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PHILIPPINE FERTILIZER SECTOR STUDY

PREPARED FOR THE
GOVERNMENT OF THE PHILIPPINES

BY

CHEMONICS INTERNATIONAL CONSULTING DIVISION
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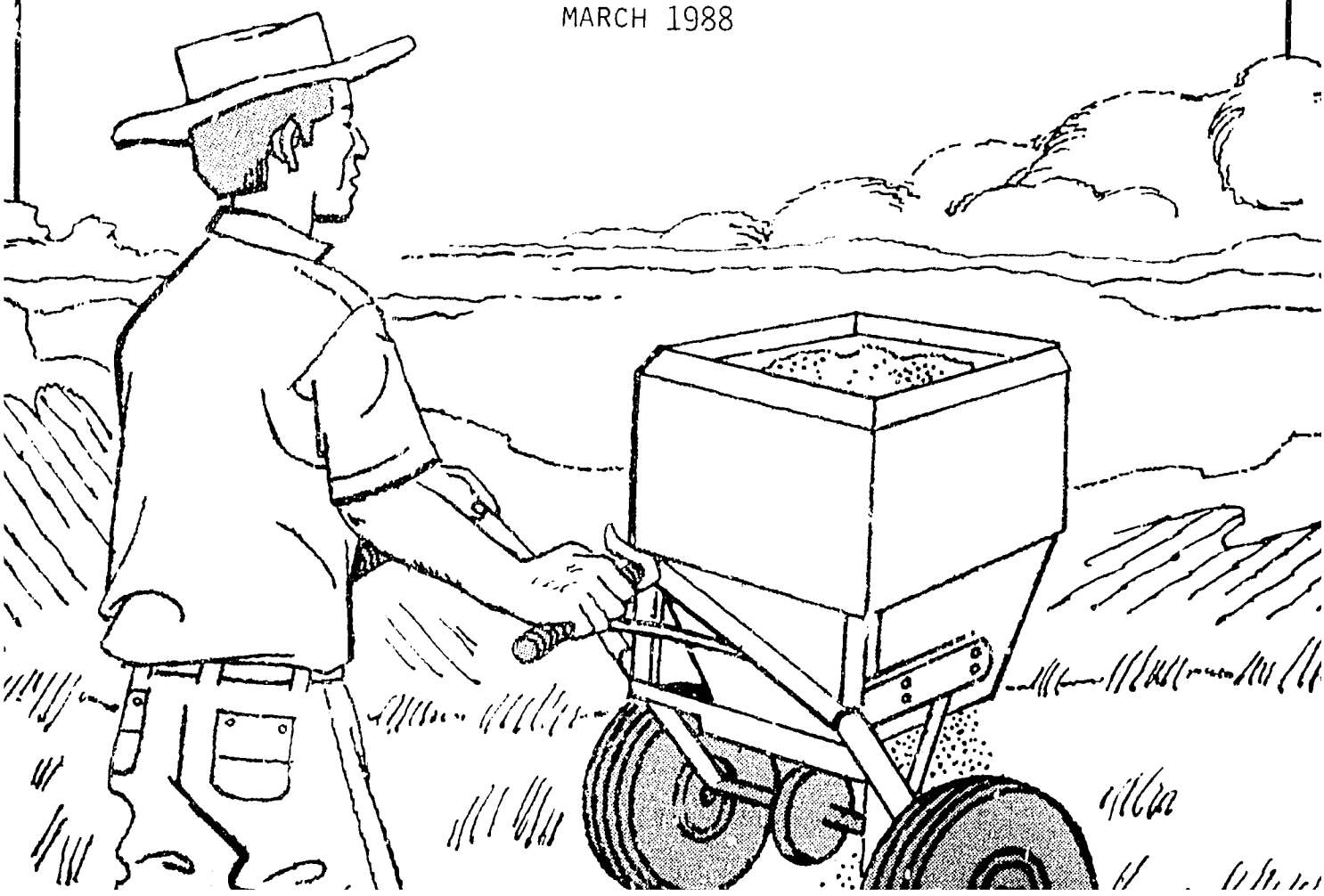

PHILIPPINE FERTILIZER SECTOR STUDY

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CHAPTER I

EXECUTIVE SUMMARY

A. Focus of Recommendations

The study team's analysis leads to recommendations furthering five objectives:

- o to lower plant nutrient prices, including (1) removal of duties and advanced sales tax on imported phosphatic compound fertilizers, and (2) general improvement in the domestic fertilizer sector;
- o to achieve stable fertilizer supplies and prices, dealing with (1) the short-term emergencies, and (2) the longer-term fluctuations on imported materials;
- o to provide the least-cost grades of fertilizers to farmers commensurate with sound agronomic practice;
- o to provide expanded and more cost-effective research and extension on fertilizer use; and
- o to give the Fertilizer and Pesticide Authority (FPA) responsibility for developing information and analysis, with prompt dissemination of the results, to assist the smooth working of a fully competitive fertilizer sector.

B. Supporting Analysis

Several elements in the analysis are emphasized as an introduction to the recommendations.

1. Recently Favorable Fertilizer/Crop Price Ratios for Rice

The growth of demand for fertilizers has been checked over several years by difficulties in the sugar sector. But it has been assisted recently by an extremely favorable change in the ratio of nitrogen/rice (and also nitrogen/corn) prices. In 1980-1985 the ratio was in the range of 3.9-4.5. In 1986 and 1987 it has averaged 2.1.

The recent improvement is due mostly to the sharp fall in the price of imported nitrogen, mainly reflecting changes in world market levels but also the ending of protection on straight nitrogen and potash since May 1986. Future changes in international fertilizer prices are likely to be the overwhelmingly important influence on the future course of the price ratio for rice.

2. International Fertilizer Prices to Rise Dramatically in the Medium Term

After eliminating the effects of inflation, international fertilizer prices are unlikely to rise much over the next two or three years, but by the early 1990s they could double or more from present levels. Table I-1 shows the most likely scenario.

The real costs of ocean freight are expected to increase substantially by the early to mid-1990s, so that the absolute increases C&F Philippines would be somewhat higher than those for FOB values.

A somewhat less likely scenario would advance the arrival of cyclical peaks by around one year.

3. A Restricted Definition and a Relatively Optimistic View of Future Fertilizer Emergencies

In the past the idea of fertilizer emergency seems to have been interpreted widely to include (1) agricultural or foreign exchange crises if they had some significant indirect impact on plant nutrient supply or price, whether or not some changes in fertilizer policy measures were justified, and (2) the heavy budgetary costs that have arisen over prolonged periods from large fertilizer subsidies intended to mitigate the effects of high import prices or to protect domestic manufacturing. The present analysis takes a much narrower view. A fertilizer emergency is considered to apply only where there are large increases in prices or severe shortages of supply that are likely to last for not more than 18-24 months and where direct action on fertilizer prices or supplies could be considered.

In principle, an emergency might contain one or more of the following six elements. In practice, some are unlikely to be at all important, so there is every justification for adopting a relatively optimistic view of future risks.

a. A Sharp Temporary Rise in Fertilizer Prices Due to International Market Forces

Given the substantial oversupply in world markets, reflected by the price forecasts given in the table, this risk is not considered important for three years at the earliest for nitrogen, four years for phosphates and longer for potash. The only situation that could cause a physical shortage would be a prolonged closing of the Straits of Hormuz, which seems most unlikely since it is in the mutual interest of all parties to keep it open.

TABLE I-1

FOB Prices at Constant 1986 Dollars

		Urea, NW Europe	Diammonium Phosphates Florida	Triple Superphosphate Florida	Potash Vancouver
		$/ton			
Actual					
1972-1976 Crisis					
	1972	141	216	160	79
	1973	212	266	223	95
	1974	651	686	626	125
	1975	373	458	381	153
	1976	201	215	163	99
	1986	107	160	120	73
	1987	112	150	126	68
Forecasts:					
Annual	1988	130	185	135	70
	1989	140	200	150	70
	1990	180	205	155	70
	1991	220	225	170	70
	1992	280	265	210	75
	1993	260	325	260	85
	1994	230	265	210	90
Trend		220	250	195	125

b. The Cyclical Peak of Fertilizer Prices

If crop prices do not rise proportionately, then an emergency situation will have to be faced some time in the early 1990s. This is by far the most serious risk.

c. Physical Shortage of International Supplies in the Early 1990s

This could conceivably be a fundamental problem when the world nitrogen industry is working close to capacity, but once again it seems to depend on the unlikely closing of the Straits of Hormuz.

d. A Physical Shortage of Domestically Produced Material, Leading under Special Circumstances to Total Domestic Supplies Being Insufficient for Demand

This situation would be initiated by a prolonged closure of domestic production, particularly at PHILPHOS, due to a strike or some other factor. Normally it would be met by the speedy procurement of additional imports and by running down pipeline inventories. In order to cause an emergency it would need to coincide with a seasonal peak in demand and be reinforced by the following: (1) unusually low pipeline stocks in the Philippines, (2) prevention of the shipment of factory stocks, including materials that could be taken from export sales, and (3) some abnormal delay in securing additional imports. The chances of such an unfavorable combination of circumstances are extremely low.

e. A Collapse of Competition in Marketing

The possibilities here are (1) collusion between leading marketers, and (2) a rapid and substantial decline in marketing services if the international trading groups, now a major factor in importing fertilizers, suddenly decided not to handle them because of a decline in profit margins relative to other lines of goods.

On balance, the risk of collusion is not great. No major distributor has a sufficient market share; excessive profits would bring in new competition, probably quickly; and existing firms are likely to be sensitive to the need to avoid public criticism. The chance of a disturbing decline in market services is small as long as marketing firms are allowed to adjust their margins freely, including any changes to recoup past losses, and government policies are not introduced to squeeze profit margins below the long-run economic level.

4. Problems of Longer-Term Price Fluctuations in International Markets not easily Resolved

Conventional long-term contracts are extremely difficult to negotiate on terms other than those that leave prices subject to frequent short-term renegotiation and change in the light of market conditions. Long-term barter contracts will normally have the same limitation. Neither of these instruments is likely to offer any significant means for the Philippines to avoid the longer-term vagaries of the world market.

Official buffer stock schemes in fertilizers are difficult to manage, due to the problem of forecasting annual or seasonal demand with sufficient accuracy. They involve large carrying charges and are likely to lead to less stockholding by the private sector.

So far the Aceh and Bintulu marketing agreements have not realized their aim of ensuring supplies at acceptable prices for either the government of the Philippines or for importers. The agreements permit Indonesia and Malaysia to give priority to the domestic market, and in the past Indonesia has embargoed exports under the agreement. Yet, in view of the forecasts for urea given earlier, these agreements could provide some measure of price security, if they are honored.

5. The Burden on Farmers from Protecting Domestic Fertilizer Production Substantially Lower since May 1986, but not completely Eliminated

Combined trade and regulatory policies have resulted in a large degree of protection, except in the few years when world prices were relatively high. In 1973-1982 farmers paid on average 20 percent more than the C&F import prices warranted, even after taking into account the substantial subsidies paid on both domestic production and foreign supplies. In 1983-1985 the subsidies were abandoned, and farmers paid on average some 41 percent more for their fertilizer than if there had been complete free trade.

