives of protecting farmers from price fluctuations and stabilising incomes were lost when marketing boards increasingly became revenue collecting agencies for the Government. The same observations were made by Oyejide (1986).

The tendencies by Governments of developing countries to neglect the agricultural sector through direct

effects as a result of suppressing producer prices and through protection to industry and other economy-wide policies have been pointed out by Krueger and et al(1988).

According to Bibangambah (1989), although Bugisu cooperative union could directly export coffee from Mbale factory without further processing and sorting, overseas marketing became a responsibility of CMB when the CMB Act was amended in 1969 giving CMB the coffee export monopoly.

The importance of price policy in stimulating production and speeding up rehabilitation and recovery was recognised in Uganda in 1983 when the Agricultural Policy Committee (APC) was set up to get prices right so as to provide incentives to producers and processors of export crops (AgSec; Bank of Uganda, 1987). Prior to the liberalisation of producer prices the following factors were considered important for determination of administered prices by APC of the agricultural secretariat: cost of production, terms of trade, crop parity, consumer prices and international price approaches. Since the export price is the shadow price of exports, the international price approach used to be

the starting point for pricing. The cost plus approach would then follow to estimate the share of producers, processors and CMB. Other price determining factors like terms of trade, intercrop parity, cost of living and Government taxation policy would then be considered for the price mechanism (Agsec 1985). They also stated that from the farmer's view point an appropriate or incentive producer price is one that results into sales that generate revenue which exceeds costs of production, or one which yields profit margin that is adequate to support family needs and induce adoption of new technology or which yields profit that exceeds levels of profit earned from competing commodities.

The importance of an optimal pricing policy through an efficient marketing system and taxation reform as a means of strengthening the role of devaluation in stimulating exports was recognised by AgSec; Bank of Uganda (1987), Ssemogerere (1990), Government of Uganda (1993) and World Bank (1993).

2.2 Farm Supply Response, Pricing and Marketing Policies

Dominant among contemporarily policy instruments for agricultural programmes in developing countries are

price policies basically used to influence the allocation of resources by farmers. The effectiveness of price policies on production depends on changes in output that accrue to changes in prices. A good understanding of economic theory is a prerequisite for any attempt to generate plausible econometric empirical results. Heady and Dillon, 1972 as cited in Jones and Mutuura(1989) stated that economic theory suggests that the planting decision of a farmer is based on the price expected for output, the price expected for substitute crops, the cost of factors of production, available resources and the riskiness of the enterprise. Further, neoclassical microeconomic theory assumes that farmers' functions are homogeneous of degree one and that their input demand functions are homogeneous of degree zero in prices. And that these conditions suggest that any specified supply function should express commodity prices in real terms. In supply response models, a measure of supply (quantity supplied, acres under planting, or area harvested) is generally specified as a function of own-price, related product prices and non-price supply shift variables such as weather and technology. Mellor (1968) and Maitha (1970) cautioned the use of area as a dependent variable in case the crop in question occupies a large

bulk of the farmer's supply of land since response through changes in acreage will be limited. Secondly producers will explore the option of improving husbandry in case of perennial crops. The effect of price and non-price supply shifters is determined using elasticities.

Mathematically if $Q = \alpha A^\beta X^{(1-\beta)}$ (2.1)

Where Q is the dependent variable, α is the constant or intercept term, A and X are the independent variables and β and $1-\beta$ are the exponents relating variable A and X to Q . Then taking logs equation (2.1) becomes :

$$\ln Q = \ln \alpha + \beta \ln A + (1-\beta) \ln X \text{(2.2)}$$

Equation (2.2) is linear in parameters or linear in coefficients and the coefficients directly estimate the short-run elasticities. The power coefficients β and $(1-\beta)$ directly represent the proportional impact of regressors A and X on variable Q and is constant for all feasible levels of Q and A . Hence referred to as constant elasticity Substitutions (CES) or Models (Gujarati, 1989 and Ellis, 1992). The own-price elasticity measures the percentage change in output (quantity supplied or acres under planting or area harvested) in response to one percent change in price of the product. Cross-price elasticities on the other

hand measure the percentage change in supply as a result of one percent change in the price of substitute crops. Considering that agricultural supply response to a causal variable may be spread over a number of time periods, the dynamics of supply are considered in the direct estimation of the supply function. Dynamic analysis takes into account supply adjustment through time and other factors affecting both speed and magnitude of adjustment (Nerlove, 1958; Shida and Tweeten, 1991).

Conceptually, the supply function can be expressed as:
 $Q_t = f(P_o, P_c, COP, Tech., Policy\ var., weather, adjust) \dots \dots \dots (2.3)$

where Q_t = Quantity of output produced in time t

P_o = Own-price of output

P_c = Price of competing crop

COP = Vector of input prices

$Tech.$ = Technology trend often captured by
time trend

$Adjust.$ = adjustment representing time lag
between price and supply changes.

$Policy\ Var.$ = Government policy

The first order partial derivatives of the supply function are expected to be:

$$\partial Q_t / \partial P_0 > 0; \partial Q_t / \partial P_c, \partial Q_t / \partial CoP < 0,$$

$$\partial Q_t / \partial \text{Tech.} > 0 \text{ or } < 0, \partial Q_t / \partial \text{Policy variable} < 0 \text{ or } > 0;$$

$\partial Q_t / \partial \text{Weather} > 0 \text{ or } < 0$, adjustment takes time hence short-run elasticity (SRE) is expected to be less than long run elasticity (LRE).

In the case of coffee, production is divided into two parts: Potential production and the proportion of potential production that is harvested. Being a perennial tree crop, coffee output can be increased in the short-run by the farmers decision to improve upon husbandry and harvesting of the existing coffee plots rather than increasing area planted. In Uganda coffee is either intercropped or mixed cropped with food crops like bananas, beans, maize among others whose prices vary with demand and supply conditions and with the rate of inflation. Price changes in these substitute crops that directly compete with coffee for the producer's identical resources lead to either neglect (poor husbandry) of coffee trees or improvement in husbandry hence a decline or raising of coffee marketed output. If n_t is the fraction of neglected plants in year t , and b_t is the extent of better husbandry; and b_t and n_t are only due to price changes alone unrelated

to technology trend, then when the real producer price increases relative to real market prices of substitutes husbandry is improved and output becomes :

$$Q_t = (1 + b_t)Q_t \dots \dots \dots (2.4)$$

When real producer prices declines relative to the real market prices of substitutes, poor husbandry results in a decline in output: $Q_t = (1 - n_t)Q_t \dots \dots \dots (2.5)$

Since equations (2.4) and (2.5) are mutually exclusive only one of them can be observed in year t (Ssemogerere, 1990).

Decisions pertaining to potential production related to past investment are long-run whereas harvesting is short-run. It is presumed that both investment and harvesting decisions are primarily determined by expected prices.

The Nerlovian supply response model expresses long-run equilibrium or desired supply as a function of expected price viz;

$$Y_t^t = b_0 + b_1 P_t^e + b_2 U_t \dots \dots \dots (2.6)$$

where Y_t^t = the long-run equilibrium supply

P_t^e = the expected price

U_t = the error or random disturbance term

2.2.1 Model specification

A time lag is expected between response of the dependent variable and the change in the independent variable(s) due to technological and psychological inertia and rising cost of rapid change. The partial (stock) adjustment model that fulfills the assumption that producers are unable to adjust their output to the desired levels within one season is chosen. The partial adjustment model which relates actual change with desired change is specified as follows :

$$Y_t - Y_{t-1} = \alpha(Y_t^* - Y_{t-1}); 0 < \alpha < 1 \dots\dots\dots(2.7)$$

where: Y_t = present production

Y_{t-1} = production last season

α = coefficient of adjustment

Y_t^* = desired long-run equilibrium supply

Equation (2.7) postulates that the actual change in output in any given time t is some fraction α of the desired change for that period. α is expected to be incomplete in one season but to lie between 0 and 1.

Simplifying equation (2.7) gives;

$$Y_t - Y_{t-1} = \alpha Y_t^* - \alpha Y_{t-1}$$

$$Y_t = \alpha Y_t^* - \alpha Y_{t-1} + Y_{t-1}$$

$$Y_t = \alpha Y_t^* + (1-\alpha)Y_{t-1} \dots\dots\dots(2.8)$$

Substituting equation (2.6) in equation (2.8) results into; $Y_t = \alpha b_0 + \alpha b_1 P_t^e + (1-\alpha)Y_{t-1} + \alpha b_2 U_t \dots\dots(2.9)$

2.2.1.1 Specifications of Price Expectations

Producers in making their forecasts of future prices take into account past as well as current prices due to uncertainty implying that farmers learn by experience. Given that farmers supply response is the result of the decision to improve husbandry and harvesting, a naive price expectations model is chosen. It assumes that farmers base their decisions on current prices alone. This model attributes lags to uncertainty and discounting of current information,

$$\text{thus } P_t^e = P_{t-1} \dots \dots \dots (2.10)$$

Substituting equation (2.10) into 2.9 forms;

$$Y_t = \alpha b_0 + \alpha b_1 + P_{t-1} + (1-\alpha)Y_{t-1} + \alpha b_2 U_t \dots \dots (2.11)$$

Simplifying equation (2.11)

$$Y_t = \beta_0 + \beta_1 P_{t-1} + \beta_2 Y_{t-1} + \beta U_t \dots \dots \dots (2.12)$$

where $\beta_0 = \alpha b_0$; $\beta_1 = \alpha b_1$ and $\beta_2 = \alpha b_2$

The supply equation to be estimated expresses the expected non-observable price and output in terms of their past predetermined values. Once the short-run function 2.12 is estimated, the coefficient of adjustment, α , obtained from Y_{t-1} is used to calculate the long-run elasticities by dividing β_0 and β_1 by λ .

Where $\lambda = 1-\alpha$.

Several studies have been conducted on the effects of sector and economy-wide policies on farmers' output response examples of which are; Maitha (1970), Alibaruho (1974), Bond(1983), Ochieng and Ssemogerere(1986), Binswanger (1989), Ssemogerere (1990), Otim (1993) and Otim and Ngategize(1993). Basing on that literature there is empirical evidence that farmers are responsive in domestic supply of output to changes in producer prices. Ssemogerere (1990), reported that coffee is price inelastic in the short-run. Similarly, Otim (1993) reported inelastic price response by farmers both in the short-run and long-run. Maitha (1970), reported own-price elasticity in coffee as being 0.5 in the short-run and 1.1 in the long-run. Short-run and long-run elasticities in cotton range from 0.02 to 0.5 and 0.07 and 0.63 respectively(Alibaruho(1974)).

