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Cameroon Fertilizer Sector Study

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Executive Summary

Introduction

The Government of the United Republic of Cameroon (GOC), recognizing the importance of agriculture to the national economy, wishes to ensure the continued growth and development of agriculture. Increased fertilizer use will be a component of this growth. Two studies focused primarily upon the identification of constraints with respect to agricultural inputs and marketing (World Bank) and the development of a more cost-effective fertilizer supply scheme based on the local mixing (bulk blending) of imported fertilizer materials (United States Agency for International Development [USAID]), have been completed.

This fertilizer sector study, which was also funded by USAID and was performed by the International Fertilizer Development Center (IFDC), is much broader in scope than the previous studies. The specific objectives of this study, which covered three interlinked areas, were as follows:

1. **Fertilizer Use**
   a. To determine the most appropriate types and quantities of fertilizer needed for principal crops on the basis of agronomic and economic criteria.
   b. To determine the actual and projected fertilizer demand by nutrient and types of products.
   c. To determine the economics of fertilizer use.
2. **Fertilizer Marketing**
   a. To determine the cost of fertilizers delivered to farmers by principal marketing components.
   b. To identify constraints to fertilizer use in the existing marketing system and recommend procedures for overcoming these constraints.
   c. To identify additional infrastructure, government support, and government policy required for an effective marketing system.
3. **Fertilizer Supply**
   To evaluate the production economics of five alternative production schemes:
   a. Domestic production of urea and diammonium phosphate (DAP) based on locally available natural gas feedstock and imported phosphoric acid. Plant capacity for supplying only domestic demand.
   b. World-scale urea and small DAP plant based on locally available natural gas feedstock and imported phosphoric acid.
   c. Importation of finished products (bagged).
   d. Importation of finished products in bulk with local bagging.
   e. Bulk blending of compound fertilizers using imported raw materials.

The study report includes comprehensive recommendations for needed improvements. Recommendations are designed to minimize existing fertilizer sector constraints and initiate changes that will result in improved crop yields through the increasingly effective use of fertilizer, develop a fertilizer marketing system that is responsive to the needs of the farmers, and reduce costs to GOC. This Executive Summary highlights the findings and recommendations of the IFDC study.

Cameroon Agriculture and Fertilizer Use

Agriculture

Agriculture provides the base for Cameroon's economy. Nearly 80% of Cameroon's estimated 8 million people earn the bulk of their livelihood in the agriculture sector, and almost 75% of the total labor force lives in rural areas and is engaged directly in agriculture. Revenues derived from Cameroon's petroleum reserves (oil and natural gas) are important; however, in terms of the long-term growth of the economy, agriculture will remain the key sector.

Cameroon's agriculture is based on a mixture of "traditional" and "modern" practices. The traditional or small farm sector, of about 1.1 million small farms averaging about 1.7 ha each, accounts for most of the country's agricultural production, provides most of the foodstuffs, and accounts for most of the coffee and cocoa production for the export market. Small farmers also account for the total production of cotton. There are, however, several important agricultural development projects based on small farm units but using modern technology. The irrigated rice project of La Société d'Expansion et de Modernization de la Riziculture de Yagoua (SEMRY) is an example. The "modern" sector of large plantations and holdings, often using state-of-the-art agronomic practices, accounts for a major portion of the production of export bananas, palm oil, sugar, tea, and rubber.

Until now, Cameroon has been essentially self-sufficient in food production. However, population growth dictates that food-crop production be increased to maintain national self-sufficiency.

Indeed, the World Bank's *World Development Report 1985* indicates that, during the 1973-83 period, the average annual growth rate in agriculture was 1.8% while that of population growth was 3.1%. Consequently, the annual growth rate of per capita food production declined from about 1.4% in 1965 to approximately -0.5% in 1975 and -2.0% in 1983 (Figure 1). Under these conditions, the value of food imports in current U.S. dollars grew from approximately US $30 million in 1970 to around US $130 million in 1980 and over US $150 million (FCFA 60 billion) in 1985 (Figure 1).

Nonfood cash crops were grown on about 33% of the cultivated land in 1984. The farm-level value of these crops, which are destined mainly for

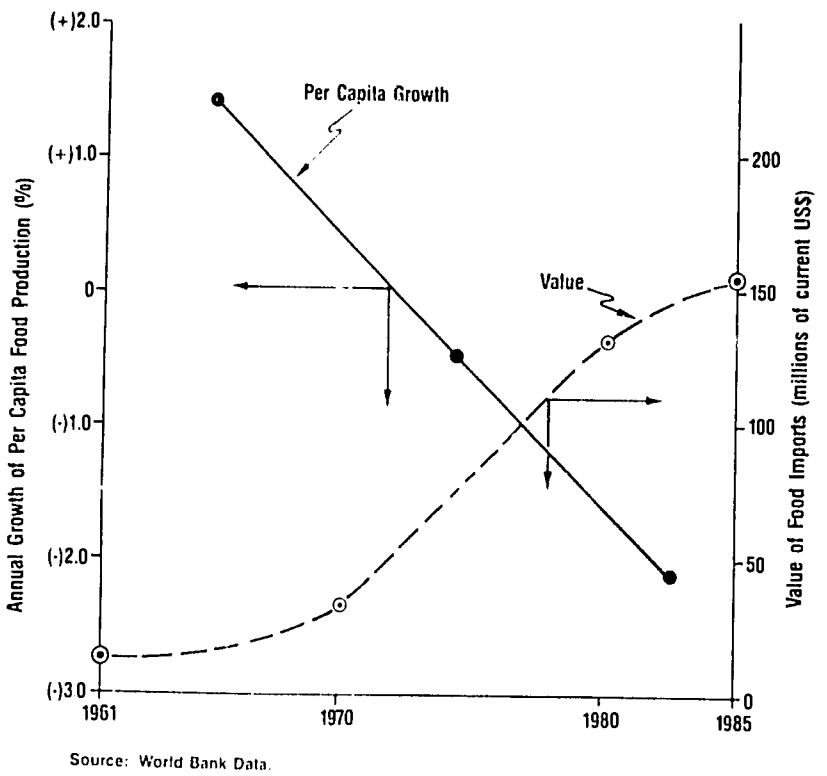


Figure 1. Per Capita Growth in Food Production and Value of Food Imports—Cameroon.

export, was estimated at approximately FCFA 108 billion (US $270 million). The promotion of cash crops for exports will gain greater importance because revenues from crude and refined oil exports, currently Cameroon's principal source of foreign exchange, will start to decline by the mid-1990s.

Therefore, although food-crop production must be emphasized, this must be balanced with the growth of nonfood cash-crop production to ensure a maximum and sustained contribution from the total agricultural sector to the economy of Cameroon. In a broader perspective, there is also the need to raise agricultural productivity to enable the rural economy to feed a fast-growing population and be more competitive in world markets. Given the unlikelihood of major technological changes in the near future, the efficient and expanded use of fertilizers associated with improved agricultural practices is the only way to significantly raise crop yields in the short and medium runs.

Fertilizer Use

Cameroon is favored with a wide range of climatic zones and can therefore grow an extremely diverse range of crops. However, the fertility of Cameroon soils is relatively low. This constraint may be overcome by the use of lengthy fallow periods and by the use of crop residues, ashes, and animal manures. With these systems, a stable but low level of crop production can be maintained without recourse to fertilizer.

Unfortunately, stable traditional systems are based on subsistence farming and low population densities. Ultimately, increases in crop production on low-fertility soils must be based on the judicious use of fertilizers. Effective organic matter recycling and the use of legumes can reduce the need for fertilizers but cannot replace them entirely. Almost all the agricultural areas of Cameroon need varying inputs of fertilizer nitrogen, phosphorus, sulfur, potassium, calcium, magnesium, and trace elements for increased crop yields. Nitrogenous fertilizers are the key to higher yields of improved cereal varieties.

More than half of the soils of Cameroon have problems of soil acidity and aluminum toxicity; thus, along with increased use of fertilizer, the application of limestone will need to be encouraged. Plant-breeding research to develop acid- and aluminum-tolerant varieties holds considerable promise also.

Table 1 shows total fertilizer use by crop while Table 2 shows the principal fertilizers used in Cameroon in 1984/85. Apart from the fertilizer used on coffee and food crops, all fertilizer is nonsubsidized.

Table 1. Fertilizer Use by Crop, 1985

Crop	Product Tons	Percent of Total
Food crops	16,259	15
Coffee	49,073	47
Oil palm	7,720	7
Cotton	21,020	20
Rubber	2,810	3
Bananas	2,018	2
Tea	1,101	1
Sugar	5,000	5
Tobacco	55	-
TOTAL	105,056	100

Source: IFDC Survey, 1985.