Since the liberalization measures of May 1986, straight nitrogen and potash imports have remained free of import duty (and associated advanced sales tax). However, a 35 percent rate of combined duty and sales tax has been imposed on mixed fertilizers. (TSP is nominally duty-free, although this status probably would not be maintained if through bulk blending it began to compete significantly with mixtures.) Since mid-1986 the nominal rate of protection on all fertilizers consumed by Philippine farmers has been 11 percent. However, under a requirement for import parity pricing, PHILPHOS is expected to price its sales to Philippine farmers at the notional levels imports would have commanded had they been allowed in free of

duty and associated sales tax. It is not clear how far this requirement has been met. A systematic and continuing review procedure, representing both domestic manufacturers and importers, is not yet in place. The greatest problem lies in an objective determination of representative prices FOB foreign suppliers and of what their freight might be to the Philippines.

Until it is determined to what extent import parity pricing has been realized, it seems best to assume that farmers have carried the full burden of nominal protection since mid-1986.

During 1983-1985, protection is estimated to have reduced net farm income by 6.0 percent in rice, 2.0 percent in corn and 14.0 percent in sugar, although the effects would have been nearly twice as much had the average level of protection been maintained on a longer-term basis.1/ The nominal rate of protection after May 1986 has reduced net farm income by 3.0 percent in rice, 1.0 per cent in corn and 2.0 percent in sugar. Here again the effect would be almost twice as large if the level of protection were maintained on a long-run basis. The protection of 1983-1985 reduced the annual average value of production by P 387 million for rice, P 60 million for corn and P 538 million for sugar. In 1986 the corresponding effects were P 155 million, P 24 million and P 32 million.

The statistical analysis understates the longer-term effect, however, namely the extent to which protection has checked, and continues to check, the development of bulk blending and the direct application of straight materials.

6. Relation of PHILPHOS to the Burden of Protection on Farmers

Compared with the major competitors, such as Florida or Morocco, PHILPHOS has the disadvantages of not being alongside or near a low-cost phosphate rock mine and of carrying an exceptionally large total investment cost. The full benefits expected from comparatively cheap, locally produced sulphuric acid and freight advantages to its main markets have not materialized.

The disadvantages to PHILPHOS seem to be only partially offset by cheaper sulphuric acid (a benefit much smaller than anticipated when the plant was planned), its premium pricing of P205 in exported compounds and phosphoric acid, and freight advantages to Southeast Asian markets. Whereas freight and sulphur costs are likely to change to PHILPHOS' advantage over

1/ Assuming larger price elasticity of demand for fertilizer (see chapter III)

margins on compounds may well be eroded quite substantially. Thus, over the next ten years, the company is unlikely to earn a satisfactory return on capital or to strengthen its competitive position appreciably.

7. Non-Price Factors Stressed in Relation to Price Factors in Influencing the Demand for Fertilizers

Fertilizer prices are an important determinant of the demand for fertilizers. However, more emphasis is placed on non-price factors (credit, land tenure, applied soils/agronomic research/extension work, development of new crop production technologies, and low-cost transport and other logistical support) for the following reasons.

- There is much empirical evidence that non-price factors are potentially more influential than fertilizer price in increasing application rates.
- Improved transport and general logistics are a critical need in the Philippines and are the pre-condition of some important reductions that can be secured in farm-gate fertilizer prices.
- The adverse effects of large increases in inflation-adjusted prices, which are inevitable in the medium term, can only be countered by non-price factors if the government of the Philippines is to avoid a severe financial burden in subsidies.

8. Marketing Margins Low

The liberalization of fertilizer importing and marketing has greatly reduced the costs of getting fertilizer from the dock or factory to the farmer. Profit margins are currently low without any excess to be eliminated, and possibly below the level that will be needed to maintain sufficient marketing services.

9. Considerable Scope for Promoting Greater and More Efficient Use of Fertilizers through Enlarged Research and Improved Extension

The deficiencies in research and extension for fertilizer use in the Philippines are underlined most clearly by the failure to match specific recommendations on nutrient use at all closely to the physical environments of individual farmers. The research and extension service relies heavily on applying generalized fertilizer/crop response relationships across local or regional areas that are agronomically heterogeneous one with another.

C. Principal Recommendations for Domestic Fertilizer Prices

It is recommended that:

- Farmers should not be required to bear the burden of whatever protection continues to be given to PHILPHOS and other domestic manufacturers of fertilizers. Farmers should be allowed to pay open market prices as determined by free international trade and competitive domestic marketing.

- Any protection or operating losses of the domestic fertilizer sector should be paid from general tax revenue or through restructuring of PHILPHOS finances.

- In the event of exceptionally high fertilizer prices in relation to those for crops, which are highly likely at the next cyclical peak of international prices sometime in the early 1990s, a temporary subsidy might be considered on all plant nutrient consumed in the Philippines. In the case of urea, this could represent an annual subsidy in the peak year of P20-P40 million at constant 1986 dollars, which is based on a real C&F price of $310/ton (about twice the real 1986 value), reduced by subsidy to somewhere within the range of $260-$285/ton, and total consumption of around 370,000 tons of nitrogen (298,000 tons in 1986).

D. Principal Recommendations for International Markets

This report does not recommend firm action to secure international supplies other than at market prices. The performance records for forward supply/pricing schemes is not encouraging. However, the possibility of reactivating the Aceh and Bintulu marketing agreements and taking an equity position in a low-cost foreign ammonia/urea complex should be studied.

As noted above, if crop prices are low, subsidies on fertilizer should be considered only at the high point of the long-term fertilizer price cycle or only in narrowly defined fertilizer emergency situations. Extension of the temporary subsidy beyond these narrowly defined terms--namely, a fertilizer price stabilization scheme--is not recommended. However, in order to make a comprehensive review of all the means of dealing with the problems of the international market, a price stabilization scheme has been described in some detail in chapter IV. To repeat, such a scheme is not recommended.

E. Recommendations for Strengthening Marketing

- o Expanded analysis of the monthly demand-supply and inventory situations for fertilizers, including additional staff to secure more detailed information regionally and at or near the dealer level, and its rapid dissemination to the fertilizer and farming sectors.

- o More detailed and regular analysis of marketing costs, aimed at determining levels of efficiency and evidence of any breakdown of competition.

- o Encouragement of bulk blending, by removing import protection on compounds and phosphates, by extension advice and, if justified, by improvements in docking and transport facilities.

- o A detailed benefit-cost appraisal of the scope for improving shipping, docks, and other transport facilities, both inter- and intra-island.

- o As an official FPA function, provision of technological and marketing information to importers, dealers, and other actors in the fertilizer industry.

F. Recommendations for the Most Appropriate Grades of Fertilizer

- o Extension workers and marketers should emphasize the opportunities for farmers to reduce fertilizer expenses by switching to higher grade materials, which cost less per unit of nutrient than other products. In particular, they need to stress the much lower cost of urea compared with ammonium sulphate.

- o Bulk blends should be encouraged for the same reason as long as agronomic conditions and farm circumstances are suitable.

G. Recommendations for Improved Efficiency of Fertilizer Use

- o As a step towards refining fertilizer recommendation practices to reflect variations in the production environment, it is proposed that the government of the Philippines initiate a program of agro-environmental statification and develop sets of fertilizer practices for each set of environments. It is recommended that the Bureau of Agricultural Research provide the coordinating mechanism for this work.

- o The agricultural support services (credit, extension and research) need to consider a cropping pattern/farming

systems approach as well as the present approach with its emphasis on specific commodities.

- A special program to train extension workers is required immediately to enhance their effectiveness in promoting fertilizer use, including proficiency in conducting on-farm trials to test fertilizer recommendations and monitoring results of recommended fertilizer rates.

- Research should be strengthened by implementing a unified research program on fertilizer use and promoting a farming systems research orientation.

H. Organization and Content of Analysis and Research to Support the Efficient Operation of a Liberalized Marketing Sector

A substantial body of information, analysis and research is needed to ensure the efficient operation of a liberalized market system, as the experiences of many Western countries show. In theory, it might seem that such work should be allocated to different institutions with expertise in particular areas. But in practice there is need for a central organization, with "its heart and soul in fertilizers," to have direct responsibility for much of the work, and a sponsoring and coordinating role for the remainder. It would, of course, be expected to collaborate closely with the leading bodies directing agricultural and economic research in the Philippines. But it would need adequate financing for its own and directly-sponsored work, which would mostly relate to economic and marketing issues.

The study team recommends that the Fertilizer and Pesticide Authority (FPA) be given these responsibilities, with appropriate finances. The principal areas of work to be undertaken directly by FPA are:

- Development of a data base and analytical expertise relating to supply and price conditions in world markets, which is the most important need;

- If domestic fertilizer manufacturing continues to be protected, a regular and detailed review of import parity pricing, involving both manufacturers and importers;

- Inventory analysis, and more rapid and extensive dissemination of results than is possible at the present time;

- Annual and seasonal forecasting of demand;

- Anticipation and diagnosis of fertilizer emergencies, and development of recommendations to respond to them;

Other important areas that should be undertaken or sponsored by FPA are:

- o A regular and detailed analysis of marketing costs and performance, and ad hoc inquiries should there be a serious charge of a breakdown of competition among middlemen.
- o Special marketing surveys for selected remote areas.
- o Microeconomic far-level fertilizer demand studies.
- o Macroeconomic fertilizer demand studies.
- o Patterns of fertilizer use in representative farming areas.
- o Development of quality control standards and implementation of guidelines for monitoring fertilizer quality.

CHAPTER II

INTRODUCTION TO THE PHILIPPINE FERTILIZER SECTOR

A. Objective of the Study

Broadly, the main objective of the study is to assist the Philippine government in framing policies and designing programs that favor economically optimal fertilizer use. Such policies and programs are needed in order to enhance fertilizer's contribution to the growth of agricultural productivity and income. Specifically, the study aims to provide recommendations that would, if implemented, lead to (1) lower fertilizer prices, (2) relatively stable fertilizer prices, (3) availability of fertilizer supplies to meet demand at all times, (4) provision of the most appropriate grades of fertilizer, and (5) improved efficiency of fertilizer use. A more detailed scope of the study is given in annex I.

B. An Overview of Philippine Agriculture

Agriculture remains a dominant sector of the Philippine economy, contributing about a third of GDP and domestic exports, employing nearly half of the labor force, and generating many of the resources and much of the domestic demand on which the industrial and service sectors depend. Expanding at an annual average of 4 percent since 1970, the performance of the sector has been quite impressive vis-a-vis the whole economy. In fact, during the economic crisis years of 1982-1986, agriculture was the only major sector that registered a positive growth rate. This occurred despite the strong bias of government pricing policies against agriculture and the drastic fall in the world prices of agricultural exports.

Increased crop production contributed much of the growth of the agriculture sector, explaining about three-fourths of the total growth of agriculture between 1970 and 1986. This growth has been attributed largely to improvements in productivity, particularly in rice. With the closing of the land frontier, the contribution of new lands to agricultural production has declined significantly from about two-thirds in the early 1960s to about one-fifth in the early 1980s.

In the case of rice, the increases in production have largely come from the widespread adoption of modern rice varieties, increased irrigation investments, and increased fertilizer use (table II-1). Of these factors, increased fertilizer use has contributed the most (about 30 percent) to the total observed growth in output between the mid-1960s and early 1980s.

Table II-1

Contribution of Specified Factors to Rice Production Increases
1965 to 1980

Country	Total observed growth in output	Percentage contribution of factors			
		MV effect	Fertilizer effect	Irrigation effect	Other factors (residual)
Burma	1,852	35	19	36	10
Bangladesh	5,554	8	23	20	49
China	50,500	26	23	32	19
India	35,152	23	31	32	14
Indonesia	13,613	23	20	20	37
Philippines	3,274	26	31	24	19
Sri Lanka	1,034	23	21	27	29
Thailand	6,400	13	11	14	62
Total	117,379	23	24	29	24

Source : Herdt and Capule, 1983.