The response is low and conservative in the short-run and goes on expanding in the long-run. This is expected since farmers lag their response in order to; study the persistence of the policy environment, to allow for adjustment to constraints imposed by technology, weather, and institutional rigidities like input supply and support services and overall

caution(Binswanger, 1989; Ssemogerere, 1990; Vanegas, 1990 and Shida and Tweeten, 1991).

In most of the studies cited one-year lag econometric models have been used in examining the price-supply relationships to reflect farmers' economic behaviour. Farmers' response to economic conditions is hypothesised to show a period that peaks after one year(Jones and Mutuura, 1989)

2.3 Policy Distortions, Private and Social Profitability

The marketing of coffee involves primary procurement, rough hulling, secondary processing, sorting and marketing. These activities were curtailed when crop finance credit to cooperative unions hit a snag. Banks became reluctant to avail the loans when Government withdrew its guarantee. Alternative liquidity sources from the private sector and recognition of stocks as credit collateral could mitigate the problem (UCDA, 1991). Implementation of liberalisation policies is geared to reduce distortions in the industry. The effects of inefficient policies that leads to misallocation of resources as well as those policies enacted to improve efficiency can be determined by a Policy Analysis Matrix (PAM). PAM is a product of two

accounting identities; one defines profitability as the difference between revenues and costs the other measures the effects of divergences (distorting policies and market failures) as a difference between observed parameters taken by considering private, actual or market prices and parameters that would exist in the absence of distortions derived by considering social prices.

Inputs and outputs are classified as:

- i) Primary factors(non-tradables or domestic factors) like land, labour, water and capital that are normally not traded internationally.
- ii) Tradables: Defined as goods that are traded or potentially traded internationally. Private profitability is examined using production (technical) coefficients at market prices.

Private prices thus incorporate the underlying economic costs and valuations plus effects of all policies and market failures. Social profitability(comparative advantage or economic efficiency) is determined using economic prices that reflect scarcity values or social opportunity costs and generated by eliminating all taxes, subsidies, and other exchange rate and commercial policy distortions (Monke and Pearson, 1989

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and Kapaliwa et al., 1993). Distortions in both factor and output prices are adjusted by social prices.

Efficiency and profitability at the macro level can be determined by use of a Policy Analysis Matrix (PAM). PAM is a technique used to test the effect of macrolevel and sector-specific policies on a commodity system. PAM is divided into three columns(see table 3) one for revenues another for costs and the other for profits. Costs are divided into tradable inputs and domestic factors. Non-traded, intermediate or composite inputs like fertiliser, transportation and fuel are divided into their tradable and domestic factor components. Primary factors are assigned social prices equal to their opportunity cost value. Tradables are valued at their world price equivalent viz import parity and export parity prices.

Table 2: An example of the PAM adapted from Pearson and Monke, 1988

	Revenues	Costs		Profits
		Tradable inputs	Domestic factors	
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergence	I	J	K	L

Net Private Profitability (NPP): $D = A - B - C$

Net Social Profitability (NSP): $H = E - F - G$

Domestic Resource Cost (social): $DRC_{\text{social}} = G/E - F$

Index of competitiveness: $(DRC_{\text{private}}) = C/A - B$

Net Financial Benefit ratio: (NFB) $= A/B + C$ or $A - B - C$

Net Policy Effect (NPE): $L = D - H = 1 - J - K$

Nominal Protection Coefficient (NPC) $= A/E$

Effective Protection Coefficient (EPC) $= A - B/E - F$

Divergences: Any divergence between the observed private and the estimated social (efficiency) price must be explained by effects of policy or existence of market failures. Social prices correct for effects of distorting policies.

2.3.1 The DRC Approach

This approach generates quantitative indicators of efficiency of using domestic resources to produce a given commodity measured against the possibilities of trade. The DRC and resource cost ratio(RCR) are often used interchangeably although the latter is calculated as the ratio between total opportunity costs of primary factors and value added to tradables.

2.3.2 Measures of Private Profitability

There are two indicators commonly used to determine export competitiveness - Index of competitiveness and Net Financial Benefit.

2.3.2.1 Index of competitiveness

The DRC at market prices is used to measure financial competitive advantage of tradables.

To an exporter the ratio between the actual financial cost incurred for an export and the actual financial benefit realised determines the comparative advantage of a commodity. For this measure market prices are not corrected for distortions and if DRC is less than one 1 then the commodity is financially(private) competitive to export.

2.3.2.2 Net Financial Benefit (NFB)

This measure shows the financial profitability of an export. It is estimated as the difference between realisable export price and cost of export at market prices both in local currency. The measure can also be estimated as a ratio between benefits and costs.

2.3.3 Measures of Economic Efficiency

Economic efficiency is usually determined using the following indicators; Domestic Resource Cost(DRC) and Net Social Profitability.

DRC at social prices is used to calculate the domestic currency cost of earning or saving one unit of foreign exchange. It measures the domestic costs incurred for a unit of foreign exchange earned from export or saved from import substitution. In case of RCR both the domestic factor costs and trade gains are expressed in local currency. A production activity has comparative advantage when DRC ratio is less than 1

Net Social Profitability (NSP) on the other hand is calculated on a per hectare basis. It is the difference between gross revenues and total costs expressed in economic prices. A production activity has comparative advantage when NSP is greater than zero.

2.3.4 Measure of Policy Distortions and Economic Incentives

A wide range of Government policies influence economic incentives in agricultural production. These effects are measured by using nominal and effective protection coefficients as indicators (Gonzales et al 1993).

2.3.4.1 Nominal Protection Coefficients (NPC)

These coefficients show the amount by which the domestic price of a tradable output deviates from its border price. Without Government intervention the domestic producer prices are expected to be closely related to the border prices. NPC values less than one imply taxation while those greater than one signify protection to a production activity.

2.3.4.2 Effective Protection Coefficients (EPC)

The coefficients measure the net effect of both sectoral and economy wide effects on the value added of an agricultural product. It is a summary measure of incentives or disincentives caused by Government policies and market distortions in both output and input markets.

Values for EPC greater than one signify protection to a production activity whereas EPC values less than one imply implicit taxation on a production activity.

2.3.4.3 Net Policy Effect (NPE)

This measure shows the difference between NPP and NSP. Negative values indicate implicit taxation on production activity, positive values indicate implicit subsidisation and zero shows neutral policy. NPE is affected by taxes and changes in yields through their effects on NPP.

Empirical estimation of profitability and policy distortions by use of policy analysis matrix has been done by Balayo (1992); Hassan and Faki (1993); and Kapaliswa and others (1993).

According to Bank of Uganda (1990), it is important to distinguish between the terms export competitiveness and comparative advantage. Such that the latter is restricted to financial analysis.

The competitiveness of a tradable activity, from an exporter's view point, depends on the financial gains from a tradable activity. Unless it is financially profitable a commodity is not competitive to export.

Exporters are also interested in knowing the financial cost incur to earn a unit of foreign exchange (Bank of Uganda, 1990).

They also reported that despite having comparative advantage most agricultural commodities are subject to various forms of Government policy intervention which ultimately determine their incentives or disincentive for production or export. And that with the official exchange rate that existed, Robusta coffee was not financially profitable to export while Arabica was only marginally profitable.

2.4 Competitiveness of Enterprises at Farm-level

Private profitability is used by farmers to assess and compare alternative plans available to them for exploring resources at their private prices (Kapaliswa et al 1993). Enterprise budgets obtained by making reference to input and output prices are used to calculate Net returns per unit area which is the result of deducting total costs from gross revenue per unit area. Gross margins are calculated by deducting from gross revenue all variable inputs that involve actual cash payments.

- (i) Average production + Theoretical production
- ii) Annual production + Theoretical production
- (iii) Peak production + Theoretical production
- (iv) Average production + Peak production

Theoretical production is equivalent to installed capacity which is equal to the number of hullers times the hourly capacity of each huller. They also reported that in Uganda there are basically two types of hullers; Africa N^o 1 and Paul Kaack with installed capacity of 0.5 metric tons per hour. Considering an eight-hour working day, 50 percent utilisation and working a single shift for 200 days per annum their annual capacity is 400 metric tonnes.

CHAPTER III

3.0 METHODOLOGY AND APPROACHES TO THE STUDY

3.1 The Coffee Supply Functions

3.1.1 Data Types

Data used to estimate the coffee supply functions consisted of; annual production and yield figures, rural market prices of competing crops, coffee producer prices, wage rates and Consumer Price Index(CPI) series.

3.1.2 Data Sources

The Ministry of Agriculture(Planning Division) was the major source of data concerning yield and prices. Other sources were reports prepared by the Bank of Uganda Agricultural Secretariat and the Ministry of Finance and Economic Planning particularly the one on Coffee Marketing and Organisation and several issues of Background to the Budget.

3.1.3 Data Adjustments and Estimation Procedures

The study covered the period from 1970 to 1993. Due to data limitations on coffee production, procurement figures were used to represent farm production.

The nominal price series in "old Uganda shillings" in use prior to the currency reform of 1987 were

standardised into new Uganda shillings now in use by dividing them by 100 - the demonetisation factor used in the reform. Nominal price series were then deflated using the Kampala low income group consumer price index which represents rural population consumption expenditure. Estimates of the coffee supply coefficients in the supply equation were made using Ordinary Least Squares(OLS) multiple regression technique by estimating elasticities with the assistance of SPSS computer package. Output was specified as a measure of farm supply. Short-run supply response was anticipated hence a lag length of one year was used. Serial correlation which is common with time series data and detected by using the Durbin h-statistic was corrected for by the Prais-Winsten iterative technique.

Unlike the recent coffee supply response studies, in particular the one by Otim and Ngategize(1993), which used a dummy variable to isolate the effects of Structural Adjustment Programmes on the industry; this study was extended by the use of an extra dummy variable(D2) to capture the effects the liberalisation policies on the coffee industry in force since 1991.

Supply functions for Arabica and Robusta were estimated separately. Given that coffee takes at least two years to mature and bear fruit and considering the period liberalisation policies have existed, supply response was expected to result from reallocation of resources into better husbandry and harvesting of the already existing plantations rather than expanding existing plots (area) and/or establishing new ones by new plantings. Considering that short-term response is expected to be a result of improvement in use of production inputs and management of already existing coffee plantations, that the decision to increase acreage is a long-term investment plan and that Uganda's coffee acreage has remained more or less stagnant over the years; a measure of supply was specified as quantity supplied in a particular year.

