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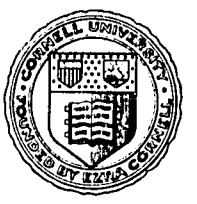
Agricultural Input Policies Under Structural Adjustment: Their Distributional Implications

Charles D. Jebuni
and Wayo Seini



CORNELL FOOD AND NUTRITION POLICY PROGRAM

AGRICULTURAL INPUT POLICIES UNDER STRUCTURAL ADJUSTMENT: THEIR DISTRIBUTIONAL IMPLICATIONS

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The Cornell Food and Nutrition Policy Program (CFNPP) was created in 1988 within the Division of Nutritional Sciences, College of Human Ecology, Cornell University, to undertake research, training, and technical assistance in food and nutrition policy with emphasis on developing countries.

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ABBREVIATIONS

ADB	—	Agricultural Development Bank
ASRP	—	Agricultural Services Rehabilitation Project
CA	—	Crown agent
COCOBOD	—	Cocoa Marketing Board
ERP	—	Economic Recovery Program
ETP	—	Extension test plot
FASCOM	—	Farmer Services Company
FPPG	—	Farmer production plot group
GNPA	—	Ghana National Procurement Agency
IFAD	—	International Fund for Agricultural Development
MOA	—	Ministry of Agriculture
NGO	—	Nongovernmental organization
PAMSCAD	—	Program of Action to Mitigate the Social Costs of Adjustment
PTP	—	Production test plot

FOREWORD

Fertilizer and other agricultural inputs to increase agricultural productivity have been heavily subsidized in sub-Saharan Africa. In part, such interventions were felt to be appropriate to compensate for low producer prices. They were also intended to encourage farmers to quickly increase their output by using more of these modern inputs. Parastatal enterprises were generally charged with importing and distributing subsidized fertilizer and other inputs such as seeds and insecticides. The state often became the sole, if not the principal, player in the market. Ghana is no exception to these generalizations.

As part of Ghana's concerted effort to reform the economy, subsidies, including the agricultural inputs, have been removed. While in theory privatization seems sound, in practice the implications of removing subsidies have not been adequately explored. In this paper, the authors explore the process of privatization of Ghana's fertilizer markets, and those for other inputs. First, the authors show the importance of considering the distributional implications of the subsidy itself, as well as the effects of rapidly eliminating the subsidy. In Ghana, in fact, it was a surprise to discover that the benefits of the fertilizer subsidy were equally distributed to households across all income levels, including the poor. And at the same time, the small, low-income farms in more remote areas that were more likely to get their fertilizer through the official system, were most likely to lose in the short-term from privatization.

The prospect of poor farmers not being adequately served by the privatized fertilizer network suggests the need for special programs to compensate the poor farmers for their losses. The difficulties and dangers inherent in implementing special programs, however, are also highlighted. In particular, the targeted programs, operated by NGOs that distribute low-cost fertilizer and/or provide cheap credit, were observed to impede the development of a private market, as traders simply could not compete. Thus, this paper amply illustrates the need to consider a wide range of factors in privatization, and foster state disengagement. In addition to the point on the perils of targeted schemes, issues such as the shortage of credit and uncertainty on the part of traders impeded the ability of the private sector to pick up the slack left by the disengagement of the public enterprises. It is hoped that such experiences will enlighten the process of privatization for agricultural inputs, as well as for market development in general.

This research was performed under a Cooperative Agreement between CFNPP and the Africa Bureau and Ghana Mission of the U.S. Agency for International Development. It is part of a larger study on the effects of economic reform on growth and poverty in Ghana and elsewhere in sub-Saharan Africa.

Washington, DC
July 1992

David E. Sahn
Director, CFNPP

1. INTRODUCTION

Since independence, and especially since the early 1970s, governments of Ghana have intervened in agriculture on the supply side to encourage productivity by subsidizing inputs, credit, and research and extension services; and by setting up specialized agencies to distribute specific inputs and crops. Fertilizers, insecticides, improved seeds, and agricultural machinery and equipment have been the main targets of policy intervention. In particular, fertilizer constitutes the most important input in the technological package provided to farmers by extension agencies, particularly in food crop production. Much of this report is therefore devoted to the fertilizer input. Other inputs are discussed together in the last part of the report.

FERTILIZER POLICY IN GHANA

In the early 1960s, Ghana experimented with fertilizer, drawing lessons for general application of fertilizer. Since then, the Ministry of Agriculture (MOA) has been the principal actor in the fertilizer business in Ghana. Fertilizers are not produced locally, and until recently, the Ministry of Agriculture has been the sole importer and the major wholesaler and distributor of fertilizers throughout the country. The overall responsibility for assessing demand and managing imports of purchased or concessionary aid supplies rests with the Crop Services Department of the Ministry of Agriculture. The fertilizer provisioning officer of the Crop Services Department compiles annually national fertilizer requirements from estimates provided by the MOA regional offices or, in the case of the Upper and Volta regions, the Farmer Services Companies (FASCOM).

After the department determines annual fertilizer requirements, the actual quantity of fertilizer to be ordered depends on the amount of foreign exchange available for fertilizer imports. If fertilizer imports fail to match estimated total regional requirements, which is often the case, the fertilizer provisioning officer allocates deliveries to the regions in proportion to their historical levels of usage. For example, the Northern region gets 22 percent, the two Upper regions 20 percent, and Brong-Ahafo 12 percent. Indeed, the four regions together consume about 60 percent of fertilizer imports annually. This is because they are ecologically suitable mainly for production of food crops on which fertilizer is widely applied. In addition to the regional distribution of fertilizer by the MOA, parastatals, private companies, and large farmers also purchase fertilizer, mainly from the MOA warehouse in Tema.

The fertilizer procurement process involves issuing tenders, evaluating bids, awarding supply contracts, arranging for and effecting payment, monitoring fertilizer shipment and arrival, and submitting documents for customs clearance.

The Ghana National Procurement Agency (GNPA) carried out the procurement function from 1976 until 1984, when lack of government funding support led the Bank of Ghana to refuse to guarantee payment of GNPA's letters of credit. This led to the cancellation of GNPA's supply contracts. The procurement function was then assigned to the Crown Agents (CA). Difficulties in securing new supply contracts delayed 1984 imports until April and May, so the fertilizer arrived too late for the major planting season in most regions of the country.[1] With the assignment of procurement rights to the Crown Agents, the procurement process is being implemented in an orderly fashion. However, delays in the preparation and approval of MOA's import requirements and the government's chronic delays in providing funds for imports continue to cause late arrival of fertilizers, limit their timely availability to farmers, and increase inventory carrying charges. These are some of the problems that privatization of fertilizer marketing is expected to eliminate.

Some fertilizers are shipped from the port to the MOA national depots at Tema, and the rest go directly to MOA and FASCOM regional and district depots, from where they are further distributed to subdistrict outlets operated by MOA, the FASCOMs, or independent farmers' groups. Fertilizers are sold to parastatals, private organizations, and large farm operators generally at the national and regional depots. Some are sold to farmers at regional and district depots, but most at the subdistrict sales outlet.

FERTILIZER PRICING POLICY

The MOA determines fertilizer prices, which are kept uniform throughout the country. The price includes a cost for transport from Tema to Tamale so that farmers in distant areas of the country can benefit from the use of fertilizer. Lack of data does not allow us to indicate regional differences in transport costs. Survey results show, however, that price differentials for a specified type of fertilizer in different locations are minimal (Obeng, Evleyn, and Asante 1990). This has been made possible by the wide distribution of MOA sales outlets. However, fertilizer pricing has been characterized by widespread subsidies since 1968. Not only are there no import tariffs on fertilizers (or other agricultural inputs), but prices are often set well below the import price. In the 1970s, the subsidy on fertilizer ranged from 49 to 86 percent of the international price, as shown in Table 1, and this does not include the additional, indirect subsidy resulting from the revaluation of the cedi (Stryker 1988). Official prices tended to remain fixed for a number of years, during which time the subsidies became increasingly important. Thus the fertilizer subsidy grew to be an important public sector expense. Indeed, Stryker reports

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[1] Supplies should be available to farmers in February or March, and at least four months' lead time should be allowed to determine needs, float tenders, evaluate offers, and place input orders. Last-minute ordering can increase prices, particularly if orders are shipped at the height of the fertilizer season in the country of origin.

Table 1 — Ghana: Fertilizer Cost, Price, and Subsidy, 1970 to 1977

Year	Compound				Ammonium Sulphate			
	Cost	Sales Price	Sub-sidy	% Sub-sidy	Cost	Sales Price	Sub-sidy	% Sub-sidy
	(Cedis)				(Cedis)			
1970	110.6	56.0	54.6	49	81.4	40.0	41.4	51
1971	122.3	56.0	66.3	54	85.6	40.0	46.5	54
1972	163.9	56.0	107.9	66	110.7	40.0	70.7	64
1973	183.2	56.0	127.2	69	155.2	40.0	115.2	74
1974	353.7	56.0	297.7	84	293.1	40.0	253.1	86
1975	408.6	56.0	352.6	86	275.6	40.0	235.5	85
1976	297.5	56.0	241.5	81	227.5	40.0	187.5	82
1977	306.0	130.0	176.0	58	296.0	100.0	196.0	66

Source: Stryker (1988).

that the subsidy on fertilizer amounted to 25 percent of the current budget for all agricultural development in 1976/77 (excluding cocoa).

POLICY CHANGES

In 1983, the government of Ghana initiated the Economic Recovery Program (ERP) to lift the economy from the generally low level it had sunk to. Basically, the program entailed both macroeconomic stabilization and structural adjustment. The key policy changes included several devaluations to establish a more realistic exchange rate, a prices and incomes policy to restore producer price incentives, fiscal and monetary policies to reduce the budget deficit to a manageable level, and several sector-specific programs.

Since agriculture is the largest sector of the economy, it naturally became a prime target of policy intervention. Particular attention was paid to overall incentives and institutional coordination in the agricultural sector, cocoa sector policies, irrigation, and research and extension. Exchange rate reforms, however, received priority during the ERP. Following a series of devaluations, the cedi depreciated *in real terms* by about 90 percent between 1983 and 1989. This was accompanied by tighter monetary and credit control policies, which helped to keep domestic inflation rates down, at a current annual average of 15 to 35 percent.

The policy changes had strong effects on import pricing. In contrast to the 1970s when input prices were fixed in the face of spiraling inflation, the government has raised the price of fertilizer several times in the 1980s by more than enough to keep pace with rising import costs. Fertilizer prices had to increase drastically between 1985 and 1989 to cover increased costs due to devaluation and inflation, as shown in Table 2. The table data are in marked contrast to the situation in the 1970s, when fertilizer prices were kept virtually constant. This reflects both changed macroeconomic policies and a desire to eliminate subsidized pricing in all sectors, including agriculture.

REMOVAL OF SUBSIDIES

The removal of subsidies on agricultural inputs has been one of the major policy changes in Ghana's adjustment program. Inputs had been subsidized to encourage farmers to use new inputs such as fertilizer, improved seeds, and mechanization. Over the years, however, subsidies have tended to encourage the inefficient use of inputs and to distort resource combinations at the farm level. Also, subsidies often benefited only or mainly the large and rich farmers, while other farmers remained largely unaffected by price changes.

Removal of subsidies on fertilizer received top priority. As shown in Table 2, subsidies on fertilizer were gradually phased out, from the 60 percent level in 1985 to 15 percent in 1989. In 1990, subsidies on fertilizer were eliminated. The removal of subsidies on fertilizer, apart from bringing fertilizer in line

Table 2 — Ghana: Fertilizer Imports, Prices, and Subsidies

Year	Total Imports (Tons)	Compound (Cedis/mt)	Sulphate of Ammonia (Cedis/mt)	Subsidy[a] (Percent)
1980	60,460	300	240	65
1981	0	600	500	45
1982	46,500	600	500	45
1983	0	1,060	760	45
1984	48,350	9,000	6,200	NA
1985	29,999	9,000	6,200	60
1986	20,100	16,000	10,000	56
1987	38,070	28,400	17,000	42
1988	43,415	46,000	32,000	30
1989	47,460	71,000	47,000	15
1990	43,350	84,000	62,000	0

Sources: FASCOM; MOA.

[a] Fertilizer subsidy on compound fertilizer alone.

with the market economy in the country, was also aimed at enhancing the privatization of fertilizer trade.

PRIVATIZATION OF FERTILIZER TRADE

A program to privatize the import and distribution of fertilizer was initiated in 1988 under the impetus of the World Bank-sponsored Agricultural Services Rehabilitation Project (ASRP). The program is intended to bring the private sector first into retailing, then into wholesaling, and finally into importing fertilizer. It is proposed that the MOA should withdraw completely from input procurement and distribution when the private sector is suitably established.