Despite the fairly impressive performance of agriculture, the absolute number of poor in the rural areas has risen, rural real wages have fallen, and the number of landless rural families has steadily grown. Of course, this reflects a combination of circumstances: high population growth rate, increasing scarcity of land, and the failure of the economy to generate enough employment outside agriculture. Further improvement in the performance of the agriculture sector continues to be a major objective of development strategies aimed at alleviating rural poverty. Improved fertilizer use and appropriate fertilizer policies are expected to be key elements of this performance.

C. Growth and Change in the Fertilizer Industry

The 1970s and early 1980s were marked by important changes in the Philippine fertilizer industry. These changes, particularly those in recent years, are briefly reviewed below.

1. Domestic Production

In the early 1980s, there were two comparatively small domestic producers of fertilizers, Atlas Fertilizer Corporation and Planters Products, Inc. The latter's plant was subsequently closed, although it is understood that it has been mothballed and could be reopened if market circumstances warranted. Production is now dominated by PHILPHOS, a world-scale plant producing ammonium phosphates, mostly diammonium phosphates, compound fertilizers (14-14-14, 15-15-15 and 16-20-0), and merchant grade phosphoric acid. It supplies virtually all the needs of the domestic market for phosphates (with a nominal protection of 35 percent) and potash, and is also a major importer and distributor of urea. Currently, about 25 percent of its total sales (in terms of tons of material) go to the domestic market.

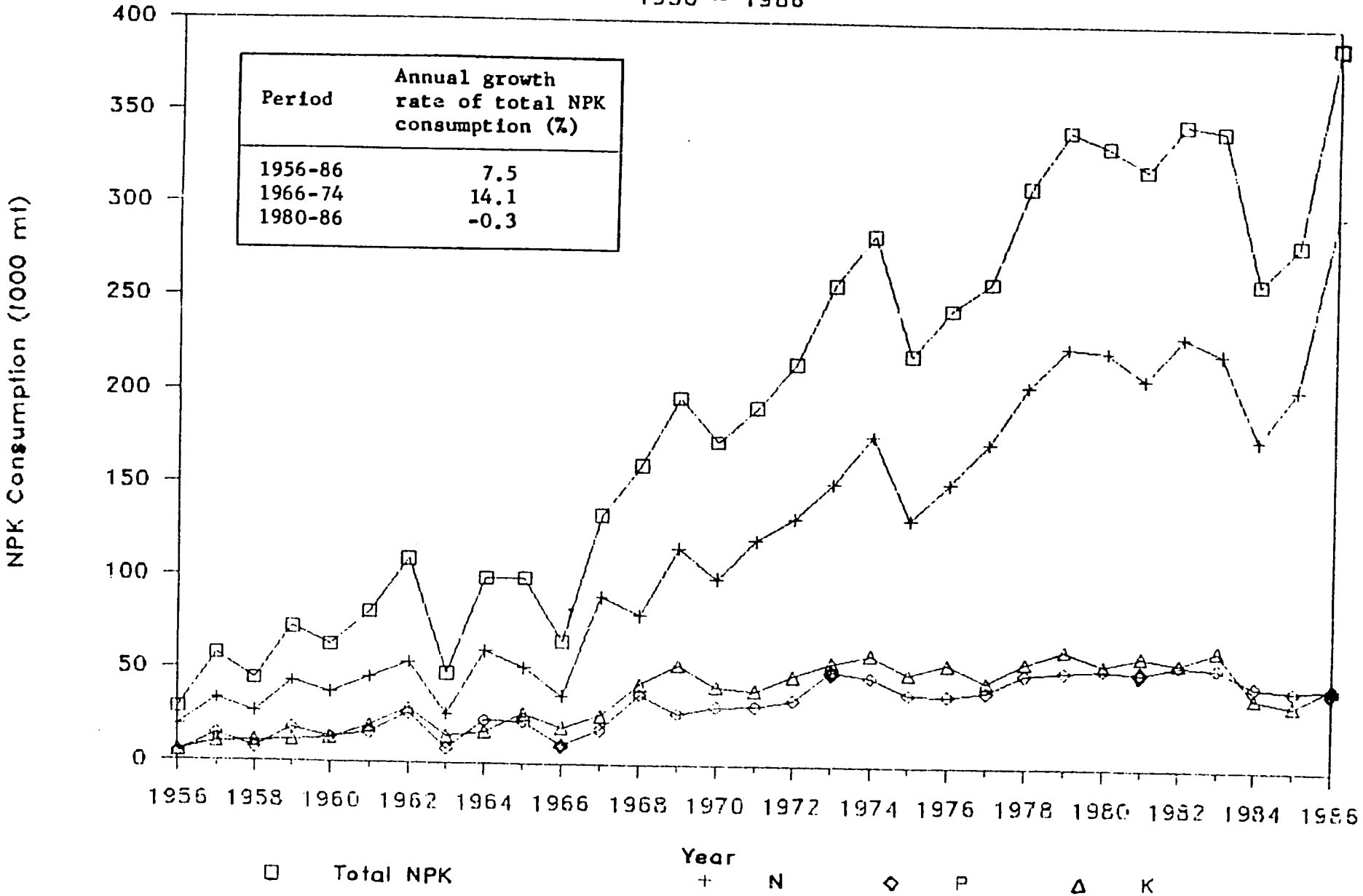
PHILPHOS enjoys "pioneer industry" status and is thus entitled to various fiscal incentives (e.g., tax credits and duty-free imports of raw materials). Currently, its financial situation is unsatisfactory. This is caused in part by the depressed conditions that are plaguing the phosphate industry worldwide, but PHILPHOS also suffers from (1) a plant with large capital costs in relation to capacity, (2) sulphur costs substantially less favorable than were originally envisaged, and (3) high phosphate rock costs--all of which are only partially offset by its proximity to Southeast Asian markets and by its sales of compound fertilizers and merchant grade phosphoric acid, which temporarily yields a greater profit margin than DAP.

2. Trends in Fertilizer Consumption

Fertilizer consumption in the Philippines grew at an annual average of 8 percent during the last three-and-a-half decades (figure II-1). This growth was particularly rapid

Fig. II-1. Fertilizer Use by Nutrient

1956 – 1986



Period	Annual growth rate of total NPK consumption (%)
1956-86	7.5
1966-74	14.1
1980-86	-0.3

(14 percent) between the mid-1960s, when modern rice varieties were first introduced in Philippine agriculture, and the early 1970s, when the government's Masagana-99 Program was launched. The program was an effort of the Philippine government to achieve self-sufficiency in rice following a 20 percent drop in rice production in 1973.

The growth slowed down somewhat during the 1980-1986 period due partly to the foreign-exchange crisis in 1984 and 1985, which led to the closure of domestic fertilizer plants and created difficulties among fertilizer importers to open letters of credit with the Central Bank.

Nitrogen accounted for most of the total nutrient growth between 1956-1986. Phosphorus and potash grew only modestly.

The growth trends in fertilizer consumption by crop present a somewhat diverse picture. Following the introduction of the fertilizer-responsive modern varieties in the mid-1960s and their rapid diffusion in the 1970s, the share of the rice sector to total consumption grew from about 25 percent in the mid-1960s to about 40 percent in the early 1980s (table II-2). The sugar industry, which was the single most important user in the 1960s, had its share decline from about one-half of total consumption to about 40 percent in the early 1980s.

With the significant cutback in the total area planted to sugar in 1985 and 1986 largely because of adverse development in the world market for sugar, the share of sugar might have been even lower over the last two years. Also, with nitrogen being the most important fertilizer nutrient in rice production, the import deregulation of nitrogenous fertilizers in 1986, which occurred when their world prices were exceptionally low, might have significantly increased application rates in rice vis-a-vis sugar.

3. Recent Changes in Fertilizer/Price Ratios

The high prices of fertilizers relative to those for crops have often been noted in the 1970s and early 1980s as an important constraint on the growth of plant nutrient use in the Philippines. Nitrogen/paddy price ratios are shown for the Philippines and other Asian countries for 1980-1987 in table II-3, and graphically for 1983 in figure II-2. Before 1986 the ratio for the Philippines averaged more than 4.0, whereas it is typically around 2.0 elsewhere, and even less for the highly protected agricultures of northeast Asia. The Philippine situation has been transformed in 1986 and 1987, however. Notwithstanding a decline of around 25 percent in paddy prices, the ratio has fallen to 2.0-2.1, reflecting the ending of protection on urea and ammonium sulphate and sharply lower world market prices for nitrogen. Much of this improvement is

Table II-2

Fertilizer Consumption by Crop
(1964 - 1983)

Year	Rice	Corn	Sugar	Tobacco	Vegetables	Others	All Crops
Volume (mt)							
1964	79,363	13,913	143,977	7,407	10,659	38,968	294,287
1967	107,400	13,000	221,100	7,729	13,400	44,213	406,842
1977	315,100	26,800	270,000	7,220	11,700	54,780	685,600
1983	365,600	56,300	323,500	8,183	22,837	101,920	878,340
Percent of total							
1964	27.0	4.7	48.9	2.5	3.6	13.2	100.0
1967	26.4	3.2	54.3	1.9	3.3	10.9	100.0
1977	46.0	3.9	39.4	1.1	1.7	8.0	100.0
1983	41.6	6.4	36.8	0.9	2.6	11.6	100.0

Sources :

1964 - Barker, R., "The Philippine Fertilizer Industry: Growth and Change," IRRI, 1969.

1967 and 1977 for rice, corn and sugarcane - David, C. and A. Balisacan, "An Analysis of Fertilizer Policies in the Philippines," Journal of Philippine Development, Vol. 8, No. 15, 1981.

1967 for tobacco - Paje, M., et.al., "The Fertilizer Supply Situation and Marketing System in the Philippines, 1954-1972," Working Paper No.4, NSDB-BAEcon.

1977 for tobacco - "The Fertilizer Industry in the Philippines," Journal of Philippine Statistics, Oct.-Dec., 1979.

1983 - Fertilizer and Pesticide Authority.

Table II-3

Farm Prices of Paddy and Nitrogen from Urea
1980 to 1986

Year	Bangladesh	India	Indonesia	Japan	Korea Rep.	Malaysia	Pakistan	Philippines	Sri Lanka	Taiwan, China	Thailand
Paddy price (US$/t)											
1980	294	170	165	1254	699	240	118	153	114	456	161
1981	175	n.a.	188	1058	711	282	136	165	135	423	159
1982	219	259	204	912	879	275	109	160	136	471	129
1983	168	292	101	967	855	511	115	137	128	470	136
1984	199	261	164	993	826	337	143	149	120	474	129
1985	173	234	159	1011	815	228	159	174	114	471	104
1986	n.a.	246	155	1432	844	225	182	138	119	495	90
1987	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	139	n.a.	n.a.	n.a.
Fertilizer (N) price (US$/t)											
1980	351	477	243	758	525	664	386	644	129	356	588
1981	384	n.a.	241	852	698	674	415	720	259	471	665
1982	373	503	248	714	712	450	397	715	291	542	606
1983	350	500	219	706	693	352	410	588	258	511	561
1984	368	423	192	690	673	410	387	641	243	518	501
1985	398	385	197	681	624	359	330	682	228	512	432
1986	n.a.	413	217	821	561	242	347	280	221	515	276
1987	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	289	n.a.	n.a.	n.a.