The expensive nonsubsidized fertilizers are used by large estate crop growers and the SODECOTON small cotton farmer in accordance with generally sound agronomic guidance as to fertilizer types and rates of application.

The subsidized fertilizers, which are distributed through government-controlled channels primarily for the benefit of small coffee growers, were originally selected and used only as coffee fertilizers. The selection of the fertilizer types and the rates at which they were applied to coffee were based on research guidance; however, through time, two problems have arisen in the small farmer sector.

1. Faults with the selection of the coffee fertilizers themselves.

   The traditional coffee fertilizers are ammonium sulfate (21-0-0) and 20-10-10. Nitrogen from

Table 2. Principal Fertilizers Used in Cameroon, 1984/85

Sector	Product	Use
Subsidized	20-10-10	Coffee and food crops
Subsidized	Ammonium sulfate (21-0-0)	Coffee and food crops
Subsidized	Urea (46-0-0)	Coffee, food crops, and rice
Nonsubsidized	22-10-15-6S-1B	Cotton
Nonsubsidized	15-15-15-6S-1B	Cotton
Nonsubsidized	15-20-15-6S-1B	Cotton
Nonsubsidized	12-6-20[a]	Banana
Nonsubsidized	Urea (46-0-0)	Industrial sector
Nonsubsidized	DAP (18-46-0)	Industrial sector
Nonsubsidized	KCl (0-0-60)	Industrial sector
Nonsubsidized	Kieserite (Mg)	Industrial sector
Nonsubsidized	Limestone (Ca) and dolomitic limestone (Ca and Mg)	Industrial sector

a. Some subsidized 12-6-20 is sold around Douala and Yaounde for use on plantains and local bananas. From 1984/85 West Province has ordered major tonnages of subsidized 12-6-20 for use on coffee and food crops.

Source: IFDC survey, 1985.

ammonium sulfate (AS) is the most expensive source of fertilizer nitrogen for Cameroon; it costs more than twice as much as urea nitrogen. Additionally, many of the soils of Cameroon are very susceptible to acidification by AS, which is almost three times as acidifying as urea. It is noted that urea is now being substituted for AS. 20-10-10 is a useful fertilizer for coffee, but the nitrogen it contains could be more cheaply applied as urea.

2. The increasingly widespread use of coffee fertilizers as general food-crop fertilizers (Table 2).

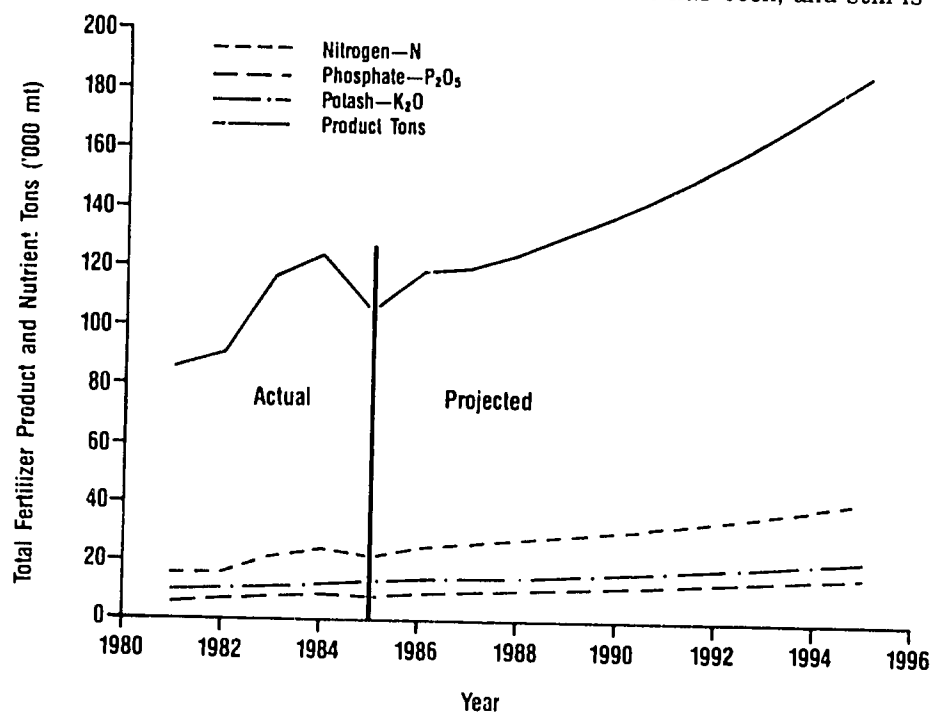
The widespread use of AS and 20-10-10 for food-crop (mainly maize) production is undesirable. AS should be replaced with urea for the reasons noted earlier, and 20-10-10 should be replaced with a high-phosphate fertilizer used at planting. Such a high-phosphate fertilizer could be used to establish a cereal crop and would be a valuable fertilizer for legume crops such as groundnut. The cereal crops could then be treated with urea after crop establishment to obtain good response to nitrogen.

The foregoing is a simplification of the situation because in many areas sulfur is needed for good crop growth and potassium, which has been a traditional component of most fertilizer treatments, may be needed in very widely varying amounts.

An additional small farmer sector problem is that the procurement and distribution of subsidized fertilizers is extremely cumbersome, time consuming, and costly. IFDC estimates show the cost of fertilizer subsidy at FCFA 9.72 billion (US $24.31 million) in 1984/85.

Although government subsidies play a beneficial role in the introduction of fertilizers among small farmers, the magnitude of the three problems mentioned above will be compounded as fertilizer use expands. Assuming the present marketing system and current fertilizer/crop prices remain unchanged, extrapolation of historical trends shows fertilizer use increasing from 105,054 mt in 1985 to 138,986 mt in 1990 and 185,977 mt in 1995 (Figure 2—related projected increases in fertilizer nutrients are also presented). These projected increases in fertilizer use will be much more significant if the present marketing system is improved and/or the current fertilizer/crop price ratio is lowered.

In spite of the deficiencies of the whole system, fertilizer use has expanded in the past and will continue to grow in the future because the use of fertilizers has been, and still is in



Note: Nutrients are the amount of N, P_2O_5, or K_2O contained in the total fertilizer product tonnage. For example, urea contains 46% N.

Source: IFDC Survey 1985.

Figure 2. Cameroon: Fertilizer Product and Nutrient Projections—Present Marketing System and Current Fertilizer/Crop Prices.

most instances, profitable to the farmers.

The Profitability of Fertilizer Use

Large Estates

These estates grow oil palm, rubber, sugar, and export bananas on an industrial scale. They use soil and plant tissue analyses to guide their fertilizer programs which are designed to give maximum profit per hectare. Without careful fertilizer use, their perennial crops would degenerate and the estate would no longer be economically viable.

Small Farmers

Fertilizers are used by small farmers to make a profit. A guide to the farmer's economic interest in fertilizers is the benefit/cost (B/C) ratio.[1] B/C ratios greater than 2 are usually needed to encourage farmers to use fertilizer. B/C ratios of 3 or more will encourage fertilizer use even with some risk.

Data on the profitability of fertilizer use, particularly under small farm cropping systems, are very limited; however, the results which follow can be used as an indication of the great potential value of fertilizer when it is correctly used.

Analysis of available data showed the following situation:

1. **Coffee**—There are two types of coffee grown in Cameroon: Arabica which is grown on 120,000 ha and Robusta which covers 153,000 ha.

   The major factor determining fertilizer use on Arabica is the increasingly unfavorable price the producer receives in relation to world prices. Producers received almost 90% of the world price of Arabica in 1961 but only 33% in 1984. Well-maintained Arabica plantations show favorable B/C ratios of 4 when fertilized according to recommendations, whereas with nonsubsidized fertilizer the B/C ratios fall to 1.5. These research data are from well-managed plots and show that fertilizer use is profitable. With average farmer practices, however, much lower B/C ratios can be anticipated. Additionally, Union Central des Coopératives Agricoles de l'Ouest (UCCAO) production cost data show the profitability of Arabica coffee to be quite marginal; therefore, the average Arabica farmer has become increasingly interested in using fertilizer on food crops.