The case for privatization of fertilizer trade assumes that the private sector has the financial means of relieving the government of the burden of funding fertilizer purchases and imports and that it has the management skills and distribution infrastructure to cost-effectively market fertilizer and thus satisfy the needs of farmers more efficiently. Yet, as we will show below, there have been problems on both counts in the early period of shifting to a free market.

The privatization program involves a three-phase transfer of marketing responsibilities to the private sector, beginning with privatization at the retail marketing level, followed by the wholesale level, and finally privatization of the entire process, including the provisioning and procurement functions. In the implementation of privatization of fertilizer marketing, a significant step was taken in November 1988, with the opening of retail trade in two regions, Volta and Brong-Ahafo, which were selected as pilot regions. One hundred private fertilizer dealers were registered in Brong-Ahafo, and 55 in Volta region. Private fertilizer wholesaling began in January 1989. The Ministry of Agriculture marked out a graduated discount rate for fertilizer dealers, depending on the volume handled per purchase: for more than 50 bags of fertilizer purchased from the MOA wholesale depot, a dealer enjoyed a discount of ¢150 per bag; for 200 bags or more, the discount was ¢250 per bag. The highest discount of ¢450 per bag was given to dealers who could take 2,000 bags of fertilizer or more. To encourage greater participation in the fertilizer retail market, the discount rates were revised in early 1991, reducing the minimum number of bags to be purchased from the wholesale depot from 50 to 20 bags, as shown in Table 3.

The discount for a dealer who purchases 2,000 bags or more has been raised significantly, from ¢450 per bag to ¢800 per bag, an increase of about 78 percent. Privatization of fertilizer retail licenses was extended to all regions in 1989, and by August 1990, there were 600 registered dealers. In addition, private importation of fertilizer has started: Wienco Ghana Ltd., a private company, imported 20,100 metric tons of urea and compound fertilizer in 1990.

Table 3 — Ghana: Discount Per Bag of Fertilizer Purchased by Private Dealers, 1989 and 1991

Number of Bags Purchased	Discount per Bag	
	1989	1991
20 or more	—	400
50 or more	150	—
100 or more	—	450
200 or more	250	—
300 or more	—	500
2,000 or more	450	800

Source: MOA.

2. FERTILIZER AVAILABILITY AND DISTRIBUTION

TRENDS IN FERTILIZER AVAILABILITY

Analysis of the trends in fertilizer availability and utilization is made difficult by problems of data availability. At the national level, only data on imports of fertilizer (see Appendix Table A.1 for data from 1970-1990) could be obtained for a sufficient period to allow the fitting of any detailed time trends. Data on sales and inventory could not be obtained. Considerably more detailed information was available at the regional and district levels, but for much shorter periods. Any attempt to fit time trends using regression techniques to such data will run into problems of degrees of freedom. In the Northern region, for instance, despite considerable efforts, data could only be obtained for the period 1986 to 1991. Part of the problem has to do with changes in responsibility for fertilizer distribution in the Ministry of Agriculture or from one parastatal to the other. In some cases, transfer of responsibility was accomplished by word of mouth. However, to obtain some idea of the annual average growth in fertilizer inputs, stocks, and sales, we fitted a trend whenever data permitted.

Total fertilizer imports into the country show an upward trend from 1970 to 1990 (Figure 1). The trend coefficients for national fertilizer imports imply that fertilizer imports have increased by an average 7 percent per annum. A caveat is in order here: these results do not imply that fertilizer use in the country has been increasing at the same rate. From 1972, the economy was ushered into a strictly controlled regime with an overvalued exchange rate. Parallel markets in every commodity with considerable smuggling developed. As May (1984) concluded, from a situation in which parallel market activities barely existed in 1965, the parallel market economy increased almost steadily to about 32.4 percent of official GDP in 1982. In these circumstances, imports of fertilizer, and even sales, will not be an adequate indication of availability and utilization, particularly when fertilizer was heavily subsidized and considerable smuggling to neighboring countries could be expected (Appendix Tables A.1, A.7, A.8, and A.9).

To obtain more detail about what was happening at the regional level, we studied four regions: the two Upper regions, Brong-Ahafo, and the Northern region. As indicated earlier, these regions account for over 60 percent of the fertilizer use in Ghana.

In Brong-Ahafo region (Figure 2), using Nkoranza district as the basis, total fertilizer availability has increased by 21 percent per annum, on average, between 1980 and 1990. However, the trend indicates that sales increased at a slower rate, so more stocks were accumulated throughout the period. The trend

Figure 1 — Fertilizer Imports, 1970-1990

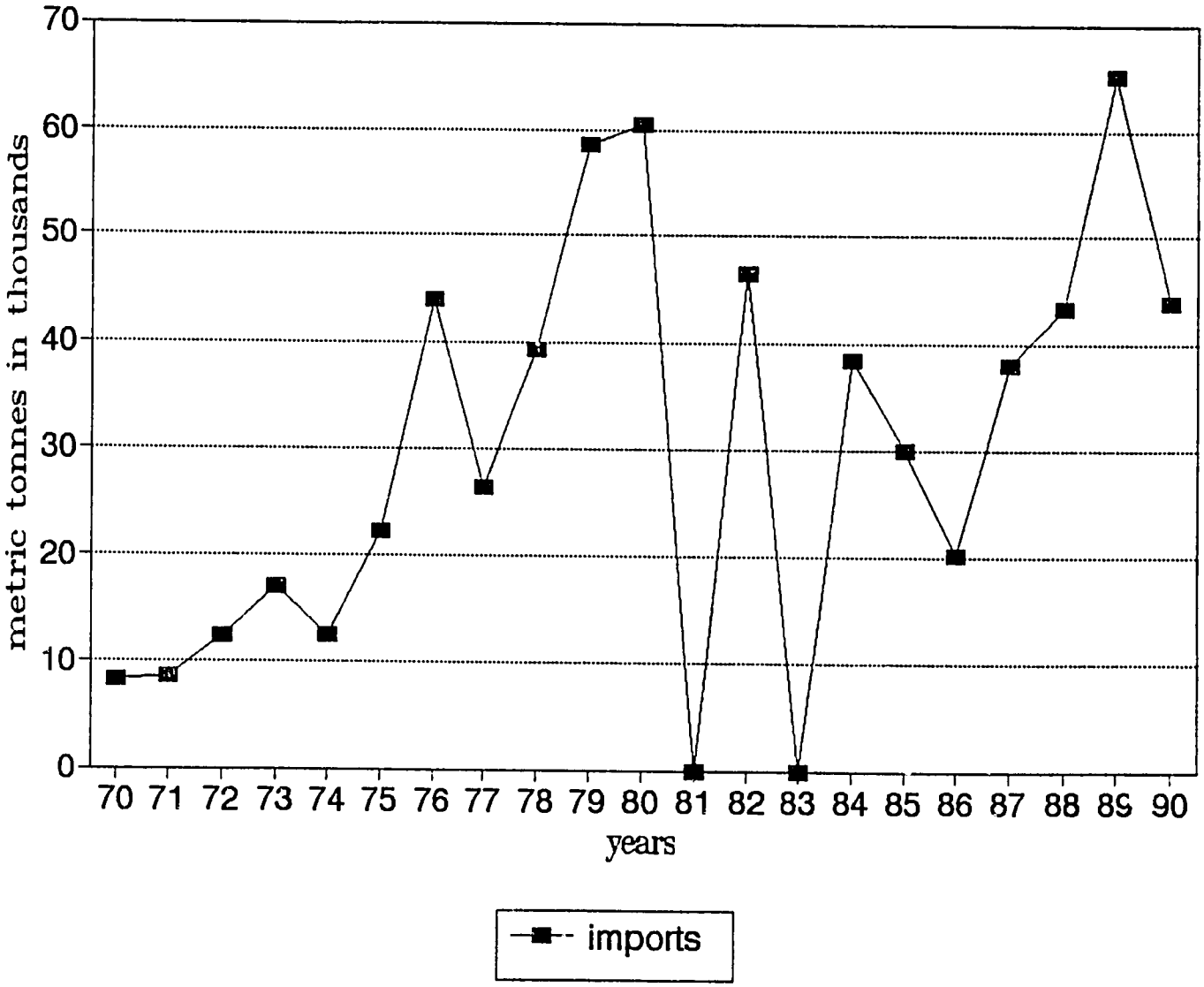
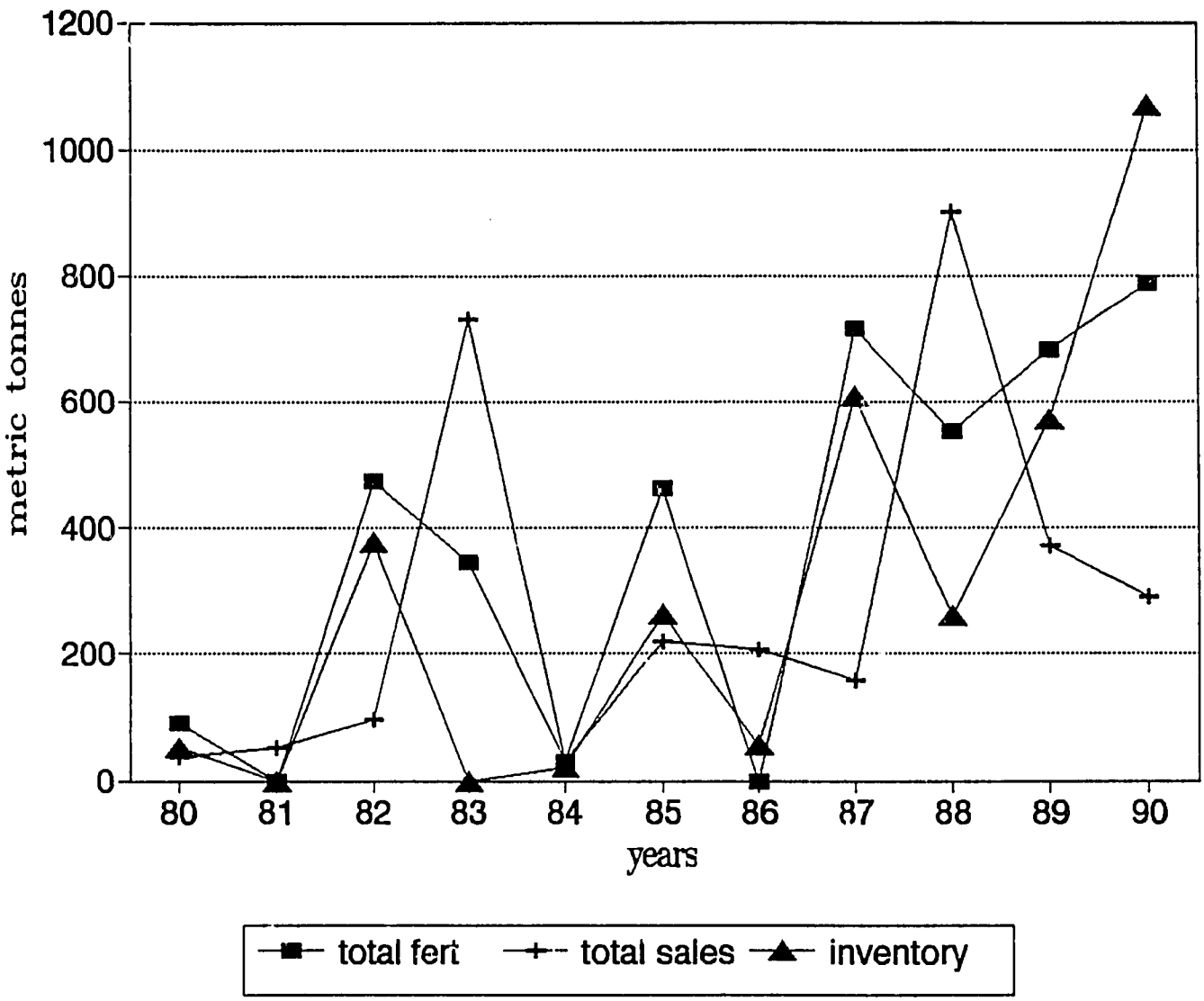


Figure 2 — Fertilizer Stocks and Sales: Nkoranza



growth rate for fertilizer sales per annum for the period was about 20 percent, and inventory accumulated at a rate of 23 percent per annum.

In the Upper regions, even though the data are too limited to allow the fitting of detailed trend based on regression analysis, Figure 3 shows a similar picture to that in the Nkoranza district. Total fertilizer available has increased from 1983/84 to 1989/90. However, sales have not kept pace, and an expensive inventory accumulated. In the Northern region, a similar conclusion can be drawn with the limited data available.