Table II-3 (Continued)

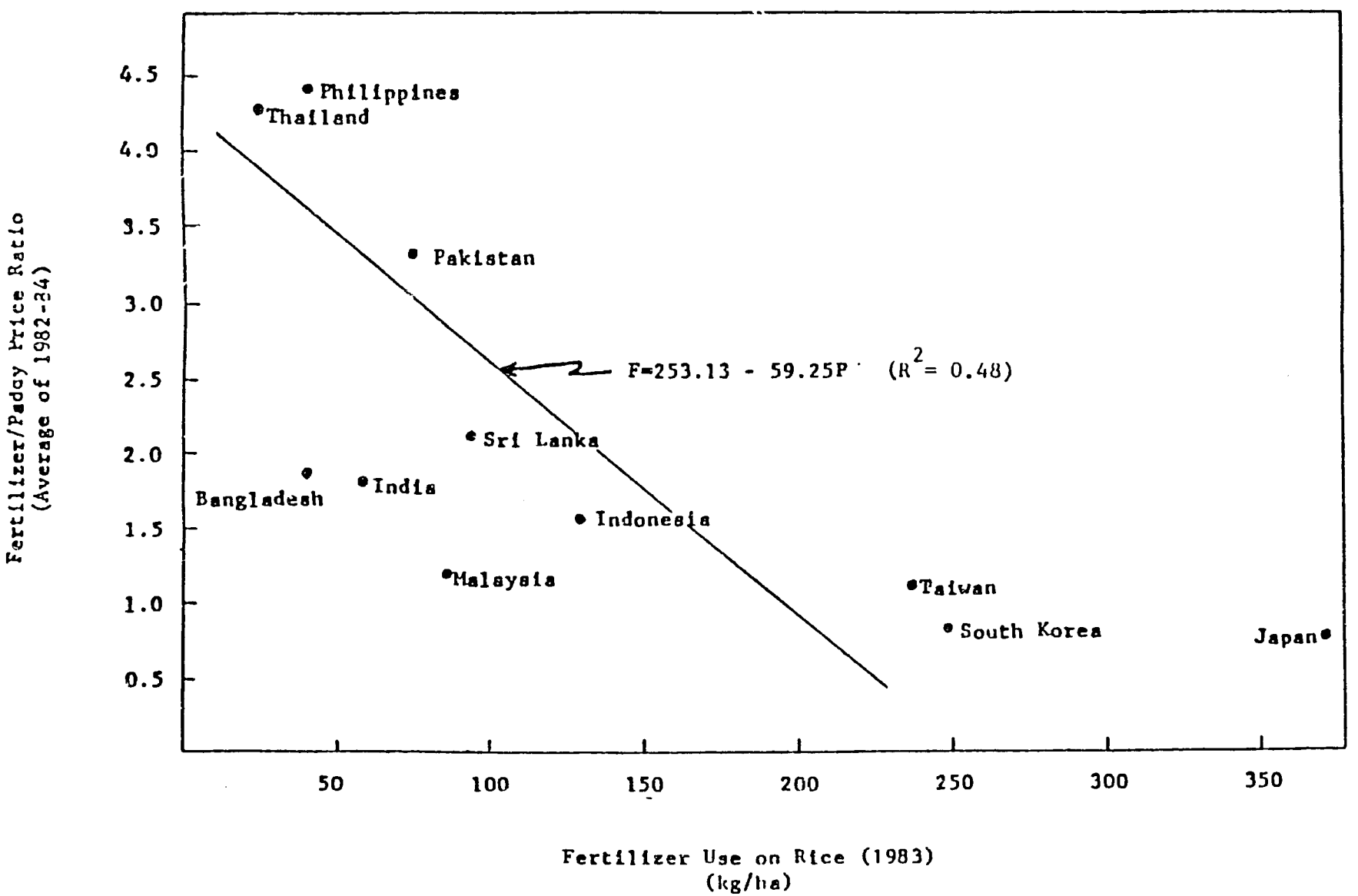
Farm Prices of Paddy and Nitrogen from Urea
1980 to 1986

	Year	Bangladesh	India	Indonesia	Japan	Korea Rep.	Malaysia	Pakistan	Philippines	Sri Lanka	Taiwan, China	Thailand
Fertilizer-paddy price ratio												
	1980	1.19	2.81	1.47	0.60	0.75	2.77	3.27	4.21	1.13	0.78	3.65
	1981	2.19	n.a.	1.28	0.81	0.98	2.39	3.05	4.38	1.92	1.11	4.18
	1982	1.70	1.94	1.22	0.78	0.81	1.64	3.64	4.46	2.14	1.15	3.70
	1983	2.08	1.71	2.17	0.73	0.81	0.69	3.57	4.30	2.02	1.09	4.13
	1984	1.85	1.62	1.17	0.69	0.81	1.22	2.71	4.31	2.03	1.09	3.88
	1985	2.30	1.65	1.24	0.67	0.77	1.57	2.08	3.93	2.00	1.09	4.15
	1986	n.a.	1 68	1.40	0.57	0.66	1.08	1.91	2.02	1.86	1.04	3.07
	1987	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.08	n.a.	n.a.	n.a.

Source : IFDC (except for the Philippines). Farm level prices for major fertilizers and crops (mimeo, various issues).
Philippines: BAEcon and FPA.

Figure II-2

Association of Fertilizer/Paddy Price Ratio and Fertilizer Use



temporary and, assuming existing agricultural and fertilizer policies are maintained, will disappear as the world nitrogen market recovers over the next three to five years.

D. Price and Non-Price Influences on Fertilizer Demand

1. General Background

Many studies of the growth of fertilizer use in Southeast Asia made during the last fifteen years have stressed the role of price, commonly using inter-country cross-sectional comparisons of national fertilizer/crop price ratios and plant nutrient use per hectare along the lines shown in figure II-2. Such comparisons always yield strong negative associations between the two variables.

The association between the variables is not perfect. Sometimes the analysis is refined by adding other variables to distinguish at least some of the non-price influences from that of price; but even such refinement cannot avoid the problem that the various causative factors are often interrelated. For example, a country that has the finances to provide a more efficient irrigation system can for the same reason afford a better trained, more motivated, and generally more effective advisory service, while simultaneously having a larger industrial base to support relatively low-cost fertilizer production.

Given the frequency with which such cross-sectional comparisons of fertilizer/crop prices and yields have been quoted, there is danger that the importance of price in relation to non-price factors in promoting plant nutrient consumption will be exaggerated.

The same issue can arise with a time series analysis of fertilizer demand in individual countries. Changes in fertilizer/crop prices can frequently be established as having an important influence on annual variations in total plant nutrient use, although sometimes other short-term factors are of similar or greater importance, such as annual changes in annual water availability. However, most of the long-term increase in consumption is usually explained by a trend factor and, if included, the growth of credit. Trend is, of course, a catch-all for the whole package of non-price influences, unless any are separately identified. (It may also reflect any long-term changes in the fertilizer/crop price ratio, although this is usually not important.) Such analysis generally serves to reduce the relative importance of the price variable.

2. Fertilizer Use on Rice in the Philippines--an International Perspective

The high fertilizer/paddy price ratios for the Philippines play some part in explaining the low level of fertilizer use in the country vis-a-vis other Southeast and South Asian countries. The wide variations in fertilizer use among these countries cannot, however, be simply attributed to differences in these ratios. Indeed, in countries such as Thailand and Burma where the fertilizer/paddy price ratios are more favorable than those of the Philippines, the levels of fertilizer use are much lower. The rate of adoption of fertilizer-responsive modern varieties and the proportion of irrigated land to total rice land are also lower than for the Philippines. In contrast, in other developing countries such as Pakistan, Sri Lanka, and Indonesia where fertilizer use is relatively high, the adoption rate of modern rice varieties and the proportion of irrigated land to total rice land are likewise fairly high. (See table II-4.)

The relatively high rates of adoption of modern rice varieties in the Philippines, which reached about 85 percent of total rice area by the early 1980s, is particularly striking, especially when it is recognized that fertilizer/paddy price ratios in the country during this period were high vis-a-vis other developing countries in Asia. This may mean that the profitability of modern rice varieties has more than outweighed the negative effect of the relatively high price of fertilizer on farmers' incomes.

E. The Role of Fertilizer/Crop Prices as a Factor in Future Fertilizer Demand in the Philippines

It will be clear from chapter III and from annex 3 that the present study is not insensitive to the role of fertilizer/crop prices. Indeed in chapter III it uses values for the responsiveness of plant nutrient demand to price (i.e., the price elasticity of fertilizer demand) in cases of large changes in fertilizer price that probably would be regarded as too high by most analysts.

There are at least two major reasons for stressing the non-price factors, however. First, in the aggregate, their long-run influence is greater than that of price. As shown in chapter III and discussed in annex 3, it requires large price changes to induce a significant change in fertilizer use and farm income, at least in the absence of development associated with agricultural technology and extension, marketing and rural infrastructure, among others.

Second, it seems unlikely that Philippine farmers can be sheltered from the large increases in import prices of fertilizer

Table II-4

Level of Irrigation, Modern Cultivars and Fertilizer Use in Selected Countries in Asia
1965 and 1983

Country	1965			1983		
	Irrigation (% of area)	Modern cultivars (% of area)	Fertilizer on rice a/ (kg/ha)	Irrigation (% of area)	Modern cultivars (% of area)	Fertilizer on rice a/ (kg/ha)
Southeast Asia						
Burma	13	0	1	18 f/	53	33
Indonesia	-	0	8	64 e/	64	128 f/
Malaysia	47	8	33	78 f/	53 c/	88 d/
Philippines	31	0	9	54 f/	85	42
Thailand	28	0	2	25 f/	13 e/	25 f/
South Asia						
Bangladesh	5	0	3	13 e/	25 f/	42
India	37	0	7	42 e/	53	62 f/
Pakistan	100	0	5	100 f/	46 f/	75 f/
Sri Lanka	92	0	25	63 e/	89 f/	96
East Asia						
Japan	96	-	327	99 f/	-	379 f/
South Korea	57	0	151	91 d/	34	250 f/
Taiwan/China	49	-	202	60 b/	-	237

a/ NPK nutrients
b/ 1973
c/ 1977
d/ 1980
e/ 1981
f/ 1982

Source : IRRI, World Rice Statistics, 1985.

(after excluding inflation) that are expected by the early 1990s. Therefore, special emphasis will need to be given to credit, extension work, marketing infrastructure (the improvement of which would permit reductions in fertilizer prices), new technologies, and other non-price factors.

F. The Place of Non-Price Variables

The non-price factors reviewed below are discussed in detail in annex 3.

1. Agronomic and Environmental Factors

Past research has demonstrated that about two-thirds of the yield gap, defined as the difference between the farmer's actual yield and the researcher's yield, can be explained by technical inefficiencies, including the improper use of fertilizer, at least in rice production. These inefficiencies, which are found to be even higher during the dry season when the irrigation problem is most pronounced, result from the failure of the farmer to produce maximum output from a given set of inputs. It thus appears that activities that promote the effective use of fertilizer demand simultaneous and equal emphasis on technologies to alleviate the constraints posed by production environments.

2. Agricultural Credit

It is often argued that lack of access to credit may prevent small farmers from adopting profitable innovations, including the use of fertilizer.

The last five years of the previous government marked the near collapse of the rural banking sector. Its unwise interest-rate policies and imprudent loan decisions led to the closure of a large number of rural banks and the decline of formal (institutional) agricultural credit for many farmers. Agricultural loans as a percent of total loans fell from about 20 percent in the mid-1960s to only about 8 percent in 1986. As a percentage share of gross value added in agriculture, the decline was from about 25 percent in the mid-1960s to about 15 percent in 1986.