Since coffee production is a set of biological processes in which growth is expected to form exponential and cyclical curves; output and yield functions were specified in log-linear forms in order to cater for use of linear regression in the analysis. The supply functions were divided into output and yield functions and had the following forms:

3.1.4 The Coffee Output Supply Functions

$$\begin{aligned} \ln Q_i = & \beta_0 + \beta_1 \ln Q_{i0} + \beta_2 \ln P_0 + \beta_3 \ln D_2 P_0 + \beta_4 \ln P_c + \beta_5 D_2 + \beta_6 D_3 \\ & + \beta_7 D_5 + \beta_8 \ln D_5 P_0 + U_{i1} \dots \dots \dots (3.1) \end{aligned}$$

Expected signs of coefficients.

$$\beta_1 \dots \beta_3 > 0; \beta_4, \beta_6 < 0; \text{ and } \beta_5, \beta_7, \beta_8 > 0$$

where Q_i = quantity of coffee produced in the current year in metric tons

Q_{i0} = Quantity of coffee produced the previous year in metric tons

P_0 = Real coffee producer price in shillings per metric ton lagged by one year

P_c = Real market price of competing crops in shillings per metric ton lagged by one year

(P_c = PMZ for maize, PMatke for matooke, Pbeans for beans and Psweetp for sweet potatoes)

D_2 = The pricing and marketing liberalisation dummy, that takes on value 1 for 1990-1993 (the post liberalisation period) and 0 otherwise

D_3 = A dummy variable to capture the effects of the civil war of 1978-79 $D_3 = 1$ for the years 1978-79 and 0 otherwise

D_5 = A dummy variable used to capture the effect of Structural Adjustment Programmes $D_5 = 1$ for adjustment period (1987-1993) and 0 for the pre-adjustment period

U_i = The error term

i = Robusta or Arabica

β_2 and β_4 are pre-liberalisation, $(\beta_2 + \beta_3)$ and β_4 are during liberalisation short-run own-price and cross price elasticities. The corresponding long-run elasticities are β_2/λ , β_4/λ and $(\beta_2 + \beta_3)/\lambda$ where $\lambda = (1 - \beta_1)$ and β_1 is the coefficient of the lagged dependent variable.

3.1.5 The Coffee Yield Supply Functions

$$\begin{aligned} \ln Y_i = & \lambda_0 + \lambda_1 \ln Y_{1i} + \lambda_2 \ln P_{0i} + \lambda_3 D_2 + \lambda_4 D_3 + \lambda_5 \ln \text{wages} + \\ & \lambda_6 \text{Trend} + \lambda_7 D_5 + \lambda_8 \ln D_2 P_0 + \lambda_9 \ln D_5 P_0 \\ & + \lambda_{10} \ln P_c + U_i \dots \dots \dots (3.2) \end{aligned}$$

$\lambda_1, \lambda_3, \lambda_7, \lambda_8 > 0$, $\lambda_4, \lambda_5, \lambda_{10} < 0$ and $\lambda_6 > \text{or} < 0$

Y_i = Yield in metric tons per hectare

Y_{1i} = Yield in metric tons per hectare lagged one year

P_{0i} = Real producer price per metric ton, lagged by one year

wages = a proxy for all coffee production inputs

Trend = linear term that takes into account factors that affect yield over time

Other variables are defined as in the output equation;

U_i = The error term i = Robusta or Arabica

3.2 Competitiveness of Coffee Production at Farm-Level

Relative profitability of coffee vis-a-vis its competing crops was determined using Gross margin analysis as an indicator of competitiveness of the various crops competing for farmer's resources in farming system.

3.2.1 Data Types

Data used for the Gross margin analysis of coffee and its competing crops included; yield figures, variable material input and hired labour costs, producer and rural market prices of coffee and the competing crops respectively. In order to have some insights about net revenues accruing to coffee and its competing crops, the study was extended to include fixed and family labour costs.

3.2.2 Data Sources

The major source of data were the cost of production and farm budgets from various APC reports issued by the Agricultural secretariat, Bank of Uganda(BOU). Supplementary sources were yield and price figures from the Ministry of Agriculture.

Enterprise budgets were drawn for the years 1990-93 separately for Arabica and Robusta coffees as well as for the common substitute crops that compete for resources with coffee namely matooke, maize and beans. Average yield in kilogrammes per hectare was multiplied with the producer or rural market prices to obtain gross revenue per hectare. Gross margin was derived using the following formula;

$$\text{Gross margin} = \text{GR} - \text{VC} \dots \dots \dots (3.3)$$

where GR = Gross revenue, a product of Yield in kilogramme per hectare and Producer/market price in shillings per kilogramme

VC = Variable costs which include material inputs and hired labour costs

Gross margin is a return to family labour earned from capital and farmer's management. Net income was obtained by subtracting fixed and family labour costs from gross margins.

3.3 Efficiency of Coffee Processing Facilities

3.3.1 Capacity Utilisation

The quantity of coffee processed in a hullery has a bearing on the unit costs of processing and hence efficiency in processing.

3.3.2 Data Types and Sources

Data used in the calculation of capacity utilisation of processing facilities was generated from field surveys on union and private factories conducted in Kampala, Luwero and Mukono districts. Data collected included; quantity of clean coffee in kilogrammes processed per day, number of shifts per day, duration of each shift in hours, number of hullers in the factory, number of operating hullers, quantity of coffee in kilogrammes hulled per huller per day and the specified hulling capacity according to the manufactures in kilogrammes per hour.

Purposive sampling procedure was used with the assistance of records and personnel from UCDA and Union Export Services(UNEX), CMBL and Uganda National Coffee Association(UNCA). Selection of the factories sampled was based on consistency of record keeping and duration of the existing management in the coffee processing business. The study was, however, restricted to dry processing factories located in Robusta coffee producing areas. Capacity utilisation was expressed as follows: Average Production + Theoretical Production(both in metric tonnes).

3.4 Efficiency of Domestic Marketing of Coffee

Efficiency of coffee domestic marketing in terms of price incentives received by farmers were measured by the following indicators; existence of multiple marketing organisations and their corresponding procurement, farmers' share of export proceeds and producer price to cost of production ratio.

3.4.1 Farmers' Share of Export Proceeds

The proportion of the export prices received by farmers reflects to the efficiency of the domestic marketing system.

3.4.1.1 Data Types and Sources

Data used to establish the proportion of coffee export proceeds that farmers receive included; export prices, the prevailing exchange rate used for exchanging export proceeds, producer prices, processing and marketing costs. The major sources of data were APC reports from Agricultural secretariat(BOU) and quarterly reports from UCDA.

The producer price was then expressed as a percentage of the export parity price. The parity prices are obtained by multiplying the export price with the

prevailing exchange rate to get the domestic currency equivalent of foreign exchange proceeds from which the processing and marketing costs are subtracted.

3.4.2 Producer Price to Cost of Production Ratio

The Competitiveness of agricultural product prices is largely determined by the extent to which they cover farmers' unit costs of production.

3.4.2.1 Data Types and Sources

Data used to indicate the extent producer prices pay for costs incurred during production were; coffee producer prices and total costs of production which were obtained from farm and cost of production budgets obtained from APC reports of Agsec Bank of Uganda.

Ratio analysis to show the extent producer prices cover farmers costs of production was used to depict trends in competitiveness of coffee producer prices for the period 1986 to 1993.

3.5 Efficiency and Competitiveness of Coffee Production and Export at the Macrolevel

Measures of economic efficiency and competitiveness at the macro level were generated by use of a Policy Analysis Matrix (PAM)

3.5.1 Data Types and Sources

Market and official exchange rates, coffee export prices, on-farm material input and labour costs, off-farm processing and marketing costs and yield figures obtained from APC reports of Agsec Bank of Uganda, UCDA quarterly reports and Background to the budget of the Ministry of Finance and Economic Planning constituted the data used. Entries were made in the Policy Analysis Matrix(PAM) from which indicators of efficiency and competitiveness at macrolevel were derived.

3.5.2 The Policy Analysis Matrix (PAM)

PAM consists of revenues, costs and profits expressed in terms of their private and social prices. Policy Analysis Matrices were separately drawn-up for Arabica and Robusta Coffee for the years 1986 to 1993. Private revenue was calculated as a product of the export price and either the official or the market exchange rate for the years 1986 to 1991 and 1992 to 1993 respectively.

Conversion factors were used to transform private values to their corresponding social values so as to correct for distortions. All foreign private costs were transformed into social costs by multiplying them

with a standard conversion factor(SCF). Similarly, private local costs were changed into their corresponding social costs by multiplying them with the relevant conversion factor that caters for the distortions.

The standard conversion factor(SCF) is expressed as a ratio of the Market to official exchange rate or calculated using the formula;

$$SCF = 1 + 1 / (1 + \text{foreign exchange premium}).$$

Social revenue is the product of private revenue adjusted with the standard conversion factor for distortions.

For non-tradable inputs (domestic or local factors), conversion factors adopted by the Agricultural secretariat (1990) in absence of national parameters prevailed as follows:

- a) hired labour = 0.9
- b) family labour = 0.6
- c) other local costs = 0.8

These conversion factors are generated from the assumptions that hired labour is semi-skilled and the conversion factor worked as a ratio of minimum wage rate for semi-skilled labourers in urban centres and

casual labour wage rate for agricultural labourers in rural areas. The conversion factor for family labour was worked out as a ratio of returns to family labour in competing crops at market prices and border prices at the market exchange rate. In order to assess the profitability of a unit area of coffee NPP and NSP in shillings per kilogramme were multiplied by the corresponding yields in kilogrammes per hectare.

CHAPTER IV

4.0 ANALYSIS AND DISCUSSION OF RESULTS

4.1 Estimation of the Supply Response Equations

All the output and yield coefficients bore the correct signs according to theoretical expectations. For the Robusta Coffee equations the adjusted coefficient of multiple Determination(R^2) averaged at 0.671 and 0.74 for Output and Yield functions, respectively. This means that the models explained 67.1 and 74 percent of the Robusta output and yield functions, respectively. Corresponding R^2 values for Arabica were 0.82 and 0.79 implying that the models explained 82 and 79 percent of the Arabica output and yield functions respectively.

4.1.1 Coffee Output Supply Functions

Regression results of Robusta and Arabica Coffee supply functions for the period 1970-93, with output in thousand metric tonnes expressed as the dependent variable, are presented in table 3.

The lagged output explanatory variables averaged at 0.583 and 0.355 for Robusta and Arabica respectively. These results confirms the fact that farmers' behaviour adjusts over time and that any

Table 3: Estimates of Coffee Output Supply Equations with RobcofPdn and AcofPdn as the Dependent Variables.