A number of factors could account for the increasing inventory accumulation. As discussed below, real prices of both compound fertilizer and top dressers have increased steadily during the period 1980 to 1990. This must have reduced the utilization of fertilizer by farmers or the demand from smugglers, thus reducing the growth in sales of fertilizer. Another plausible explanation has to do with the timing of fertilizer arrival in the regions and districts. In the Southern sector, peak farming activity takes place between April and June, while in the Northern sector it is between May and July. Ideally the fertilizer should arrive at the station before the start of the farming season. If the fertilizer arrives late, this will result in costly, unintended inventory accumulation. At the national level, information on the time of arrival of fertilizer is not available. Nkoranza district provided us with approximate dates of receipts of fertilizer from 1980 to 1990. In the eleven-year period, fertilizer arrived before the farming season or at the beginning of the season in only four years. In five other years, the fertilizer arrived during the middle of the peak period or after it. (On two other occasions, no fertilizer was received.) This clearly reduces farmers' demand for the input.

In the last two years, the change in policy with regard to the top dressers must have affected inventory accumulation. For the 1991 operation year, field investigations show that while stocks of accumulated compound fertilizer are being cleared, leading to possible shortages, stocks of urea remain. According to field officers, this is because urea, which is a top dresser, is not popular with farmers compared with sulphate of ammonia. The application of urea involves more labor time, and the extra benefits do not seem obvious to farmers.

An increasing trend toward institutional purchase and use of fertilizer is emerging in the Upper regions. In 1986/87, Plantations and Development Ltd. (a cotton production company in Wa), Ghana Cotton Company, the Social Security Bank, and Global 2000 accounted for 4.56 percent of compound fertilizer sales and 14.55 percent of top dressers. By 1988/89, these four institutional buyers accounted for 67.42 percent of compound fertilizer and 89 percent of top dressers sales.[2] Their share dropped in the 1989/90 farming season, due largely to the reduced activity of Global 2000.

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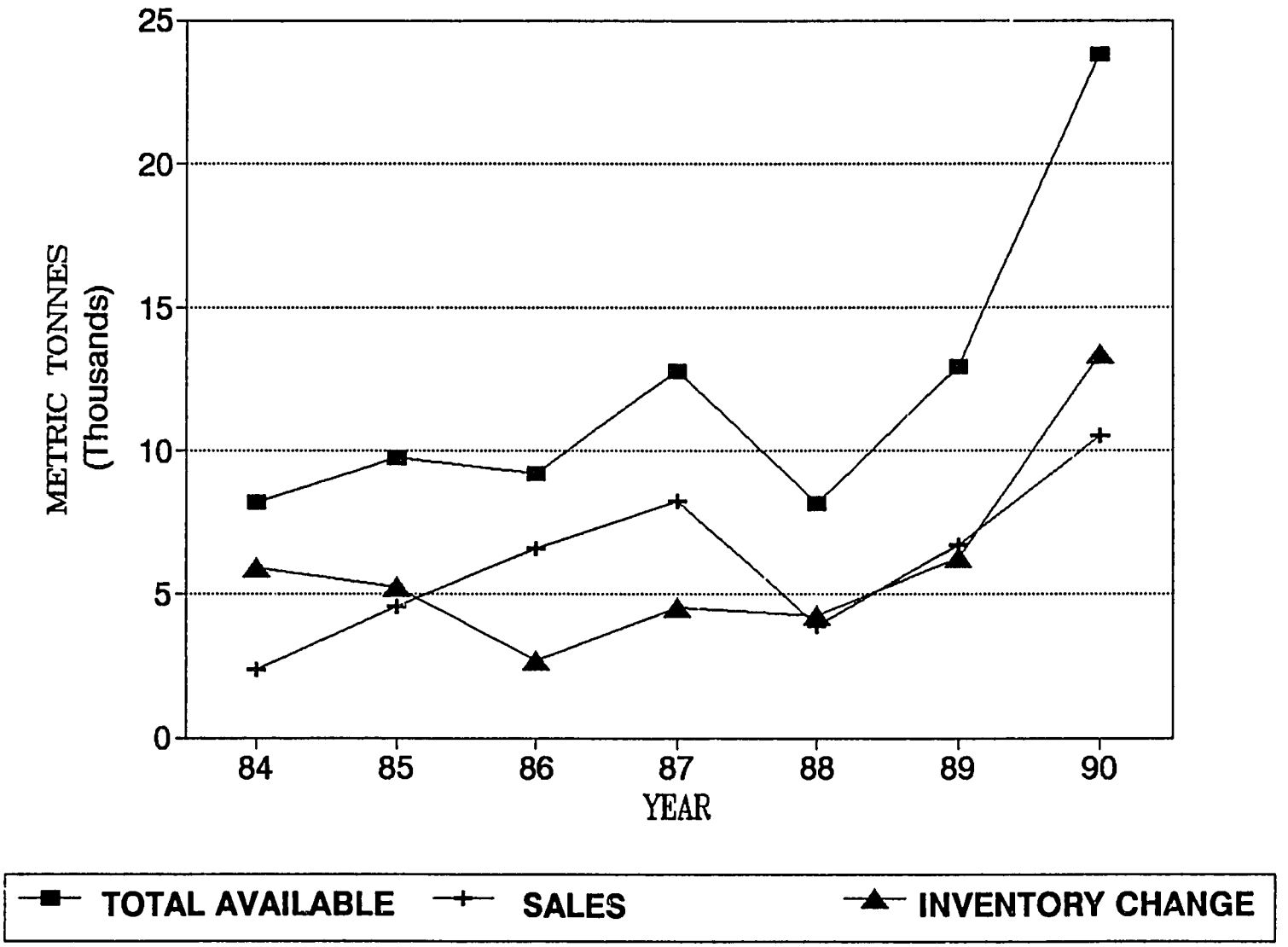
[2] Global 2000 resells the fertilizer it purchases to farmers, so its growing importance reflects a concentration of purchases, but not necessarily a concentration of fertilizer use.

Figure 3 — Upper Regions: Fertilizer Total Availability, Sales, and Inventory



FERTILIZER PRICE TRENDS

Field surveys show that current fertilizer prices are the same across the country. Changes in national fertilizer prices will therefore be reflected in changes across the country. To examine the trend of fertilizer prices, prices were obtained from the Ministry of Agriculture for compound fertilizer and sulphate of ammonia for 1980 through 1990. These prices were deflated by the national consumer price index.

Figure 4 shows an upward trend in real fertilizer prices. The real price of compound fertilizer increased by about 29 percent per annum, on average, between 1980 and 1990. The real price of sulphate of ammonia increased by 27 percent per annum for the same period.

As discussed earlier, these increases have been the result of the continuous depreciation of the currency and the policy of phasing out subsidies on fertilizer and other agricultural inputs. However, the relatively lower rates of inflation since 1984, as a result of the Economic Recovery Program, could also partly explain the trend.

DISTRIBUTION OF FERTILIZER

Before the Economic Recovery Program, the Ministry of Agriculture was responsible for importing and distributing fertilizer. The distribution network usually consisted of a number of regional depots, with district warehouses and sales outlets. Table 4 shows the distribution of fertilizer per region and the number of sales outlets in 1989. As shown in the table, the Northern region usually received the most fertilizer. There is, however, no close relationship between fertilizer use and the number of sales outlets.

In the 1970s, however, distribution and marketing difficulties, combined with the foreign exchange constraint, resulted in shortages and increased parallel market transactions in fertilizer, with subsequent higher prices. Since the Economic Recovery Program was initiated in 1983, the Farmer Services Company has been responsible for marketing fertilizer in the Upper regions and Volta region. This partly accounts for the higher number of sales outlets in the three regions. In the Upper regions, the strategy of FASCOM was to locate one outlet within every ten-mile radius. By 1989 it was operating over one hundred sales outlets. With the government emphasis on commercial viability of parastatal organizations, however, the company has had to close nonviable sales outlets and now operates only one-third of its former number. The company currently runs 36 sales outlets in the two regions. On the other hand, with the new liberalization of input marketing, FASCOM has seized the opportunity to move into the Northern and Brong-Ahafo regions. So far its operations are limited to areas considered commercially viable — basically the regional and some district capitals.

Since 1986/87, a number of nongovernmental organizations (NGOs) have been involved in distributing fertilizer to farms on a credit basis as part of a technology package. The most significant has been Global 2000, which we discuss

Figure 4 — Real Fertilizer Prices per Ton in 1980 Constant Prices

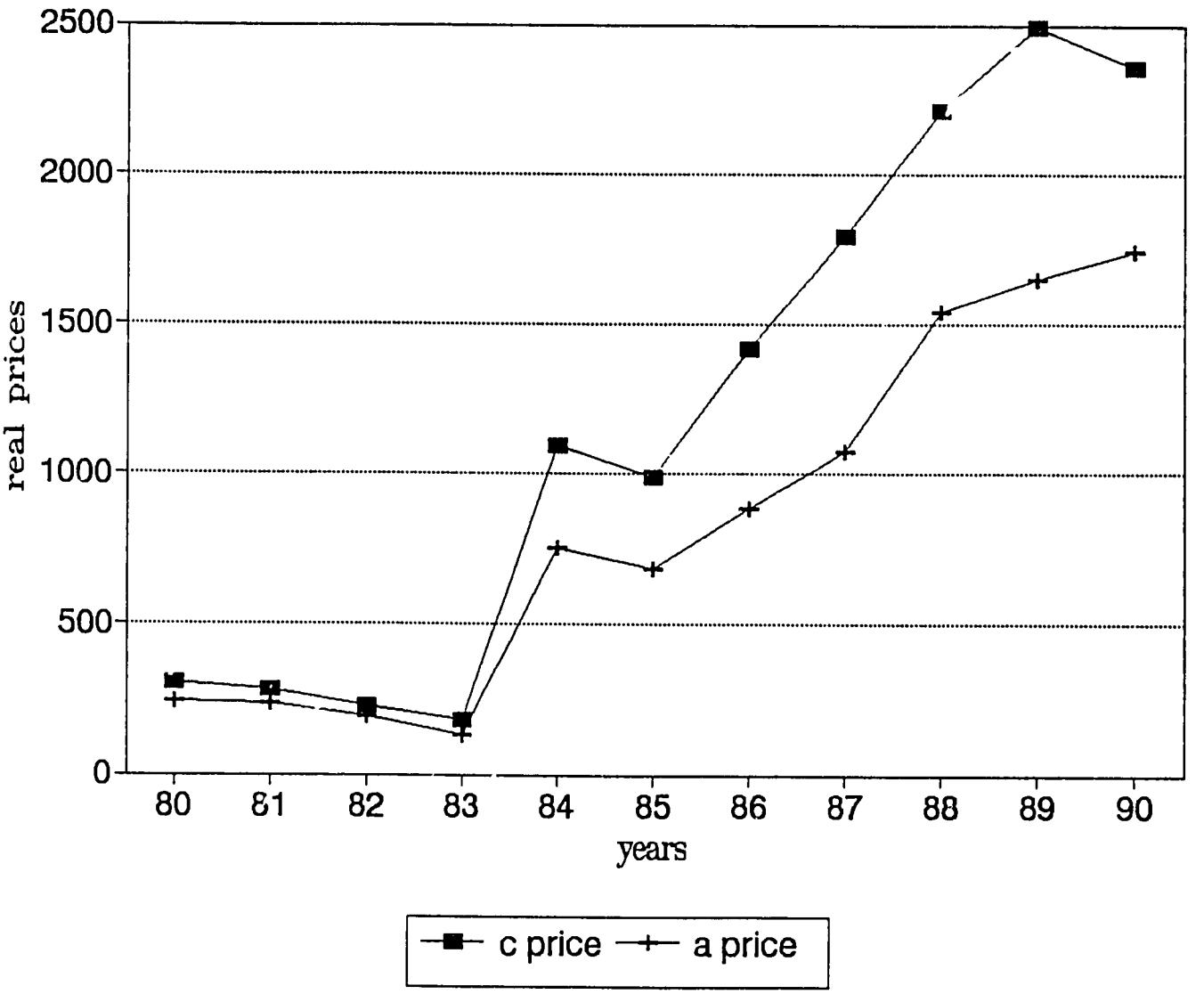


Table 4 — Ghana: Fertilizer Distribution in Ghana for 1989

Region	% of Total Fertilizer	Potential Capacity MT	Number of Districts	Number of Sales Outlets
Northern	22	10,947	7	90
Upper (West/East)	20	31,500	7	98
Brong Ahafo	12	5,550	9	25
Ashanti	11	4,400	11	13
Volta	9	2,735	8	75
Eastern	5	6,100	8	30
Greater Accra	5	1,565	4	34
Central	3	1,573	6	8
Western	2	2,030	7	17
Others (mainly companies)	11	n/a	n/a	n/a
Total	**100**			

Source: MOA.

in detail in the section "Impact of Global 2000." The churches and International Fund For Agricultural Development (IFAD) have been involved in selling fertilizer and machinery services to farmers on a basis similar to that of Global 2000. All the groups see fertilizer as part of a technology package aimed at improving farmers' productivity. They offer fertilizer to farmers on credit for repayment in kind.