Correspondingly, informal credit sources (traders, millers, input suppliers, moneylenders, friends, family) took a larger share of agricultural credit. In the late 1970s, these sources accounted for 65-80 percent of total agricultural credit.

An increasing number of studies now indicate that what is crucial to agriculture is the availability of credit commensurate with agriculture's share in national income. This, of course, does not imply that credit need be subsidized. What these studies point out is that an interest rate reduction constrains

the flow of funds into the rural financial markets, unduly increasing the cost of credit to marginal farmers. Higher interest rates, if they attract substantially more funds into the rural markets, would be preferable to subsidized low interest rates and would not likely reduce fertilizer purchase and agricultural production significantly.

3. Agrarian Reform

As the Philippine president has announced, the Comprehensive Agrarian Reform Program seeks to accelerate the land reform programs of the previous government in rice and corn areas and, more important, to extend land reform to other areas and make available to smallholders idle, abandoned, expropriated, and foreclosed land.

It is conceivable that the fragmentation of plantation croplands (e.g., sugar and coconut plantations) will facilitate crop diversification, including the expansion of food croplands. If this will be the case, fertilizer use in the food crop sector may expand, and the share of plantation crops (mainly sugar) in total fertilizer consumption may shrink further from their levels in 1985 and 1986. On the other hand, if the program is not accompanied by an increase in public support services (extension, credit, post-harvest facilities) and rural infrastructure, small farmer beneficiaries of land reform will be constrained in their adoption of modern agricultural innovations, including the use of fertilizer-responsive varieties. This may mean that fertilizer use and agricultural production may fall.

It is important to note that land reform, by itself, will not substantially improve the long-term economic welfare of farmer beneficiaries. For the program to do so, it must be supported by follow-up services, particularly credit, extension, and assistance in developing appropriate models of post-reform organizations. The proper use and management of fertilizer may be an important component of this development support.

4. Marketing and Distribution

Distribution and marketing costs of fertilizers are exceptionally large in the Philippines compared with other Asian countries at similar stages of development. Transport costs are a particular burden, reflecting the poor state of rural transport, including inter-island shipping. Profit margins, while currently low, probably have been much above the average for other developing Asian countries. Comparative evidence for 1985-86 is shown in table II-5.

Table II-5

Marketing Costs and Margins for Urea in Selected Developing Countries of Asia and the Pacific, 1985-86
(in $US per ton)

Country	Distribution channel	C.I.F. import price	Ex-factory price	Marketing costs	Marketing margins	Marketing costs and margins	Total costs	Marketing costs as percentage of total costs	Marketing margins as percentage of total costs	Marketing costs and margins as percentage of total costs
India	public		256.53	44.11	11.32	55.43	311.96	14.1	3.6	17.8
	private		232.52	40.78	10.51	51.29	283.81	14.4	3.7	18.1
Indonesia	public		90.77	50.98	13.95	64.93	155.70	32.7	9.0	41.7
Malaysia	public		130.00	30.35	6.00	36.35	166.35	18.2	3.6	21.9
	private	128.00		36.35	9.00	45.35	173.35	21.0	5.2	26.2
Nepal	public	95.00		56.32	9.06	65.38	160.38	35.1	5.6	40.8
Philippines	private	178.12		90.18	40.00	130.18	308.30	29.3	13.0	42.2
Republic of Korea	public		262.10	41.63	9.52	51.15	313.25	13.3	3.0	16.3
Sri Lanka	public	115.40		33.44	11.88	45.32	160.72	20.8	7.4	28.2
Thailand	private	170.00		41.64	17.88	59.52	229.52	18.1	7.8	25.9

Source : Coster, R., 1987.

G. Conclusion

Non-price factors should be recognized as playing a major role in promoting the demand for fertilizers. This situation will apply even when fertilizer/crop prices are moving in the farmer's favor. It is an even stronger consideration over the next five to ten years when, as chapter IV will show, import prices of plant nutrient are expected to rise by a large margin over their present levels.

CHAPTER III

IMPACT OF FERTILIZER POLICIES ON AGRICULTURE

A. Introduction

Over the years, Philippine fertilizer policies have covered a wide spectrum, including the development of domestic capacity to produce fertilizer, importation, marketing, rural credit, research and development of fertilizer substitutes (e.g., Azolla), development of fertilizer-responsive crops, and the regulation of domestic prices. These activities have induced effects on the pattern of production and the consumption of food and export crops, on the costs to the government treasury, and on the structure of domestic incentives to produce and use fertilizer (Balisacan, 1987).

This chapter focuses on the effects of fertilizer trade, regulatory, and subsidy policies on the agricultural sector, specifically the effects of these policies on fertilizer prices, fertilizer consumption, crop production, farm income, and general rural development. The analysis covers 1973-1987, with emphasis on the 1980s. The first section briefly reviews the changing nature of fertilizer policies. The second section presents the results of the analysis with respect to the effects of these policies on farmers.

B. Fertilizer Trade, Regulatory, and Subsidy Policies

Philippine fertilizer policies have taken the dual, oftentimes conflicting, objectives of providing low-priced fertilizer to farmers and adequate incentives to local manufacturers. This was no less true during the 1973-1986 period than in the 1950s and 1960s when various legislations were enacted to promote local production and fertilizer use. In contrast to the 1950s and 1960s, however, the 1970s and early 1980s marked the first comprehensive and direct intervention of the government in the fertilizer industry. In 1973, Presidential Decree 135 created the Fertilizer Industry Authority, whose functions included the control and regulation of prices, production, imports, marketing, and the extension of financial assistance to domestic fertilizer producers.

The creation of the FIA was a policy response to two major shocks in the early 1970s: the four-fold increase in world prices of fertilizer, and the fall (by about 20 percent) in the domestic production of rice. With respect to the latter, FIA was mandated to support the then newly-launched Masagana-99 program to bolster rice production.

With the creation of the Fertilizer and Pesticide Authority in 1977 (PD 1144), FIA was abolished, and its functions became those of FPA. In addition, FPA became the sole agency empowered to control the quality and safety of fertilizer and agricultural products.

Between 1973 and 1982, the government embarked on a direct (cash) subsidy program. Initially, between 1973 and 1976, the program was based on a two-tier pricing scheme, in which farmers of priority I crops (rice, corn, feedgrains, and vegetables) could purchase their fertilizer at 50 to 70 percent less than those of priority II crops (sugarcane, banana, and pineapple). The prices set for priority II crops reflected the actual costs (including profit margins) of domestically produced fertilizer. This scheme was terminated in 1976 partly because of the rampant diversion of fertilizer from priority I to priority II crops and partly because of the decline in world prices of fertilizer. Fertilizer prices for priority II crops were rolled back to the levels for priority I crops, a pricing scheme that remained intact until termination of the cash subsidy program in mid-1982 when budgetary difficulties in the government started to become acute. For the period of the program, the cash subsidy cumulated to P 2.02 billion.

From 1973 to 1984, the government pricing formula allowed for the recovery of full production costs plus a guaranteed mark-up of 5 percent. For imported grades, the mark-up was 2 percent. (In the case of Planters Products, Inc., the pricing policy before 1980 was based on a no-loss-no-gain formula.) Ex-warehouse prices were based on the amount of cash subsidies available to the fertilizer companies and on the weighted-average costs of locally produced and imported fertilizer. These prices were made to prevail in the market by FPA intervention (licensing) in the importation of fertilizer grades. It was unavoidable that this scheme rewarded traditional companies that were relatively inefficient in the production of fertilizer (David and Balisacan, 1981).

Under Letter of Instruction 1419, import liberalization of fertilizer was declared in 1984. The effort did not, however, prosper for two major reasons. First, the foreign-exchange crisis at the time, coupled with the stringent import licensing requirements of FPA, prevented traditional importers from obtaining the required letters of credit from the Central Bank. FPA thus turned over the import allocations of these companies to government-controlled corporations. (The crisis prompted the government to secure a $130 million loan from the Asian Development Bank and $150 million from the World Bank for the importation of vital inputs. The bulk of the loan disbursements went to fertilizer imports, with FPA setting the import requirements, allocating the import volumes to selected companies, and conducting tenders.)

Second, the Letter of Undertaking (LOU) signed by the Marcos government and the foreign bank creditors of Planters' Products, Inc. (PPI) "committed" the government to ensure that, until the repayment in full of PPI's $57 million loan from a consortium of foreign banks, FPA would maintain a fertilizer pricing policy that would enable PPI to cover its operating and interest costs as well as to repay its creditors in accordance with the rehabilitation program agreed to by PPI and the creditors. Part of this deal was the imposition of a levy of P 10 per bag on all fertilizer sales. In addition, the government was to settle in full the subsidy claims of PPI.

With the installation of the Aquino government, it became the avowed policy to liberate the sector from the control of private and quasi-public monopolies. In consonance with this policy, FPA relinquished in May 1986 its control over procurement, namely, the determination of import requirements, allocation of import volumes, and the conduct of tenders or canvassing for fertilizer importation. In addition, it also abolished the P 10-per-bag levy on fertilizer. Recently, it has also settled its capital obligations to PPI which were supposed to be covered by the P 10 fertilizer levy.

Import liberalization is incomplete. Urea and ammonium sulphate are allowed in duty free. Duties are levied on all compound materials and ammonium phosphates. In addition, PHILPHOS and the Atlas Fertilizer Corporation, through their production of compounds and ammonium phosphates, are deemed to be exercising their option to meet all domestic requirements for phosphatic fertilizers, thereby assuring full import duty on triple superphosphate.

The impact of the remaining protection is not clear. Domestic manufacturers are expected to apply import parity pricing to their domestic sales of protected materials, namely to charge what the same products would command assuming they were imported duty free and added only normal marketing costs. In this case, protection would assure the volume of the Philippine market to domestic manufacturers but deny them any price advantage over a free trade situation. There must be some concern that import parity has not been rigorously applied, however, that the margins of error surrounding the necessarily hypothetical import prices have inclined in favor of the manufacturers, and that much if not all actual protection has been reflected in farm-gate fertilizer prices.

To emphasize the magnitude of the issue, it seems advisable to measure the maximum burden from the nominal rate of protection that farmers <u>may</u> have experienced since mid-1986. This view forms the basis of the calculations given below.

C. Measurable Effects of Trade, Regulatory, and Subsidy Policies on Agriculture

This section measures the quantifiable effects of the trade, regulatory and subsidy policies discussed above on fertilizer prices and consumption, crop production, and farm income. (Other effects that cannot be quantified, namely the longer-term influence on plant nutrient use and the impact on general rural development, are considered in section D.)

Briefly, the estimation procedure uses empirical information about the responsiveness of farmers' fertilizer application rates to fertilizer price changes. This information is drawn from the results of a literature review on factors affecting fertilizer demand. Also, changes in prices, fertilizer consumption, and crop production are measured with reference to what their values would have been in the absence of trade, regulatory, and subsidy policies. Thus, the effects as measured here do not represent a movement from, say, one actual price level in a given year to another actual price level in another year. Rather, the actual price in any given year is compared with the price that would have prevailed in that same year in the absence of trade, regulatory and subsidy policies affecting the fertilizer sector.

At the outset, it should be noted that the quantitative analysis performed here considers only the short-term effects of fertilizer policies. It is, of course, recognized that the long-term effects may well be also important. This chapter provides only a qualitative assessment of long-term effects.

1. Impact on Fertilizer Prices

The impact of government policies on the fertilizer prices paid by farmers can be quantified by the concept of implicit tariff (T), which measures the percentage difference between the domestic price and the price that would have prevailed in the absence of these policies. Under free trade, the latter is the border price, which, in the present case, is the C&F import unit value of fertilizer. This price represents the social opportunity cost of fertilizer. When both prices are measured at the same point in the marketing chain, the domestic price differs from the border price as a result of government interventions, which in this case are primarily import restrictions, price controls, and subsidy policies.

