COLOMBIA: AN ANALYSIS OF AGRICULTURAL PRICING AND TRADE POLICY

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ABSTRACT

This study is part of a larger study on Trade and Agriculture that was requested by the Colombian Government and carried out under the supervision of the Colombia Division. Its purpose was to suggest agricultural pricing and trade policies to improve economic efficiency. Specific issues analyzed included the Government's price support policy, trade policy, the optimal level of stocks, and credit policy.

It was found that while the import restrictions resulted in high prices giving incentives for increased production, the support prices themselves had little additional impact on production. The support price-cum-import restrictions policy, by raising domestic prices well above world prices, created a distortion which had an efficiency cost to the economy. A welfare analysis, which explicitly recognized other distortions in the economy, was conducted to measure the potential gain in welfare in moving to an optimal pricing policy. The results for wheat show that the net efficiency gains would be small (less than 1%); however, consumers would gain substantially. The gain would come mainly at the expense of lowered economic rents currently enjoyed by the government importing agency.

The major issue facing agriculture is the overvaluation of the Colombian peso of about 25% as compared to 1975. Two solutions, each with its pros and cons, are suggested: speed-up the rate of crawl of the peso to about 30%, or have a one-shot devaluation of about 30% followed by a rate of crawl that reflects the difference between world and domestic inflation. In addition, it is suggested that the export and import licensing requirements be removed. Realizing that this may be difficult to do in the short-run, a system of auctioning licenses is proposed. It has the advantage of eliminating the need to monitor each request and is preferable to tariffs, which, unlike licenses, are perceived to be difficult to remove once instituted.

Because Colombia belongs to the International Coffee Organization, it faces an export quota which is determined, in part, by its level of stocks. Based on an analysis of the costs and benefits of holding stocks, the optimal level of stocks is found to be too high. Therefore, various ways to reduce the profitability of coffee are suggested. They include removing the fertilizer subsidy, increasing coffee taxes, and expanding the program on coffee diversification. The analysis suggests that the gains would be substantial.

The credit subsidy in agriculture is expected to decrease welfare because it would bring about production of crops whose social return is negative. Similarly, output in other sectors would be below their socially optimal level as credit in those sectors would be priced higher than in the absence of the earmarked subsidy. Therefore, it is suggested that the subsidy be gradually removed and finally eliminated. An analysis of the importance of the credit subsidy for 12 crops in Colombia suggests that while the subsidy is not an insignificant part of total costs, it is an incentive that can be replaced by other measures such as a faster rate of depreciation of the peso.
1. **Overview**

The growth rate of agricultural GDP in Colombia has fallen from over 4% in the 1970s to 1.5% for the period 1979-1982. In 1982, real agricultural GDP declined by 1%. Agriculture is an important sector of the Colombian economy accounting for about 25% of GDP and between two-thirds and three-fifths of commodity exports during 1970-1981. The decline in the sector is, therefore, of great concern to the Government. This study attempts to examine the major government interventions in agricultural pricing and trade policy and to suggest measures to improve the efficiency of the sector. 1/ Wherever possible, an attempt will be made to measure the net gains in efficiency from the suggested changes and to assess their welfare impact on various groups.

Before describing the government interventions in agriculture it is useful to give a brief description of the structure of production and trade in agriculture: The gross value of output in agriculture can be divided into three roughly equal parts — coffee production (28%), other agricultural crops (36%) and livestock (33%). 2/ This study will address only issues relating to agricultural crops including coffee. Agricultural exports comprise 54% of Colombia’s export earnings from goods and services. The proportion would be significantly higher if illegal exports of marijuana and cocaine were

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1/ This study is part of a larger mission on Trade and Agricultural Policies that visited Colombia in April and May, 1983. Some important issues that have been addressed at length in the larger study and are therefore only briefly discussed here, if at all, include the exchange rate policy, commodity price stabilization, agricultural investment, and marketing and transportation margins.

2/ Garcia, J., "Aspects of Agricultural Development in Colombia, 1970-1971," World Bank Mimeo, April 1983. The figures do not sum to 100 because of the exclusion of certain activities such as fence building which are carried out in the agricultural sector but do not belong in the above categories.
included. 1/ Coffee is the principal export and in 1981 constituted 45% of commodity exports. Agricultural imports, on the other hand, are small. The value of imports, expressed in 1975 pesos, was about one-tenth that of exports in 1981. 2/

About 60% of agricultural output is composed of exportables (some of the good is exported), 10% is composed of importables (some is imported) and the balance is composed of non-traded goods (not traded at current prices). 3/ The important exportables include coffee, sugar, cotton, bananas, flowers, tobacco and rice; the major importables are cereals and beans; and the most important non-traded crops are tubers: potatoes, yucca and cassava. Exports of agricultural goods grew at an average annual rate of 6% in real value terms during the 1970s. Most of this growth can be ascribed to coffee and sugar, whose prices increased dramatically during that period. Over the same period, the proportion of imports in agricultural GDP remained about the same.

The Colombian government utilizes a variety of policy tools in order to stimulate the agricultural sector. Four major government interventions are analyzed in this paper. They are price support policy, trade policy, coffee stocks policy and credit policy. The important issues raised by these interventions are noted below:

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1/ It is difficult to hazard a guess as to the volume of the illegal drug trade. There is, however, a consensus that it is a significant part of GDP, and that while the exports of marijuana have been decreasing because the US is becoming self-sufficient in marijuana, the cocaine trade has picked up the slack. In all figures mentioned in this report, the illegal drug traffic will be excluded for lack of reliable estimates.

2/ Garcia, J., op. cit.

3/ Ibid.
(a) **Price Support Policy.** The Agricultural Marketing Institute (IDEMA) sets producer support prices for several crops. It is important to understand the nature of and reasons for this intervention and to examine its implications for economic efficiency. If the objectives of the intervention are other than efficiency, it will be instructive to see whether the objectives are realized, and to measure the costs of achieving these objectives, both on efficiency and on income distribution grounds.

(b) **Trade Policy.** Issues under this heading include those relating to exchange rate policy such as whether to devalue, those dealing with restrictions on trade such as whether to change the system of tariffs, quotas or licensing, and those relating to export subsidies such as whether to change the structure of the export tax rebate. Again, the efficiency implications of these policies will be analyzed and suggestions made to improve efficiency.

(c) **Coffee Stocks Policy.** While the Government does not directly decide on the level of stocks held by the Federation of Coffee Growers (FEDERACAFE), its system of taxes on coffee can indirectly determine the level of stocks. There is concern that Colombia may be holding too high a level of stocks. This issue will be analyzed and suggestions made on how to change the level of stocks.

(d) **Credit Policy.** Farmers receive credit that is subsidized, directly or indirectly, by the Government. It is useful to evaluate the reasons for this subsidy and to measure its magnitude and importance to farmers. The issue of whether it is possible to achieve the objectives of this subsidy in a less costly manner will also be examined.
In sections 2-5 of this paper, each intervention is described and analyzed in detail. Conclusions and policy recommendations are presented in section 6.