DEMAND FOR FERTILIZER

The Crop Services Department reports that fertilizer consumption has declined in recent years from 13,520 kilograms of nutrients in 1987 to about 8,400 kilograms of nutrients in 1990. Indeed, fertilizer sales have declined markedly since the early 1980s, when over 20,000 tons of fertilizer nutrients were used annually. Consumption was about 7.7 kilograms per hectare in 1983/84 and has declined to about 3.8 kilograms of nutrients per hectare in 1990.

The decline in fertilizer use has discouraged the development of private-sector fertilizer marketing. Many private dealers complain about the slow movement of fertilizer in comparison with other merchandise. In addition, the system of government-fixed prices and discounts to dealers based on volume of purchase is prejudicial to small dealers who often cannot pay for loading, transport, and storage and still have any profit margin if they sell at the fixed retail price, which is still pronounced by MOA.

3. PRIVATIZATION EXPERIENCES

INTRODUCTION

Even though the dealer registration exercise was successful in terms of numbers registered (since there are no restrictions on registration), dealer participation in fertilizer retailing has not been encouraging. In the Brong-Ahafo region, where the fertilizer privatization exercise started with much enthusiasm, 60 private dealers were registered in 1989. Of this number, 38 were very active. The most active retailer was the Derma Rural Bank, which serves tomato farmers. By early 1991, the Brong-Ahafo region had 100 registered fertilizer dealers. Yet ironically, the number of active dealers decreased as the number of registered dealers increased. In fact, the regional director of the Crops Department reported that only about 25 percent of dealers are actually operating, with about one-half that number described as active retailers. The most active retail outlet in the region remains the Derma Rural Bank. In the Northern region, out of a total of 83 registered dealers, only 20 had engaged in any fertilizer transactions in 1990, and only 4 by the first week in June 1991. The slow pace of privatization can be attributed to a number of reasons, which include lack of credit to fertilizer dealers and farmers, lack of storage facilities for private dealers, low demand for fertilizer, and unfair competition from Global 2000 and the FASCOM. We discuss each of these factors below.

CREDIT TO DEALERS

Private dealers stress their lack of working capital to purchase and store large quantities of fertilizers. A dealer needs ¢84,000 to purchase 20 bags of compound fertilizer from the wholesale depot. Wholesalers generally require a minimum purchase of 200 bags of fertilizer, at a cost of ¢840,000. Thus, to support and speed up the privatization process, there is widespread need for institutional credit on reasonable terms. The period for which dealers have to hold stocks will vary from one ecological zone to the other. In areas with bimodal rainfall pattern, three months may elapse between one season and the next. For those with unimodal rainfall patterns, eight to twelve months may be required. Credit to private dealers will be required at all levels — importer, wholesaler, retailer, and farmer. Most registered fertilizer dealers claim that with credit available, they can become active members of the fertilizer trade.

CREDIT TO FARMERS

Even if fertilizer dealers are able to take the fertilizer from the wholesale stores, sales to farmers are often very slow and low in quantity. This

is because most food crop farmers are small-scale operators who lack the funds to purchase fertilizer at the beginning of the planting season. Obeng, Evleyn, and Asante (1990) report that only a small percentage (18.4 percent) of small-scale farmers applied fertilizer to their crops in 1989. A few fertilizer dealers indicated that they had sold fertilizer on credit to farmers, albeit only to farmers with whom they had personal, long-standing relationships and who were considered to be trustworthy.

Despite the apparent need for input credit, financial institutions in Ghana are reluctant to make agricultural loans. The costs of intermediation are high, and loan recovery rates are often poor. Poor infrastructure has also contributed to the high cost of credit administration and supervision difficulties, with resultant high default rates. And at a more fundamental level, farming is risky. For example, in 1983, farmers were unable to repay loans despite high prices, because of a severe drought that led to crop failure. In 1984, the reverse situation occurred: low prices received for a good crop inhibited loan repayments. Any credit scheme for farmers has to take into consideration the need for a crop-pricing scheme to eliminate extreme fluctuations.

STORAGE FACILITIES

Dealers in the field give the impression that storage is a major constraint to the expansion of the private fertilizer business. Few dealers have storage capacity for 300 or 400 bags. Even those with the capacity must store other merchandise as well as fertilizer.

Lack of storage facilities by the private dealers implies that large stocks of fertilizer are still held in MOA warehouses. As a result of the decline in fertilizer sales, there were nearly 68,000 tons of product in storage in government warehouses at the end of September 1990. As about 26,000 tons are sold per year, there is enough fertilizer in the system to supply two years' requirements. This supply will cancel any incentive for private importers to import, and, because of the lack of storage facilities in the private sector, wholesaling will for some time to come remain largely in the hands of the public sector either directly or indirectly.

UNFAIR COMPETITION

Many private fertilizer dealers complained about unfair competition, either directly from the public institutions or indirectly from publicly aided NGOs and programs. Dealers are particularly unhappy that the Global 2000 program buys fertilizer directly from MOA (sometimes on credit) and sells to its farmers on credit. Thus that program tends to capture the potential market that might have gone to private dealers. The lack of an adequate market for private dealers is further compounded by a fair amount of direct sales to farmers (particularly large-scale farmers) by the Extension Services of the Ministry of Agriculture. Another source of unfair competition is the Program of Action to Mitigate the

Social Costs of Adjustment (PAMSCAD) agriculture component, which also takes large quantities of fertilizer for distribution on credit to groups of farmers.

Perhaps most problematic for fertilizer privatization is the role of the two FASCOMs (for Volta and the Upper regions). There is no clear definition as to whether the FASCOMs are public or private organizations. To most private dealers, however, they are parastatals. The FASCOMs continue to dominate the fertilizer trade in the Volta and the Upper regions and in the past two years have extended their activities into the Northern and Brong-Ahafo regions. Most (if not all) of the MOA fertilizer depots in the Northern and Upper regions have been transferred to the FASCOMs by the MOA, which regards them as private companies.

However the FASCOMs are defined, the fact is that their fertilizer marketing activities do impede the rapid growth of the private sector. In Brong-Ahafo region, for instance, the high enthusiasm with which the privatization program took off seems to have been dampened by the takeover of the MOA wholesale depots by the FASCOMs. The FASCOMs have marketed fertilizer aggressively by offering a flat discount rate of ¢450 per bag, no matter the quantity purchased by a dealer. (This is almost 50 percent lower than the highest discount given by the MOA.) This tactic has dampened the enthusiasm of other potential entrants: the Crop Services Department reported that even though few of the registered dealers are actually operating, sales by private dealers were 59.52 percent of the total in 1990. This figure masks the fact that most of these sales are probably from the FASCOMs and Global 2000. Indeed, those organizations handled about half of the total fertilizer sold in Ghana in 1989.

LACK OF SPECIALIZATION

Even though the registration of fertilizer dealers by the MOA is highly successful, judging from the numbers registered, there is hardly a dealer whose main occupation is trading in fertilizer. Field experiences indicate that registered dealers are mostly traders in other merchandise, large-scale farmers, and even some public officials. This is not surprising; because fertilizer use is highly seasonal, dealers are not likely to specialize in fertilizer.

Most registered dealers are urban-based, which is likely to reduce the anticipated impact of wider distribution of fertilizer to the rural areas as a result of privatization. The effects of lack of specialization, the bias of dealers toward the urban centers, and the concentration on commercial viability/profitability will ultimately reduce the availability of fertilizer to the rural areas where it is most needed. In addition, the rural farmer will incur the additional costs of transportation from the urban center to the rural farm. Lack of specialization in fertilizer also implies that the learning period in the fertilizer trade is going to be longer than expected. The cost of the longer learning period may decrease fertilizer availability and utilization in the rural areas.

IMPACT OF GLOBAL 2000

Global 2000 is a nongovernmental organization (NGO) jointly sponsored by the Sasakawa Foundation of Japan and the Jimmy Carter Foundation of the USA. The organization aims at increasing the productivity of small-scale farmers by providing (a) a technological package of fertilizer, improved seeds, and improved cultural practices, including line planting and weed control, to rural farmers; (b) adequate credit to cover the costs of the recommended and required purchased inputs, to be repaid in cash or in kind after harvesting and drying of produce; and (c) extension advice from the Ministry of Agriculture.

Its method of operation is the production test plot (PTP). One acre in size, it is operated by a farmer who agrees to follow recommended practices and to demonstrate his plot and the results to a minimum of ten neighboring farmers. For this the cooperating farmer receives the inputs on credit. Global 2000 started in 1986, with 20 PTPs each in the Northern and Upper West regions but expanded to cover the whole country, with about 85,000 PTPs and about 1,000 extension specialists of the Ministry of Agriculture, by 1989.

With such large numbers, the program ran into system failures. Credit recovery became a problem to varying degrees throughout the country. Recovery rates varied from as high as 90 percent in the northern regions to as low as 15 to 30 percent in the southern regions. Much of the poor loan recovery was attributed to "ghost farmers." Apart from nonperforming loans, the volume of in-kind payment undermined the initiative, as loan repayment reached a quarter of a million bags of grain by early 1990. In the case of sorghum, the pile-up of unsold stocks was attributed to the lack of a market for the high-yielding varieties that were introduced by the program. These varieties often lacked the taste and preparation qualities of the indigenous varieties.

With these problems, the Global 2000 programs were limited to 32,000 PTPs in 1990, and the emphasis shifted away from maize and sorghum to other crops, including cowpeas, soybeans, quality protein maize, and to some degree, intercropping with root crops. In addition, the organization has been helping farmers to construct cribs designed to improve drying and eliminate rodents and insects to cut down on post-harvest losses.

The Global 2000 program has sufficiently demonstrated that, given the right back-up, small-scale farmers can increase their yields and incomes. The orientation of the program for 1991 has therefore been shifted to new areas. The organization now supports potential seed growers for up to 5 hectares of maize, sorghum, rice, cowpeas, soybeans, etc., per grower, with additional credit for cribs for proper drying and storage. This is, in fact, to offset the lack of improved seed marketing in Ghana, as a result of the closure of the Ghana Seed Company.

In addition, Global 2000 has shifted from PTPs to farmer production plot groups (FPPG). These groups are village-based and restricted to small numbers. In 1991, 35 FPPGs each were formed for the northern and southern parts of the country, covering a total of 20,000 farmers and 20,000 acres. Once the FPPG has

country, covering a total of 20,000 farmers and 20,000 acres. Once the FPPG has been formed, the groups receive credit (which is restricted to inputs) directly from the government-owned Agricultural Development Bank (ADP) and technical advice from the Extension Services Division of the MOA. The responsibility for loan recovery now rests solely with the banks. Meanwhile, Global 2000, in collaboration with MOA, has introduced the extension test plot (ETP) system of extension to replace the PTPs. These are basically demonstration plots for the project and are very few in number. The ETPs are established on the farmers' own fields.

At the peak of its operation in 1989, when Global 2000 had over 85,000 PTPs, it was a major consumer of fertilizer and therefore had significant influence on the fertilizer privatization program. Now that its operations have been scaled down to less than 25 percent of its peak, that impact has also been reduced. This implies that most small-scale farmers have lost the Global 2000 credit facility that enabled them to satisfy some of their fertilizer requirements. On the other hand, a substantial amount of potential demand has been released to the private fertilizer dealers. The meeting of this demand is, however, largely dependent on the ability to work out an appropriate small farmer credit scheme for the country.

4. NONFERTILIZER INPUTS

INTRODUCTION

Nonfertilizer agricultural inputs include mainly agricultural chemicals, agricultural machinery and equipment, seeds, farm tools and implements, animal vaccines, and fishing gear. Government policies toward these inputs have been quite similar to those on fertilizer. Since the mid-1960s, the government has subsidized inputs, provided research and extension services, and intervened in specialized areas and crops, such as cocoa, cotton, and grain production. Funds available for these nonfertilizer inputs were often allocated among its departments by the Ministry of Agriculture based on the way that its determined requirements for inputs fell under the auspices of those departments. However, unlike fertilizer, information on historical inputs, sales, and inventories of nonfertilizer agricultural inputs is hard to obtain because these inputs have largely been imported by the private sector. For cocoa, however, the importation and distribution of nonfertilizer inputs is done largely by the Cocoa Marketing Board (COCOBOD).

AGROCHEMICALS

Agrochemicals are largely handled by the private sector, and prices have been uncontrolled for some time. Several major companies are involved in importing and distributing them. Availability, however, is restricted to dealers in the large towns because currently, effective demand is small. There is the potential for effective demand to increase as Ghana's agriculture develops. Herbicides, insecticides, and fungicides are now not generally used by food crop producers. As effective demand for these agrochemicals increases, perhaps as a result of credit becoming available to enable farmers to adopt improved technology, dealers can be expected to respond by increasing their stocks and improving distribution.