Const.	Pbns	PSxt	PKze	LgPA	LgPR	LgRpd	LgAPd	Wages	D3	D2	D5	PA*02	PR*02	A*05	R*05	DW	F-Ratio	h-Stat	R ²	N(Yrs)	SERp	SEApd	λ	Ful.Adj.(Yrs)	LRE
1) 2.390 (2.367)***	-	-0.478 (-2.355)***	-	0.439 (2.229)**	-	-0.365 (1.809)*	-0.322 (-2.747)***	-0.516 (-1.670)NS	1.219 (4.002)***	-	-	-	-	-	-	2.135	12.49	-0.109	0.755	23	-	0.202	0.635	2.97	0.691
2) 2.701 (2.844)***	-	-0.531 (-2.729)***	-	0.423 (2.363)**	-	-0.341 (1.739)NS	-0.308 (-2.800)**	-0.586 (-1.982)*	-	-	-	0.189 (4.329)***	-	-	-	2.153	14.95	-0.362	0.789	23	-	0.196	0.659	2.78	0.642
3) 2.391 (4.032)***	-	-	-0.652 (-4.416)***	0.514 (3.408)**	-	-0.362 (2.345)*	-0.294 (-3.317)***	-0.365 (-1.692)NS	1.145 (5.842)***	-	-	-	-	-	-	2.071	26.34	-0.248	0.873	23	-	0.154	0.638	2.95	0.806
4) 3.019 (4.233)***	-	-	-0.644 (-4.445)***	0.483 (3.312)***	-	-0.354 (2.298)**	-0.282 (-3.242)***	-0.394 (-1.831)NS	-	-	-	0.169 (5.892)***	-	-	-	2.101	27.15	-0.355	0.876	23	-	0.154	0.646	2.89	0.748
5) 1.22 (2.16)**	-	-	-0.144 (-1.909)*	-	0.155 (3.154)***	0.732 (4.551)***	-	-	-	-	-	0.012 (1.150)NS	-	-	-	2.048	15.90	-0.178	0.729	23	0.159	-	0.277	9.2	0.560
6) 1.233 (2.194)**	-	-	-0.142 (-1.867)*	-	0.156 (3.150)***	0.718 (4.501)***	-	-	0.071 (1.088)NS	-	-	-	-	-	-	2.040	15.80	-0.148	0.726	23	0.159	-	0.282	9.0	0.553
7) 2.519 (2.321)***	-0.240 (-1.564)*	-	-	0.256 (2.922)***	0.449 (2.784)**	-	-	-	-	-	-	-	-	-	-	1.851	8.14	0.562	0.611	23	0.161	-	0.551	3.7	0.465
8) 2.697 (2.359)***	-0.232 (-1.844)*	-	-	0.255 (2.888)***	0.443 (2.723)**	-	-	-0.026 (-1.455)NS	0.112 (1.351)NS	-	-	-	-	-	0.019 (1.410)NS	1.853	8.00	0.565	0.817	23	0.163	0.557	3.7	0.458	

Note: NS = Not significant; ** and * = significant at 1, 5 and 10 percent respectively; R² = Coefficient of Multiple Determination; Rob/AcofPdn = Robusta/Arabica coffee production; Const. = constant; Pbns/PSxt/PKze = real price of beans, sweet potatoes and maize respectively; LgPA/LgPR = lagged Arabica/Robusta prices; LgRpd/LgAPd = lagged Arabica/Robusta production; Wages = wages (inputs); D3/D2/D5 = dummy variables for the 1978/79 liberation war, liberalisation policies and structural adjustment respectively; PA*02/PR*02/A*05/R*05 = interaction of Arabica and Robusta producer prices with the respective policies; SEAPd/SEAPd = standard error of Robusta and Arabica coffee lagged production; λ = 1-the coefficient of the lagged dependent variable; Ful.Adj.(Yrs) = time taken to attain full adjustment; LRE = Long-run elasticity.

improvement in the previous year's crop results into an increase in output the following year.

This implies that farmers would adjust output by 42 and 65 percent in the first year in case of Robusta and Arabica respectively.

All estimated coefficients on the competing crops bore the expected signs. Beans and maize had statistically significant results when tested against Robusta coffee with coefficients in the order of about -0.236 and -0.143 respectively. These findings suggest that a one percent increase in the real prices of maize and beans causes reduction of Robusta coffee by 0.236 and 0.143 percent, respectively. Competing crops for Arabica coffee that have statistically significant results were maize with coefficient of -0.648 and sweet potatoes with a coefficient of -0.505. A rise in the market prices of these competing crops relative to the producer price of coffee makes farmers shift their resources from coffee to production of competing crops thereby increasing output of the competing crops at the expense of the coffee. Since output of these competing crops of coffee is commonly increased by increasing their acreage; these crops only compete with coffee for land. Secondly since coffee is a perennial crop,

increasing acreage of competing crops seldom results into reduction of coffee acreage. In fact, introduction of competing crops in a coffee-based farming system usually results into delays in operations on coffee management. This results into decline in the output as indicated by the results. Shifting of resources away from coffee is most likely to affect its output through reduction in its yield. These results concur with the observation that area under Robusta coffee has for long remained constant and in some cases it declined (see fig.2). It is, however, Government policy not to expand it but rather to replace the existing stock of old, run-down trees with high yielding clones. If real prices of competing crops rose relative to that of Arabica coffee, however, the Government strategy of ensuring adoption of improved practices and expansion of its existing acreage by 2-5 percent per annum would be jeopardised. The upward trend in export prices and the recent reaction of Bugisu Cooperative Union to increase farm-gate prices are expected to rectify the situation. Surprisingly, when rice and wheat were entered into the Arabica functions, their results produced insignificant results although these crops are gaining prominence in Mbale and Kapchorwa districts respectively.

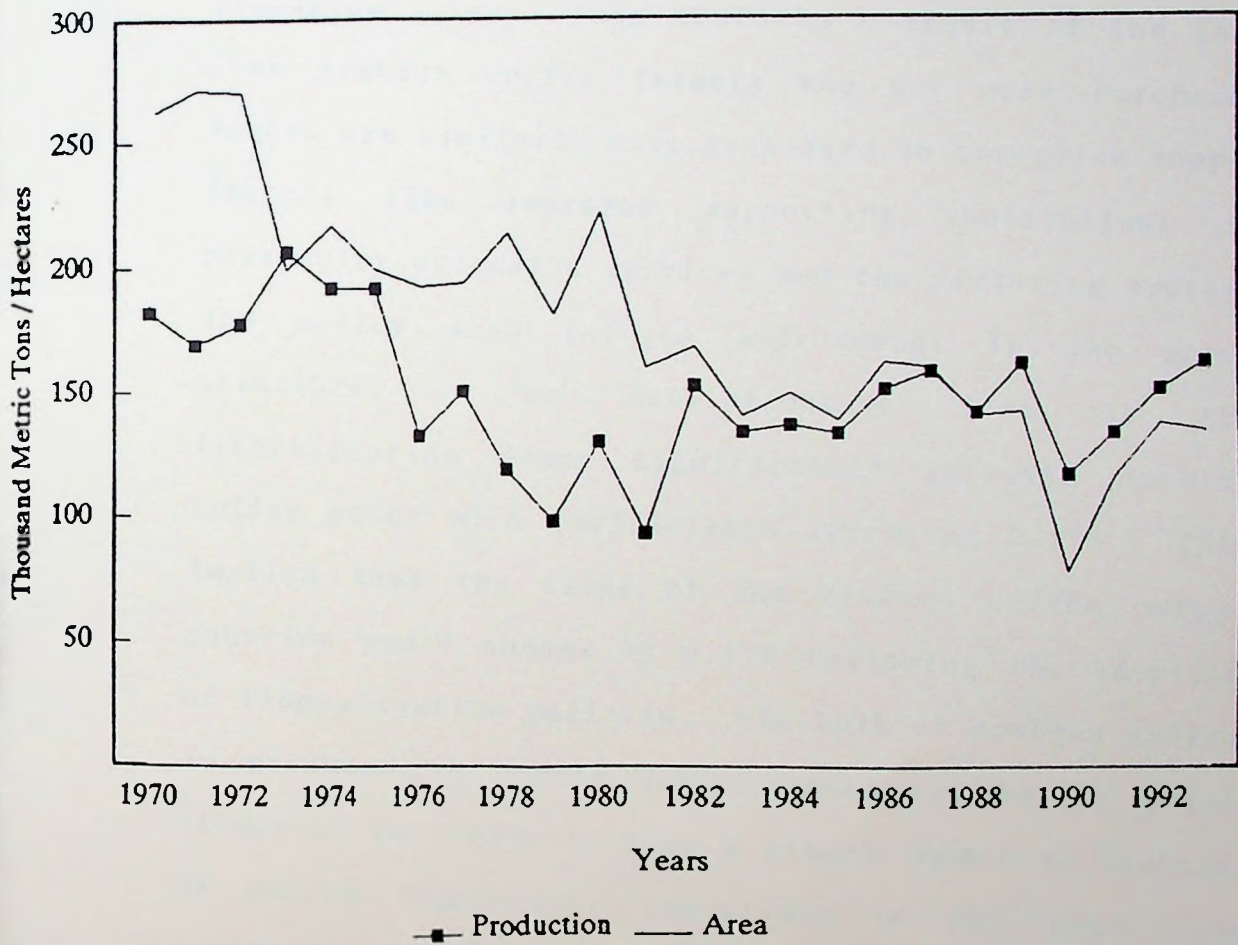


Fig.2: Production and Area Trends of Robusta Coffee
1970 - 1993.

With regards to the liberalisation policies, results of the dummy variable for price and market liberalisation policies entered additively indicate that the policies had a positive impact on Arabica Coffee output in particular with statistically significant coefficient averaging 1.182. This could be a result of the fact that Arabica coffee farmers who use more purchased inputs are similarly more sensitive to non-price supply factors like improved supporting institutions in particular extension services and the marketing system. The policy also led to improvement in the price structure. The multiplicative form of the liberalisation dummy significantly improved Arabica coffee price with coefficients averaging 0.179. This implies that the slope of the Arabica coffee output equation would change by 0.179 following the adoption of liberalisation policies. The bulk of Arabica coffee is produced in border areas, hence the better price structure is likely to have a bigger impact on Arabica by making significant reductions in the quantities smuggled out of the country. In case of Robusta coffee, results indicate that this dummy variable had the hypothesised signs but with coefficients that were not significant hence the slope of the supply equation

remained the same before and after the adoption of liberalisation policies.