2. Price Supports and Import Restrictions

The Agricultural Marketing Institute (IDEMA) sets support prices for wheat, barley, corn, soybean, sorghum, sesame, beans and rice. The prices are announced twice a year at the beginning of the planting season in an attempt to stimulate production by reducing the uncertainty of returns to the farmer. 1/ IDEMA's policy objective for producer prices is to guarantee domestic producers of agricultural commodities the recovery of their production costs or a minimum level of income per unit of output. 2/ Support prices are based primarily on production costs which come from surveys conducted by IDEMA agents. According to IDEMA's senior management, the Institute is also concerned with reducing domestic prices to the level of international prices. 3/ However, the price support increases given most crops in 1983 are fairly uniform and correspond closely to inflation levels. For example, the increases announced for semester A of 1983 ranged from 7% to 9% for all crops although the initial gap between domestic and international prices was very different for these crops. Similarly, while IDEMA claims to be concerned with levels of stock, last semester's support price for rice was raised by 9%. This occurred even though IDEMA had large stocks of rice from the previous year which it could not profitably export and, according to

1/ The crop year is divided into two semesters, A and B.


3/ See, for example, CAMBIO, IDEMA Newsletter, p. 7, March 1983.
IDEMA's own estimates, costs of production increased by only 5% during the semester. Thus it appears that IDEMA's support prices are based primarily on the rate of inflation. This implies an attempt to ensure that farmers' returns for a crop do not drop below previous levels rather than an attempt to alter the production mix.

The support price is the one that IDEMA would pay for a certain grade of the commodity, usually a superior one, and is therefore typically higher than the average price paid by IDEMA (Table VI.1). Both the support price and the average price paid by IDEMA are usually above what the market price would have been in areas located far from consumption centers, but lower than the average open market price in the country. For this reason IDEMA manages to purchase only a small fraction of output for most crops. The major exceptions to this are wheat and sesame in which IDEMA has purchased 49% and 43% respectively of the total production during the last 3 years. Given IDEMA's tight financial situation and the Government's concern with controlling food prices, the support prices are not likely to be raised to levels which would stimulate production significantly. Therefore, while IDEMA has a strong influence in stimulating production and raising farm incomes in some regions, its price support role is not an effective way of stimulating production nation-wide.

IDEMA's import policy is closely linked to its support price policy. The link occurs because the support prices for most importables are able to be maintained above their international prices only because imports are restricted. The Foreign Trade Institute, INCOMEX, must approve the import of every crop whose price is supported by IDEMA. It grants a license only after consulting with IDEMA and the Ministry of Agriculture and confirming that a deficit for the crop exists. This ensures that consumer prices do not
### Table 1  PRICE COMPARISONS AND IDEMA PURCHASES, 1980-1982

(in pesos/ton)

<table>
<thead>
<tr>
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<tbody>
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<td>a</td>
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<td>a</td>
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<tr>
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<td>2.07%</td>
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<td>15600</td>
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<td>11318</td>
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<tr>
<td>IDEMA purchases</td>
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<td>1.99%</td>
<td>5.23%</td>
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<td>Beans</td>
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<td>46000</td>
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<td>11500</td>
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<tr>
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<td>-</td>
<td>30636</td>
<td>35891</td>
</tr>
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<td>IDEMA purchases</td>
<td>-</td>
<td>-</td>
<td>1.64%</td>
<td>0.18%</td>
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<td>Rice</td>
<td></td>
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<td>IDEMA purchases</td>
<td>5.37%</td>
<td>7.52%</td>
<td>0.24%</td>
<td>1.60%</td>
</tr>
</tbody>
</table>

* As a proportion of total production.

Notes: The support price is set for a certain grade of the crop, usually a superior one, and the average price paid by IDEMA is typically lower. The market price is the national average farmgate price.

Source: IDEMA
fall below IDEMA's support prices. IDEMA may import the commodity without paying any tariffs, whereas other importers must pay between 15.5 and 24.5%. While IDEMA's domestic purchase price may be higher than its import purchase price, the price at which IDEMA subsequently sells is based on its domestic purchase price.  

Thus IDEMA obtains all the rents from the system of tariffs and licenses. For example, the farmgate price of wheat in 1982 was 91% higher than its c.i.f. price. Even after accounting for differences in the costs of transportation from the port to Bogota versus Pasto, the major wheat growing region, to Bogota, the farmgate price remains about 70% higher than its import parity price. Since tariffs on wheat in 1982 were only 16.5% until October (when they were raised to 18.5%) and IDEMA does not pay tariffs anyway, the 70% differential constitutes port charges and economic rents to IDEMA. Port charges have been estimated to be very high in Colombia and are also likely to include elements of economic rent.  

The stated purpose of the protection given to farmers, at least for wheat, is not so much to stimulate domestic production (in which IDEMA has had limited success since over 80% of the Colombian consumption of wheat is still imported) as to increase farm incomes in certain regions. The concerns are the cost of this policy in terms of net efficiency loss and the impact of this policy on farm incomes, consumer welfare and government revenues. Here, a simple analysis based on consumer and producer surplus attempts to measure the 

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1/ IDEMA's selling price is much higher than its import price plus transportation and handling costs and is only feasible because of a Government policy of restricting imports via licensing. Thus the support price policy and its restrictions policy go hand in hand.

gains and losses to various groups from this policy as compared to a policy that maximizes efficiency.

In an economy where there are no distortions except in the wheat market, the optimal policy would be to eliminate the distortion on wheat by removing all trade restrictions. However, if, as is the case in Colombia, there are certain commodities in the economy whose import tariffs or export subsidies are taken to be given and which are substitutes or complements for wheat in either consumption or production, the optimal policy will no longer be the removal of tariffs on wheat. This is because removing all distortions from wheat would lead to resources moving into the production of say, barley, which is protected. Assuming that barley is a perfect substitute for wheat in production, the second-best policy would be to equate wheat's effective rate of protection (ERP) with the ERP of barley, while equating the tariff for wheat with that of its substitute good in consumption. 1/

Calculating the welfare cost of protecting wheat via the support prices-cum-import restrictions when price supports or import restrictions for all other crops remain unchanged is not particularly interesting. This is because the welfare loss is likely to be negligible since wheat's major substitutes in production, barley and livestock, and its major substitute in consumption, corn, also have fairly high levels of protection. The more interesting case is to calculate the potential welfare gain if IDEMA were to lower its support prices for all its imported crops to an optimal level but all other distortions remain unchanged. The optimal price level for each crop

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1/ In reality, of course, even if the land used in wheat can only otherwise be used for barley, it is not likely to be true for all factors of production (labor may migrate) and so one cannot think of perfect substitutes. Instead one needs to think in terms of a series of substitute goods in production (consumption) with different weights given to their ERPs (tariffs) depending on how close a substitute the good is.
in this case will be the c.i.f. price plus the average distortion on its
substitute goods in consumption and production. Thus the second-best optimal
policy would be to remove all licensing requirements and impose a tariff equal
to the average distortion on its substitute goods in production and
consumption.

The welfare impact on consumers, producers and the Government
associated with moving to this optimal level is shown in Table 2 for the case
of wheat under three different scenarios: the average distortion on the
substitute goods is 10%, 15% or 20% implying optimal tariff levels for wheat
of 10%, 15% or 20% respectively. The analysis is explained in detail in Annex
1. The distortion level is based on the assumption that the resources
diverted from wheat production and consumption are used to purchase or produce
an "average" bundle composed of exportables, importables and non-traded
goods. The range for the distortion from 10% to 20% depends on plausible
parameters for various combinations of the distribution of importables,
exportables, and non-traded goods, coupled with average levels of import
tariffs and export subsidies.