From the viewpoint of farmers, domestic fertilizer prices over the 1973-1987 period have generally been higher by 23 percent than they would have been in the absence of the trade, regulatory, and subsidy policies affecting the fertilizer sector (table III-1). Even in those years (1973-1982) when explicit cash subsidies were given to local fertilizer manufacturers and

Table III-1

Estimated Percentage Difference Between the Domestic Price and the Price that Would Have Prevailed in the Absence of Trade, Regulatory, and Subsidy Policies.
1973 -1987

Year		Fertilizer Grade				Weighted Average
		Urea	Ammosul	Mixed	MOP	
		Percent				
1973	P-1	-25	-9	-49		}-5
	P-2	31	39	-2	119	
1974	P-1	-11	-23	-33		} 7
	P-2	50	44	17	81	
1975	P-1	39	-43	-56		}-30
	P-2	5	-5	-31	86	
1976		65	86	30	85	56
1977		55	59	13	105	41
1978		28	37	-5	96	19
1979		34	52	15	89	32
1980		7	43	-14	68	5
1981		8	45	-11	80	7
1982		37	96	44	103	54
1983		50	77	30	95	51
1984		25	29	26	61	28
1985		15	57	53	113	39
1986 1/		0	0	35	0	9
1987 1/		0	0	35	0	12
Weighted Average						
1973-87		34	38	12	83	23
1973-82		44	40	0	91	20
1983-85		32	55	36	90	41
1986(May)-87		0	0	35	0	0

1/ Figures refer to the applicable legislated rates following the decontrol measures adopted in May 1986.

Note : P-1 refers to priority-I crops (food crops).
P-2 refers to priority-II crops (export crops).

Sources : 1973-81, David, C. and A. Balisacan, "An Analysis of Fertilizer Policies in the Philippines," Journal of Philippine Development, Vol. 8, 1981. 1982-87, Balisacan, A., "Getting Leverage with Fertilizer: Policy, Use, and the Anatomy of the Market," UPLB, 1987.

importers, the prices paid by farmers were, on the average, about 20 percent higher than the border prices. Annual changes in these differences have been due mainly to the fluctuations in world prices of fertilizers, with the government seeking to stabilize their domestic values.

For the first three years of the cash subsidy program when the two-tier pricing scheme was in effect, the food crop sector indeed received a subsidy. When this scheme was abolished in 1975, partly in response to the large inventory carryovers from the huge imports ordered in 1974, both the export crop and food crop sectors received a subsidy of about 46 and 14 percent, respectively. After 1975, the implicit tariffs on both sectors rose to high levels.

Fertilizer pricing policy during the cash subsidy period appeared to promote the use of mixed fertilizer, a typical Masagana-99 recommendation for rice. (The typical recommendation was four bags of mixed fertilizer and three bags of urea.) During this period, the implicit tariff on mixed fertilizer was practically non-existent whereas for the other grades, the implicit tariffs were higher than the legislated rates of about 35 percent.

Import and price controls by FPA remained intact after the abolition of the cash subsidy program in mid-1982. Thus, implicit tariffs on fertilizer remained high prior to import deregulation of nitrogenous fertilizer in mid-1986, averaging about 41 percent during the 1973-1985 period. With the import deregulation of urea, ammonium sulphate, and potash, the implicit tariffs dropped from 32, 55, and 90 percent, respectively, to practically nil in mid-1986 and in 1987.

For phosphate fertilizer grades locally produced by PHILPHOS, the implicit tariff rates have remained at about 35 percent since May 1986 subject to the caveat regarding import parity pricing. This protection arises mainly from the tariff duty of 20 percent and an advanced sales tax of 10 percent, whose base is the tariff inclusive of landed costs (i.e., home consumption value plus 10 percent of home consumption value plus postage commission and other charges except freight and insurance) plus a 25 percent markup. As one of the Bureau of Investment's "pioneer industries," PHILPHOS also receives other fiscal incentives (subsidies), but the incidence of these incentives are borne by the general public.

2. Impact on Fertilizer Consumption

The effect of fertilizer policies on the fertilizer application rates of farmers depends on the extent to which the policies distort the price farmers pay and on the responsiveness of farmers to fertilizer price changes, i.e., to the elasticity

of fertilizer demand. The first factor has been shown to be significant, particularly in years when FPA imposed import and price controls. The second factor--farmers' response to price changes--has also been shown to be quite significant, with the price elasticity of fertilizer demand ranging from about -0.4 to -0.5 for a short-term (one-year) small price change (see annex 3). For large fertilizer price changes (say, over 30 percent), this elasticity would be around -0.8. Here, the analysis assumes a short-term elasticity of -0.5 for small price changes and -0.8 for large price changes, where the changes are measured as the difference between the price paid by farmers and the price that would have prevailed in the absence of fertilizer trade, regulatory, and subsidy policies, i.e., the implicit tariff. Thus, a small price increase of, say, 10 percent, would lead to a reduction in fertilizer use of about 5 percent.

The implicit tariffs for each crop are the weighted averages of the fertilizer grades predominantly used for that crop. For rice, the major grades typically recommended are urea and mixed fertilizer, the shares of total volume being 40 percent and 60 percent, respectively. The same proportion is assumed for corn. In sugar, the proportion assumed is 30 percent mixed, 25 percent MOP, and 45 percent urea, reflecting the apparent mix of fertilizer consumption in this sector.

Table III-2 presents estimates of the impact of fertilizer policies on fertilizer consumption. Over the 1973-1987 period, the average actual fertilizer consumption per hectare was generally lower than the consumption that would have prevailed in the absence of the policies under review. In sugar, the application rate was about 288 kg/ha lower than the rate that would have prevailed in the absence of these policies. In rice and corn, the difference was about 17 kg/ha and 2 kg/ha, respectively. Expressed as a percentage of fertilizer use at border prices (i.e., at prices free of the effects of these policies), the differences were about 28 percent for sugar and 10 percent each for rice and corn.

The effects were less during the cash-subsidy period (1973-1982), but because the fertilizer prices paid by farmers were still higher than they would otherwise have been, actual consumption was still lower by about 20 percent for sugar and 10 percent for rice and corn.

The proportional reduction in fertilizer use was highest during the first half of the 1980s, particularly between 1982 and 1985, when fertilizer policies were highly unfavorable to farmers. Fertilizer use in sugar was lower by about 38 percent vis-a-vis what would have prevailed in the absence of these policies. For rice and corn, the reduction was approximately 25 percent.

Table III-2

Estimated Difference Between the Actual Fertilizer Consumption and the Consumption that Would Have Prevailed in the Absence of Trade, Regulatory, and Subsidy Policies 1973 - 1987

Year	Change in fertilizer use (material kg/ha)			Percent change in fertilizer consumption		
	Rice paddy	Corn	Sugarcane	Rice paddy	Corn	Sugarcane
1973	12.2	1.6	-337.5	19.7	19.7	-34.5
1974	8.7	1.0	-387.3	12.1	12.1	-38.3
1975	5.4	0.6	-35.3	9.0	9.0	-7.2
1976	-41.6	-4.2	-429.5	-35.2	-35.2	-47.6
1977	-27.2	-2.6	-386.3	-23.8	-23.8	-43.9
1978	-4.3	-0.4	-247.4	-4.1	-4.1	-28.1
1979	-13.4	-1.5	-378.9	-11.3	-11.3	-33.6
1980	2.8	0.3	-64.0	2.8	2.8	-8.0
1981	1.6	0.2	-74.9	1.7	1.7	-10.2
1982	-52.7	-7.5	-564.3	-33.0	-33.0	-44.5
1983	-50.1	-7.7	-567.6	-30.4	-30.4	-44.2
1984	-16.8	-2.6	-271.0	-12.8	-12.8	-27.4
1985	-48.4	-7.3	-489.4	-30.2	-30.2	-40.7
1986	-13.3	-2.0	-39.6	-10.5	-10.5	-5.3
1987	-13.3	-2.0	-39.6	-10.5	-10.5	-5.3
Average						
1973-87	-16.7	-2.3	-287.5	-10.4	-10.4	-27.9
1973-82	-10.8	-1.3	-290.5	-6.2	-6.2	-29.6
1983-85	-38.4	-5.8	-442.6	-24.5	-24.5	-37.5
1986-87	-13.3	-2.0	-39.6	-10.5	-10.5	-5.3

Following the import deregulation of nitrogenous fertilizer in 1986, the gap between actual fertilizer use and the use that would have prevailed in the absence of fertilizer policies became much smaller in 1986 and 1987, compared with the 1983-1985 period. Even ignoring any beneficial effect of import parity pricing, the gap fell from 38 percent to 5 percent for sugar, and from 25 percent to about 10 percent for rice and corn. The proportionally smaller decline of the gap in rice and corn vis-a-vis sugar was due to the greater proportion of mixed fertilizer used in rice and corn.

3. Impact on Crop Production

The extent of the decline in crop production due to unfavorable fertilizer policies depends on the responsiveness of crops to fertilizers (i.e., to the farm-level production function) and on the extent to which the domestic fertilizer price has risen in relation to its world price, the price of outputs, and the price of other production inputs. As noted in chapter II and in annex 3, the responsiveness of crops to fertilizers is largely dictated by the availability of complementary inputs (e.g., fertilizer-responsive modern varieties, irrigation, extension, and rural infrastructure). Where the provision of these inputs is low, the scope for profitable increases in fertilizer use is limited.

The reduction in crop production is shown in table III-3. [For an elaboration of the analytical methodology, see Balisacan (1987a)]. In sugar, the largest user of fertilizer on a per-hectare basis, production was lower by about 309 kg/ha annually during the 1973-1987 period. In rice and corn, the decline in production was about 21 kg/ha and 3 kg/ha, respectively. The small effect on corn is due to the low rate of fertilizer use for this crop.

Expressed as percentages of fertilizer consumption that would be realized in the absence of the above policies, these differences are, however, small. In sugar, the difference was about 4 percent. In rice and corn, it was less than 1 percent.

The import liberalization of nitrogenous fertilizer in 1986 led to a significant decline in the difference between actual crop production and the production that would have been obtained in the absence of policies that raised the domestic prices of fertilizer. The sugar sector benefited most, with the difference declining from an average of 402 kg/ha during the 1983-1985 period to about 26 kg/ha in 1986 and 1987. In the rice sector, it declined from 51 kg/ha of palay to 16 kg/ha. In corn, the difference fell from 9 kg/ha to about 2 kg/ha.