The dummy variable(D3) representing the 1978/79 war did not bear significant results in the Robusta coffee equation but was significant in case of Arabica coffee. This indicates that the war actually disrupted Arabica production whose coefficient averaged -0.465 . This could be a result of the fact that Arabica coffee is more sensitive to adverse conditions like poor management resulting from abandoning coffee fields.

When a dummy variable(D5) representing the effect of Structural adjustment policy (1987-1993) was entered additively, it showed insignificant results for both Robusta and Arabica. This could be explained by the fact that Robusta coffee forms the bulk of Uganda's coffee and is mainly produced in the lake crescent region with various economic activities and where several enterprises compete for its resources. This suggests that the incentives presented by the policy were not attractive enough to increase investments in the industry to significantly affect output. The multiplicative form of that variable produced similar results implying that policy did not significantly

change the coffee price structure and hence the percentage change in output as a result of a one percent change in the price remained the same. The macro-policy could, however, positively impact Robusta coffee output and can potentially improve upon the price incentive to farmers since the sign on multiplicative form of the variable bore the correct sign. A dummy variable entered additively shifts the constant term whereas one entered multiplicatively affects the slope of the supply function hence the policy affected neither the supply nor the price structure.

The coefficients on the own-price variables were positive and significant for both Arabica and Robusta coffee with values in the order of 0.465 and 0.205, respectively. This indicates that short-run Arabica and Robusta coffee output response was inelastic and that by increasing the producer price by one percent, coffee output in Uganda would increase by about 0.47 and 0.21 percent, respectively. This confirms the fact that coffee farmers are responsive to price incentives as noted by earlier studies (Maitha, 1970 , Otim, 1993 and Otim and Ngategize, 1993). Also concurring with Binswanger, 1989; Ochieng and Ssemogerere, 1986;

Ssemogerere, 1990; Vanegas, 1990 and Shida and Tweeter (1991) is the observation that price response is inelastic in the short-run.

Results of the study further indicate that Robusta coffee during liberalisation short-run price elasticity (SRE) of output was not statistically different from the pre-liberalisation one at 0.205 whereas the during-liberalisation (SRE) at 0.644 was significantly higher than the one before at 0.465 for Arabica coffee.

Coefficients of the pre-liberalisation long-run elasticities averaged 0.509 and 0.722 respectively for Robusta and Arabica coffee indicating that the long-run elasticities were inelastic with Robusta and Arabica coffee. The findings of the study further revealed that Robusta coffee output would take 6.4 years to attain full adjustment whereas Arabica would take 2.9 years. It is also indicated that the during-liberalisation Arabica coffee long-run elasticity which averaged 0.998 rose quite close to unit elasticity. This further confirms the fact that output response is higher in Arabica than Robusta.

4.1.2 Coffee Yield Supply Equations

Results of the Coffee supply functions in Uganda for the period 1970-1993, with yield expressed in metric tons per hectare, as the dependent variable are shown in table 4.

All regressors were signed as hypothesised but many of them were not significant.

Table 4: Estimates of Coffee Supply Functions Dependent Variables:

Acofyld and Robcofyld

Variable	Eqn. 1	Eqn. 2	Eqn. 3	Eqn. 4	Eqn. 5
Constant	0.045 (0.068) ^{NS}	-0.851 (-0.814) ^{NS}	-0.877 (-0.924) ^{NS}	-1.043 (-0.987) ^{NS}	-0.986 (0.942) ^{NS}
PProbcof _{t-1}	0.218 (1.956) [*]	-	-	-	-
PARcof _{t-1}	-	0.197 (1.804) [*]	0.226 (2.245) ^{**}	0.243 (1.933) [*]	0.233 (1.920) [*]
PBeans _{t-1}	-0.281 (-1.876) [*]	-	-	-	-
PMaize _{t-1}	-	-0.168 (-1.395) ^{NS}	-0.203 (-1.824) [*]	-0.202 (-1.522) ^{NS}	-0.198 (1.502) ^{NS}
D ₂	-	-	-	0.136 (0.690) ^{NS}	-
D ₃	-0.555 (-2.398) ^{**}	-	-	-	-
D ₅	0.281 (1.925) [*]	-	-	-	-
Trend	0.013 (1.636) ^{NS}	0.019 (1.738) [*]	0.008 (0.771) ^{NS}	0.019 (2.140) ^{**}	0.019 (2.114) [*]
Acof*D ₂	-	-	-	-	0.018 (0.629) ^{NS}
Rcof*D ₂	-	-	-	-	-
Acof*D ₅	-	0.006 (0.271) ^{NS}	-	-	-
Rcof*D ₅	-	-	-	-	-
Acofyld _{t-1}	-	0.729 (4.196) ^{***}	0.559 (3.363) ^{***}	0.652 (3.164) ^{***}	0.669 (3.350) ^{***}
Robcofyld _{t-1}	0.184 (0.818) ^{NS}	-	-	-	-
N(Years)	23	23	23	23	23
h-statistic	0.289	-0.170	-0.244	-0.310	-0.195
R ₋₂	0.737	0.782	0.822	0.782	0.782
DW	1.978	2.039	2.053	2.020	2.023
λ	0.816	0.271	0.441	0.348	0.301
LRE	0.267	0.716	0.512	0.698	0.774
Full Adj.(Yrs)	1.8	9.5	5.8	7.0	7.5
SE _{yldt-1}	0.205	0.174	0.178	0.206	0.200
F-ratio	11.607	17.035	21.482	16.985	17.029

Note: Figures in parenthesis are t-values

NS = Not Significant

***, ** and * = Statistical Significance at 1, 5 and 10 percent respectively

R² = Adjusted coefficient of Multiple Determination

LRE = Long-run elasticity

Variables are defined as in table 3 with yld included to refer to yield.

Among competing crops only beans and maize produced significant results on the Robusta and Arabica coffee equations respectively. Corresponding coefficients were -0.281 and -0.200 implying that a one percent increase in the real prices of beans and maize would lead to reduction of 0.281 and 0.2 percent in Robusta and Arabica coffee yield. Bean production requires a fine tilth and limited shading and hence lacks compatibility with coffee. Regarding Arabica coffee, other than lack of compatibility with coffee maize fetches higher prices in the Eastern than in other parts of Uganda because of its high demand in Kenya which borders this major Arabica producing areas in Uganda. It is therefore possible that both beans and maize competing with coffee for land and labour - the key factors of production used on coffee. Other crops like sweet potatoes and matooke did not produce significant results. A possible explanation is that Robusta coffee being indigenous to Uganda and both Robusta and Arabica coffee having been dominant traditional cash crops occupying quite a large proportion of the farmers' land, coffee plots have become the key area on which a bulk of staple foods like matooke are grown. Consequent to this, coffee benefits from any improvement made to the associate crops whose prices have remained traditionally liberalised. Sweet potato production on the other hand does not significantly compete for resources because of its low input demand.

With regards to policy variables, the structural adjustment dummy produced significant results in the Robusta coffee equation with a coefficient of 0.281. This suggests that this policy resulted into better husbandry and increased use of inputs significantly enhancing Robusta coffee yield. Farmers had completely abandoned and some had even started cutting down Robusta coffee trees in some areas. With the improvement in producer prices and the implementation of the Coffee Rehabilitation Programme(CRP) in the ministry of Agriculture, farmers improved on coffee husbandry in general.

The dummy variable on liberalisation policies did not produce significant results on either type of coffee. Possibly because the producer prices are much more attractive especially for improved technologies the bulk of which are still immature. Secondly, the producer price of the traditional coffee types are more or less equal to those of competing crops which the farmers must primarily produce to cater for their subsistence needs.

Significant results were obtained for Arabica coffee lagged yield variable with coefficient averaged at 0.692 implying that yield adjustment of 31 percent can be achieved within one year for Arabica. Being more vulnerable to disease and pest attacks and therefore more responsive to good management and input use yield response is greater for Arabica than Robusta.

Results on technology trend indicate that factors which influence yield like weather and technology have had a significant impact on the yield of Arabica coffee in particular with a coefficient of 0.017.

The dummy variable for the 1978/79 war showed significant results on Robusta coffee yield with coefficient at -0.555 implying that the war disrupted Robusta coffee production.

Results on own-price variable produced short-run elasticities of 0.218 and 0.225 respectively for Robusta and Arabica coffee. This suggests that a hundred percent increase in real prices would increase Robusta and Arabica coffee yields by 22 and 23 percent respectively.

Corresponding long-run elasticities were 0.267 and 0.673 and full adjustment would be attained in 1.8 and 7.5 years respectively. This too supports the argument that most Robusta coffee trees have surpassed their active production cycle hence their yields can no longer be stretched.

4.2 Examination of the Relative Profitability of Coffee and its Competing Crops

Results of comparative profitability of coffee, matooke, beans and maize are presented in table 5.

4.2.1 Robusta coffee

Traditional Robusta coffee, with gross margin at shillings per hectare 19600, was less profitable to produce than both beans and matooke with gross margins at shillings 41600 and 113140, respectively but more profitable to produce than maize with gross margin at shillings 8135 in 1990.

Table 5: The Relative Profitability of Coffee and its competing Crops

Year	Income	R.Coffee	A.Coffee	Maize	Beans	Matooke
1990	Gross	19600	43500	8135	41600	113140
1991	Net	-74600	1735	-22518	-18521	10230
	Gross	122700	221170	72450	78730	160485
1992	Net	-159500	-82172	-2582	-18570	177280
	Gross	61550	168250	72310	93970	277000
1993	Net	-29200a	116282a	8605	115525	186800
		262550b	272053b	---	---	---
	Gross	127000a	222682a	139330	137300	362810
		360150b	401653b			

Source: APC Reports for Various Years and Economics of Crop Production, 1993.

a = Present Variety and /or management practices

b = Clonal coffee or improved practices

In 1991, corresponding gross margin figures for Robusta coffee, maize, matooke and beans were shillings 122700, 72450, 160485 and 78730, respectively. These findings suggest that producing Robusta coffee was less profitable than only matooke. This means that although

the minimum producer prices were continuously being revised upwards up to 1992 when they were completely liberalised, profitability of coffee was still lower than the most competing crop given the low yields realized. It is also worthwhile to note that all net incomes from Robusta coffee were negative throughout. This indicates that exclusion of family labour cost makes Robusta Coffee profitable to produce. Farmers therefore continue to nurture and harvest Robusta coffee since they do not make cash payments to family labour which accounts for about 70 percent of the total cost of production. Due to increased yields from clonal coffee, both the net and gross revenues from clonal Robusta coffee are positive and greatly increased to shillings 262550 and 360150, respectively.