Based on an analysis of producer and consumer surplus, the results
in Table 2 show that it is the consumer who would stand to gain most from the
policy whereas the Government and IDEMA would lose the most. The net
efficiency gain varies from Col $163 to $226 depending on the distortions in
the rest of the economy. The net efficiency loss is modest as compared to the
value of consumption (less than 1%). Even when the elasticity of supply was
increased from a short-run value of 0.6 used in the analysis to a long-run
elasticity of 1.2, the efficiency gain as a percentage of GDP increases to
only slightly over 1% in the 10% distortion case (not shown here).
Table 2

EFFICIENCY GAINS AND LOSSES IN WHEAT FROM LOWERED TARIFFS

<table>
<thead>
<tr>
<th>Tariff Level</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease in Producer Surplus</td>
<td>161</td>
<td>430</td>
<td>398</td>
</tr>
<tr>
<td>Increase in Consumer Surplus</td>
<td>4084</td>
<td>3763</td>
<td>3444</td>
</tr>
<tr>
<td>Decrease in Tariffs and Reasts</td>
<td>3325</td>
<td>3045</td>
<td>2767</td>
</tr>
<tr>
<td>Cost of Increased FX</td>
<td>93</td>
<td>95</td>
<td>116</td>
</tr>
<tr>
<td>Net Gain</td>
<td>225</td>
<td>193</td>
<td>163</td>
</tr>
</tbody>
</table>

The obvious solution for eliminating the distortion caused by the licenses is to remove them. However, because of interest groups of farmers and importers, this would be politically difficult. Also, the Government is concerned about the additional loss of foreign exchange reserves implied by the removal of quantitative restrictions. The next-best alternative would be a system of higher tariffs, which is preferable to the quantitative restrictions because the problem of deciding upon each request for a license would be eliminated. However, there is a perception that the system of quantitative restrictions is temporary and can be easily changed as the foreign exchange situation eases, whereas tariffs are difficult to remove once instituted. If, therefore, quantitative restrictions will continue, the Government should consider auctioning import licenses. This would have the advantage of eliminating the need to monitor each importer’s request.

3. Trade Policy

Interventions in agricultural trade policy occur in three forms: exchange rate policy, trade restrictions, and export subsidies. The nature of these interventions and their implications for efficiency will be analyzed in turn.

(i) Exchange Rate Policy. Colombia has been following a crawling peg system. The rate of crawl is adjusted each year based on several criteria, one of them being the difference between world inflation and
Colombian inflation. Until 1981, this system allowed Colombia to build a sizable stock of foreign exchange reserves. Recently, there has been a rapid depletion of reserves caused primarily by two factors: 1/ (1) The Colombian peso has appreciated relative to the currencies of its major trading partners by about 25% since 1975 based on the nominal exchange rate adjusted for differences in the rates of inflation; and (2) the recession in world demand has adversely affected Colombian exports. The effect of these phenomena has been particularly severe in agriculture since about 60% of agricultural GDP is composed of exportables, whose domestic prices have been depressed. The prices of importables have, however, been protected in spite of the overvalued peso by the imposition of other import restrictions described below. However, because importables comprise only about 10 to 12% of agricultural GDP, this stimulus to agriculture is small.

Thus, perhaps the single most important problem facing the agricultural sector is the overvaluation of the peso. The real effective 2/ exchange rate needs to depreciate by about 20% in order to bring it to parity with the 1975 level. Two ways to achieve this objective have been suggested: (1) speed-up the annual rate of crawl of devaluation to 28 or 30% or (2) undertake a one-shot nominal devaluation of about 30 to 35% to stave off further speculation against the peso and then adhere to a slower rate of crawl which, among other things, reflects the difference between Colombian inflation and the inflation of major trading partners. Increasing the rate of crawl would achieve the objective in about two or three years assuming that the


2/ The real effective exchange rate refers to the real exchange rate adjusted for export subsidies.
Colombian rate of inflation does not change significantly. The Government has already increased the rate of crawl from 17% to approximately 24% per year. The merits and demerits of the two approaches are spelled out in Edwards (1983). 1/

(ii) Trade Restrictions. In Colombia, quantitative restrictions via licensing mechanisms are more important than tariffs in providing incentives to producers of importables. After more than 10 years of pursuing a policy of mild liberalization, the Colombian Government, in 1982, increased both tariff levels and the number of items in the restricted import list. 2/
While the increases in tariff levels were small (no more than 5 percentage points for any of the twenty-one categories comprising agriculture and processed foods), the numbers of items in the restricted list increased dramatically. In the first quarter of 1979, the number of categories in which over 80% of the items were restricted was only four out of the twenty-one categories of agriculture and processed foods. In the first quarter of 1983, this number had increased to seventeen. 3/
In addition, even in categories such as cereals in which all items were restricted in 1979, the rates of nominal protection increased significantly by 1982 (Table 3), presumably due in part to tighter import restrictions.

There are also licensing requirements on the export side for several export crops including coffee, sugar, cotton and rice. Of the major agricultural exports, the only ones not subject to a quota are tobacco, bananas and flowers. Licenses for the export of the restricted crops are

1/ Edwards, op. cit.
2/ Imports of items in the restricted list require a license from INCOMEX.
3/ Edwards, op. cit., Table 2-8.
obtained only after INCOMEX is satisfied that a surplus of the crop exists at the current price. Coffee and sugar are special cases subject to export quotas fixed by international agreement and there is little that government policy can do to stimulate exports of these crops other than affect export quotas by directing the level of stocks toward the optimum. 1/ However, in cotton and rice the Government could stimulate domestic production and exports by removing export restrictions.

Nominal rates of protection give the net distortionary impact on output pricing. To calculate the nominal rates of protection for importables, we would like to compare the farmgate price to the c.i.f. import price plus port and transportation charges to the consumption center less transportation charges from the farm to the consumption center. However, since port and transportation cost data are not readily available, it is assumed that the sum of port charges and transportation costs from the port to the consumption center is equal to the transportation costs from the farm to the consumption center. This allows us to directly compare the c.i.f. price to the farmgate price. Since port charges in Colombia are high, our simplifying assumption leads to an overestimate of the nominal rate of protection. In a sense, this estimate gives a measure of protection from both policies on import restrictions (including tariffs) and "natural" protection in the form of high port charges. The nominal rates of protection calculated thus are given in Table 3.

The high nominal rates of protection show that the bulk of the importable crops receive a production subsidy in the sense that they could have been imported more cheaply. The protection rates implicitly act as a

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1/ The next section explains how the Government may do this for coffee.
Table 3

<table>
<thead>
<tr>
<th>Nominal Rates of Protection for Select Importable Crops</th>
<th>Percentage</th>
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<tbody>
<tr>
<td></td>
<td>1980</td>
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<tr>
<td>Wheat</td>
<td>36</td>
</tr>
<tr>
<td>Corn</td>
<td>87</td>
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<td>Soybean</td>
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<td>Sorghum</td>
<td>67</td>
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<tr>
<td>Beans</td>
<td>42</td>
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</table>

Measures the percentage difference between farmgate and c.i.f. import price. Sources: IDEMA and DNP.