By far the largest consumers of agrochemicals in Ghana are the cocoa farmers. The COCOBOD imports and distributes insecticides, fungicides, and sprayers to cocoa farmers at subsidized prices, with subsidies ranging from 36 to 97 percent for insecticides between 1970 and 1986 (see Table 5). The table shows that subsidies for insecticides are always higher than those for fertilizer, the ratio averaging about 1:1.5.

Under economic reforms, subsidies on inputs have been eliminated for fiscal reasons. Present government policy favors private participation in the importation and distribution of all agricultural inputs (including cocoa inputs) as a way of improving the input supply mechanism.

Table 5 — Ghana: Relative Magnitude of Subsidies

Year	Percent Subsidies		Ratio of Pesticides to Fertilizer
	Insecticides	Fertilizer	
1980	97	65	1.5
1981	97	45	2.2
1982	97	45	2.2
1983	36	45	0.8
1984	68	n/a	n/a
1985	68	60	1.1
1986	80	56	1.4
1987	n/a	43	n/a
1988	n/a	30	n/a
1989	n/a	15	n/a

Sources: MOA; FASCOM; COCOBOD.

Note: See Appendix Table A.3 for more data.

Table 6 shows the value of imports of insecticides and fertilizer. The table shows that, as a percentage of agricultural GDP, slightly more is spent on fertilizer imports than on insecticides for cocoa farmers. The average value of fertilizer inputs as a percentage of agricultural GDP is 0.19 percent compared with 0.17 percent for insecticides.

SEEDS

The seed industry as a whole and the Ghana Seed Company in particular have been scrutinized during the Economic Recovery Program. The Ghana Seed Company is being considered for divestiture and has been shut down since 1989. This has created a vacuum in Ghana's seed industry, since that company was the largest distributor of improved seeds (particularly for grains) in the country. Reliance is now placed on the Grains Development Board, Ejura Farms, Kpong Farms, and a few selected private seed growers to step up production to fill the void created by the closure of the Ghana Seed Company.

Meanwhile, the seed industry continues to undergo structural changes. A national seed service and seed inspection unit have been established to supervise the seed industry, to protect the interests of the farmers. The Grains and Legumes Development Board has been structured to produce and market foundation seeds. In line with the privatization of most agricultural services, private seed growers have been registered in all the major ecological zones. These seed growers will be assisted to produce and market certified seeds to farmers throughout the country.

MACHINERY SERVICES

In line with government policy to cut down direct public involvement in areas that can be more efficiently handled by the private sector, the Ministry of Agriculture has systematically eliminated mechanized services to farmers; these services were introduced in the early sixties to support the government's policy of increasing agricultural production through the development of large-scale plantations. Most of the ministry's tractors and combine harvesters have been sold to private farmers, and policy now is to divert resources to soil and water management, as well as to the design and testing of simple tools and equipment for small-scale farmers.

Nevertheless, the government continues to receive both bilateral and multilateral aid for agricultural machinery and equipment, which is used to support the private sector. Between 1985 and 1990, for instance, the Ghana government received 2,500 million Japanese yen as donor assistance for agricultural machinery and equipment (mostly tractors). Information on imports of agricultural machinery is rather difficult to come by. In 1990, however, a total of 13,546 million cedis was spent in importing agricultural machinery and equipment (including spare parts).

Table 6 — Value of Imports of Insecticides and Fertilizer

Year	Value of Imports		Agri-cultural GDP	Value as Percent of Agriculture GDP	
	Insecticides	Fertilizer		Insecticides	Fertilizer
	(Millions of Cedis)			(Percent)	
1980	11.317	18.138	24,820	0.05	0.07
1981	10.966	0.000	38,553	0.03	0.00
1982	39.250	27.900	49,572	0.08	0.06
1983	44.175	0.000	109,927	0.04	0.00
1984	348.925	435.150	133,232	0.26	0.33
1985	284.104	269.991	154,003	0.18	0.18
1986	446.378	321.600	244,317	0.18	0.13
1987	840.000	1,081.188	377,481	0.22	0.29
1988	1,200.000	1,997.090	521,529	0.23	0.38
1989	1,200.000	3,369.660	693,974	0.17	0.48

Sources: MOA; COCOBOD; FASCOM; World Bank (1984, 1991).

As indicated earlier, public participation in the delivery of mechanization services has diminished. Imports of machinery and equipment are meant for the private sector. In 1988, for instance, a mechanization project was launched at Donkorkrom, on the Afram Plains, as part of government's program for the development of the area. The idea is to equip cooperative groups in the area for mechanized agriculture. Sales are made to the farmer cooperative, which makes token deposits for the machinery and equipment purchased. Repayments are then made over a long period (not specified) under liberal terms.

Tractor services to farmers, which include the initial ground preparation and the carting of farm produce, are now in the hands of the private sector. Charges for such services depend on the individual owners or company. On the whole, however, the charges do not vary significantly in a particular area. In the transitional zone of Brong-Ahafo, charges for plowing and harrowing in 1990 were around ¢5,500 per acre, and the charge for carting farm produce was around ¢3,500 per trip for farms close to the village. For the same operations, fees were ¢300 per acre and ¢80 per trip, respectively, in 1980, and ¢3,000 per acre and ¢500 per trip in 1985. Although 1991 charges in nominal terms were 1,800 percent of the 1980 fees for plowing and harvesting and 4,400 percent higher for carting, these figures do not represent significant increases in real terms. In fact, real costs for hiring services have actually decreased. At 1980 constant prices, the fee for plowing and harvesting was ¢226 per acre in 1985, representing a fall of 25 percent from 1980 fees. This further declined to just ¢90 per acre in real terms by 1990. Thus, even though nominal charges for tractor hire services have gone up appreciably in response to policy changes such as devaluation, the removal of subsidies, and increases in fuel prices, in real terms, the policies have benefited the farmers who pay for such services. In real terms, farmers now pay 70 percent less than they did in 1980 for plowing and harvesting and 30 percent less for carting.

5. AGRICULTURAL INPUT POLICY: DISTRIBUTIONAL CONSEQUENCES

Changes in policies affecting the availability and prices of agricultural inputs could have considerable effect on farmers and the economy as a whole. Even though estimates of the impact implications at the farm level are not available for Ghana, estimates for other African countries suggest that the impact could be substantial in terms of lost production. Braun and Puetz (1987) have estimated that output loss as a result of fertilizer shortages and reduced use in The Gambia was about 10 percent of agricultural GDP.

Equally important could be the induced change in the structure of input use by crop and by region. These could have considerable distributional consequences both among regions and among farmers within the same region. To examine the distributional implications of these changes, detailed time series on the structure and levels of input use would be required. In the absence of these time series, we rely on the results of the Ghana Living Standards Survey (GLSS) which provides a one-period data set on input use patterns in the country for 1987. These can be used to discuss the distributional implications of the input supply policy changes discussed in the earlier part of this paper in the context of the existing poverty profiles in Ghana.

Using the GLSS data, Boateng et al. (1990) observed that poverty in Ghana is primarily a rural phenomenon. The incidence of poverty in rural areas is more than 13 times that in Accra. About 80 percent of the poverty in Ghana is rural poverty. Since the main activity in rural areas is agriculture, it is not surprising that the paper observed that "fully 65.1 percent of poor households' income comes from agriculture . . . " (Boateng et al. 1990, 51).

Poverty in Ghana also has a regional dimension. Analyzing poverty in 10 geographical regions in Ghana, Boateng et al. show that the savannah zone is the poorest, contributing about 34.6 percent of national poverty, even though it has only 10 percent of the population. This zone comprises Northern, Upper East, and Upper West regions, and the northern parts of Brong-Ahafo and Volta regions. This pattern of poverty is confirmed by Table 7. Using the same indicators of welfare as the GLSS preliminary report, we present mean values of the various indicators.

Fertilizer use in Ghana is fairly limited. Data from the GLSS show that only about 13.52 percent of farmers in Ghana use fertilizer. The use of insecticides is at about the same level (13.69 percent). A considerably larger proportion of farmers, about 47.02 percent, use purchased seed. These figures are low compared with The Gambia (Braun and Puetz 1987), but use is concentrated. Farmers who use fertilizer are found in clusters where 38 percent of farming households are using it; for insecticide, they are found in clusters where 36

Table 7 — Ghana: Means of Welfare Measures by Region

Region	Indicator				
	Total Household Assets	Total Household Expenditure	Per Capita Household Expenditure	Total Household Expenditure on Food	Per Capita Household Expenditure on Food
	(Cedis)				
Greater Accra	1,288,470.09	388,468.00	98,255.33	239,299.59	63,322.69
Eastern	488,286.78	283,437.93	68,427.15	189,961.89	45,915.61
Central	379,704.61	203,202.45	59,845.04	133,932.08	37,386.30
Western	727,434.62	346,991.76	84,802.18	228,624.62	55,962.28
Ashanti	350,004.39	233,394.12	62,255.36	158,196.86	42,020.50
Volta	434,502.90	239,368.03	53,232.40	157,466.33	35,177.24
Brong-Ahafo	477,877.60	307,315.82	65,940.49	199,732.98	43,198.50
Northern	189,238.22	233,647.90	43,790.92	177,673.31	32,667.95
Upper East	217,577.64	173,084.66	40,267.13	120,750.64	27,948.80
Upper West	266,442.67	233,116.13	40,412.18	190,795.09	32,983.12

Source: Computed from Ghana Statistical Service (1989).

percent use it. Those who do not use these inputs are again found in clusters where only 10 percent of farmers use them (Table 8). The use of purchased seed is less concentrated. However, there are wide regional disparities in the use of these inputs.

Table 4 shows that in terms of quantity, fertilizer use in Ghana is concentrated in the savannah zone. Its use is much more widespread in the poorest regions identified in the GLSS survey. The Northern and two Upper regions account for about 42 percent of all fertilizer use in the country. If the Brong-Ahafo region is added, they use up to 54 percent of all fertilizer. This pattern is corroborated by the data in Table 9, which shows the proportion of farmers in each region who use the various inputs. Apart from Greater Accra, the use of fertilizer is much more widespread among farmers in the Northern, Upper East, Upper West, and the savannah areas of Volta and Brong-Ahafo regions. The high ratio for Accra is due to the recent company purchases and the increase in pineapple production in the region for export.

The burden of changes in policy affecting insecticides will fall on farmers in the Brong-Ahafo, Accra, Western and Ashanti regions, as shown in Tables 9 and 10. In Brong-Ahafo, 34.5 percent of farmers surveyed use insecticides. The ratio for Accra is 21.2 percent, Western, 19.2 percent and Ashanti, 18.6 percent. Also, 28.1 percent of all farmers who use insecticides come from Brong-Ahafo (Table 10). The use of purchased seed is fairly widespread in all regions, compared with fertilizer and insecticides. But there is a concentration of farmers using purchased seeds in Ashanti, Brong-Ahafo, Western, and Volta regions (Table 10). Purchased seed would usually be improved varieties with higher yields than the traditional varieties.

Regional disparities in input use can also be seen by looking at the average expenditures by farmers on various inputs, as reported in Table 11. The table shows that while mean expenditure on fertilizer in the Northern region is over 10,000 cedis, the mean expenditure on the same input in the Western region is about 1,000 cedis. The data in Table 11, however, must be interpreted with care. Expenditures on inputs reflect both quantity and price variation. Even though the price of fertilizer, for instance, is supposed to be uniform across the country, prices could vary because of different transportation costs from the nearest depot, and because of rebagging in certain cases into smaller units for retail sale.

Table 12 shows the proportion of farmers who reported using the various inputs, by crop. The main users of fertilizer are rice, tomatoes, sorghum/millet, and maize farmers. In the case of insecticide, the main users are cocoa and tomato farmers. The purchase of seed is a much more widespread practice, affecting all except a few crops. Most of the impact of the changes in fertilizer policy will fall on farmers who grow rice, tomatoes, sorghum/millet, tobacco, and maize. These crops are grown to a large extent in the savannah zone, comprising the poorest zone in Ghana. The burden of insecticide policy will be borne mostly by cocoa and tomato farmers.

Table 8 — Proportion of Farmers in Cluster Using Input

Input	Input Index	
	Farmers Using Input	Farmers Not Using Input
Fertilizer	0.382	0.103
Insecticide	0.362	0.108
Purchased Seed	0.601	0.380
Extension Service	0.193	0.050

Source: Computed from Ghana Statistical Service (1989).