Clonal Robusta coffee is more profitable to produce than either beans or maize although still slightly less profitable than matooke at 1993 prices. This implies that the policy of pricing and market liberalisation of the coffee sub-sector should be combined with an aggressive campaign of replacing the existing coffee tree with high yielding clones. Notable is the fact that the high cost input package of clonal coffee results into benefits that by far exceed the cost of

production. Since the producer prices have improved as a result of the policy reforms, the net and gross incomes of shillings 262550 and 360150 accruing to clonal coffee should encourage adoption of the new technologies.

These gross income figures are greater than the ones of shillings 137300 for beans and 139330 for maize, respectively.

4.2.2 Arabica Coffee

The relative profitability of unimproved Arabica coffee with respect to gross margin was higher for Arabica coffee at shillings 43500 compared to that of beans and maize at 41600 and 8135, respectively but lower than that of matooke at 113140 in 1990. In 1991, Arabica coffee became more profitable to produce than any of its competing crops namely, beans, maize and matooke with corresponding gross margins of; 221170, 78730, 72450 and 160485. The 1990 trend recurred in 1992 with Arabica coffee having an edge over beans and maize but being less profitable than matooke based on corresponding gross margin figures of shillings 168250, 93970, 72310 and 277000 for Arabica, beans, maize and matooke, respectively.

Although Arabica coffee producer prices were stagnant at shillings per kilogramme 471 for both 1991 and 1992, unimproved Arabica coffee, with gross margin of shillings 222682, it became more profitable to produce than any of its competing crops except matooke in 1993, respectively after the decisive step in pricing and marketing liberalisation, which spelled out the removal of the implicit exchange rate tax in September 1992.

In case of improved Arabica coffee, both its gross and net incomes exceed those of any of its competing crops. This implies that the benefits that accrue to farmers as a result of adopting Arabica improved practices by far exceed the associated costs of production. Noteworthy is the fact that gross margins of shillings per hectare of 401653 from improved Arabica is now also greater than that of shillings per hectare 362810 accruing to matooke. This implies that allocation of resources will be in favour of Arabica coffee compared to its competing crops.

4.3 Estimation of the Efficiency of Coffee Marketing and Processing Facilities

4.3.1. Capacity Utilisation of Coffee Processing facilities

Results for capacity utilisation of coffee processing factories are presented in table 6. The combined private and union hullery capacity utilisation was 38.66 per cent in 1989/90 coffee season. In 1990/91 union hulleries alone had capacity utilisation of 20.4 per cent. When private processors were allowed to export coffee in 1991, they registered capacity utilisation of 104.4 per cent in the 1991/92 coffee season whereas that of union factories dropped to 13.9 per cent during the same coffee season.

Aggressive procurement strategies which involve pre-financing store buyers by the private processors, the bad attitude that farmers already had regarding timeliness in payment by unions, unions own chronic constraints stemming from dilapidated machinery and persistent power failures are likely to have put unions in a disadvantaged position. The stiff competition for limited supply of parchment or kiboko coffee implied that inefficient firms would automatically lose out.

Farmers had acquired alternative markets offering better prices for their coffee, paying cash promptly and many times reducing farmers' post-harvest costs by buying right at the farm.

In 1993/94 coffee season private factories maintained capacity utilisation of 104 per cent that of the unions increased to 39.9 per cent. Due to persistent decline of coffee stocks at the farm level over the years coupled with mushrooming of private coffee factories, excess processing capacity which already existed was intensified. In addition, in order to react to the challenges of the liberalised marketing policy environment, unions exporters have shown improvements in promptness of payments and price incentives to their members. Notable among these was Masaka and Banyankole Kweterana unions which in 1991 offered producers bonuses of 10 and 30 shillings respectively higher than the Government price of shillings 210 per kilogramme. In addition, some unions rented some of their factories to private processors. For example West Mengo rented its Kidumule factory to Kyagalanyi Coffee Ltd. Besides, CMBL is also now seriously involved in primary processing with its factories at Ndese, Kiira, Budde and Kawoko and started engaging into direct procurement

of kiboko and parchment rather than depending on other processors who had got a wider avenue for the clean coffee as a result of the liberalised export trade. These reactions could have created room for improved efficiency in union factories and stagnation of efficiency in case of private factories. The increasing number of processors is facing declining volumes of raw coffee. Capacity utilisation is used to capture efficiency - the larger the volume of coffee processed the lower the unit costs of operation. Processing machinery present quite a substantial amount of fixed costs.

Table 6: Average Capacity Utilisation(%) Per Coffee Huller 1989/90 to 1993/94

Coffee season	Private hullers	Union hullers
1989/90	38.66	38.66
1990/91	NA	20.40
1991/92	104.4	13.9
1992/93	NA	NA
1993/94	104	39.9

Source: APC Report 1992/93 and Researcher's Field surveys; NA: Data missing.

4.3.2. Participation and Efficiency of Organisations Involved in Coffee Processing and Trade

Trends showing participation of various actors engaged in domestic and export trade of coffee are shown in table 7. In 1991, when Unions entered the coffee export trade, CMBL still procured the bulk of Uganda's coffee with over 98 and 67 percent respectively for Robusta and Arabica. In 1991, unions procured 16.1 percent of Robusta coffee and the rest was handled by CMBL. Unions procured 82.5 percent of Arabica coffee in the same year and the remaining proportion was procured by CMBL.

It is evident that there is increasing participation of unions and the private sector for both domestic and export marketing of coffee.

Robusta procurement was shared in percentages of 39, 11.7 and 49.2 by CMBL, UNEX and the private sector in 1993. Corresponding figures are 40, 46.6 and 12.6 for Arabica respectively for the year 1993. These findings further reveal that by 1993 a larger share of Robusta coffee trade was being done by the private sector with 49.2 percent and almost equal proportions of Arabica being traded by CMBL and UNEX with percentages of 40 and 46.6 respectively. Although CMBL is still

the largest single exporter its total volume of procurement is less than 50 percent of Uganda's total procurement. Such conditions indicate that there is increasing participation of new entrants, with competition being injected efficiency is improved in the coffee trade hence the competitive prices and absence of coffee stocks at farm and processor levels.

Table 7: Trends in Exporter's Procurement (%) for the Period
1989 - 1993

Year		CMB/CMBL	UNEX	Private Exporters
1989	Robusta	100	-	-
	Arabica	100	-	-
1990	Robusta	98.4	1.6	-
	Arabica	67.4	32.6	-
1991	Robusta	83.3	16.1	-
	Arabica	17.5	82.5	-
1992	Robusta	63.3	10.9	25.8
	Arabica	52.7	46.3	1.03
1993	Robusta	39	11.7	49.2
	Arabica	40	46.6	12.6

Source: Several issues of UCDA quarterly Reports and Background to the Budget.

4.3.3 Farmers' share of Coffee Export Prices

Trends in farmers' share of export prices are presented in table 8. Owing to the dismantling of the export monopoly of coffee together with removal of Government policy induced

distortions farm-level profitability as reflected by farmers' share of the export prices, has improved. In 1987, even before the collapse of the ICA agreement, farmers' share of the export price based on the shadow exchange rate was barely 14 and 12 percent respectively for Robusta and Arabica coffee. With the improvement in the direct and indirect policy environment in Uganda farmers gained 55 and 47 percent of the Robusta and Arabica coffee export price by 1993.

Table 8: Trends in Farmers' Share(%) of International Coffee Prices 1987-1993

Year	ROBUSTA		ARABICA	
	%share with OER	%share with MER	%share with OER	%share with MER
1987	37	12	35	12
1988	44	18	39	16
1989	27	14	22	12
1990	26	18	31	22
May 1991	58	43	49	33
Nov. 1991	42	37	36	29
March 1992	NA	42	NA	39
Oct. 1992	NA	35	NA	39
May 1993	NA	55	NA	47

Source: Various: Agsec, APC Reports and Economics of Crop Production 1993

OER = Official Exchange Rate, MER = Market Exchange Rate, NA = Not applicable.

4.3.4 Coffee Producer Prices to Cost of Production Ratio

Trends showing producer prices as a percentage of costs of production are presented in table 9. These results indicate that since the implementation of liberalisation policies farmers

started receiving increasingly larger recovery of their costs of production from producer prices. In 1989, after the collapse of the ICA agreement, producer prices could only salvage 28 and 27.5 percent respectively of Robusta and Arabica coffee costs of production. By 1993, 92 percent of the unimproved Robusta coffee costs of production could be recovered while the entire costs of production together with a reasonable profit margin could be obtained in case of unimproved Arabica which recorded a percentage of 143. Improved technologies are capable of covering the total costs with reasonable profit margins. Their producer price to cost of production ratios were of the order of 1.42 and 1.54 respectively for improved Robusta and Arabica.

Table 9: Trends in Coffee Unit Costs of Production and Producer Price as a Percentage of Cost of Production

Year	Robusta		Arabica	
	Shillings/Kg	Price(%)	Shillings/Kg	Price(%)
1986	16	53	18	94.0
1987	34	70	58	75.0
1988	78	76	120	83.3
1989	215	28	363	27.5
1990	263	37	423	25.5
1991	315	38	485	72.0
1992	315	60	580	81.2
1993a	304	92	421	143.0
1993b	212	142	423	154.0

Source: Several; Issues of APC Reports and Economics of Crop Production Agsec, Bank of Uganda.

a = Present technologies

b = Improved technologies

4.4 Efficiency and Competitiveness at the Macrolevel

4.4.1 Robusta Coffee

Trends in private and economic efficiency as well as changes Government induced distortions in producer incentives relating to Robusta coffee derived from the Policy Analysis Matrix (PAM) are presented in table 10.

4.4.1.1 Indicators of Private Profitability and Efficiency

Trade of Robusta coffee on the world market was competitive for the years 1986 to 1988 with the index of competitiveness ranging between 0.39 and 0.7 and Net Financial Benefit ranging between 1.30 and 2.06. These results concur with those reported by Agsec(1990) and Balayo(1992) who reported that with the prevailing exchange rate of 1990 Robusta coffee was not profitable while Arabica was only marginally profitable to export.