Consumption tax since retail price are based on mark-ups from the protected farmgate prices. This distortion suggests that there would be gains from lowering import restrictions. Such an analysis was conducted in the last section for wheat.

Calculating nominal rates of protection for Colombia's exportable crops is a difficult task for two reasons: (1) The comparison must now be made between the f.o.b. price and the farmgate price plus the sum of transportation costs to the port and port charges — our earlier simplifying assumption on transportation and port charges can no longer be made; detailed transportation and port charges' data are now necessary. (2) Colombia's exportables of sugar, cotton, rice, flowers and tobacco, unlike its importables, have significant processing costs before being exported. One way to circumvent these problems is to compare the f.o.b. price to the domestic wholesale price in the hope that the wholesale price approximates the farmgate price plus processing and transportation costs. However, the problem with port charges remains and a new problem is introduced because of differences in quality between domestically consumed exportable and exports. Therefore it was considered better not to estimate protection rates for exportables. However, nominal rates of protection for exportables are expected to be
significantly lower than for importables and may even be negative for certain crops in some years.

Another measure of the degree of protection awarded a crop is the effective rate of protection. The effective rate of protection is the subsidy to value-added $1/1$ and is therefore a better measure of the incentive given to a farmer. It takes into account both distortions in the output price and in the prices of traded inputs. If the inputs receive the same degree of protection as outputs, the nominal and effective rates would be equal. Since agricultural inputs in Colombia receive much lower protection than outputs, especially importables, the effective rate of protection exceeds the nominal rates given in Table 3. Therefore, importables unambiguously receive high protection. The situation with exportables, however, is unclear.

(iii) Export Subsidies. There are two major forms of export subsidies in agriculture: subsidized credit via PROEXPO, which is a combination of an export promotion agency and a bank, and CAT, which is a direct export subsidy given in the form of a negotiable tax rebate certificate. Of the major exports, bananas, cotton, rice and tobacco currently receive a CAT of 15%. The PROEXPO credit subsidy is given to all agricultural exports except coffee, which receives subsidized credit through FEDERAGRO. In addition, there are ad hoc subsidies which are given in certain special hardship cases as for cotton (and now rice) when world prices are depressed and domestic production exceeds domestic demand.

One of the purposes of both the PROEXPO credit subsidy and CAT is to partially offset the real appreciation of the peso. For this reason, in

August 1982, the level of CAT was raised from its old level of between 5-9% to 15% for most categories of agricultural exports. Similarly, the level of the PROEXPO credit subsidy increased from 4.8% in 1980 to 8.0% in 1981. 1/

Currently, PROEXPO credit on working capital is given at 19% whereas market rates are close to 50%. Both the PROEXPO credit subsidy and CAT serve a useful purpose in partly correcting for the overvaluation of the peso. However, CAT is not awarded to all crops; flowers, for example, had to have their CAT subsidy removed at the insistence of the US which threatened retaliatory action. For this reason, a devaluation or real depreciation of the peso is a measure that would be preferred to the use of increased CATs.

A new proposal to replace CAT by a variable export subsidy, CERT, is presently under consideration. The level of CERT would be fixed for each crop based on the expected export price. This proposal is recommended because its advantages over CAT include its flexibility (it can be changed at any time by a resolution of the Monetary Board rather than by presidential decree) and the greater likelihood of its acceptance by CATT. The flexibility of CERT would be particularly useful if a faster rate of crawl is adopted. A one-shot devaluation is likely to make CERT (or CAT) less necessary but would still be useful in partially overcoming the distortions caused by tariffs on imports.

4. Coffee Stocks Policy

In 1981, coffee accounted for 30.7% of the value of gross output in agriculture and comprised 45% of total legal commodity exports. Coffee sales are subject to an elaborate system of taxes. The two major forms of taxes are a retention tax and an ad valorem export tax, which is currently at 9% but has been as high as 26%. The retention tax refers to the proportion of coffee

1/ Edwards, op cit., Table 2-9.
that an exporter must deposit with the National Coffee Fund before he may export. It is currently 40% but has varied between 15% and 62% since 1979. This tax now accounts for about 70% of all tax revenues from coffee. In an effort to stabilize production, the Government varies these tax rates, by as much as 7 times a year. By doing this, the Government is able to determine the price received by growers as well as whether growers sell to the Federation or private exporters.

Although the net impact of government interventions is to introduce a bias against coffee production, coffee farmers do receive some subsidies. Like most farmers, coffee growers receive credit at subsidized interest rates and at present they receive about a 20% subsidy on fertilizer from FEDERACAFE which indirectly comes from the National Coffee Fund. This subsidy was initiated only five or six years ago when FEDERACAFE felt that returns to farmers needed to be raised. In addition, a small part of the revenue from the two major taxes on coffee comes back to farmers in the form of infrastructural improvements and technical assistance. There is an ongoing program of coffee diversification sponsored by FEDERACAFE whereby farmers are offered financial and technical assistance to grow other crops. The program is achieving its objective of encouraging some farmers in selected areas to grow other crops. However, it has not yet succeeded in bringing down the growing inventories of coffee. The major reason for farmers reluctance to diversify is a guarantee from FEDERACAFE that the entire crop of coffee will be purchased at a fixed price that assures an adequate return.

Colombia is a member of the International Coffee Organization (ICO) which obliges Colombia to limit its exports to a quota. The quota has two components: the larger, "fixed" component is decided by negotiation between

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Colombia and the rest of ICO; the smaller, variable component is based strictly on a formula that takes into account the proportion of Colombian coffee stocks in world stocks. In recent years, the output of coffee has exceeded the sum of domestic demand and the export quota. As a result, coffee stocks have been growing and now stand at a level equal to that of annual exports. Given the high level of world stocks, it is unlikely that Colombia will ever need to draw its stocks down to zero, even in the case of bad harvests in Colombia or elsewhere. Therefore, the current level of Colombian stocks cannot be justified on world efficiency grounds, nor are they necessary for the purpose of meeting production shortfalls. However, it may be in Colombia's interest to hold the high level of stocks if the benefits to Colombia from having a larger quota due to high stocks outweigh the costs of producing the coffee and the costs of storage. To see whether this is true, an analysis of the costs and benefits of holding coffee stocks is conducted in Annex 2.

Assuming that prices remain constant in real terms and that stocks are desired only for increasing the variable part of the quota, the analysis in Annex 2 shows that the optimal stock of coffee would be at least 0, 1.4 and 3.1 million bags respectively in the 10%, 15% and 20% distortion cases. 1/ These are lower bound figures given the level of distortion. The actual optimal level is likely to be higher because stocks serve two other purposes -- they act to insure against production shortfalls that would otherwise decrease consumption or exports, and they are a useful instrument in negotiating the "fixed" part of quota.

The analysis makes two useful statements. First, in order to take

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1/ These distortions refer to the difference between the peso value of the dollar at the official rate and the social value of the dollar in pesos. The latter is higher because of tariffs and export subsidies.
maximum advantage of the formula that allows Colombia to increase its exports beyond the "fixed" level, no more than 3.1m bags are required — and 3.1m bags are required in the extreme case when the premium on foreign exchange is expected to be 20%. Second, even if the optimal level of stocks is higher than the figures given above, the current level of stocks is too high. In fact a gain of Col $1100, 902 and 704 respectively can be expected from decreasing stocks by one bag in the 10%, 15% and 20% distortion cases. The current levels of stock are too high to justify stocks as a means of insuring against production shortfalls, and the benefits of holding stocks as a bargaining tool for negotiations are not likely to exceed the net costs of storing such a high level of stocks.