The large effect of fertilizer policy reform on sugar in 1986 is partially attributable to the complete deregulation of

Table III-3

Estimated Difference Between the Actual Crop Production and the Production that Would Have Prevailed in the Absence of Trade, Regulatory, and Subsidy Policies 1973 - 1987

Year	Change in crop production (kg/ha)			Percent change in crop production		
	Rice paddy	Corn	Sugarcane	Rice paddy	Corn	Sugarcane
1973	13.1	2.1	-360.4	0.9	0.3	-4.9
1974	15.9	1.9	-872.8	1.0	0.2	-11.7
1975	13.8	1.6	-100.9	0.8	0.2	-1.4
1976	-48.2	-5.1	-383.0	-2.6	-0.6	-5.3
1977	-32.9	-3.2	-308.6	-1.7	-0.4	-4.7
1978	-5.7	-0.6	-271.0	-0.3	-0.1	-3.9
1979	-19.2	-2.3	-425.5	-0.9	-0.2	-5.6
1980	4.6	0.6	-59.2	0.2	0.1	-0.8
1981	2.8	0.4	-69.8	0.1	0.0	-0.9
1982	-75.7	-11.1	-525.3	-3.1	-1.1	-6.4
1983	-71.8	-12.0	-428.3	-2.9	-1.2	-5.5
1984	-24.3	-3.9	-272.1	-1.0	-0.4	-3.9
1985	-57.9	-9.5	-508.0	-2.2	-0.9	-7.4
1986	-16.1	-2.6	-22.6	-0.6	-0.2	-0.5
1987	-16.2	-2.3	-23.2	-0.6	-0.2	-0.4
Average						
1973-87	-21.2	-3.1	-308.7	-0.9	-0.3	-4.2
1973-82	-13.1	-1.6	-337.6	-0.6	-0.2	-4.6
1983-85	-51.3	-8.5	-402.8	-2.0	-0.8	-5.6
1986-87	-16.1	-2.5	-22.9	-0.6	-0.2	-0.5

Note: The fertilizer/crop response ratios for each year and crop can be obtained by bringing together the annual changes in the corresponding columns of tables III-2 and III-3. These ratios are implied by the chosen price elasticities of demand for fertilizer, and change as these elasticities are changed. They are incremental, not average, values incorporating both physical and economic responses. They relate to fertilizer use measured in kg of material, not kg of nutrient.

fertilizer grades other than phosphatic fertilizer as well as to the decrease in the level of implicit tariffs of phosphate-based fertilizer grades from about 50 percent in 1985 to about 35 percent in 1986. Urea and potash comprise about 45 percent and 25 percent, respectively, of the total volume of fertilizer used on sugar. Table III-4 indicates the total effects of the various policies on the quantities and values of output.

4. Impact on Farm Income

The value of the change in crop production due to fertilizer price policies less the value of the change in fertilizer consumption due to the same policies gives a measure of the change in net farm income that is attributable to these policies. It is assumed that other costs of production do not change with changes in fertilizer use. To the extent that they do, the effects of fertilizer policies on net farm income would be over-estimated.

The effects of the above policies were highest among sugar farmers. In real terms, the average decline in net farm income attributable to these policies was about P 390 per hectare, or about 11 percent of net farm income, during the 1973-1987 period. Net farm income was assumed to be 35 percent of total gross revenue, based on the U.S. Department of Agriculture's analysis of costs and returns of sugar production in the Philippines in 1986.

Among rice and corn farmers, the effects on net farm incomes were much less, barely P 10/ha, or less than 2 percent of net farm income. Net farm incomes in rice and corn production were assumed to be 35 and 40 percent, respectively, of total gross revenue, based on published data from the U.S. Department of Agriculture and the International Rice Research Institute. (See table III-5.)

Three years prior to import liberalization in 1986, sugar farmers' net farm incomes were lower by about 14 percent compared with what they would have been in the absence of fertilizer policies. This figure has dropped to just about 2 percent in 1986 and 1987. Among rice farmers, net farm incomes were lower by about 6 percent during the 1983-85 period, but have dropped to about 3 percent in 1986 and 1987.

D. Non-Quantified Price Effects of Fertilizer Policies

Some consideration should be given to two sets of policy consequences that cannot be quantified.

Table III-4

Total Reduction in Crop Production due to Trade, Regulatory, and Subsidy Policies
1973 - 1986

Year	Metric Tons			Value (in thousand pesos)					
				Nominal			Real (1978 = 100)		
	Rice	Corn	Sugar	Rice	Corn	Sugar	Rice	Corn	Sugar
1973	44146	5256	-170460	30020	2943	-141691	55695	5461	-262877
1974	56928	5560	-447634	53512	5060	-399256	73810	6979	-550698
1975	50579	4819	-53956	49568	4530	-45393	63958	5845	-58572
1976	-176318	-16357	-212094	-174555	-15376	-261324	-205359	-18089	-307440
1977	-119179	-10139	-168922	-119179	-10139	-243564	-127601	-10856	-260775
1978	-20485	-1941	-131797	-20075	-1883	-150979	-20075	-1883	-150979
1979	-68982	-7365	-186319	-71741	-7439	-235540	-61056	-6331	-200459
1980	16171	1836	-25036	18597	2130	-50697	13389	1534	-36499
1981	9699	1236	-31130	12609	1594	-72873	8026	1015	-46387
1982	-253036	-36129	-234903	-346659	-48412	-484362	-200150	-27952	-279654
1983	-229209	-38652	-197385	-348397	-53727	-530537	-182886	-28203	-278497
1984	-77218	-12845	-120614	-191500	-30313	-410126	-66865	-10584	-143201
1985	-191838	-33022	-193809	-619637	-96093	-672406	-175734	-27253	-190699
1986	-54841	-9008	-6720	-154653	-24323	-31854	-43533	-6846	-8966
Average									
1973-86	-72399	-10482	-155484	-134435	-19389	-266472	-62027	-8369	-198265
1973-82	-46048	-5322	-166225	-56791	-6699	-208568	-39936	-4428	-215434
1983-85	-166088	-28173	-169270	-386511	-60044	-537690	-141828	-22013	-204132

Table III-5

Estimated Difference Between Actual Net Farm Income and the Net Farm Income that would have prevailed in the Absence of Trade, Regulatory, and Subsidy Policies
1973 - 1987

Year	Change in net farm income (P/ha)						Percent of net farm income		
	Nominal			Real (1978 = 100)					
	Rice	Corn	Sugar	Rice	Corn	Sugar	Rice	Corn	Sugar
1973	24.4	3.2	-255.0	45.3	5.9	-473.1	6.6	1.8	-12.5
1974	36.1	4.3	-634.9	49.7	5.9	-875.8	6.7	1.4	-31.0
1975	31.2	3.4	-152.6	40.2	4.3	-196.9	5.4	1.1	-7.5
1976	-40.3	-4.0	-346.4	-47.4	-4.7	-407.5	-6.5	-1.3	-11.7
1977	-31.5	-3.0	-340.6	-33.8	-3.3	-364.6	-4.7	-0.9	-10.8
1978	-10.5	-1.1	-283.7	-10.5	-1.1	-283.7	-1.5	-0.3	-10.6
1979	-33.8	-3.9	-462.1	-28.8	-3.3	-393.3	-4.4	-1.0	-14.5
1980	10.9	1.4	-213.2	7.9	1.0	-153.5	1.2	0.3	-4.0
1981	7.5	1.0	-281.6	4.8	0.6	-179.3	0.7	0.2	-4.6
1982	-89.8	-12.9	-823.8	-51.9	-7.4	-475.6	-7.9	-2.4	-14.9
1983	-97.3	-14.9	-896.5	-51.1	-7.8	-470.6	-7.5	-2.7	-12.6
1984	-99.9	-15.3	-851.8	-34.9	-5.3	-297.4	-4.6	-1.6	-10.6
1985	-167.1	-25.0	-1398.6	-47.4	-7.1	-396.6	-5.7	-2.0	-18.0
1986	-77.9	-11.8	-198.1	-21.9	-3.3	-55.8	-3.0	-1.0	-2.4
1987	-79.4	-12.0	-203.5	-22.0	-3.3	-56.3	-3.0	-0.9	-2.0
Average									
1973-87	-41.2	-6.1	-489.5	-13.4	-1.9	-338.7	-1.9	-0.6	-11.2
1973-82	-9.6	-1.2	-379.4	-2.4	-0.2	-380.3	-0.4	-0.1	-12.2
1983-85	-121.4	-18.4	-1049.0	-44.4	-6.7	-388.2	-5.9	-2.1	-13.7
1986-87	-78.5	-11.9	-200.8	-22.0	-3.3	-56.1	-3.0	-1.0	-2.2

1. Longer-term Impact on Fertilizer Use

Before mid-1986, protection did not discriminate significantly between compound fertilizers and other materials. This is no longer the case, especially if import parity pricing is in some degree enforced to the advantage of domestically produced compounds and at the expense of importable TSP, MAP and DAP. While the effect is likely to be less noticeable than those already discussed, any continued protection of compounds is likely to check the use of bulk blends and straight materials, which are a somewhat cheaper means of supplying plant nutrient. This possibility mainly concerns crops other than rice, although it may be of some significance in this case as well.

2. Impact on General Rural Development

The effects of fertilizer policies on general rural development (e.g., on rural employment and wages, land use, and rural demand for agricultural as well as non-agricultural goods) are not expected to be great. As shown above, the changes in net farm incomes were small, so that the induced demand linkages would also be likely to be small. An exception might be the effects caused by the relatively large decline in fertilizer use, crop production, and net farm incomes in the sugar sector, which might have caused a decline in the employment opportunities of rural, particularly landless, workers.

E. Summary

The trade, regulatory, and subsidy policies affecting the fertilizer sector have had negative effects on the prices of fertilizer paid by farmers. During the 1973-1987 period, these prices were, on the average, about 23 percent higher than what they would have been in the absence of these policies. Deregulation in the fertilizer industry following the ascension to power of the Aquino government in 1986 brought these differences to an average of 11 percent. In particular, the importation of nitrogenous fertilizer was completely liberalized, and the implicit tariffs of other fertilizer grades were reduced from their high levels in the early 1980s to about 35 percent in 1986. The 35 percent implicit tariff on mixed fertilizer represents the extent of protection afforded by government policy on the finished products of PHILPHOS.

The effects of these policies on fertilizer consumption, crop production, and net farm incomes vary by crop. The effects were largest for sugar, which is, on a per-hectare basis, the largest user of fertilizer. In real terms, the average decline in net farm income among sugar farmers was about P 340 per hectare (or about 11 percent of net farm income) during the 1973-87 period. For rice and corn, the decline was barely P 10 per hectare (or less than 2 percent of net farm income).

Overall, the results suggest that fertilizer policies have not significantly affected net farm incomes among rice and corn farmers. They further suggest that fertilizer price policies, when used alone, would have limited effects on farm income as a whole. This conclusion has been elaborated already in chapter II. From a long-term point of view, when used in conjunction with other policies, in particular the provision of complementary productivity-enhancing technologies and support services (extension, credit, marketing, etc.), the effects of changes in fertilizer policies will be much larger.

F. Note on the Calculation of Import Parity Pricing

Table III-6 provides an example of calculations of import parity prices by PHILPHOS for December 14, 1987, which the company has supplied to Chemonics and which show its domestic prices on that day being below parity levels.

The results depend critically on adjustments that have been made to foreign price quotations to develop hypothetical C&F import prices and, even more important, on the degree to which they are representative of market trends. In December (and also January 1988) DAP prices FOB U.S. Gulf rose sharply, in part reflecting adjustment towards the long-term trend but also in all likelihood containing a substantial overshoot due to a tight market following unexpectedly large Chinese imports in the face of reduced U.S. inventories. By contrast, estimates made at the time of the seasonal fall in U.S. DAP prices in April-May 1987 probably would have told against PHILPHOS. Calculations made on any single day can be misleading, either for or against the farmers' or PHILPHOS' interests.

It is not at all clear how far import parity calculations have been determined on a regular and widely accepted basis or to what extent they have been a factor in influencing the burden of protection borne by Philippine farmers. There does not appear to be accumulated data for making the necessary assessment.

Chemonics recommends undertaking such a task on a permanent basis in its discussion on the future activities of FPA in chapter VIII.