For the three subsequent years that followed, it was unprofitable to trade in Robusta coffee internationally. Private DRC figures were in the order of 1.05 and 1.61 while NFB values ranged between 0.69 and 0.98. This shift in competitiveness is attributed to the existence of an overvalued exchange rate, the collapse of the ICA in July 1989 which led to the slumping of export prices and the failure of the exporting monopoly, CMB, to quickly adjust to the worsening international coffee price performance by aggressively

identifying new market niches especially in the non-quota markets.

Table: 10. Robusta Coffee : Results of Measures of Private and Economic Efficiency from the PAM

Year	DRCp	NFB	DRCs	NPC	EPC	NPpt	NSPt	NPet
Sept.1986	0.48	1.75	0.06	0.17	0.17	23.8	248.6	-224.8
Nov. 1987	0.39	2.06	0.09	0.23	0.23	92.6	592	-499.4
May 1988	0.70	1.3	0.08	0.15	0.15	44.4	908.2	-863.7
Nov. 1989	1.05	0.98	0.46	0.56	0.56	-20.4	377.3	-397.7
Nov. 1990	1.61	0.69	0.78	0.68	0.68	-34.4	181.3	-525.1
Nov. 1991	1.31	0.81	0.91	0.85	0.85	-235.1	82.2	-317.3
Oct. 1992	0.98	1.01	0.69	1.0	1.01	15.1	284	-268.9
May 1993a	0.80	1.3	0.63	1.0	1.02	207.1	373	-166.3
May 1993b	0.66	1.17	0.54	1.0	1.03	860.5	1149	-288.4

Source: Several; Issues of APC Reports and Economics of Crop Production Agsec, Bank of Uganda.

a = Present variety and/or management

b = Clonal coffee or improved practices

p = Private, s = social and t = figures in 1000_s

It is, however, clearly displayed that the policy reversals initiated in 1991 led to recovery of Uganda's Robusta coffee export competitiveness. Index of competitiveness and NFB ratios obtained for 1992 and 1993 were 0.98 and 0.66 and 1.01 and 1.17 respectively. Exporters gained access to a realistic foreign exchange market and therefore became more competitive in the world market. Net private profitability which shows the returns that would accrue to the sector after

deducting all farm and off-farm costs from export realisation also follows a trend similar to that of export competitiveness. Loss of net private profitability from 1989 to 1991 is attributed to the collapse of the ICA in 1989 and to the existence of an export monopoly parastatal with no incentive to minimize its operational costs. All the profits it was making were being taken by Government. Similarly, losses incurred by CMB were being covered by Government.

Starting with 1992 subsequent to dismantling of the monopoly and liberalisation of the foreign exchange market, the sector regained its private profitability. Implicit taxation associated with monopolies and having to exchange export proceeds at the official exchange rate were eliminated. Further, unit off-farm costs declined following the restructuring of CMB.

4.4.1.2 Measures of Economic Profitability and Efficiency

The DRC at social prices indicates that when all policy distortions and market failures are corrected for in the coffee industry, Uganda maintains comparative advantage in the production of Robusta coffee

throughout the period 1986 to 1993. Social DRC ratios are of the order between 0.06 and 0.91. The same inference can be made based on the trend followed by Net Social Profitability which indicates that without distortions the Ugandan coffee sector could earn between shillings per hectare 82225 and 1148880 throughout the period 1986-1993. DRC figures further indicate that the trend of policy distortions starts by rising reaching a climax in 1991. Thereafter it declines hence emphasizing improvements in the sub-sector due to favourable policy changes.

Net Policy Effect(NPE) has negative figures both before and after the policy reforms. Poor yields combined with low export prices provides the possible explanation. This implies that despite the favourable policy environment the sector has not achieved its maximum profitability potential. The present trend of increase in export prices and the Government policy of replacing old coffee trees with high yielding clones and adoption of improved practices in case of Arabica coffee are some of the possible remedies to this problem.

4.4.1.3 Measures of Policy Distortions and Economic

Incentives Both the Nominal and Effective Protection Coefficients show implicit taxation on the coffee industry up to 1991. NPC of 1.0 for the years 1992 and 1993 implies neutral policy on the output producer price which is now completely liberalised to be determined by forces of demand and supply without any Government intervention. EPC values on the other hand show that coffee production received Government protection in the years 1992 and 1993. This implicit subsidisation is a result of the fact that the bulk of agricultural inputs were being procured under the Special Import Programme(SIP) with dollars provided by the Bank of Uganda at slightly lower than the market rate and sold by Projects in the Ministry of Agriculture. The situation is further explained by subsidised sales of farm inputs by the Farming Systems Support Programme(FSSP) of the Ministry of Agriculture and several local and international NGOs(World Bank, 1993)

4.4.2 Arabica Coffee

Trends in private and economic efficiency and Government policy induced distortions in producer

incentives relating to Arabica coffee derived from the (PAM) are presented in table 11.

4.4.2.1 Measures of Private Profitability and Efficiency

Export competitiveness follows a somewhat similar trend to that of Robusta coffee except that competitiveness is regained in 1991.

This is explained by the fact that international prices of Arabica did not slump as deep as those of Robusta coffee. In fact the export price of Arabica rose from US \$/Kg 1.70 in 1990 to US\$/Kg 1.81 in 1991. NPP however became negative in 1988 even before the collapse of the ICA. This is a result of the fact that foreign(tradable) and local costs had soared from shillings per kilogramme 13.49 and 71.67 in 1987 to shillings per Kilogramme 58.15 and 338.66 in 1988 respectively. Besides, the export price fell from US \$/Kg 2.85 in 1987 to US \$/Kg 2.80 in 1988. NPP recorded the lowest value of -465200 in the year 1989 during the period 1986-1993. This coincided with the acute slumping of the export price from US \$ 2.80 to US \$1.25 owing to the collapse of the ICA.

4.4.2.2 Measures of Economic Profitability and Efficiency

As in the case of Robusta coffee, positive NSP and Social DRC values less than 1 indicate that Uganda has always had comparative advantage in the production of Arabica. It is, however, suspected that due to poor yields and/or high costs of production the sector does not reach its maximum potential profitability in absence of distortions between 1986 and 1993. This is

shown by negative NPE values. It is interesting to note that, notwithstanding the high yields of clonal coffee and improved practices in Arabica, NPE values are still negative. The major reason for this being the low export prices that are 35 to 45 percent of their respective 1986 levels. As shown by the 1993_b NPE figures, improved yields substantially reduce the negative values and a combination of good yields and improving world prices has promising favourable prospects for the industry.

Table 11: Arabica Coffee: Results of Measures of Private and Economic Efficiency from the PAM

Year	DRCp	NFB	DRCs	NPC	EPC	NPpt	NSPt	NPEt
Sept. 1986	0.66	1.36	0.09	0.17	0.17	8.0	125.6	-117.6
Nov. 1987	0.46	2.01	0.08	0.23	0.23	64.4	472.2	-407.9
May 1988	3.08	0.33	0.33	0.15	0.15	-171.6	375.5	-547.1
Nov. 1989	1.17	0.89	0.48	0.56	0.56	-465.2	261.4	-307.9
Nov. 1990	1.07	0.96	0.45	0.68	0.58	-28.5	409.7	-438.1
Nov. 1991	0.51	1.5	0.43	0.85	1.02	715.1	115.1	-599.9
Oct. 1992	0.80	1.1	0.60	1.0	1.01	185.1	363.6	-181.6
May 1993a	0.66	1.42	0.51	1.0	1.02	265.9	373.7	-107
May 1993b	0.59	1.36	0.48	1.0	1.03	570.2	709.8	-116.3

Source: Several; Issues of APC Reports and Economics of Crop Production Agsec, Bank of Uganda.

a: Present variety and/or management

b: Clonal coffee or improved practices

p = private, s = social and t = figures in thousands

CHAPTER V

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Results of this study indicate that the during liberalisation Robusta coffee output short-run elasticity(SRE) was not statistically different from pre-libralisation SRE at 0.205 whereas the during liberalisation Short run elasticity(SRE) at 0.644 was significantly higher than the pre-liberalisation one at 0.465 for Arabica coffee.

Yield equations indicated that Robusta and Arabica pre and during-liberalisation short-run elasticities were also statistically the same at 0.218 and 0.225, respectively.

Findings of the study also revealed that, since the implementation of sectoral pricing and marketing liberalisation policies on Uganda's coffee industry, the profitability of coffee compared to its competing crops was improved and by 1993, gross margins of shillings 127000 and 222682 for traditional Robusta and Arabica coffee, respectively compared to 139330, 137300 and 362810, respectively for maize, beans and matooke indicate that coffee can favourably compete for farmers' resources. Further, gross margins of

shillings 360144 and 4016536, that accrue to Robusta and Arabica respectively as a result adoption of new technologies show that coffee production could become more profitable than any of its competing crops. This suggests that the policies made coffee production more competitive than the competing crops from the farmers' view point.

With regard to efficiency of domestic marketing of coffee the results show improvements in the domestic marketing system of uganda's coffee subsequent to the adoption of the liberalisation policies. Farmers' share of the export proceeds increased too. For instance, in 1989 farmers received 27 and 22 percent of the world market price of Robusta and Arabica respectively whereas by May 1993 the corresponding figures were 55 and 47.

The policy reforms also improved the extent producer price cover the farmers' costs of production hence the competitiveness of producer prices. By 1993, the producer price as a percentage of cost of production was 92 and 143 for Robusta and Arabica respectively compared to 70 and 75 respectively in 1987.

Considering capacity utilisation of processing factories owned by different categories of coffee processors. The findings showed that private processors are more efficient in coffee processing with capacity utilisation of 104 percent compared to that of only 39.9 percent by unions registered for 1993.

Likewise, the participation of unions and private exporters, as reflected by procurement figures, increased following the dismantling of CMB's export monopoly. In 1993, procurement of Robusta coffee recorded percentages of 39, 11.7 and 49.2 for CMBL, UNEX, and private exporters respectively. Corresponding figures for Arabica coffee are; 40, 46.6 and 12.6. These conditions suggest that competition, a precursor for efficiency that results into higher returns to various actors in the industry, is being injected into the coffee export business.

Regarding results on export competitiveness findings show that, following the adoption of liberalisation policies, by 1993 it was financially profitable to export both Arabica and Robusta coffee with NFB ratios of 1.17 and 1.36 respectively and corresponding figures for Index of competitiveness being 0.66 and 0.59. Also, the industry was freed of implicit taxation when

the major sources of disincentives to the producers, processors and exporters namely the over-valued official exchange rate, price and profit margin controls, CMB monopoly, export-taxes and prohibitive export licensing procedures, that limited the number exporters were eliminated subsequent to the adoption of the liberalisation policies.