Note: We calculate the proportion of farmers using an input in each household's cluster exclusive of the household itself. Thus, if there are n farming households in a cluster and I_j is a variable equal to one if household j uses the input and 0 otherwise, the figures shown are the average of $P_i = \sum_{j \neq i}^{n} \frac{I_j}{(n-1)}$ across all farming households (indexed by i) that use and do not use the input, respectively. Obviously, we excluded clusters with only one farming household.

Table 9 — Ghana: Proportion of Farmers in Each Region Using Inputs

Region	Fertilizer	Insecticide	Purchased Seed	Extension
	(Percent)			
Greater Accra	30.3	21.2	56.6	6.0
Eastern	8.3	11.4	30.4	3.2
Central	4.9	8.0	53.3	6.7
Western	4.0	19.2	55.2	7.6
Ashanti	11.0	18.6	61.7	6.0
Volta	20.7	6.5	57.3	7.3
Brong-Ahafo	18.6	34.1	62.8	10.8
Northern	29.9	1.4	27.9	2.7
Upper East	25.9	1.9	36.5	0.9
Upper West	21.1	5.5	20.0	2.2

Source: Computed from Ghana Statistical Service (1989).

Table 10 — Ghana: Proportion of Total Input Users in Region

Region	Fertilizer	Insecticide	Purchased Seed	Extension
	(Percent)			
Greater Accra	9.7	6.7	5.3	4.7
Eastern	10.0	13.7	10.8	9.4
Central	3.5	5.7	11.4	11.8
Western	3.2	15.3	13.1	14.9
Ashanti	13.5	22.7	22.3	18.1
Volta	15.5	4.8	12.6	13.4
Brong-Ahafo	15.5	28.1	15.4	22.0
Northern	14.2	0.6	3.9	3.1
Upper East	8.7	0.6	3.6	0.8
Upper West	6.1	1.6	1.7	1.6
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Computed from Ghana Statistical Service (1989).

Table 11 — Ghana: Mean Expenditures by Farming Households on Inputs, by Region

Region	Fertilizer	Insecticide	Seed	Transport	Extension
			(Cedis)		
Greater Accra	2,015	3,096	2,514	2,407	831
Eastern	3,762	2,616	3,284	4,240	1,462
Central	1,724	2,764	2,468	3,481	947
Western	1,064	3,233	6,455	3,866	1,053
Ashanti	2,711	3,729	3,162	2,770	639
Volta	2,343	1,319	1,150	1,458	484
Brong-Ahafo	5,461	2,239	3,486	3,890	641
Northern	10,047	9,675	2,442	6,100	3,616
Upper East	3,956	1,050	2,436	—	1,569
Upper West	9,289	440	1,020	—	2,602

Source: Computed from Ghana Statistical Service (1989).

Table 12 — Ghana: Percent of Farmers Using Various Inputs by Crop

Crop	Fertilizer	Insecticide	Purchased Seed
Cocoa	0.6	20.2	12.4
Coffee	5.2	5.2	0.0
Coconut palm	0.0	0.7	3.6
Oil palm	1.9	1.6	7.7
Plantains	0.5	0.5	28.4
Bananas	0.2	0.2	0.4
Oranges	0.0	0.8	1.9
Other fruit trees	0.0	0.0	0.3
Wood	5.5	0.0	0.0
Cola nuts	0.0	0.0	0.0
Kenef	2.5	0.0	0.0
Cotton[a]	0.0	0.0	0.0
Peanuts	3.1	0.0	14.4
Tobacco	10.6	0.0	1.5
Pineapple	0.0	0.0	1.2
Sugar cane	1.5	0.0	5.4
Cassava	0.4	0.2	6.5
Yam	0.3	0.1	0.7
Cocoyam	0.0	0.1	5.4
Potato	1.9	0.9	0.9
Maize	8.1	2.1	18.8
Rice	12.8	4.8	13.2
Sorghum	10.8	1.0	5.1
Tomatoes	12.5	13.7	21.2
Okro	1.5	1.9	8.9
Garden eggs	4.0	7.4	13.2
Beans and peas	1.0	2.3	11.8
Pepper	3.7	3.2	15.9
Leafy vegetables	1.6	0.8	5.4
Other vegetables	1.7	2.6	5.3
Other crops	1.8	0.0	16.6

Source: Computed from Ghana Statistical Service (1989).

[a] Apparently, the survey had a problem of interpretation with respect to cotton. Seed, fertilizer and insecticides are normally supplied by the Ghana Cotton Company, which supplies them on credit and then deducts the costs before payment is made for the crop.

To obtain some idea of the distributional implications for different categories of farmers — small-scale, rich, or poor — we examined input use by different categories of farmers. This is done by looking at input use by size of farm, educational level, and expenditures. We used expenditure instead of income because the income data contained in the GLSS data are considered unreliable. In any case, given a positive relation between expenditure and income, the use of expenditures will capture the general trend in terms of fertilizer use by wealth. The results are presented in Tables 13, 14, 15, and 16.

There is no evidence that the use of fertilizer is skewed in favor of richer farmers. The proportion of farmers using fertilizer in the lowest expenditure quartile is 12.9 percent, and that for the highest quartile is 13.4 percent. The difference is insignificant. The story is different for insecticide. Of farmers in the lowest expenditure quartile, 7.6 percent are reported to be using insecticide, while the figure for the highest quartile is 18.7 percent, or more than twice that of the lowest quartile. The purchase of seed is widespread among all expenditure categories and does not appear skewed (Table 13). This looks reasonable if we look at the distribution of farmers who use these inputs according to expenditure quartiles. Of all farmers who use fertilizer, 22.6 percent belong to the lowest quartile, and the figure for the highest quartile is only slightly above that, at 23.9 percent. The skewness in insecticide use is also shown in Table 14.

The use of fertilizer is higher among farmers cultivating between two and six acres. Table 15 shows that about 20 percent of farmers cultivating between two and six acres use fertilizers. The proportion is lower for those with farms of more than six acres or less than two acres. Thus there is no evidence that large-scale farmers have a greater tendency to use fertilizer. For insecticide the highest categories are four and eight acres. But again, there is no greater tendency for larger farmers to use insecticide than small-scale farmers.

There is a clear tendency for a greater proportion of the more-educated farmers to use both fertilizer and insecticide compared with the less-educated farmers. In the case of purchased seed, the distribution is flat (Table 16).

These results have to be interpreted with care. The ideal comparisons should involve quantities of input used rather than simply whether or not farmers used an input. Yet the regressions we report below yield similar results whether we use a discrete indicator variable for input use (as we do here) or actual quantities used.

PROBIT AND TOBIT ANALYSES

To test the correlation of several factors with input use, we performed probit and tobit analyses. The Probit model was used to explain the adoption of particular inputs, while the tobit analysis was used to analyze variation in the levels of input use.

Table 13 — Ghana: Percentage of Farming Households Using Inputs, Per Capita Expenditure Quintile

	Lowest Expenditure Quintile	Lower Middle Quintile	Upper Middle Quintile	Highest Expenditure Quintile	Highest Five Percent
	(Percent of farmers)				
Fertilizer	12.9	13.7	17.0	13.4	14.8
Insecticide	7.5	15.5	16.1	18.7	18.5
Purchased seed	39.9	49.6	50.7	54.4	57.4
Extension service	4.6	4.8	5.5	9.4	4.6

Source: Computed from Ghana Statistical Service (1989).

Table 14 — Ghana: Distribution of Input Users by Per Capita Expenditure Quintile

	Lowest Expenditure Quintile	Lower Middle Quintile	Upper Middle Quintile	Highest Expenditure Quintile
	(Percent of farmers)			
Fertilizer	22.5	23.8	29.6	23.8
Insecticide	13.1	26.8	27.8	32.2
Purchased seed	29.3	24.5	24.0	21.9
Extension service	19.6	20.4	23.6	36.2

Source: Computed from Ghana Statistical Service (1989).

Table 15 — Ghana: Percentage of Farming Households Using Inputs, by Farm Size

Input	<1	1 to 2	2 to 4	4 to 6	6 to 8	6 to 10	10 +
	(Acres)						
Fertilizer	12.4	14.5	20.1	20.2	15.6	14.3	12.5
Insecticide	5.8	7.2	10.0	12.7	13.7	11.7	17.6
Purchased seed	53.5	49.0	55.2	50.5	50.9	45.1	47.0
Extension services	2.6	3.6	4.0	4.7	5.8	8.5	6.6

Source: Computed from Ghana Statistical Service (1989).

Table 16 — Ghana: Percentage of Farming Households Using Inputs, by Level of Education of Head of Household

Input	0	0 to 6	6 to 10	10 to 15	15 to 19	19 +
	(Years of education)					
Fertilizer	13.3	10.0	15.1	28.1	18.1	0
Insecticide	11.4	13.7	18.0	22.3	27.2	0
Purchased seed	42.5	48.6	56.9	59.2	63.6	0
Extension service	3.8	3.6	8.0	16.5	18.1	0

Source: Computed from Ghana Statistical Service (1989).

The basic model was specified as follows:

$$Y_{ij} = F\{ln(Assets)_j, ln(Totcr)_j, Fertprop_j, Expen_j, Craeindx_j, Grnindx_j, Tomaindx_j, Edhed_j, AEZ1, AEZ2\}$$

where:

Y	=	1 if the household used input, 0 otherwise (probit); or Y = actual expenditure per acre (tobit)
Assets[3]	=	Value of total assets of the farm household
Expen	=	Per capita expenditure of the household
Totcr	=	Total number of acres farmed by household
Fertprop	=	Proportion of farmers in the household's sample cluster using input (excluding the household itself)
Craeindx	=	1 if household had one or more contacts with an extension officer, 0 otherwise
Grnindx	=	1 for those with at least ten percent of total acreage in cereals, 0 otherwise
Cocoindx	=	Cocoa index
Tomaindx	=	1 for tomato growers, 0 otherwise
Edhed	=	Number of years of education of household head
AEZ1, AEZ2	=	Dummy variables for coastal and forest agroecological zones.

Data on quantities of inputs used (fertilizer and insecticide) are unreliable. A number of nonstandard units of measurement have been reported. These pose problems of conversion to a common unit such as kilos. To obtain some idea of the levels of input use, we estimated expenditure on the two inputs (fertilizer and insecticide) per acre. Since the prices of these two inputs are uniform across the country, variations in expenditure per acre should reflect variations in the levels of these inputs applied per acre. This variable is used in the tobit analysis. In the analysis, the dependent variable is equal to the actual expenditure per acre, if the household used fertilizer (insecticide), and zero otherwise.

The explanatory variables included in the equations are meant to capture the effects of wealth and farm size, information and access to agricultural extension, and the type of crop grown. To capture the correlation between input use and household welfare, two variables, assets and total per capita expenditure of the household, are used. Farm size is represented by the total cropped acreage for the household.

The decision to use fertilizer or insecticide can be affected by its availability in the village and the number of other people using it within one's neighborhood. To capture this type of demonstration effect, we included the proportion of households using fertilizer or insecticides in the equation.

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[3] The assets variable here does not include the value of land.

Contact with extension agents and the level of education of the head of the household can be important in obtaining information about improved technologies and the benefits to be obtained. These two variables are included as explanatory variables in our model.

The type of crop grown by the household can be an important factor in input use. The discussion in the first section of Chapter 5 suggested that fertilizer may be used more widely by staple food grain producers, while insecticides are used more widely by cocoa producers. Tomatoes feature prominently in the use of both inputs. We therefore created three variables to capture these effects. Grnindx is used to capture whether the household produces cereals or not, Cocoindx captures the production of cocoa; and Tomaindx represents tomatoes. Finally, AEZ1 and AEZ2 are dummy variables for the coastal and forest agroecological zones (the savannah being the default).

Tables 17 and 18 present the probit results for fertilizer and insecticides, respectively. In the case of fertilizer, when household expenditure per capita is used as the household welfare indicator, both it and farm size are statistically insignificant in explaining the likelihood that a household will use fertilizer (see column 2). The value of assets, however, is important (see column 1). This contrasts with the results for insecticides, in which assets, size of the farm, and total household expenditure are positive and statistically significant. The results are consistent with the observations made in the first section of Chapter 5 using the cross tabulations: fertilizer use does not appear to increase with household expenditures per capita, but insecticide use does. Both tend to be used more extensively by wealthier farmers, however.

The most important factors explaining the likelihood of a household's using fertilizer or insecticide seem to be the proportion of farmers in the cluster already using the input, contact with the extension officer or some other agent, and the level of education of the household head. All three variables are positive and statistically significant in both the fertilizer and insecticide equations. This result has strong implications in terms of efforts to increase the use of these inputs among farmers. They suggest that increased extension activities, establishment of demonstration farms, and education of farmers will be important considerations. The "cluster effect" may also be due to a restricted distribution network that does not serve all areas of the country equally well.