   Robusta coffee prices were about 65% of world prices in 1961, and had fallen to about 30% by 1984. Research results for Robusta coffee indicate a lower profitability of fertilizer use than with Arabica, namely, B/C ratios of 2-4 with subsidized fertilizer and B/C ratios of less than 1 with nonsubsidized fertilizer. However, average gross income per hectare —based on the 1984 Census data, average yields, and average prices—for Robusta is FCFA 292,500/ha, which is more than double the gross income for Arabica at FCFA 117,600/ha. With this higher net income, farmers will continue to fertilize Robusta in order to maintain production.
2. **Maize**—Data, which are again from research-managed trials, show that when nonsubsidized fertilizer prices are used B/C ratios are 3 or higher in the north and generally in the range of 1-3 in the west. Thus, unsubsidized fertilizers are profitable when correctly used.

   In one trial, the use of a single application of subsidized AS is shown to be unprofitable, thus illustrating the inaptness of using current coffee fertilizers as all-purpose food-crop fertilizers.
3. **Rice**—Modern rice varieties grown under irrigated conditions give profitable response even to nonsubsidized fertilizer with B/C ratios of 2-3.
4. **Cotton**—Although B/C ratios were not available, Société de Developpement du Coton du Cameroun (SODECOTON) recommendations imply that nonsubsidized fertilizer is profitable in that SODECOTON operates by commercial evaluation of all stages of its cotton-growing activities.

The profitability of fertilizer use can be improved by improving the efficiency of fertilizer use. This is achieved by having good crop production practices combined with correct fertilizer product, rate, and application information based on sound farm-level research.

Improvement of B/C ratios can also be brought about by a reduction in fertilizer prices through subsidies or by an increase in crop prices or by various combinations of these.

The saving which can be made through improved procurement and distribution of fertilizers and the possibilities for reduction of fertilizer prices by local processing are discussed below.

It is considered that, in terms of a healthy growth of the fertilizer use, fertilizer subsidies should be gradually phased out with compensating increases in crop prices being made when necessary. This latter approach can be used to stimulate production of those crops to which the GOC assigns a national priority or in which Cameroon has a comparative advantage.

Fertilizer Marketing

Evolution of Fertilizer Sector

The earliest users of fertilizers in Cameroon were the large estate crop growers. The fertilizer system that developed to serve them has been extended to cover all industrial and export crop operations in accordance with standard commercial practices. This system exists today as a nonsubsidized fertilizer sector which

1. Benefit/Cost ratio = value of increase in crop yield due to fertilizer ÷ cost of fertilizer.

supplies fertilizer to all major estates, to private growers, and through SODECOTON to the small cotton growers of the north. In 1984/85, 40,724 mt of nonsubsidized fertilizer was imported to meet the needs of growers. Of this total, the Northern Provinces utilized 54%, the Littoral Province 23%, and the East and South West Provinces 12% and 11%, respectively (Table 3).

To overcome declining coffee production, the GOC introduced subsidies on fertilizers to encourage their use by small coffee farmers and instituted the subsidized fertilizer procurement/distribution system. In 1984/85, 64,322 mt of subsidized fertilizers was imported. Farmers in the Littoral and West Provinces were the principal recipients of subsidized fertilizers (42% and 32%, respectively) (Table 3).

Fertilizers are procured by international tenders and delivered to the estate or farm. Prices are based on c.i.f. values plus the necessary commercial cost for brokerage, handling, distribution, and commission. Because many of these organizations are direct consumers, often there is no exchange of the fertilizers for money. Others, like SODECOTON, sell fertilizers and other inputs to farmers and recover the cost of the products at the time of harvest.

In 1984/85, that fertilizer consumed by the large estates and those with centrally managed crop production systems which was not subsidized was estimated to cost on average FCFA 191,168/mt.

The system operates at no direct cost to the GOC except for its foreign exchange and is also fairly efficient. The principal areas of improvement are the needs to reduce costs by buying in shipload lots, to reduce the time between purchase and use, and to have improved flexibility in choice of products.

Table 3. Subsidized and Nonsubsidized Fertilizer Usage by Province, 1984/85

Province	Subsidized	Unsubsidized	Total
	(mt)		
Center and South	994	0	994
West	20,896	0	20,896
East	1,425	5,055	6,480
Northern Provinces	5,164	22,020	27,184
Littoral	27,257	9,245	36,502
South West	3,868	4,404	8,272
North West	4,728	0	4,728
Cameroon Total	64,322	40,724	105,056

Source: IFDC survey, November 1985.

Present Fertilizer System

The Nonsubsidized Fertilizer Sector—Generally, the estates and those with centrally managed crop production systems provide for their own research needs, select their own fertilizer products, and provide for procurement and physical distribution. In 1984/85, the nonsubsidized sector consumed 40,724 mt in 13 different fertilizer products. Fertilizer use in the sector is expected to increase at about 5%/year with little change in the product mix. Assuming current B/C ratios and unchanged methods of operation, the consumption is expected to be 75,791 mt in 1995.

The Subsidized Fertilizer Sector—To supply fertilizers to the large number of small individual farmers, the GOC developed a system to procure and physically distribute fertilizers through input supply organizations, mainly coffee cooperatives and government agricultural development schemes. In 1984/85, this sector consumed 64,332 mt of fertilizers of which 26,818 mt was 20-10-10; 15,295 mt was ammonium sulfate (21-0-0); 11,812 mt was 12-6-20; and 10,356 mt was urea (46-0-0).

In 1984/85 the official price for GOC-subsidized coffee fertilizers was FCFA 40,000/mt for all fertilizers regardless of nutrient content, cost, and location. Thus, in principle, urea with 46% nitrogen in Yaounde was sold at the same price as ammonium sulfate with 21% nitrogen in Bamenda.

The methods used by the ordering agencies are extremely cumbersome and time consuming; they cause local scarcities, late arrivals, and excessive losses. Shortages of money, both at the national and local levels, initiate these problems. Late arrivals result not only from complex and time-consuming purchasing procedures but also from poor timing of fertilizer movement to consuming areas. The infrequent assessment of needs and low numbers of sales points result in under- and overstockage. These faulty distribution operations create scarcities which cause local prices to go well above official prices.

The total national field storage capacity for fertilizers equivalent to 106,750 mt appears to be adequate. However, 67.4% of the total storage capacity is located in one province—the West. The Bonaberi shed and the crop storage warehouses are unsuitable for fertilizer storage. The South West Province needs 12 warehouses; it has only one. The North West Province needs 62 farm service center warehouses; it has constructed only 25. In general, there are too few warehouses at sales points near farms. None of the provinces in the west have in-transit warehouses to receive shipments in the rainy season. The physical losses incurred in the subsidized sector are 4%-5% instead of a more acceptable 1%.

There is a clear need at all levels for improved knowledge about fertilizers and their proper use. Such knowledge is inseparably linked to stimulating the purchase and successful use of fertilizers. Only a few leaflets, isolated demonstrations, and some limited supervision by extension workers were found in the small farmer sector.

The result has been nonuse or less than optimum agronomic and economic use.

The amount and kind of fertilizers to be supplied is based upon official provincial requests. These annual requests are consolidated to give the projected national needs for subsidized fertilizers. Ministère de l'Agriculture (MINAGRI), working through Fonds National de Developpement Rural (FONADER), reconciles the total national requirements for subsidized fertilizers with the funds available and then arranges for purchase through international tenders. This process requires a minimum of 10 administrative steps (Figure 3). The fertilizers are brought into the port of Douala and transported to the market mainly by input supply organizations. These operations are expensive, and they also fail to supply many farmers.

Farmers fail to get fertilizer when they need it. Moreover, as was pointed out, the fertilizer grades supplied often do not meet the agronomic and economic needs of the small farmer. In addition, the small farmers often do not know what or how much of each nutrient to apply for optimum economic production under their soil and crop conditions; they have insufficient funds to purchase fertilizers; and they must travel long distances to their supply source.

The above shortcomings of the subsidized sector dictate the establishment of a new and complete marketing system to service individual farmers at the lowest possible farm-gate cost and to reduce the financial burden to the GOC. The new marketing system must include research, procurement, farmer education, improved distribution efficiency, and remunerative crop prices. Failure to institute a new, efficient integrated marketing system will be costly for the GOC.

Implications of Inefficiencies and Cost of Present System—The current procurement and distribution system for subsidized fertilizers is expensive. Data for 1984/85 show, for example, that a fertilizer costing FCFA 100,000/mt at Douala climbs to a cost of FCFA 191,168/mt at an average retail sales point. A breakdown of these costs (in FCFA/mt) is as follows: c.i.f. price of fertilizer—100,000; port handling—14,692; warehousing—19,867; transport—9,700; losses—24,557; diverse costs—16,553; distributor margins—4,000; administration and overhead —1,799.