It can be concluded that producer prices, the variety and husbandry practices adopted by the farmers, the exchange rate and processor and exporter management are important factors determining Uganda's coffee farm production and exports.

5.2 Policy Recommendations

In order to have practical decision-making working tools necessary for improving upon the contribution to the coffee industry by farmers, store-buyers, processors, exporters and policy-makers the following recommendations were made based on the findings of the study.

- i) Interaction of various direct Government policy instruments created strong incentives for production and export of Uganda's coffee. The policy of price and

marketing liberalisation should therefore be upheld. Since the lifting of the exchange rate implicit taxation and following the implementation of the managed float exchange rate policy, it became fairly profitable to export coffee from Uganda. The managed float exchange rate policy should therefore also be maintained. This exchange rate system provides ample latitude for maintenance of producer incentives by the intervention of Bank of Uganda to avoid adverse levels of appreciation of the shilling that may discourage coffee export without affecting the long term trends in the exchange rate.

ii) Adoption of new production technology is clearly highly profitable and makes coffee production very competitive compared to other enterprises at farm-level. It is, however, also worthy to point out that improved technology increases farmers' current total costs incurred on traditional practices by between 63 and 75 percent although unit costs of production are lower and higher profits are obtained. Availability of extra funds from own-resources, formal and informal banking system is therefore central to adoption of this new technology. Absence of effective farmer-oriented rural banking system may therefore deter technology

adoption. In order to ensure the much desired widespread adoption of the technology, on-farm research/extension efforts to demonstrate the biological(yield) and financial superiority of new practices are a must. It is when farmers have confidence in the performance of a particular technology and its attributes that they will accept it for adoption. To achieve this end Government organs concerned with coffee production and marketing namely UCDA, and ministries of Agriculture and that of Trade and Industry should make concerted efforts and mount an aggressive campaign for adoption of new coffee technologies.

iii) Considering coffee processing, it is also important to recognise the fact that although there is still need for investment in the industry, there exists over capacity of processing facilities. Guidelines and regulations regarding licensing of intending processors should carefully consider availability of sufficient raw coffee in the proposed factories' catchment areas. Also, since capacity utilisation of private processors is beyond the specified hulling capacity of their hullers and yet union factories have idle capacity the

idea of unions renting idle hullers to private processors should be encouraged.

The following issues closely linked with the liberalised policy framework also require attention especially from UCDA. The dismantling of CMB's procurement monopsony led to a rise in producer prices and returns to farmers and processors. The increase in profitability and competition for limited quantities of raw material (catchment or kiboko) for coffee processing could tempt farmers to harvest unripe cherries and processors to buy coffee before it is properly dry to the detriment of Uganda's coffee quality on the world market. The monitoring and quality control functions of UCDA should be equipped to prevent such practices. There is also an upsurge in locally made hullers. There is therefore need to ensure that they conform to the expected standards with the view to maintaining quality output from them.

5.3 Proposed Areas of Further Research

During the course of conducting this study, certain issues which require research attention were unveiled.

i) Further research is required in future to establish whether superiority of the new production technologies

actually results into significant farmer adoption of these technologies. This would require assessing adoption rates.

ii) All the factories covered in the study were undertaking dry processing. The performance of hand pulperies and large scale wet-processing facilities and its effects on the profitability of the currently dry processed Robusta and Arabica coffee needs to be examined.

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APPENDICES

Appendix(i)

YEAR	Pmatke	PMz	CPI	PSweetp	WAGES	TREND	Pbeans
1970	193.3	286.7	1.5		1246.7	1	526.7
1971	200.0	376.5	1.7	180.0	1100.0	2	541.2
1972	188.9	244.4	1.8	164.7	1038.9	3	377.8
1973	150.0	395.0	2	205.6	935.0	4	405.0
1974	205.9	291.2	3.4	160	550.0	5	314.7
1975	248.8	314.6	4.1	185.3	456.1	6	473.2
1976	203.3	395.0	6	285.4	480.0	7	415.0
1977	170.8	303.5	11.3	245.0	254.9	8	235.4
1978	81.2	290.3	15.4	185.8	187.0	9	155.8
1979	62.6	112.9	48.7	152.6	59.1	10	49.3
1980	131.1	216.2	54.4	53.4	88.2	11	468.8
1981	70.4	91.8	100	139.9	114.0	12	296.8
1982	53.6	118.6	116.7	92.1	97.9	13	251.2
1983	122.1	182.7	154.9	68.8	110.4	14	374.4
1984	329.4	447.9	217.7	116.5	331.2	15	718.9
1985	144.8	269.2	584.5	330.7	123.4	16	509.9
1986	287.7	335.8	1355.4	128.2	132.8	17	1106.7
1987	140.5	215.1	4375.7	188.1	82.3	18	678.1
1988	104.3	198.7	13082.4	172.3	151.3	19	427.8
1989	257.3	454.6	18236.9	152.9	263.2	20	570.7
1990	148.2	314.2	22777.9	295.7	237.1	21	585.5
1991	155.2	309.6	27701.8	230	303.2	22	644.2
1992	384.8	552.3	40726.0	464.8	294.7	23	825.8
1993	574.6	802.6	41287.2	418.2	436.0	24	1146.2

Variables are defined in the methodology and tables 3 and 4

YEAR	RCOFPDN	RCOFARE	RCOFYLD	ACOFPDN	ACOFARE	ACOFYLD
1970	182.0	261.9	0.695	15.0	23.0	0.652
1971	169.2	271.6	0.623	6.0	13.2	0.456
1972	177.4	270.8	0.655	6.3	7.7	0.816
1973	206.4	199.2	1.036	7.3	8.7	0.836
1974	191.8	216.7	0.885	6.8	13.7	0.495
1975	191.8	199.4	0.962	6.8	13.7	0.498
1976	132.3	192.6	0.687	4.7	17.0	0.276
1977	150.5	193.9	0.776	5.4	14.8	0.364
1978	118.9	213.8	0.556	2.3	8.4	0.273
1979	98.3	181.4	0.542	4.7	17.2	0.273
1980	130.0	221.8	0.586	4.8	15.8	0.303
1981	93.0	159.5	0.583	4.5	14.4	0.313
1982	152.3	167.9	0.907	14.3	37.0	0.387
1983	134.0	140.5	0.954	14.2	32.8	0.433
1984	136.7	149.7	0.913	9.3	19.9	0.467
1985	133.8	138.8	0.964	10.2	20.4	0.500
1986	151.3	162.0	0.934	8.6	18.4	0.467
1987	158.0	159.6	0.990	9.1	18.2	0.500
1988	141.7	140.3	1.010	9.4	12.5	0.750
1989	161.2	142.0	1.135	7.9	9.9	0.800
1990	116.8	77.9	1.500	11.9	15.9	0.750
1991	133.5	116.1	1.150	13.9	18.5	0.750
1992	151.2	137.5	1.100	20.4	27.2	0.750
1993	161.7	134.8	1.200	24.8	26.8	0.925

Variables are defined in the methodology and tables 3 and 4

YEAR	PRORCOF	PROACOF
1970	726.7	2973.3
1971	700.0	2623.5
1972	661.1	2477.8
1973	595.0	2230.0
1974	367.6	1311.8
1975	609.8	1109.8
1976	416.7	810.0
1977	221.2	752.2
1978	227.3	649.4
1979	143.7	308.0
1980	128.7	275.7
1981	350.0	650.0
1982	428.4	796.9
1983	516.5	897.4
1984	964.6	1332.1
1985	804.1	1103.5
1986	627.1	1248.3
1987	548.5	997.8
1988	305.8	764.4
1989	329.0	548.3
1990	412.7	474.1
1991	595.6	1263.5
1992	466.5	1156.5
1993	605.5	1453.2

PRORCOF/PROACOF = Real Producer Price Series for Robusta and Arabica Coffee Respectively.

Appendix (ii)

Derivation of Measures of Private and Social Efficiency as well as Policy Distortions from a Policy Analysis Matrix(PAM)

	Financial		Economic	
Off-farm costs	Foreign	Local	Foreign	Local
Processing costs	154.80	232.20	164.09	185.76
Marketing costs	106.76	71.18	113.17	59.94
Collection costs	-	56.25	-	45.00
Sub-Total	251.56	359.63	277.26	290.70
On-Farm costs				
Fertilizer/Chemicals	157.21	67.38	166.64	53.90
Hired Labour	-	88.00	-	79.20
Transport	5.50	3.67	5.83	2.94
Family labour	-	130.17	-	78.10
Fixed Labour	32.21	48.32	34.14	38.66
Sub-Total	194.92	337.54	206.61	252.80
Total costs	446.48	697.17	483.87	543.50
Surplus/Deficit	1172.35		1134.96	

Note: Crop = Arabica Coffee (Unimproved), Year = May 1993

A) Average Export Realisation (US\$/Kg) = 1.30

B) Official Exchange Rate (OER) (Shs/US\$) = 1180.00

C) Market Exchange Rate(MER) in (Shs/US\$) = 1245.25

Value of Output at MER (Shs) = $A \times C = 1618.83$

Standard Conversion Factor(SCF) $C/B = 1245.25/1180 = 1.06$

Measures of Private and Social Profitability

i) Private Profitability.

DRC_p (Index of Competitiveness) = Domestic costs/Trade gains
 $= 697.17/1172.35 = 0.59$

ii) Economic(Social) Profitability.

DRC_s (Domestic Resource Cost Ratio) = Domestic costs/Trade gains
 $= 543.50/1134.96 = 0.48$

The Policy Analysis Matrix(PAM)

	Costs			
	Revenues	Tradeable inputs	Domestic Factors	Profits
Private values	1618.83	446.48	697.48	475.18
Social values	1618.83	483.87	543.50	591.46
Divergencies	-	-37.39	153.67	-116.28

Measures of Private and Economic Profitability as well as Policy Distortions Derived from the PAM.

i) Net Private Profitability(NPP) = $475.18 \times 1200(\text{yield})$
 = 570,216 Shs/ha.

ii) Net Social Profitability(NSP)
 = $1618.83 - 483.87 - 543.50 = 591.46$
 = $591.46 \times 1200(\text{yield}) = 709,752 \text{ Shs/ha.}$

iii)
$$\text{EPC} = \frac{1618.83 - 446.48}{1618.83 - 483.87} = \frac{1172.35}{1134.96} = 1.03$$

iv)
$$\text{NPC} = \frac{1618.83}{1618.83} = 1.00$$

v) $\text{NPE} = 475.18 - 591.46 \text{ or}$

$0 - -37.39 - 153.67 = -116.28$