The indices for the type of crop are significant in all the insecticide equations. In the fertilizer equations, however, whether one is growing cereals or not is statistically insignificant in explaining the likelihood of using fertilizer. This is probably due to the fact that nearly all farmers grow at least some cereal.[4]

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[4] In separate regressions for the savannah zone (not reported) this variable is significant, and the level of education of the household head is insignificant. Given the high level of illiteracy in this zone, the results are not surprising.

Table 17 — Ghana: Probit Results; Dependent Variable = Use of Fertilizer (1 = Yes, 0 = No)

Explanatory Variable	Equation (1)	(2)	(3)
Constant	-2.46 (18.431)	-2.16 (3.237)	-1.72 (11.484)
Log total household assets	0.067 (2.99)		
Log household expenditure per capita		0.042 (0.69)	
Total cropped acreage	0.012 (0.43)	0.034 (1.23)	0.034 (1.23)
Proportion of farmers in survey cluster using fertilizer	2.64 (14.107)	2.67 (14.34)	2.67 (14.38)
Index for control with an extension agent	0.57 (4.09)	0.61 (4.43)	0.61 (4.43)
Index for whether at least 10 percent of total acreage is cropped in grain	0.031 (0.34)	0.021 (0.23)	0.015 (0.16)
Index for whether at least 10 percent of total acreage is cropped in tomatoes	0.47 (4.61)	0.45 (4.39)	0.45 (4.419)
Years of education of household head	0.043 (5.15)	0.039 (4.68)	0.041 (4.95)
Coastal dummy	-0.34 (3.07)	-0.33 (2.99)	-0.32 (2.92)
Forest dummy	-0.41 (4.01)	-0.43 (4.23)	-0.42 (4.18)

Source: Computed from Ghana Statistical Service (1989).

Note: Absolute t-values in parenthesis.

Table 18 — Ghana: Probit Results; Dependent Variable = Use of Insecticide (1 = Yes, 0 = No)

Explanatory Variable	Equation (1)	(2)	(3)
Constant	-3.66 (12.74)	-3.62 (5.29)	-2.19 (17.19)
Log total household assets	0.3 (5.84)		
Log household expenditure per capita		0.14 (2.13)	
Total cropped acreage	0.042 (1.45)	0.087 (3.19)	0.087 (3.20)
Proportion of farmers in survey cluster using insecticide	2.46 (12.83)	2.52 (13.19)	2.57 (13.56)
Index for control with an extension agent	0.65 (5.04)	0.71 (5.55)	0.71 (5.59)
Index for whether at least 10 percent of total acreage is cropped in cocoa	0.39 (3.84)	0.49 (5.01)	0.50 (5.07)
Index for whether at least 10 percent of total acreage is cropped in tomatoes	0.43 (3.84)	0.40 (3.14)	0.40 (3.64)
Years of education of household head	0.031 (3.87)	0.025 (3.14)	0.029 (3.64)
Coastal dummy	-0.040 (0.31)	-0.048 (0.37)	-0.003 (0.02)
Forest dummy	0.14 (1.22)	0.044 (0.39)	0.061 (0.54)

Source: Computed from Ghana Statistical Service (1989).

Note: Absolute t-values in parenthesis.

In Tables 19 and 20 we report the tobit results for fertilizer and insecticides, respectively. This is an attempt to capture the distinction between the probability of using input and levels or quantities of the input used. Of special interest to us in this analysis is whether producers of particular crops were likely to suffer more from the policy changes affecting the price and availability of fertilizer and insecticides. The crop indicator variables have positive and statistically significant coefficients. Cereal and tomato producers will be affected by fertilizer policies; cocoa and tomato farmers will be affected to a large extent by insecticide policies.

The analysis in the preceding sections shows that the changes in policies affecting the availability and prices of fertilizer and seeds will affect all categories of farmers almost proportionately, irrespective of their farm size and level of per capita expenditure. In the case of insecticides, large-scale and richer farmers may be affected more than small-scale farmers. Since subsidies on insecticides had always been higher than those on fertilizer, users of insecticides could be much more affected by removal of the subsidy. On the other hand, most insecticide users are cocoa farmers, so the impact is (partly) offset by increases in real producer prices.

Most fertilizer users are in food production (rice, sorghum/millet, maize, etc.). Apart from the increase in input prices as a result of policy change, these farmers have also suffered a real decline in their product prices. Alderman (1991) has shown that the real wholesale price of food, usually taken as a proxy for producer price, has been declining slowly in the 1970s and more rapidly since 1984.

With privatization, it is smallholders in the more remote areas who have had their depots closed. Furthermore, most of the registered distributors are urban-based. Rural smallholders will most likely not gain access to fertilizer sales points. To the extent that poverty in Ghana is a rural phenomenon, one way to reduce poverty through increased productivity may have been eliminated with the concentration of distribution centers. The policy could therefore worsen the rural-urban income differential.

Table 19 — Ghana: Tobit Results; Dependent Variable = Household Expenditure on Fertilizer Per Acre of Cropped Land

Explanatory Variable	Equation (1)	(2)	(3)
Constant	-2328.00 (7.83)	-1897.00 (2.90)	-1603.00 (11.45)
Log total household assets	61.11 (2.88)		
Log household expenditure per capita		27.70 (0.46)	
Proportion of farmers in survey cluster using fertilizer	2,379.00 (12.31)	2,417.00 (12.46)	2,421.00 (12.49)
Index for contact with extension agent	595.00 (4.59)	640.00 (4.93)	638.00 (4.93)
Index for whether at least 10 percent of total acreage is cropped in grain	66.40 (0.75)	51.80 (0.58)	47.40 (0.53)
Index for whether at least 10 percent of total acreage is cropped in tomato	411.00 (4.28)	389.00 (4.06)	390.00 (4.09)
Years of education of household head	41.70 (5.20)	38.70 (4.73)	39.50 (4.96)
Coastal dummy	-320.00 (3.15)	-325.00 (3.14)	-316.00 (3.11)
Forest dummy	-557.00 (5.72)	-566.00 (5.76)	-561.00 (5.74)
Regression standard error	1013.00 (22.49)	1016.00 (22.47)	1016.00 (22.47)

Source: Computed from Ghana Statistical Service (1989).

Table 20 — Ghana: Tobit Results; Dependent Variable = Household Expenditure on Insecticide Per Acre Cropped

Explanatory Variable	Equation (1)	(2)	(3)
Constant	-2,346.00 (10.12)	-2,511.00 (5.00)	-1,434.00 (14.38)
Log total household assets	77.40 (4.71)		
Log household expenditure per capita		102.00 (2.23)	
Proportion of farmers in survey cluster using insecticide	1,600.00 (10.96)	1,634.00 (11.20)	1,676.00 (11.48)
Index for contact with extension agent	370.00 (4.13)	404.00 (4.53)	409.00 (4.58)
Index for whether at least 10 percent of total acreage is cropped in cocoa	243.00 (3.36)	321.00 (4.57)	327.00 (4.66)
Index for whether at least 10 percent of total acreage is cropped in tomato	326.00 (4.17)	291.00 (3.78)	295.00 (3.83)
Years of education of household head	24.2422 (4.18)	19.80 (3.44)	22.39 (3.95)
Coastal dummy	-49.50 (0.54)	-70.40 (0.77)	-35.60 (0.40)
Forest dummy	22.40 (0.28)	-19.90 (0.25)	-6.27 (0.08)
Regression standard error	753.00 (23.00)	750.00 (23.05)	752.00 (23.03)

Source: Computed from Ghana Statistical Service (1989).

Note: Absolute t-values in parenthesis.

6. GENDER-RELATED ANALYSIS

Economists have paid considerable attention to the gender-specificity of economic activity in recent years. While in principle the use of agricultural inputs by gender would make for an interesting study, it would be difficult with the Living Standards Survey data because the survey collects information on self-employed agricultural activity only at the household level. The closest one can come to gender-specific analysis is to use the gender of the household head as an indicator of whether men or women purchased inputs.[5]

Table 21 reports the proportion of farms using various agricultural inputs by the household head's gender. While it is generally true that households with a male head are more likely to use purchased inputs, the difference is generally small in absolute terms and likely to be explained by factors other than gender. This conjecture is confirmed by a regression analysis which includes the gender of the household head in the regressions we discussed in the previous section. In each regression, the coefficient on a dummy variable for female-headed households is negative but statistically insignificant. Thus, although these data are not ideal for investigating gender-related issues, they offer little support for the hypothesis that either fertilizer or insecticide use differs significantly by the household head's gender.

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[5] The employment module of the survey does ask each individual if he or she was self-employed in agriculture during the last year. This might permit us to calculate a variable such as "number of (fe)male workers in agriculture" for each family. Unfortunately, only 496 males and 592 females reported working in agriculture in the past year. Even assuming that each family had only one person working in agriculture, this falls far short of the 2,132 households reporting agricultural production. Thus, these employment data are probably very unreliable, and we have not pursued any analysis of them.

Table 21 — Proportion of Agricultural Households Using Purchases Inputs, by Gender of the Household Head

Input	Proportion of Households Using this Input		Probability of Fisher's Two-tail Chi-Square
	Male Head	Female Head	
Improved Seeds	0.48	0.51	0.35
Fertilizers	0.16	0.11	0.00
Insecticides	0.16	0.10	0.00
Transport Services	0.14	0.10	0.00
Purchased Containers	0.35	0.33	0.41
Extension Contact	0.07	0.02	0.00

Source: Computed from Ghana Statistical Service (1989).

7. SUMMARY AND CONCLUSIONS

In recent years the Ghana government has gradually removed all subsidies on agricultural inputs and has tried to privatize their distribution. This paper has examined some of the implications of these policies.

The removal of subsidies has led to increases in the real price of the inputs and reduced the growth in their sales. In the case of fertilizer, the result has been increased inventory accumulation to such an extent that, for 1991, no fertilizer imports were planned. The reduction in sales has come partly as a result of the failure to import fertilizers far enough in advance of the planting season. It is also true that private agents' response to the privatization policy has been poor. A considerable number registered but could not operate. The main constraints included the lack of credit, competition from NGOs, and uncertainty about the sustainability of the new policies.

Privatization has also resulted in increasing concentration of the distribution network in urban areas. Many of the depots that were located in remote areas, including those pertaining to the FASCOMs, are now closed. The private agents who have registered to sell fertilizer are largely urban-based. This may result in fertilizer not being available to rural areas, with consequent loss in productivity.

In terms of the distributional implications of the policies, the proportion of farms normally using these inputs is small. At a first level, then, we can conclude that the effect of price liberalization will be minimal. However, the analysis has shown that these policies will have implications for regional inequalities. What is more, for the farmers who *do* use fertilizer, the poor will be hit about as hard as the better-off.

Fertilizer policies will affect most the poorest regions of the country and, to a large extent, staple food grain farmers. While insecticide policies will affect mainly exporters, who have also had substantial increases in real producer prices, the burden of the lost fertilizer and seed subsidies will fall proportionately on farmers across all income categories. For insecticides, better-off households may bear the greater burden.

THOUGHTS ON POLICY

While this paper has focused on describing the facts of agricultural input use and the changes in the policy environment that have taken place during the last several years in Ghana, it does suggest some important policy issues for the future. The clearest results from our household-level regressions are that

agricultural extension increases fertilizer and insecticide use, and that being in a cluster (usually a village) where other people are using these inputs significantly increases the probability that a household will also use them. This latter result can be interpreted in at least two ways: it may be that there is a "demonstration effect" such that farmers who see their neighbors' good results with fertilizer or insecticides will be more inclined to use them themselves. But it may also reflect the fact that input distribution was rather spotty when controlled by the MOA and/or any one of several other official or nongovernmental organizations (and continues to be so). There may be widespread demand for inputs that is only met at certain sites.

These results suggest that more aggressive agricultural extension service could increase fertilizer and insecticide use in Ghana, both through education of farmers and (perhaps) through a demonstration effect. Although we cannot provide any information as to whether this would be a cost-effective investment — increased input use is not a good thing per se; it must be compared to the costs of the inputs — most cost-benefit analyses of extension services in other countries suggest that they are in fact highly profitable. The weakness of the MOA's extension service is widely recognized in Ghana. This would seem to be an important area for improvement in the context of a general structural adjustment of the agricultural sector.

It may also be the case that a more wide-ranging distribution system for inputs would increase their use. In this regard, the evidence thus far from Ghana is not encouraging. While many of the official distribution channels have shut down, private traders have not rushed in to replace them. Even the semiofficial FASCOMs have consolidated their distribution networks, withdrawing from remote (and therefore less-profitable) sites and concentrating their sales in urban areas. The sluggish response of private firms is probably attributable to two temporal problems: scarcity of credit (which is a problem for the entire private sector in Ghana) and uncertainty about future MOA input policy. Competition from nonprofit NGOs offering cheaper prices and/or credit that private traders cannot match may also impede their growth.