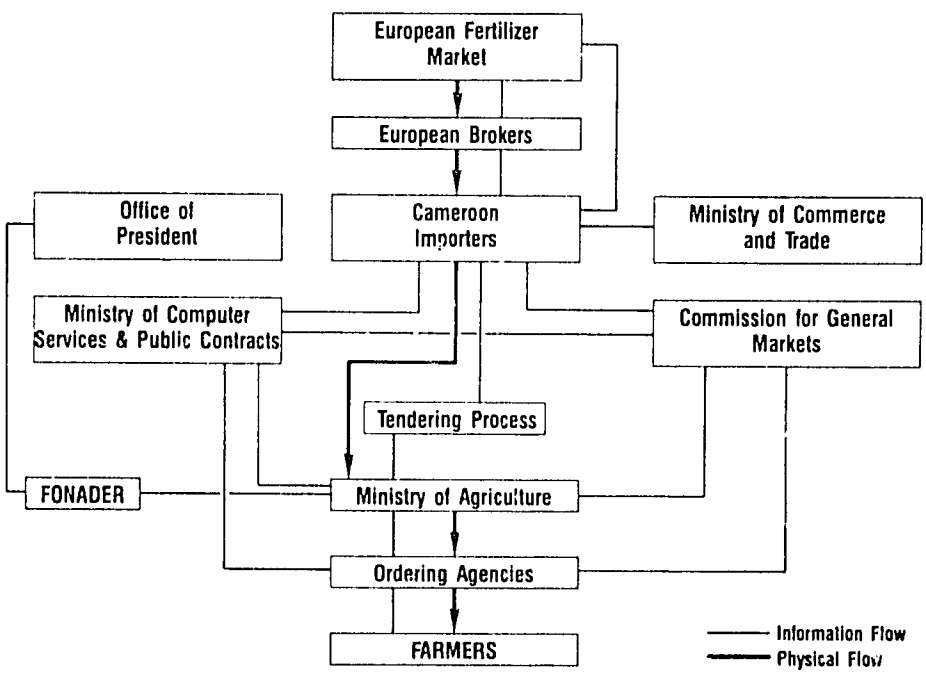


Figure 3. The Present Organizational Structure for Ordering and Distributing Subsidized Fertilizers in Cameroon.

On the basis of the 1984/85 selling price to farmers of FCFA 40,000/mt, this IFDC study estimated that the GOC and its agents are covering 79.1% or FCFA 151,168 of the real delivered cost. Since the amount of subsidized fertilizer reached 64,332 mt in 1984/85, the subsidy cost to the GOC was estimated at FCFA 9.72 billion (US $24.30 million). If the subsidized system continues until 1995, it will distribute 110,186 mt at an estimated subsidy cost of FCFA 16.7 billion (US $41.75 million). There is an obvious need to reduce the budgetary burden of the subsidy to the GOC and its agents.

The current procurement and distribution system for the nonsubsidized sector operates at no cost to the GOC except for foreign exchange. In 1984/85, the amount of foreign exchange needed to import 40,724 mt of nonsubsidized fertilizer was estimated at FCFA 4.1 billion (US $10.2 million).

Rail and Road Networks

The transport of fertilizers for both the subsidized and nonsubsidized sectors from the port to the farm is seriously impeded by deficiencies in the existing rail and road systems. Transport of fertilizers to the heavy consuming areas during the rainy season is limited to sites served by tarred roads. Secondary and tertiary movement is limited to the dry season when suitable vehicles are in scarce supply.

The poor condition as well as the extent of the farm-to-market roads especially limits both the establishment of primary distribution centers within short distances of the farms and the size of fertilizer loads that can be transported. The price margin is not sufficient to cover these warehousing, handling, and transport costs.

Recommended Fertilizer Marketing System (RFMS)

A need exists to establish an efficient marketing system for the subsidized

sector that integrates product selection, pricing, promotion/farmer education, and physical distribution at the lowest possible cost while at the same time reducing the subsidy burden to the COC. The successful introduction of an integrated marketing system will hinge, in part, upon the establishment of favorable B/C ratios by improved prices for crops produced by small farmers. Furthermore, the marketing system should utilize crop production research to determine the best mix of fertilizers and should complement the extension service in transferring fertilizer technology to the farmers. The system should determine the best supply of fertilizers and utilize the most cost-efficient physical distribution methods for reaching the farmers. A retail network should be utilized to link the supply system to the farmers and be an integral component of the marketing system.

The objective of the RFMS is to reform the current subsidized system through gradual transfer of the marketing functions from public institutions to a self-supporting commercial-type system that will expand fertilizer consumption at the lowest possible cost. Because the recommended system can be self-sufficient, it can reduce the fertilizer costs to the GOC. By eliminating the constraints to fertilizer use, the system will encourage farmers to use fertilizer correctly and thus increase crop yields.

To ensure its viability, the RFMS must be phased into operation over a 5-year period. Phase I represents a pilot operation during which the present government subsidy system continues. During this phase, staff must be recruited and trained, and the retailer network must be established. The system will gain momentum and by Phase V will be fully operational.

As the RFMS is phased in, the present subsidized system will decrease in importance. The decrease in the current system operations is in direct correlation with the proposed expansion of the recommended system. It is envisioned that, by the end of Phase V, the new RFMS will commence to sell fertilizer in the present nonsubsidized sector. During the phasing periods, new forms and types of fertilizers will be introduced. These products will be based upon the acceptance of the fertilizers recommended by the RFMS and the findings of the supply scheme study cited below.

Sales Objectives and Timing

Five phases are identified for the development of the RFMS. During Phase I, a major training period for RFMS personnel, only 6,000 mt of fertilizers will be marketed. Sales targets for the remainder of the startup period will be Phase II—50,000 mt; Phase III—70,000 mt; Phase IV—90,000 mt; and Phase V—110,000 mt. In Phase I, the current practice of importing bagged fertilizer will continue. In Phase II, 50% of the fertilizers sold will be those that were imported in bulk and packaged in-country in the company's new facilities. The balance will continue to be imported in bags. During Phases III and IV, all of the fertilizers marketed by the RFMS will be those that were imported in bulk and bagged by the company. A test of the market will be made during these phases to determine the desirability of marketing bulk-blended fertilizers. Provided responses are positive, the locally blended and bagged products will be marketed in Phase V.

The RFMS will stimulate increased use so that by the end of Phase V the total market will be 156,548 mt of fertilizers containing 69,807 mt of nutrients. Urea will gradually replace ammonium sulfate, 12-6-20 will be dropped, and 10-30-10-5S will be introduced. Sales to parastatals and plantations are forecast beginning in Phase IV.

The estimated amounts and kinds of fertilizers to be marketed by RFMS are shown in Table 4.

Potassium chloride and diammonium phosphate will be procured and marketed as demand requires.

To reach the small farmer sector, an independent, private, franchise-type retailer network will be established through contractual agreements. The 350-500 retailers chosen will sell, store, price, and promote the use of the correct fertilizers. The RFMS company field staff will strengthen these retail companies by running promotion campaigns, selecting sales points, preparing monthly demand forecasts, and other marketing activities.

Organization

The RFMS increases the cost-effectiveness of fertilizer by ensuring efficient delivery of the correct fertilizers to farmers fully educated in their use. To meet these objectives an organization will be structured to oversee all four of the marketing functions, i.e., products, promotion, physical distribution, and price. Initially the staff will receive formal training and prepare the first detailed annual marketing plan covering both channels. The marketing plan will include seven components or subplans: (1) products, (2) sales, (3) promotion,

Table 4. Amounts and Types of Fertilizer to be Marketed by the RFMS by Phases

Grades	Phase I	Phase II	Phase III	Phase IV	Phase V
20-10-10	2,000	26,479	28,438	33,618	39,303
12-6-20	500	1,518	-	-	-
0-30-10	-	3,999	7,998	12,000	16,002
Urea (46-0-0)	2,600	12,650	26,578	36,738	47,176
AS (21-0-0)	1,000	5,336	6,986	7,644	7,519
Total	6,000	50,000	70,000	90,000	110,000

Source: IFDC estimates.

(4) market research, (5) distribution, (6) price, and (7) personnel development. Resources are budgeted to each of these activities according to the needs of farmers served by each channel.

Promotion

The RFMS will organize and conduct an intensive farmer education and sales promotion program in cooperation with retailers through crop production demonstrations, field days, farmer meetings, farm visits, crop yield contests, soil testing, crop production posters, literature, radio programs, advertising, and publicity. These activities supplement ongoing extension programs. The primary role of the company agronomists is to support these educational activities. Typically, at least one demonstration and one farmer meeting are conducted in cooperation with each retailer.