Since the export quota is fixed and domestic demand is limited, the only way of bringing down stocks is by decreasing production. Farmers will produce less coffee only if the profitability of coffee falls relative to other crops. This can occur through a decrease in the profitability of coffee or an increase in the profitability of substitute crops. Given the need for a substantial reduction in stocks, the Government should try both means.

A first step in reducing the profitability of coffee is to remove the fertilizer subsidy given to coffee growers. This would have the additional benefit of removing the distortion created by the subsidy. The implications of removing the fertilizer subsidy are analyzed in Annex 3. Unfortunately, while the benefits of this change would be significant, it would have only a small impact on prices and consequently on production. The impact on production (and therefore on the level of stocks) would be to decrease output by approximately 319,000 bags in the short-run and 798,000 bags in the long-run. The benefits of this policy are given in Table 4.
Table 4
Net Benefits from Removing the Fertilizer Subsidy
(Millions of pesos)

<table>
<thead>
<tr>
<th>Distortion Level</th>
<th>Short-run</th>
<th>Long-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>36.2</td>
<td>88.9</td>
</tr>
<tr>
<td>15%</td>
<td>29.9</td>
<td>73.1</td>
</tr>
<tr>
<td>20%</td>
<td>23.6</td>
<td>57.3</td>
</tr>
</tbody>
</table>

Another way to reduce the profitability of coffee production is to increase taxes on coffee so as to decrease the real farmgate price of coffee. The impact of such a measure on incomes of farmers, FEDERACAFE, and the Government would depend on the magnitude and type of tax that the Government increases and FEDERACAFE's decision as to what portion of the tax to pass on to producers. This issue is best left to policy makers who have a good understanding of the political economy of tariffs. It is, however, worth pointing out that the benefits of increasing taxes would be substantial even if the production response is small, as in the short-run.

Finally, additional efforts need to be made to increase the profitability of other crops in the coffee zones. The most obvious way to do this would be to expand the program on coffee diversification. The program gives technical assistance and some financial assistance to farmers in coffee zones. It provides information to farmers regarding the most suitable crops for a specific area with respect to climatic and soil conditions as well as marketing possibilities. The information includes farm budget estimates, expected output prices, rates of returns, and technical information on suitable production methods. The program has had some success and needs to be expanded in view of the divergence between net social benefits and net private benefits in the production of coffee.
5. **Credit**

Virtually all farmers receive credit that is subsidized directly or indirectly by the Government. The volume of credit given to a farmer usually accounts for over 50% of the costs of production. Several intermediaries including commercial banks are involved in the distribution of credit. However, two sources of funds, the Fondo Financiero Agropecuario (Agricultural Finance Fund) and the Caja Agraria (Agricultural Development Bank) account for about 70% of all funds lent to agriculture.

The term of the loan and the interest rate charged to the farmer depends on the lending institution, the crop being financed and the assets of the farmer. There does not seem to be a government policy on the level of the interest subsidy. For example, when market interest rates were falling in early 1983, the nominal interest rate for the largest line of credit, the Fondo Financiero Agropecuario (FFAP), did not change. The Caja Agraria has recently lowered its interest rates by 5 to 7 percentage points for loans earmarked for food crops. However, this move appears to have been prompted by a desire to stimulate food production at the expense of other crops rather than a desire to maintain a constant level of subsidy in the face of falling interest rates.

One surprising discovery is that all farmers eligible to receive the subsidized credit are able to do so. The subsidy does not cause some eligible farmers to be deprived of the credit as is often the case when a good is subsidized. The eligibility criteria include a title to the land; the volume of credit is based on the crop and area planted. The fact that no eligible farmers are denied the subsidized credit is supported by the fact that last

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1/ The Caja Agraria charges lower interest rates to farmers with low levels of assets.
year 5% of FFAP funds that were committed to agricultural loans were not lent because there were no eligible farmers who demanded the loans. In fact, several people mentioned that there is some diversion of money earmarked for credit to other activities. Therefore, the agricultural credit subsidy comes at the expense of credit availability in other sectors. The subsidy is not limited to specific crops and is available to small farmers.

In a study conducted jointly by the Colombian Agricultural Institute (IICA) and the Ministry of Agriculture, average levels of interest on agricultural loans were found to be between 45% and 60% of market interest rates during the period 1976 to 1980. The credit subsidy during this period amounted to 2.2% of agricultural GDP. In 1982, the weighted average "effective" interest rate on Caja Agraria loans to farmers was 31% while FFAP funds were lent at 24%. Market interest rates for unsubsidized loans in the formal sector were about 50%. The benefit to farmers from the government subsidized loans may not be simply the difference between the government subsidized rate and the formal sector market rate because of two

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1/ This may also have been due to bureaucratic delays in processing loans and in transferring lines of credit from one crop to another.


3/ The "nominal" interest rate on Caja loans was 26% while FFAP loans were generally given at a "nominal" interest rate of 21%. Because of the Colombian system of deducting quarterly interest payments in advance, the "effective" interest rates turn out to be 24% and 31%. However, it must be noted that some transactions do occur at the nominal rate. The extent of this phenomenon is not known.

4/ See "Colombia: Colombian Investment Ranking System and Related Financial Sector." World Bank, Report No. 4274-CO, January 1983. Again "nominal" rates were lower and some transactions are expected to have been carried out at the lower rate.
other important considerations that work in opposite directions. On the one hand, the transactions cost to farmers of the government loans is high because of red tape and bureaucracy; on the other hand, most farmers would not otherwise be able to avail of the formal market but would have to get credit in the informal sector where interest rates are estimated to be upwards of 55%. While data on loans given to farmers through the informal sector are not available, the proportion of loans made through the informal sector is thought to be low.

At first glance, the effect of the agricultural credit subsidy on the composition of agricultural output or on the choice of farming techniques does not seem to be distortionary since credit is readily available for most purposes at roughly comparable interest rates. However, some agricultural projects that may not be socially beneficial will be undertaken because the private cost of borrowing is below the social cost due to the subsidy. In so far as these low return projects are concentrated in a given sub-sector of agriculture, the composition of agricultural output will be affected.

The subsidized credit in agriculture is also a source of distortion for other sectors since part of the cheap and subsidized credit in agriculture comes at the expense of reduced credit availability in other sectors. This increases the market interest rate in other sectors to a level above the social cost to the economy in the absence of subsidies. Therefore, projects in other sectors that may be socially beneficial at the social cost of borrowing are not undertaken because the private cost of borrowing is higher than the social cost. The policy prescription is therefore to raise the interest rate to agriculture which, under competitive banking conditions, would also lead to a lowering of interest rates to industry.
Higher interest rates will induce fewer farmers to borrow from the formal sector. Currently, there are high transaction costs in processing agricultural loans. These costs — a lot of them are due to red tape — represent a significant loss to society. By switching the number of farmers willing to borrow from the formal to the informal market, the loss from transactions costs is reduced.