If it were true that only better-off farmers had been consuming subsidized, state-distributed agricultural inputs prior to the reforms, one could be sanguine about the problems faced in the transition to a competitive private market. But our household-level data seem to suggest otherwise, at least in the case of fertilizers. Roughly the same proportion of small, low-income farms were using fertilizer as large and high-income farms. Further, small farmers were more likely to get their fertilizer from an official source. Like most analysts, we recognize the general inefficiency of the MOA distribution system, and it seems likely that the push to privatize the agricultural input markets is driven mostly by a desire to reduce the fiscal burden of this inefficiency. At the same time, it does appear that the ministry succeeded in getting fertilizer to remote and poor farmers in about the same proportion that better-off farmers were able to acquire it. (This may be one of the few government programs that actually benefited remote farmers.) Unfortunately, these same farmers are those who are least likely to be served by a private distribution network. Policymakers should recognize this problem and, on social welfare grounds, consider options for

reintroducing and expanding input distribution to those least likely to be served by a private market.

The last and most difficult policy issue is credit. At the wholesale level, many potential traders complain that they cannot generate necessary volume because they cannot finance the purchase of fertilizers or other inputs with the banks. While agricultural credit has a bad history in Ghana, the problem at the wholesale level probably has more to do with tight credit policies at a macro level than with problems inherent in the agricultural input business. Any loans to input traders could be collateralized with the purchased inputs, which should keep the banks' risks at acceptable levels.

There is also a credit problem at the retail level, one which is not so easily resolved. Most potential purchasers of agricultural inputs are sufficiently poor that they cannot self-finance the purchase of inputs through the growing season. At the same time, the fact that they are poor means that they have no collateral to offer in return for a loan to buy inputs. (Schemes to tie repayments to crops harvested have generally been difficult to enforce.) One possible resolution of this problem is to link input credit with traditional forms of credit, where social (rather than purely financial or legal) controls can improve loan recovery rates. But this may also be an area in which non-market-priced aid, in the form of grants to small farmers to buy inputs, would both increase productivity and be socially progressive.

In sum, while the privatization of input trade will almost certainly eliminate the gross inefficiencies observed in the past, we must recognize that private markets are only efficient, not equitable. There is no guarantee that poorer farmers will benefit from private distribution of inputs, and the termination of government programs that did succeed in distributing inputs to poorer farmers will have a negative impact on those farmers' productivity and incomes.

APPENDIX A

APPENDIX TABLES

Table A.1 — Ghana: Fertilizer Imports, 1970-1990

Year	Total
1970	8,250
1971	8,626
1972	12,307
1973	16,931
1974	12,470
1975	22,241
1976	43,983
1977	26,550
1978	39,360
1979	58,650
1980	60,460
1981	—
1982	46,500
1983	—
1984	38,350
1985	29,999
1986	20,100
1987	38,070
1988	43,415
1989	65,239
1990	43,850

Source: MOA.

Table A.2 — FASCOM VOLTA

	Fertilizer Sales	
1983	4,300	
1984	1,300	Late Arrival
1985	1,800	Prices up.
1986	5,000	
1987	3,200	
1988	4,300	50% taken by G.2000
1989	3,000	
1990	1,500	as at

Source: MOA.

Table A.3 — Ghana: Supply of Insecticides to Cocoa Farmers

Year	Quantity Imported	Cost to Government	Quantity Sold to Farmer	Cost of Farmer	Total Cost
	Liters	Cedis/liter	'000 liters	Cedis/liter	
1970/71	1,243,220	0.80	1,243	4.00	4.80
1971/72	533,570	0.56	849	4.00	4.56
1972/73	1,000,500	0.64	1,000	4.00	4.64
1973/74	937,100	0.97	937	2.00	2.97
1974/75	700,000	1.62	700	2.00	3.62
1975/76	909,110	2.32	909	2.00	4.32
1976/77	1,800,840	4.81	887	2.00	6.81
1977/78	800,000	11.50	58	0.50	12.00
1978/79	1,735,000	16.86	2,067	0.50	17.36
1979/80	650,000	16.91	247	0.50	17.41
1980/81	745,000	14.22	1,250	0.50	14.72
1981/82	2,500,000	15.07	1,651	0.50	15.57
1982/83	950,000	16.50	402	30.00	46.50
1983/84	850,000	277.00	756	133.50	410.50
1984/85	685,413	281.00	1,043	133.50	414.50
1985/86	675,000	527.80	1,058	133.50	661.30
1986/87	1,400,000	n/a	1,387	600.00	600.00
1987/88	2,000,000	n/a	1,093	600.00	600.00
1988/89	2,000,000	n/a	902	600.00	600.00

Source: COCOBOD.

Table A.4 — Ghana: Supply of Motorized Spraying Machines to Cocoa Farmers

Year	Quantity Imported	Cost of Govt. # Per Unit	Quantity Sold to Farmers	Cost of Farmer Per Unit ¢
1970/71	3,363	63.90	3,300	10.00
1971/72	3,820	64.32	3,820	10.00
1972/73	—	—	—	10.00
1973/74	4,250	68.60	4,200	30.00
1974/75	4,936	69.72	4,920	30.00
1975/76	12,500	71.60	12,500	30.00
1976/77	21,000	78.52	15,000	30.00
1977/78	14,270	79.64	18,250	30.00
1978/79	10,000	78.52	8,000	30.00
1979/80	—	—	4,020	30.00
1980/81	6,500	90.00	6,450	30.00
1981/82	23,945	113.18	17,742	30.00
1982/83	5,000	119.80	8,333	700.00
1983/84	4,000	120.10	8,780	700.00
1984/85	25,300	126.25	10,503	700.00
1985/86	15,000	127.50	5,334	5,000.00
1986/87	5,000	130.00	10,280	5,000.00
1987/88	4,623	—	8,875	23,000.00
1988/89	—	—	3,530	23,000.00

Source: COCOBOD.

Table A.5 — Ghana: Supply of Hand Operated Sprayers to Cocoa Farmers

Year	Quantity Imported	Amount US$
1987/88	4,280	289,473.05
1989	12,000	871,692.50
Total	**16,280**	**1,161,165.55**

Source: COCOBOD.

Note: No records are available for earlier years.

Table A.6 — Ghana: Supply of Fungicides to Cocoa Farmers

Year	Quantity Imported (kgs)	Amount US$	Quantity Sold to Farmers (kgs)
1986/87	429,560	4,124,558.50	13,352
1987/88	347,925	2,652,776.94	195,654
1988/89	101,500	614,471.20	631,676
Total	**878,985**	**7,391,806.73**	**840,682**

Source: COCOBOD.

Note: No records are available for earlier year.

Table A.7 — Ghana: Fertilizer Stocks and Sales, 1987

District	Fertilizer Type	Previous Type	Quantity Received	Quantity Sold
Tamale (RAO.)	15:15:15	—	2,268	—
	20:20:20	—	51,639	18,934
	S/Ammonia	—	49,750	38,233
Bimbilla	15:15:15	—	242	242
	20:20:20	—	2,890	1,499
	S/Ammonia	—	2,830	2,206
Tamale	15:15:15	—	159	159
	20:20:20	—	8,436	8,065
	S/Ammonia	—	2,650	2,456
Yendi	15:15:15	—	—	—
	20:20:20	—	15,769	8,005
	S/Ammonia	—	5,302	5,302
Salaga	15:15:15	—	3,844	3,464
	20:20:20	—	3,167	1,141
	S/Ammonia	—	2,364	2,146
Walewale	15:15:15	—	—	—
	20:20:20	—	5,750	3,443
	S/Ammonia	—	3,650	2,040
Damongo	15:15:15	—	—	—
	20:20:20	—	29,550	16,753
	S/Ammonia	—	5,141	4,941
	15:15:15	—	—	—
	20:20:20	—	3,961	3,074
	S/Ammonia	—	2,856	2,856

(continued on next page)

Table A.7 (continued)

District	Fertilizer Type	Previous Stock	Quantity Received	Quantity Sold
Regional Depot	17:17:17	-	26,080	13,319
	15:15:15	-	6,428	3,258
	20:20:20	-	900	870
	S/Ammonia	-	34,033	25,811
Tamale	17:17:17	-	1,050	149
	S/Ammonia	-	200	179
Tolon/Kumbungu	17:17:17	-	1,300	486
Bole	17:17:17	-	200	160
	15:15:15	-	1,000	764
	S/Ammonia	-	1,800	1,529
Saboba	S/Ammonia	-	950	345
Zabzugu	15:15:15	-	600	491
	S/Ammonia	-	1,702	1,350
	S/S.Phosphate	-	300	80
Yendi	15:15:15	-	3,000	2,416
	S/Ammonia	-	6,400	5,152
Gambaga	15:15:15	-	1,000	846
	S/Ammonia	-	2,200	1,790
Bimbilla	17:17:17	-	200	170
	15:15:15	-	1,198	992
	S/Ammonia	-	4,091	3,139
Walewale	17:17:17	-	200	198
	15:15:15	-	950	950
	S/Ammonia	-	5,197	3,729
Damongo	17:17:17	-	850	288
	15:15:15	-	3,350	2,016
	S/Ammonia	-	9,550	6,704

Source: MOA.

Table A.8 — Ghana: Fertilizer Stocks and Sales, 1989

District	Fertilizer Type	Previous Stock	Quantity Received	Quantity Sold
Regional Depot	15:15:15	3,170	—	1,102 (1097 at 2330)
	17:17:17	15,548	—	1,839 (1130 at 2640)
	20:20:20	—	85,862	9661
	25:15:50	—	10,000	6
	S/Ammonia	7,536	127,014	26,085 (1360 at 1600)
	Urea	—	24,994	590
Bimbilla	15:15:15	142	650	(112 at 2,300) 470
	17:17:17	30	2,000	305 (1 at 2,640)
	20:20:20	—	2,750	417
	S/Ammonia	926	3,610	2,185 (413 at 1,600)
Tolon/Kumbungu	17:17:17	814	2,900	1,229 (4 at 2,640)
	20:20:20	—	818	354
	S/Ammonia	—	5,328	2,872
Saboba	17:17:17	—	350	48
	20:20:20	—	1,900	897
	S/Ammonia	605	1,600	1,241 (605 at 1,600)
Walewale	15:15:15	—	400	142
	17:17:17	2	550	77
	20:20:20	—	1,400	189
	S/Ammonia	1468	5,880	2,888 (1,416 at 1,600)
Bole	15:15:15	24	—	21 (at 2300)
	17:17:17	40	150	171 (25 at 2,640)
	20:20:20	—	1,400	486
	S/Ammonia	59	2,500	1,326 (32 at 1,600)
Gambaga	15:15:15	154	—	77 at 2,300)
	17:17:17	—	1,400	123
	20:20:20	—	2,800	338
	S/Ammonia	410	1,800	734 (293 at 1,600)
Damongo	17:17:17	—	1,250	47
	20:20:20	—	9,446	1293
	S/Ammonia	621	14,284	1,754 (30 at 1,660)
Zabzugu	15:15:15	—	350	71
	17:17:17	—	1,350	85
	20:20:20	—	300	300
	S/Ammonia	—	3,200	859
Yendi	15:15:15	123	—	123 (12 at 2,300)
	17:17:17	—	2,650	681
	20:20:20	—	1,500	841
	S/Ammonia	283	8,950	4,059 (283 at 1,600)

Source: MOA.

Table A.9 —Ghana: Crop Services Department, Northern Region

Fertilizer Returns, 1986-1989

			Damongo		Gambaga	
Year	Type	Total Quantity	Quantity Received	Quantity Sold	Quantity Received	Quantity Sold
1989	15:15:15	3613	-	-	-	-
	17:17:17	1,6434	1250	47(1054-Global 2000)	1400	123 (1000)
	20:20:20	85,862	9446	1293(4519G/2000)	2800	338(600) Global
	25:25:25	10,000	-		-	2000
	Urea	24,994	-	-	-	
	S/A	139,222	14,284	1754(5841 G.2000)	1800	734(400)GL.2000
1988	17:17:17	29,880	850	288(562.Gl.2000)	-	
	15:15:15	17,528	3,350	2016(1321.Gl2000)	1000	846
	20:20:20	900	-		-	
	S/A	66,123	9,550	6704(2215.Gl.2000)	2200	1790
1987[a]	15:15:15	6,513	-			
	20:20:20	142,555	29,550	29,550	5750	3443
	S/A	70,893	5,741	4,941	3650	2040
1986	15:15:15	-	14,394	7,381	-	-
	20:20:20	-	9,500	1,929	-	-
	S/A	-	12,645	12,485	-	-

Source: MOA.

[a] Walewale and Gambaga were one district.

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