Physical Distribution

A substantial flow of information and documentation from the field staff to the central office is required for low-cost distribution operations. To minimize inventory costs and to prevent frequent retail level shortages, the RFMS will collect a monthly sales forecast by product from each sales point. This information will be synthesized into sales territory and regional and national demand data for distribution planning.

The RFMS will employ centralized inventory, transportation, and warehousing management for year-round movement of products into the market areas. Primary delivery points or in-transit warehouses will be established at sites that are served by all-weather roads. Retailers will arrange and be compensated for secondary and tertiary storage and transport. Fifty to seventy-five percent of the storage is to be established at the retail level. Contracts with the railway, haulers, port agents, and warehouse operators will determine fixed costs and levels of performance.

The RFMS should reduce costs by about FCFA 14.4 billion (US $36 million) against current practices through improved distribution management alone during the 5-year startup period.

Market Research

Measurements of performance in relation to each marketing objective are made monthly so that RFMS can make timely adjustments and compile data for future plans. The RFMS will conduct a continuing market research program to determine the feasibility of entering into the marketing of seeds, pesticides, lime, or other crop production inputs and for purchasing crop produce from the retail network. The relevance of the 50-kg fertilizer bag to farmers' needs will be studied.

Pricing Policies

The company will enter into an agreement with the GOC to establish retail prices for each fertilizer grade for each of the 5 years of establishment. The agreed-upon policy will price individual fertilizer products based upon their nutrient content. Retail cost of an average fertilizer is forecast to be FCFA 191,168/mt or US $477.92 during Phases I-IV. In Phase V the cost is estimated at FCFA 195,000/mt or US $487.50/mt. The difference between these costs and the agreed-upon subsidized retail price will be paid monthly by MINAGRI directly to the company. Under the RFMS, the subsidy will be reduced beginning in Phase II at a rate of FCFA 30,200/mt/year for the average fertilizer. In the sixth year the subsidy will be eliminated entirely (Table 5).

Table 5. Comparison of Fertilizer Sales by the Recommended Marketing System With Current Forecast of Subsidized Sales, Reduction in Government Subsidy, Revenue Generated by the Recommended Marketing System, Marketing Expenses and the Subsidy Paid by the Government, by Phases

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Phases	Year	Current System Forecast of Subsidized Sales	Recommended System Forecast of Subsidized Sales	Subsidy[a]	Recommended Marketing System Revenue[b]	Recommended Marketing System Expenses[c]	Difference Between Total Delivered Retail Cost and Subsidized Price[d]	Total Subsidy Paid by Government[e]
		('000 mt)	('000 mt)	(%)	(million US $)	(million US $)	(US $/mt)	(million US $)
I	1987	73.7	6.0	79.1	2.87	3.89	377.92	2.27
II	1988	76.0	50.0	63.3	23.90[f]	17.97[f]	302.42	15.12
III	1989	79.7	70.0	47.5	33.45	24.44	226.92	15.88
IV	1990	83.7	90.0	31.7	43.01	31.14	151.42	13.63
V	1991	88.0	110.0	15.9	53.63[g]	39.05	77.51	8.53
-	1992	-	-	0	-	-	0	0

a. Represents IFDC recommendation of a constant 15.8% annual subsidy reduction.
b. Figures obtained by multiplying figures in column (4) by US $477.92/mt (or FCFA 191,168/mt) for Phases I-IV.
c. Figures from Table II-14 of the main report.
d. Figures obtained by multiplying figures in column (5) by US $477.92/mt for Phases I-IV and US $487.50/mt for Phase V.
e. Figures obtained by multiplying figures in column (4) by those in column (8).
f. Breakeven period where revenue exceeds expenses by end of period.
g. Calculated at FCFA 195,000/mt or US $487.50/mt times tons sold starting in Phase V.

Source: IFDC estimates in constant 1985 US dollars.

Personnel Development

Marketing is carried out by people, and its efficiency is unavoidably dependent upon their personal capabilities. The RFMS will make a large and long-lasting investment in the development of the technical and behavioral skills of all the individuals with whom it comes in contact. Beginning with a 6-week formal training program for the in-coming company staff, the human resource development program will continue during all phases to strengthen and to build the expertise of the retailer network. The entire promotion program will be focused on increasing the knowledge of the farmer-customers.

Capitalization

The company will need to be capitalized. One procedure for this is to form a joint venture private compay that can be capitalized through grants or low-cost loans from external sources to the GOC. The GOC will use loan funds to acquire shares in the joint venture company. A U.S. fertiiizer company basic in fertilizer materials and with a proven record of market development should be solicited to purchase shares in the joint venture company. The advantages of a joint venture with a U.S. firm would include the following: (1) access to experienced management skills for fertilizer manufacturing and marketing; (2) proven experience in market development especially involving services needed by small farmers; (3) availability of appropriate fertilizer materials direct from a primary producer; (4) experience in the manufacture of all types of fertilizers including bulk blending; (5) facilities for the simplification of the logistics of supply; (6) experience in forecasting demand for fertilizers and its synchronization with supply sources for maximum cost effectiveness; (7) ability to train a cadre of national personnel for efficient fertilizer sector operation; (8) experience in private sector operations; (9) stability in fulfilling contractual objectives; (10) a source of capital for the venture.

RFMS' operating expenses by phases are shown in Table 5. These requirements cover the entire cost of marketing, i.e., management, product, distribution, and promotion at estimated delivered prices based on constant 1985 prices. The total expenses in Phase I representing one and one-half year amount to US $3.89 million (FCFA 1.56 billion). These expenses cover the cost of importing 6,000 mt of fertilizers (equal to US $1.5 million, FCFA 600 million) and marketing startup costs such as employment training and posting of personnel, selection and training of retailers, and establishment of a physical distribution system. The RFMS operating expenses by phases are (US $ million): I—3.89; II—17.97; III—24.44; IV—31.14; and V—39.05. These operating expenses represent transfer costs of fertilizer from the production-procurement unit and do not include capital funds required for building the processing facilities. The expenses accelerate during Phases II-IV because of the increased costs due to the greater fertilizer tonnages required for sales. In Phase IV, 90,000 mt of fertilizer will be needed for sales, and estimated total expenses amount to US $31.14 million (FCFA 12.46 billion).

The RFMS reaches a breakeven point during Phase II with revenue generated from the sale of 50,000 mt of fertilizers (Table 5). In Phase II, revenue generated amounts to US $23.90 million (FCFA 9.56 billion) and sales expenses amount to US $17.97 million (FCFA 7.19 billion). The revenue reaches US $53.63 million (FCFA 21.45 billion) during Phase V with marketing expenses of US $39.05 million (FCFA 15.62 billion). The expenses, revenue generated from fertilizer sales, and the removal of the subsidy by phases are graphically shown in Figure 4A, 4B, and 4C.

Subsidy

It is recommended that fertilizer subsidies be phased out completely during the first five phases of the RFMS. During Phase I, the present 79.1% subsidy should continue. It is

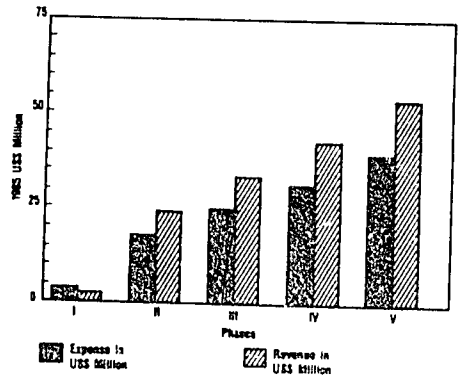


Figure 4A. Recommended Fertilizer Marketing System (RFMS) Estimated Expense and Revenue by Phases.

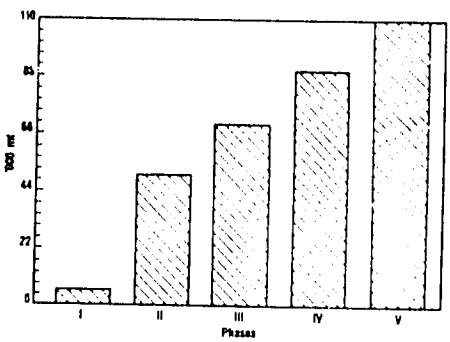


Figure 4B. RFMS Fertilizer Sales Forecast by Phases.