While the direction of the recommended change is clear, the phasing out of the credit subsidy to agriculture is a delicate issue. This is because many farmers have a vested interest in maintaining the subsidy. Also, the Government is concerned about stimulating the agricultural sector. At the least, interest rates charged by lending institutions in agriculture should no longer be lowered when market interest rates worldwide or in Colombia fall.

The impact of lowering the credit subsidy on agricultural production and farm incomes is not expected to be large. Based on an analysis of 12 major crops including coffee, credit accounts for 10.9% of total costs of production. Since the subsidized interest rate is about 5% of the market rate, the credit subsidy accounts for about 5% of total production costs. Removing the subsidy would raise the production costs by less than 5% if, as expected, it would lead to lower market interest rates and farmers obtain credit from both sources. In comparison, fertilizer accounts for about 12.5% of total production costs while machinery rental accounts for about 13.9% (Table 5). Thus, while the credit subsidy is not an insignificant part of total costs, it is an incentive that can be reasonably expected to be substituted by other measures: a faster rate of depreciation of the Peso, or reduction in costs of other inputs (by a reduction in tariffs or increased efficiency in transportation or ports).
Table 5

INPUT COSTS AS A PROPORTION OF TOTAL COSTS OF PRODUCTION*
(percentage)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Credit</th>
<th>Fertilizer</th>
<th>Rental</th>
<th>Pesticides</th>
<th>Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>6.89</td>
<td>11.66</td>
<td>24.01</td>
<td>4.28</td>
<td>11.23</td>
</tr>
<tr>
<td>Corn</td>
<td>8.03</td>
<td>6.10</td>
<td>11.37</td>
<td>0.59</td>
<td>4.70</td>
</tr>
<tr>
<td>Soybeans</td>
<td>7.58</td>
<td>10.99</td>
<td>14.34</td>
<td>8.58</td>
<td>9.56</td>
</tr>
<tr>
<td>Sorghum</td>
<td>7.41</td>
<td>20.24</td>
<td>14.46</td>
<td>6.49</td>
<td>2.57</td>
</tr>
<tr>
<td>Sesame</td>
<td>8.27</td>
<td>8.00</td>
<td>10.76</td>
<td>2.29</td>
<td>1.57</td>
</tr>
<tr>
<td>Beans</td>
<td>7.98</td>
<td>9.05</td>
<td>13.53</td>
<td>0.04</td>
<td>13.51</td>
</tr>
<tr>
<td>Coffee</td>
<td>13.85</td>
<td>13.76</td>
<td>18.76</td>
<td>2.19</td>
<td>1.30</td>
</tr>
<tr>
<td>Rice</td>
<td>7.04</td>
<td>10.99</td>
<td>10.01</td>
<td>9.07</td>
<td>13.74</td>
</tr>
<tr>
<td>Cotton</td>
<td>8.43</td>
<td>9.99</td>
<td>7.30</td>
<td>11.58</td>
<td>2.35</td>
</tr>
<tr>
<td>Potatoes</td>
<td>7.90</td>
<td>13.89</td>
<td>6.94</td>
<td>4.12</td>
<td>16.18</td>
</tr>
<tr>
<td>Yucca</td>
<td>13.54</td>
<td>5.5d</td>
<td>10.19</td>
<td>1.97</td>
<td>4.84</td>
</tr>
</tbody>
</table>

Weighted Avg. (w/ coffee) 10.93 11.86 13.73 4.33 6.02

Weighted avg. (w/o coffee) 8.82 10.49 10.08 5.88 9.45

* Weighted average based on area planted of 'technificado' and 'tradicional' except for yucca which is an arithmetic average.

** Includes pesticides, herbicides, fungicides and insecticides.

Source: Caja de Credito Agrario

Surprisingly, World Bank loans given to the agricultural sector in Colombia via the FFAP carry a stipulation on the interest rate at which those funds may be on-lent. Currently, that stipulated interest rate is not only well below market rates, it is below the interest rate charged by the IFAP on the majority of its loans. The reasons for this need to be studied further and increased attempts need to be made to lower the subsidy element to farmers on World Bank loans.
6. **Policy Recommendations and Conclusions**

The major findings and policy recommendations are listed below:

(1) IDEMA's support price policy is not very effective in stimulating output for most crops on a national scale, however it achieves its output and income distribution objectives in certain regions. Its policy, in conjunction with INCOME, of maintaining price supports by restricting imports transfers incomes to farmers and importers at the expense of consumers. The net efficiency loss due to this policy for wheat is estimated to be in the range of $163 to $226 million.

(2) One of the most important issues facing the agricultural sector is the overvaluation of the exchange rate since this depresses the prices of exportables which are the major component of agricultural GDP. It is important to either (a) accelerate the rate of crawl of devaluation of the peso to about 28 or 30%; or (b) undertake a one-shot nominal devaluation of 30 to 35% to stave off further speculation against the peso and then maintain a slower rate of crawl. For the agricultural sector, at least, the latter option sounds best.

(3) The system of import and export licenses has created a situation of high protection for importables and negative protection for some exportables. It is important to move towards dismantling this system. However, in the short-run, it may be useful to introduce a system of auctioning the existing licenses.

(4) Direct export subsidies such as CAT presently serve a useful purpose in partly correcting for the overvaluation. However, the proposed system of variable export subsidies, CERT, which is intended to compensate the producer for deviations from expected export prices, is preferable.
(5) Given the projections for coffee prices in the future, the level of
Colombian stocks of coffee is too high. Based on an analysis of the costs
and benefits of the increased export quota due to higher levels of stock,
a figure of 0 to 3.1 million bags (depending on the assumed distortion in
the foreign exchange market) is obtained for the minimum level of
stocks. The optimal figure will be a somewhat higher because the use of
stocks for the purpose of meeting production shortfalls has been ignored,
as has its use as a negotiation instrument for the fixed part Colombia's
quota. In any case, current levels are expected to be high, and a net
gain of between Col $700 and $1100 is expected for every bag that is
removed from storage. Reducing storage implies reducing production, and
this should be achieved in three ways:

(1) remove the subsidy on fertilizer for coffee production -- this only
has a small impact on production (about 319,000 bags in the short-
run, 798,000 bags in the long-run) but has sizable net benefits
(between Col $22 million and $87 million depending on various
assumptions regarding elasticities and the distortion on foreign
exchange.)

(11) increase the level of taxes on coffee -- the decision as to which
taxes to increase, and the magnitude of the increases is best left
to the policy maker familiar with the political economy of coffee
taxes.

(111) expand the program on coffee diversification to help increase the
expected profitability of alternate crops.

(6) The credit subsidy to agriculture is expected at the margin to bring about
the production of crops for which the social return is negative but
private return is positive. Similarly, to the extent that the
agricultural credit subsidy reduces credit availability in other sectors, marginal projects with positive social returns in those sectors will not be undertaken because their private return will be negative due to higher interest rates. In the medium and long-term, the subsidy should be reduced. In the short-term this can be achieved by not lowering interest on agricultural loans as domestic or world interest rates fall.

(7) World Bank loans to the agricultural sector in Colombia carry a lower interest rate than the already subsidized agricultural loans. Increased attempts must be made to raise the interest rate on these loans, at least to the level of other agricultural loans.
Annex 1

Welfare Impact of Reducing Import Restrictions on Wheat

In the absence of any import restrictions and port charges, the price of wheat in Bogota would be no more than the c.i.f. price at a port (say, Cartagena) plus the cost of shipping from Cartagena to Bogota. Under competitive conditions, this also implies that the price in Pasto, the major wheat growing region, would be no more than the latter price minus the cost of transportation from Pasto to Cartagena. In 1982, because of import restrictions, the farmgate price was about 66% over what it would have been in the free trade situation. Part of the differential accrued to the government in the form of tariffs and part of it is in the form of economic rents to IDEMA.