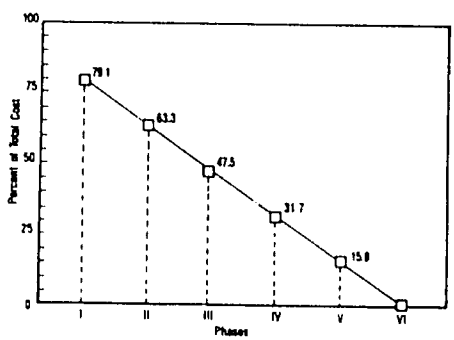


Figure 4C. Recommended Fertilizer Subsidy Levels by Phases.

recommended that the subsidy be reduced thereafter at the rate of 15.8%/year until the end of Phase V. At the beginning of Phase VI, the subsidy has been totally eliminated as shown in Figure 4C. The difference between the subsidized price and the actual marketing cost per ton is to be collected from the government and paid directly to the company. For example, the amount of money collected by the RFMS from the GOC is equal to the total delivered cost of a typical fertilizer (in 1985, US $477.93/mt) minus the amount paid

by the farmer at retail level for that fertilizer. Table 5 shows the reduction in subsidy and the amount of money to be collected by the RFMS from the government. The total collected by the RFMS reaches a high of US $15.88 million (FCFA 6.35 billion) in Phase III and reaches zero after the fifth phase. Reductions of fertilizer subsidy must, however, be accompanied by upward adjustments in crop prices to avoid elimination of producer incentive.

Savings and Cost Reduction

The saving to the government due to the elimination of subsidy amounts to at least US $24.16 million (FCFA 9.66 billion) over the phasing period (Table 6). This estimated government savings can be achieved by transferring the cost of the fertilizer from the government to the farmer over the five phases of the program. The price farmers pay per ton increases from US $100 in Phase I, the present situation, to the full cost of US $487.50 (in constant 1985 prices) at the end of Phase V. In addition, cost reductions associated with improving the distribution system alone amount to at least US $36.15 million (FCFA 14.46 billion) (Table 6). These cost reductions are derived from a reduction in physical losses, nonpayments, and risk losses; diverse costs; and interest on cost of carrying inventory. These cost reductions could be used to reduce fertilizer price or allocated to develop the fertilizer market.

Fertilizer Supplies

Cameroon has large reserves of natural gas and oil which could be used for the production of nitrogen-based fertilizers.

There are no known deposits of phosphate or potash in Cameroon which could be used as raw material for fertilizer production.

A fertilizer production facility based on imported raw materials was built at Bonaberi in 1978. The unit closed after only a few years of operation because its operation was uneconomical.

All fertilizers currently used in Cameroon are imported. These fertilizers are not only expensive but are also a major drain on Cameroon foreign exchange. The current practice of importation of small lots of bagged products increases costs to the farmer. Therefore, the potential for price reduction and foreign exchange savings benefits by using cost-reducing technologies, such as bulk importation with local bagging and bulk blending, and the potential for and desirability of building national fertilizer production units must be taken into consideration.

A brief discussion of the major fertilizer supply options and recommendations follows.

Improved Procurement Procedures

The major reason for the relatively high cost of fertilizer in Cameroon is that small lots (usually less than 2,000 mt) of several fertilizer grades are imported. These small lots make it impossible to negotiate favorable purchase prices with the manufacturers and result in excessive ocean freight rates. As shown in Table 7, the procurement of larger lots of fertilizer (5,000 mt minimum) will result in a savings of about US $35/mt (FCFA 14,000/mt). To achieve this savings, improvements in the marketing system are needed. The most significant improvements needed are (1) more reliable fertilizer demand forecasting,

Table 6. Some Savings (by Phase) Resulting From the Implementation of the Recommended Marketing System[a]

(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Actual Delivered Retail Cost[b]		Government Savings Due to Subsidy Reduction		Cost Reduction Through Improved Distribution Efficiency[f]
Phases	Tonnages	Farmer Price	Government Contribution	Per Metric Ton	Total[e]	
		(US $/mt)	(US $/mt)	(US $)[c]	(million US $)	(million US $)
I	6,000	100	377.92	[d]	[d]	0.665
II	50,000	177.51	302.42	75.51	3.77	5.545
III	70,000	251.02	226.91	75.51	5.28	7.763
IV	90,000	326.53	151.42	75.51	6.80	9.981
V	110,000	409.99	77.51	73.91	8.13	12.199
	(undetermined)	487.50	0	77.51	(undetermined)	(undetermined)[g]
Total					23.98	36.153

a. Calculated in constant 1985 US prices.
b. Farmers' price plus government contribution is equal to actual total delivered cost of US $477.92/mt for Phases I-V and US $487.50/mt in Phase VI.
c. Government savings per metric ton is US $75.51, i.e., 15.8% of US $477.92 for Phases I-IV and 15.8% of US $487.50/mt in Phase V. The difference represents the increase in price experienced by farmers in each phase.
d. In Phase I the current government subsidy rate of US $377.92/mt continues; thus, there are no savings.
e. Figures in this column are determined by multiplying figures in column (5) by those in column (2).
f. Figures in this column are determined by reducing physical, nonpayment, and risk losses; diverse costs; and one-third of interest on cost of carrying inventory. These costs are estimated to be equal to FCFA 14,360/mt or US $110.9/mt based on data in Table II-9.
g. Undetermined because forecasts of tonnages to be sold were not made.
Source: IFDC.

Table 7. Savings Due to Improved Procurement Practices

Fertilizer	Fertilizer Cost[a]		
	Current System	Proposed System	Savings
	(US $/mt)		
Ammonium sulfate	226	190	36
Urea	283	234	49
Diammonium phosphate	335	301	34
Potassium chloride	230	194	36
20-10-10	281	245	36
15-15-15-6S-1B	293	256	37
22-10-15-5S-1B	313	279	34

a. US $1.0 equals FCFA 400.

Source: IFDC.

(2) consolidation of fertilizer orders to achieve at least 5,000-mt lots, (3) a reduction in the number of fertilizer grades to ensure larger lots of commonly available grades, and (4) a reliable offtake pattern and storage program to relieve port congestion and other delays that are costly to the system. These improvements are also basic to implementation of the second stage of development involving local bagging of imported bulk fertilizers.

Local Bagging of Imported Fertilizers

In the short term, the smooth, timely, and cost-effective importation of bulk fertilizer by one or more supply organizations is recommended. These fertilizers would be bagged locally and dispatched to the farm level through the improved marketing system previously described. The investment for the proposed bulk-handling and bagging facility in the Douala area is estimated at about US $1.8 million (FCFA 720 million) for an annual capacity of 100,000 mt. An anticipated saving in cost of about US $55/mt or FCFA 22,000 compared with the current fertilizer supply practice would be attributed to saving in ocean freight due to larger, more economic shipments and to the use of local labor for bagging fertilizers that are imported in bulk.

Bulk Blending of Fertilizers

The increasingly sophisticated crop production practices of the Cameroon farmer are expected to result in the need for fertilizer grades (nutrient ratios and concentrations) tailored more to the needs of the different agroclimatic zones. When this occurs, a local fertilizer production strategy based on bulk blending will be needed.

The bulk-blending process is the physical mixing of dry fertilizer materials to obtain a compound fertilizer of desired nutrient ratio and concentration. In order to avoid segregation and caking, the bulk-blend raw materials should be in granular form of 1-3 mm size range and compatible with each other. The recommended fertilizer materials to supply nitrogen, phosphate, and potash for the bulk-blending plant in Cameroon are granular AS, DAP, monoammonium phosphate (MAP), and KCl. Under present conditions, urea is not recommended as a nitrogen source in bulk blends. Unless there are very strict quality control and highly efficient storage, blending, and bagging operations, the use of urea can cause serious problems due to its hygroscopicity when mixed with other fertilizer materials.

The bulk-blending and bagging plant would be located in the Douala area and would have an annual capacity of 160,000 mt (100,000 mt of NPK and 60,000 mt of straight fertilizers) which corresponds approximately to the projected fertilizer demand for 1995. The fixed capital (on 1985 U.S. dollar cost basis) for the bulk-blending/bagging plant, including storage facilities and other support facilities is estimated at US $4.4 million (FCFA 1.76 billion). The working capital is estimated at US $5.0 million (FCFA 2.00 billion) for a production rate of 160,000 metric tons per year (mtpy). The corresponding conversion cost of bulk blending is US $25.5/mt including the cost of bags. The estimated ex-plant production costs for bulk-blended grades depend largely on the raw materials used for bulk blending and their costs. The cost of bulk blending and bagging would be about US $37-$57/mt less than importing comparable grades of bagged NPK fertilizers, depending, of course, on the grades produced. An additional cost saving of US $35/mt could be obtained if more economic shipments are practiced. A diagram of the recommended fully integrated fertilizer supply and distribution system is shown in Figure 5.

Production of Ammonia, Urea, and DAP in Cameroon

Cameroon's large natural gas reserves provide a potential opportunity for becoming not only self-sufficient in the production of nitrogen fertilizer but also for entering the nitrogen fertilizer export market.

The economics of small- and large-scale production of ammonia and urea (small and large ammonia/urea/DAP complex) were evaluated. The production complexes would be built at Kribi and use locally available natural gas and imported phosphoric acid. The small complex, capable of producing 84,000 mtpy of granular urea and 45,000 mtpy of DAP, would be designed to supply only Cameroon's domestic nitrogen and phosphate fertilizer (DAP) needs. The urea and DAP produced could be used as raw materials for the bulk-blending plant and for direct application. With the large complex the urea not needed for domestic consumption would be exported. The large complex would have an annual urea capacity of about 500,000 mt. The DAP capacity (45,000 mtpy for domestic consumption only) would remain small because the economics of producing DAP for export are unfavorable.

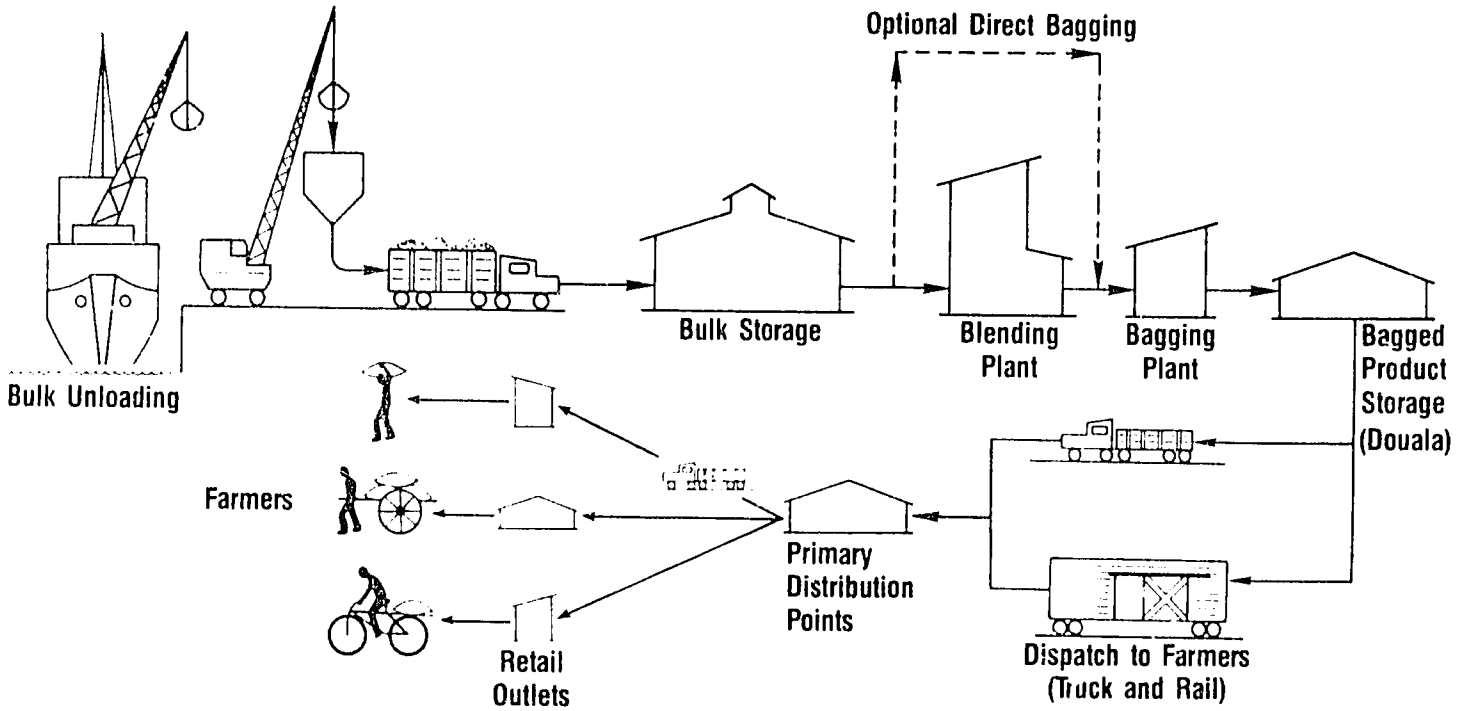


Figure 5. Recommended Completely Integrated Fertilizer Supply and Distribution System.

The fixed capital estimates (1985 cost basis) are about US $176 million (FCFA 70.40 billion) and US $413 million (FCFA 165.20 billion), respectively, for the small and large complex. The corresponding working capital for the two complexes is US $15 million (FCFA 6.00 billion) and US $30 million (FCFA 12.00 billion), bringing the total capital investment estimates to US $191 million (FCFA 76.40 billion) and US $446 million (FCFA 178.40 billion) for the small and large complexes, respectively.

On the basis of a base-case delivered price of US $1.5/million Btu (US $6.0/million kcal) for natural gas and US $270/mt (US $500/mt P_2O_5) for 54% phosphoric acid, the production costs for bagged granular urea and DAP in the two complexes are summarized and compared with the prices of imported products (1985 cost basis) as shown below:

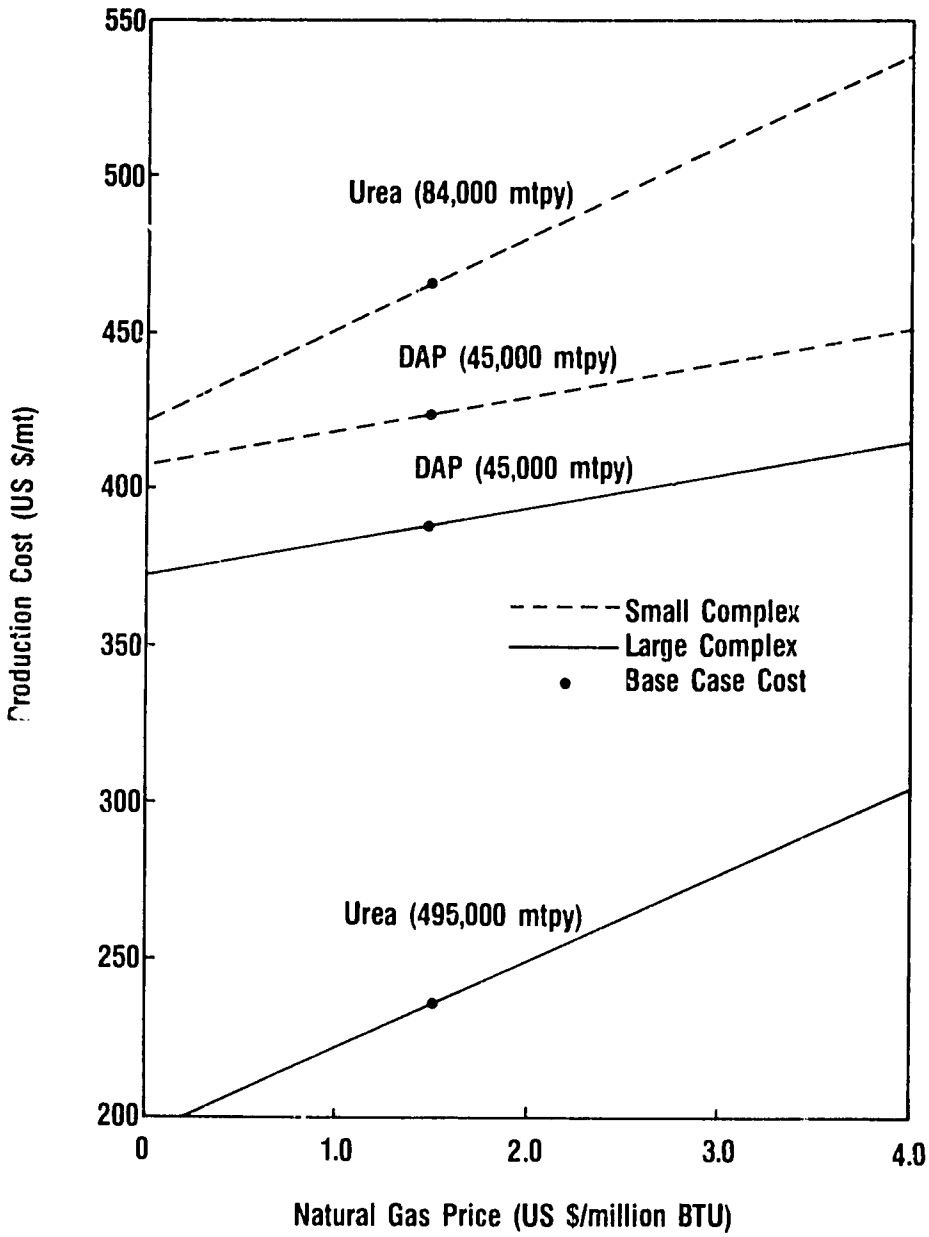
	Estimated Production Cost		Imported Price	
Fertilizer	Small Complex	Large Complex	f.o.b. Europe	Delivered Price to Plant
	(US $/mt)			
Urea	466	237	140	234
DAP	425	388	200	301

The effects of natural gas price on production cost are given in Figure 6.