As mentioned in Section 2, the optimum tariff policy for wheat would not be a zero tariff but a tariff equal to those of its substitute in consumption and production. For lack of better information on the substitute goods, it will be assumed that the resources released from reduced domestic production of wheat and the expenditures diverted to the increased consumption of wheat go to/cone from some representative composite good. The composite good is assumed to contain exportables, importables and non-traded goods in the same proportion as the composition of GDP. Also, the tradeables are assumed to have the same level of tariffs or export subsidies as the average level in the economy.

Because both the breakdown GDP into tradeables and non-tradeables and the levels of protection for trad. es is not known with a great deal of reliability, a sensitivity analysis of the resulting average level of
protection is conducted. The range covers most plausible values for the parameters. To obtain a base case, it is assumed that 50% of the economy is composed of non-traded goods, 25% is exportable and 25% is importable. \(^1\) The average nominal tariff weighted by imports is found to be 30% in the first quarter of 1983. \(^2\) The actual protection on importables is expected to be higher due to licensing restrictions. Also, based on previous studies, \(^3\) the average effective rate of protection is expected to be higher than the nominal. Therefore, a plausible value of the average distortion to importables -- which is a weighted average of the effective and nominal rates of protection -- is taken to be 45%.

On the side of exportables, there are two major subsidies, CAT, which in 1983 had an average level of 11.3%, and PROEXPO credit which in 1981 had an average level of 8%. \(^4\) However, because of certain export restrictions and taxes on some crops, a figure of 15% rather than 19% is used for the base case calculation of the average distortion in exportables. \(^5\) Thus the average distortion on the economy as a whole will be 
\[
.25 \times 15\% + .25 \times 45\% + .50 \times 0\% = 15\%.
\]
Making fairly large changes in the base case parameters causes the average distortion to vary from 10 to 20% and hence these values are the ones used in the sensitivity analysis.

\(^1\) About 55% of the GDP is composed of services, most of which are non-traded. Similarly over 40% of the GDP is composed of agricultural and industrial goods, most of which are tradeable.

\(^2\) Edwards, op cit.


\(^4\) Edwards, op cit.

\(^5\) Information on the effective rates of protection for exportables is not available so they are implicitly assumed to be equal to the nominal protection rates (i.e., export subsidies).
Under the assumptions made here, the tariff on wheat that is optimal will be equal to the average level of distortion in the economy. Figure 1 shows the changes in welfare and net efficiency gains from lowering tariffs to the optimal level. At the current price \( P_1 \), \( Q_1 \) units are domestically produced but \( Q_3 \) are consumed, implying imports of \( Q_3 - Q_1 \). Lowering the price to \( P_2 \), which is the price that would prevail with a tariff equal to the average distortion, would decrease production to \( Q_2 \) and increase consumption to \( Q_4 \) implying an increase in imports of \((Q_1 - Q_2) + (Q_4 - Q_3)\). \( P_3 \) is the price that would prevail in the absence of any tariffs and hence \( G + H \) reflects the expenditure in foreign exchange on the increased imports of wheat. Of course, this is not the net loss in foreign exchange since the resources freed from the production of wheat and the increased expenditure on wheat would cause an increase in production of other goods and a decrease in the consumption of other goods. This would cause decreased imports or increased exports of other goods. Under our assumptions, the cost of the additional foreign exchange will simply be \( E + F \), which may be interpreted either as the decrease in tariff revenue and increase in export subsidies from the decreased imports and increased exports, or as reflecting the shadow price of foreign exchange (since \( P_3 \) units of foreign exchange have a worth to society of \( P_2 \) units). The calculation of changes in welfare is given in Figure 1. The reader should verify that under our assumptions, no net gain can result from lowering tariffs to a level below \( P_2 \) because the increased cost of foreign exchange or the reduction in tariff revenues from substitute goods outweighs the reduction in deadweight loss.
Figure 1
Impact of Lowering Import Restrictions

Change in Consumer Surplus \( A + B + C + D \)
Change in Producer Surplus \(- A\)
Change in Rents and Tariff Revenues \(- C + E + F\)
Cost of Foreign Exchange (Reduction in Tariff Revenues on Substitute Goods) \(- E - F\)

Net Efficiency Gain \( B + D\)
Table 6 calculates the welfare gains and losses from lowering wheat restrictions based on three values of the level of distortion (and hence the optimal tariff level). All price and quantity data are for 1982. The elasticities of demand and supply have been taken from a study conducted by FEDESARROLLO. The implied farmgate price is simply the c.i.f. price plus transportation costs from Cartagena to Bogota less transportation costs from Bogota to Pasto. The implications of the results are discussed in the text.

Table 6

IMPACT OF LOWERING IMPORT RESTRICTIONS

(All prices in 1982 pesos/ton, all quantities in tons, all welfare measures in millions of pesos)

<table>
<thead>
<tr>
<th>Initial Values</th>
<th>21,008</th>
<th>70,700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmgate Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIF Price</td>
<td>11,000</td>
<td>537,400</td>
</tr>
<tr>
<td>Transp. (Cartagena-Bogota)</td>
<td>3,700</td>
<td>466,700</td>
</tr>
<tr>
<td>Transp. (Bogota-Pasto)</td>
<td>2,070</td>
<td></td>
</tr>
</tbody>
</table>

| Elasticity of Demand | 0.5343 |
| Elasticity of Supply  | 0.6    |

<table>
<thead>
<tr>
<th>Tariff Level</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implied Farmgate Price</td>
<td>13,730</td>
<td>14,280</td>
<td>14,830</td>
</tr>
<tr>
<td>Implied Decrease in Price</td>
<td>7,278</td>
<td>6,728</td>
<td>6,178</td>
</tr>
<tr>
<td>Decrease in Production</td>
<td>14,696</td>
<td>13,585</td>
<td>12,475</td>
</tr>
<tr>
<td>Increase in Consumption</td>
<td>47,451</td>
<td>43,865</td>
<td>40,279</td>
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<tr>
<td>Increase in Imports</td>
<td>62,147</td>
<td>57,450</td>
<td>52,754</td>
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<tr>
<td>Decrease in Producer Surplus</td>
<td>461</td>
<td>430</td>
<td>398</td>
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<tr>
<td>Increase in Government Surplus</td>
<td>4,084</td>
<td>3,763</td>
<td>3,444</td>
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<tr>
<td>Decrease in Tariffs and Rents</td>
<td>3,328</td>
<td>3,045</td>
<td>2,767</td>
</tr>
<tr>
<td>Cost of Increase Foreign Exchange</td>
<td>68</td>
<td>95</td>
<td>116</td>
</tr>
<tr>
<td>NET GAIN</td>
<td>226</td>
<td>193</td>
<td>163</td>
</tr>
</tbody>
</table>

Annex 2

Calculating the Optimal Level of Coffee Stocks \(^1\)

Under the International Coffee Agreement, the variable component of Colombia's export quota is given by the formula

\[ Q_v = 0.3 \frac{S_c D_w}{S_c + S_n} \quad (1) \]

where \(Q_v\) is the variable part of the export quota,

\(S_c\) is the quantity of Colombia's stocks held the previous year,

\(S_n\) is the quantity of stocks carried the previous year by producers other than Colombia,

and \(D_w\) is the projected world demand by ICO member importers.