These estimates confirm that the production costs in the small complex are excessively high when compared with the 1984/85 price of imported urea and DAP. Therefore, construction of a small production complex is not recommended. The production costs in the large complex are more favorable (especially urea) when compared with the delivered prices of imported products, but they are still high in comparison with the current export f.o.b. world market prices.

Since it is expected that the average world market price of urea in the next 15 years will be considerably higher than the current depressed level, it is likely that the proposed large urea complex could be feasible if the world market price of urea improves in the future and/or if the GOC fixes the price of natural gas for the complex at an appropriate level to accommodate downward fluctuations in the world market price of urea. For example, a change of US $1.0 (FCFA 400)/million Btu in the price of natural gas will result in a change of approximately US $27 (FCFA 10,800)/mt in the production cost of urea. A more detailed feasibility study, including the analysis of urea and natural gas world market, would be needed to confirm the project viability.

According to the premises and assumptions used for this study, the production of DAP based on locally produced ammonia and imported phosphoric acid is economically unfavorable in either size complex. This is because the phosphate raw material (phosphoric acid) must be imported, and it accounts for a large portion of the total production cost of DAP (about 60%). Phosphate in the form of imported phosphoric acid is only about 10%-15% less expensive (not including the cost of converting it to DAP) than phosphate in the form of imported DAP. However, since the installation of DAP production capacity within the overall ammonia/urea complex would increase the investment requirement for the total complex by only about 5% for the large complex, the production of DAP only for local consumption may be justified on the basis of foreign exchange saving and/or national security if the ammonia/urea production is justified.



Source: IFDC.

Figure 6. Effect of Natural Gas Price on Urea and DAP Production Costs in Small and Large Urea Complexes.

Conclusions

Given the large land area and the wide range of climatic conditions, Cameroon has great potential for agricultural and particularly crop production development. Such development is needed in order to meet the food and fiber needs of the growing population and to strengthen agricultural exports, which are a major source of foreign exchange. The soils of Cameroon are of relatively low fertility, and varying amounts of fertilizer nitrogen, phosphorus, potassium, sulfur, calcium, magnesium, and trace elements are needed for improved crop growth.

Fertilizer is only one component of the crop production packages that must be put together in order to increase crop production. However, in Cameroon where crop production is mainly from nonirrigated upland agriculture, fertilizer use when combined with good agronomic practices can give significant increases in crop yields in the short term. This being said, fertilizer is a bulky and relatively expensive input which gives economic benefits only when correctly used in terms of fertilizer product selection, rate of application, timing, and placement methodology.

More than 105,000 mt of fertilizer was used in Cameroon in 1984/85. Of this fertilizer, 40% was sold at nonsubsidized prices through the private sector, including SODECOTON, and was used on industrial and export crops. The remaining 60% or 64,000 mt was procured and distributed as subsidized fertilizer principally to the small coffee farmer who uses it for both his coffee and his food crops. Fertilizer consumption is projected to reach only 186,000 mt by 1995 if the present marketing system and present fertilizer crop price ratios are maintained.

The more expensive nonsubsidized fertilizers are used in accordance with generally sound agronomic guidance as to fertilizer types and rates of application. The subsidized fertilizers are used primarily on coffee and maize or other food crops. The traditional coffee fertilizers are 20-10-10 and ammonium sulfate, although urea is being increasingly imported to replace AS.

Per unit of nitrogen, ammonium sulfate is expensive. Where sulfur deficiency is not a problem, ammonium sulfate should be replaced by urea for both coffee and food crops. On maize and other food crops, 20-10-10 can be economically replaced by a high-phosphate starter fertilizer such as 10-30-10-5S combined with the use of urea as a topdressing for the cereal crop.

Results based on research-managed trials show that nonsubsidized fertilizer is profitable with specific crops and that subsidized fertilizer is generally profitable. Low crop prices are a major constraint to fertilizer use even when using subsidized fertilizer on Arabica coffee. Research on the development of fertilizer recommendations for the small farm situation needs to be intensified and must incorporate socioeconomic components. In addition, there

is a need for involvement of extension staff with research staff and a wider appreciation by both research and extension staff of marketing problems related to inputs and crops produced. Fertilizer must be seen as an essential but costly input to be used in the most cost-effective way possible. Good research well coordinated with the extension service is one way to achieve this objective.

The nonsubsidized fertilizer sector is fairly efficient and operates at no direct cost to the Government of Cameroon except for its foreign exchange costs. Greater efficiency and savings can be achieved by buying in shipload lots, by reducing the time between purchase and use, and by flexibility in the selection of fertilizer products.

The subsidized component of the fertilizer sector in Cameroon is currently experiencing numerous supply and marketing constraints which are creating increasing costs to the GOC and holding down farmer demand for fertilizer. A cost-effective and self-sufficient system to service the large number of independent small farmers can be established. To be more operationally efficient and at the same time to facilitate the removal of the subsidy burden to the GOC, the responsibility for the management of the subsidized sector should be transferred to an organization having authority, responsibility, and accountability for its effective performance. Through an integrated marketing effort and the assurance of a fair crop price to the farmer, GOC subsidy on fertilizer can be eliminated.

The system recommended for the subsidized fertilizer sector closely links supply and marketing. It increases cost-effectiveness by ensuring efficient delivery of the correct fertilizers to farmers more fully educated in their use. The marketing component of the system integrates sales, promotion, education, market research, distribution, price, and personnel development with processing/procurement to achieve the maximum savings to the national economy and to the farmer. The system is flexible, and linkages with existing institutions are established. A network of retailers to enhance the crop production education of small farmers is a key component. The system features strong educational efforts to expedite the transfer of fertilizer and crop production use technology to small farmers. It places the appropriate fertilizers at locations close to the farms in time for use. Fertilizer consumption by 1995 under this new system is projected to be 20% higher than if the present marketing system continues and nutrient usage would be 25% higher.

A significant savings in the cost of fertilizer (about US $35/mt [FCFA 14,000/mt]) can be achieved through improvements in procurement. To obtain these savings it will be necessary to order larger lots of fertilizer (5,000 mt minimum) to obtain more favorable purchase prices from the manufacturers and more economic ocean freight rates. Efficient procurement is heavily dependent upon an effective fertilizer marketing system to (1) provide reliable demand forecasts, (2) minimize the number of required grades, and (3) smooth the flow of material from the port to the farmer through an effective distribution and retailing network.

Additional savings, up to a total of about US $55/mt or about FCFA 22,000/mt, can be obtained by importing relatively large lots of fertilizer (5,000 mt minimum) in bulk and bagging the material locally. This system will also require the strong support of an effective marketing system for the same reasons as indicated above.

Bulk blending of imported bulk materials is a logical extension of the above supply options. However, this option should only be implemented after the economics of bulk imports and local bagging are clearly demonstrated and a market for bulk blends is established.

During the evolution of the recommended system, 326,000 mt of fertilizers would be supplied with a reduction in distribution costs of FCFA 14.48 billion (US $36.2 million), a supply savings of FCFA 6.42 billion (US $16.05 million), and major cost reductions for the GOC due to reduction and eventual elimination of the fertilizer subsidy.

Exploitation of Cameroon's natural gas reserves by producing urea for the export market (a separate issue evaluated in this study) appears to be feasible if the GOC adopts a natural gas pricing policy that will result in a urea production cost that is competitive in the world market. An in-depth study is needed to more closely identify the cost and world-scale marketing factors that will determine the feasibility of such a project. A small-scale urea production complex for supplying only Cameroon's domestic needs is too uneconomic to warrant further consideration.