Currently, the approximate values of these parameters in millions of bags \(^2\) are \(D_w = 56\), \(S_c = 8.8\), and \(S_n = 41.3\) which, from equation (1), imply that the variable part of the quota \(Q_v\) is 2.95 \(m\) bags or about one-third of the total quota.

The analysis in this section attempts to estimate the optimal level of total stocks under the assumption that the only purpose of Colombia's holding stocks is to increase its export quota. In particular, it ignores the need for filling Colombia's quota when production falls in some years. It also ignores and the use of stocks as a bargaining tool in negotiating the

\(^1\) Work on this section was carried out jointly with John Nash.

\(^2\) Each bag contains 60 kg. of coffee.
"fixed" component of Colombia's quota. Thus, the "optimal" figure calculated here represents the minimum stock of coffee that Colombia should hold.

In any given year, the benefit from a quota is simply the revenue that the country earns by being able to export an amount \( Q_v \). The cost of the quota is simply the cost of storing the stock \( S_c \) and the costs of replacing the amount \( Q_v \) which is exported each year. The cost of actually producing the initial stock \( S_c \) may be ignored since we are interested in a steady-state phenomenon. Alternatively, we could argue that as long as the current level of stocks is above the optimal, the opportunity cost of creating \( S_c \) is zero. Therefore, in a steady-state, the net social benefit of the coffee stocks is given by:

\[
NB = pQ_v - kQ_v - cS_c
\]

\[
= (p-k) \frac{0.3D_{D_c}}{\frac{S_c}{S_n}} - cS_c
\]

(2)

where \( p \) is the f.o.b. unit price of coffee

\( k \) is the unit cost of production and transport

and \( c \) is the unit cost of storage

Since World Bank projections of coffee prices show little change in the real price and there is no better indication of changes in the other parameters, it is assumed that all parameters are unchanged in real terms over time. Therefore, the problem is reduced to a steady-state static problem and it is sufficient to consider costs and benefits for any one year.

To obtain the change in net benefit resulting from an increase in stock, we differentiate (2) with respect to \( S_c \):

\[
\frac{dNB}{dS_c} = \frac{0.3D_nS_c(p-k)}{S_c + S_n} - c
\]

(3)

A maximum will occur at \( dNB/dS_c = 0 \) or
where \( S_c = \sqrt{0.3D \omega n (p-k)} - S_n \) \( \sqrt{c} \) 

While costs are incurred in Colombian pesos, the export price is received in U.S. dollars. In so far as there are distortions in the rest of the economy which create a divergence between the official peso price of foreign exchange and the social benefit derived from the foreign exchange, the social benefit of a bag of coffee expressed in pesos will be higher than the official peso price. The production and transportation costs, \( k \), based on farm budget and private transportation data, are estimated to be $7,800. Similarly, the costs of storage, \( c \), are estimated to be $3,300. Ideally, we should use social costs instead of private costs. The social costs would take into account any subsidies and foreign exchange distortions for the traded components of \( k \) and \( c \). However, since these are difficult to estimate and are unlikely to change the estimates significantly, they have been ignored. Using a range from 10% to 20% for the premium to foreign exchange and evaluating equation (4) at \( p = \text{US}\$191, k = \text{Col}\$.7800 \) and \( c = \text{Col}\$.3300 \), we obtain optimal values for the coffee stock to be -0.4 (i.e. 0), 1.4 and 3.1 million bags for the 10%, 15% and 20% distortion cases respectively.

Unfortunately, the optimal level of stock is extremely sensitive to the foreign exchange distortion in the economy. However, our calculations do tell us is that if one wants to hold high levels of stocks for reasons of increasing the variable part of the quota, no more than 3.1 million bags are needed. The current high levels of stock cannot be justified according to this argument. (The marginal net benefits are negative at high levels of stocks.) As mentioned earlier, the above figures for the optimal stock are lower bounds for their respective levels of distortion because the holding of stock for the purpose of meeting production shortfalls and as a bargaining
tool in ICO negotiations is ignored. At least 1.4 million bags need to be stored if the premium on foreign exchange is expected to be 15%.

Another useful outcome of this analysis is that the net benefit from reducing current stocks by one unit can be calculated. It is given by $\frac{dNB}{dS_C}$ and is found to be Col.$1100, 902 and 704 respectively in the 10%, 15% and 20% distortion cases. The figures are overestimates because the negotiation value of the high level of stocks is ignored, as is the value they may have in future production shortfalls. However, current levels of stock are so high that their expected marginal value for the production shortfall purpose is close to zero. In addition, since the benefits from holding stocks for negotiation purposes are unlikely to be large, there is a good case for lowering the current level of stocks.
Annex 3

Impact of Removing the Subsidy on Fertilizer Used in the Production of Coffee

In 1982, about 216,000 tons of fertilizer were used in the production of 774,000 tons of coffee. The average farmgate price for coffee was $94,862/ton while fertilizer sold at an average price of $17,800/ton as compared to the average unsubsidized price of about $22,000/ton. Removing this subsidy of $4,200/ton (about 20% of the market price) and assuming that the quantity of fertilizer per unit of coffee remains unchanged would cause an increase in the price of coffee equal to an expression that simplifies to the proportion of fertilizer used in the production of coffee times the increase in fertilizer price, or $\frac{216327}{774000} \times 4200 = $1174/ton.

The increased price of coffee would cause a short-run decline in coffee production of 1,916 tons based on an estimated short-run elasticity of 0.2, 1/ or a long-run decline in production of 4,789 tons assuming a long-run elasticity of 0.5. Since there are 60 kgs. to a bag of coffee, this implies a reduction in coffee of 31,900 bags in the short-run and 79,800 bags in the long-run. Given the huge quantity of stocks of about 8.8m bags, the policy will have a negligible impact on lowering the level of stocks.

The direct consequences of the removal of the subsidy would be to lower producer surplus by $907.5m and increase FEDERACAFE's income by 908.6m. The difference $1.1m is the net gain in efficiency from removing the distortion created by pricing fertilizer below its opportunity cost. However,

1/ Junguito, R. op cit.
there is an additional gain which occurs because of a reduction in the production of coffee because the current social costs of additional storage exceed its social benefits. From Annex 2, the net marginal benefits from reduced stocks is found to be Col $1100, 902 and 704 respectively for the 10%, 15% and 20% distortion cases. The benefit from reducing stocks is given in Table 8 below. To obtain the total benefit, the fertilizer efficiency gains of $1.1 million described above must be added to the figures from Table 8 since the calculations of Annex 2 did not include the social costs of the fertilizer subsidy.

<table>
<thead>
<tr>
<th>Distortion Level</th>
<th>Short-run</th>
<th>Long-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>35.1</td>
<td>87.8</td>
</tr>
<tr>
<td>15%</td>
<td>28.8</td>
<td>72.0</td>
</tr>
<tr>
<td>20%</td>
<td>22.5</td>
<td>56.2</td>
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