Table III-6

PHILPHOS Estimates of Import Parity Prices and Comparisons With Actual PHILPHOS Prices on December 14, 1987

Import Parity Prices	18-46-0	14-14-14	16-20-0
	----------	$/ton	----------
C&F -	228.00	174.50	163.15
	---------	Pesos/ton	----------
C&F -	4,788.00	3,664.50	3.426.15
Landing Charges:			
FPA import fee	0.04	0.04	0.04
Brokerage	0.45	0.45	0.45
Documentation	0.34	0.34	0.34
Customs guard	1.87	1.87	1.87
Wharfage (import)	23.50	23.50	23.50
Handling (pier to truck)	6.00	6.00	6.00
Arrastre/stevedoring/loading	140.00	140.00	140.00
Checking and surveying	4.50	4.50	4.50
Checking-out	3.00	3.00	3.00
Insurance	23.81	20.13	15.79
L/C charges	29.93	22.91	21.41
Bank charges	23.94	18.32	17.13
Interest/inventory/carrying cost	199.05	154.08	144.40
Sub-Total	456.42	395.14	378.43
Total landed cost	5,244.42	4,059.64	3,804.58
Inter-island freight	120.00	120.00	120.00
Import parity price to distributors	5,364.42	4,179.64	3,924.58
Actual PHILPHOS prices to distributors	4,603.20	3,875.00	3,704.60

Basis of calculations: insurance 0.5967% of FOB, L/C charges 0.63% of C&F, bank charges 0.5% of C&F, interest/inventory/carrying cost 16.0% p.a. for 3 months.
C&F price offers based on Fertecon telex of 14 December 1987: DAP - South Korea, 14-14-14 based on 15-15-15M South Korea to Nigeria, 16-20-0 based on 20-20-0 Korea to Nigeria.
Freight cost South Korea-Philippines estimated by PHILPHOS at U.S. $13/ton.

CHAPTER IV

WORLD SUPPLY AND PRICE OUTLOOK, FERTILIZER--EMERGENCY GUIDELINES, LONG-TERM PRICE AND SUPPLY STABILIZATION

This chapter provides a basis for making annual forecasts of international fertilizer prices, with more detail in annex 2. In addition, it attempts to reach a narrow definition of "fertilizer emergencies" and to establish guidelines for government policy intervention. Third, it looks at a possible price and supply stabilization scheme and considers the likelihood of its success.

A. Analysis and Prospects for International Fertilizer Prices

1. Introduction

The main purpose of this analysis is to give the GOP a general framework on which it can build to develop a comprehensive analysis of the medium and long-term outlook for international prices and supplies, which is a necessary part of the information base that will help the liberalized fertilizer sector function more effectively. In addition, it responds to an immediate concern of chapter V by providing annual price forecasts for sulphur, phosphate rock, diammonium phosphates, triple superphosphate, urea, and potash, information that is particularly critical in evaluating the international competitive status of Philippine producers of compounds and ammonium phosphates, particularly PHILPHOS.

These forecasts are given FOB representative sources of supply rather than C&F Philippines. They do not directly cover the compound materials that provide virtually all of the phosphate and potash and much of the nitrogen consumed in the Philippines. However,

- International prices on any particular material usually follow each other closely in different parts of the globe, subject to differences in freight. As long as some allowance is made for likely future changes in ocean freight, the FOB price quotations will give a sufficiently precise indication of the prospects for the Philippines.

- The annual prices per unit of nutrient in each of the straight materials (urea for N, triple superphosphate for P205, and muriate of potash for K20) give good indicators of annual changes in the international market values of the same nutrients contained in compounds, and sufficiently close measures of their actual levels.

2. Price Scenarios

Annex 2 provides the details for developing three alternative sets of price forecasts to 1997, which reflect Chemonics' judgment in light of (1) historical relationships between annual changes in inflation-adjusted prices and in global demand/supply balances in the nitrogen, phosphate and potash sectors, (2) expected changes in demand/supply, and (3) any fundamental shifts in future costs of production due to technological or other factors. The three scenarios are given the following probabilities:

High 5%
Medium 40%
Low 55%

In the early phase of the study the intention was to give the medium scenario a much larger weighting relative to the low. However, the recent collapse in stock market values and the difficulties that are arising in finding satisfactory responses by leading economic nations require the more pessimistic balance shown above. (No doubt, many would say it still errs on the side of optimism.)

The two principal scenarios differ somewhat in their outlooks for production capacity, with slightly more expected closures of old plants in the low case. However, the principal differences are on the side of demand. The medium case gives the annual fertilizer use judged necessary to realize the trend in agricultural production consistent with FAO commodity projections (discussed in annex 2), which were published in mid-1986 but were probably based on optimistic macroeconomic expectations. In comparison, the low pushes back the growth of world fertilizer demand by about a year and a half.

The high scenario generally has the same macroeconomic underpinnings as the medium scenario. It is intended mainly to allow for the possibility that price increases in periods of cyclical shortage would be much more serious than in the medium case.

3. Outlook for Demand in Relation to Supply

Table IV-1 summarizes the recent experience for world fertilizer consumption and supply potential and the forecasts of final demand and supply potential to 1991/1992. The information is reviewed in more detail in annex 2. As regards forecasts, final demand assumes adequate supplies. If, however, final demand outruns supply potential, rising market prices provide the balancing mechanism, by giving some boost to output in that plants operate above their normal levels, but mainly by checking consumption. In addition, in interpreting the results some

allowance must be made for the short-term surge in demand (not shown in table IV-1) caused by the rebuilding of pipeline inventories when the market senses that a particular sector is approaching full operation of its capacity.

Table IV-1

World Supply Potential Above/(Below) Consumption/
Final Demand 1985/86 - 1991/92

	N		P205		K20		Total	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
	million tons							
1985/86	3.3	3.3	3.1	3.1	4.8	4.8	11.2	11.2
1986/87	3.0	3.0	2.6	2.6	4.2	4.2	9.8	9.8
1987/88	1.7	1.8	1.7	1.4	2.7	2.5	6.1	5.5
1988/89	1.5	1.3	2.0	2.2	2.7	2.4	6.2	5.9
1989/90	1.4	(0.7)	1.5	1.0	3.4	2.8	6.3	3.1
1990/91	(0.4)	(2.4)	0.6	0.1	3.2	2.3	3.4	-
1991/92	(1.4)	(4.0)	0.1	(0.9)	2.7	1.7	1.4	(3.2)

Nitrogen is expected to be the first sector that returns to demand/supply balance--by the end of the July 1989/June 1990 fertilizer year in the more likely low price scenario, but one year earlier if either of the other scenarios applies. Phosphates lag nitrogen by about two years in either case, while potash remains in serious oversupply throughout.

For nitrogen and phosphates several years of cyclical shortage are then likely, starting and ending first in the medium/high scenarios. For nitrogen this period would continue through 1992/1993 (medium/high) or 1993/1994 (low), and for phosphates, 1993/1994 or even 1993/1994 (medium/low) or one year later (low). Potash should return to balance by early 1993/94.

For sulphur (see table 2A.12 of annex 2) there is no serious pressure on supplies through the whole review period for either the low or medium scenarios, but possible difficulties in developing critically important new sources in the USSR are factored into the high case.

4. Inflation-Adjusted FOB Forecasts

Representative FOB annual prices from the mid-1960s to 1997 are shown in constant 1986 dollars in table IV-2, with the forecasts through the next cycle reflecting the demand/supply balances of the low price scenario. In addition, equilibrium prices (as estimated in annex 2) are shown for 1986 and 1997. These two are the expected/forecasted prices assuming there were

Table IV-2

Inflation Adjusted Prices of Fertilizer and Fertilizer Raw Materials, Historical and Low Price Forecasts 1988-1997
(FOB at constant 1986 $/ton)

	TSP Florida	DAP Florida	Urea Western Europe	Potash Vancouver	Phosphate Rock Morocco	Sulphur U.S. Sources
Dates						
1964	$150	*	295	106	38	64
1965	147	*	305	94	42	69
1966	145	*	275	85	37	77
1967	141	226	238	77	34	95
1968	109	188	188	69	31	112
1969	106	158	153	60	29	72
1970	110	140	125	82	27	58
1971	107	153	114	80	26	42
1972	160	216	141	79	25	39
1973	223	266	212	95	29	39
1974	626	686	651	125	105	58
1975	381	458	373	153	118	83
1976	163	215	201	99	63	80
1977	166	225	215	86	50	74
1978	154	220	228	89	44	70
1979	206	280	251	111	46	80
1980	240	295	295	154	60	116
1981	195	236	262	136	60	133
1982	158	209	181	93	48	124
1983	148	202	149	83	41	96
1984	139	201	182	89	40	100
1985	125	173	140	86	35	109
1986 (Est.)	120	160	107	73	32	104
1987 (Est.)	126	155	112	68	30	78
Forecasts						
1988	135	185	130	70	31	80
1989	150	200	140	70	35	80
1990	155	205	180	70	38	80
1991	170	225	220	70	43	85
1992	210	265	280	75	47	90
1993	260	325	260	85	49	100
1994	210	265	230	90	49	110
1995	195	250	220	105	45	115
1996	195	250	220	130	45	120
1997	195	250	220	140	45	120
Trends						
1986	190	245	210	105	45	100
1997	195	250	220	105	45	120

* Not available

global demand/supply balance. They indicate the likely impact on price of changes in costs of production through 1997, and they apply to all scenarios.

The well-known cyclical nature of inflation-adjusted international fertilizer prices is evident in all of the series, both historically and forecasted. In the present context the following points should be noted:

- o Prices in 1986 and 1987 have been exceptionally low in relation to trend (measured by the equilibrium prices for 1986 and 1997) and to the cyclical peaks projected in the early 1990s. Most significant in this context, the real prices of TSP, DAP and urea are forecast to more than double in this phase, with the increase particularly strong for urea.

- o However, the real prices during the next set of peaks will be much lower than those realized in the crisis years of 1973-1975. They are reached by generally accelerating increases over four or five years.

- o The cyclical recovery takes longer and is weaker in potash.

- o Price changes in phosphate rock follow the same time pattern as converted phosphates, but at their peak are less than twice their real values of 1986 and 1987.

- o Sulphur prices show a recovery as slow as but weaker than potash.

Apart from the obvious implications for Philippine farmers, the most significant conclusions concern PHILPHOS (chapter V and annex 4).

Table IV-3 summarizes medium price forecasts that differ substantially from their low values.

These advance the cyclical recoveries by one or two years and show a somewhat higher peak for urea. However, the general conclusions remain as already given with respect to table IV-2. (The price forecasts of the high price scenario, given in annex 2, show similar timing but higher peaks than in the medium case, and real sulphur prices substantially higher than in table IV-2. As already indicated, this scenario is given an extremely low chance.)

5. C&F Prices Philippines

The large oversupply of dry cargo ocean shipping and the depressed prices of bunker fuel have resulted in

Table IV-3

Actual and Real Prices of
Triple Superphosphate and Diammonium Phosphate 1964 - 1997

	TSP Bulk FOB Actual	Florida 1986 $	DAP Bulk FOB Florida Actual	1986 $
1964	$ 46	$ 150		
1965	46	147		
1966	47	145		
1967	47	141	69	226
1968	38	109	66	188
1969	39	106	58	158
1970	43	110	54	140
1971	43	107	62	153
1972	68	160	91	216
1973	100	223	119	266
1974	304	626	333	686
1975	203	381	243	458
1976	91	163	120	215
1977	98	166	133	225
1978	98	154	140	220
1979	142	206	193	280
1980	180	240	222	295
1981	161	195	195	236
1982	138	158	183	209
1983	135	148	184	202
1984	131	139	189	201
1985	121	125	169	173
1986 (Est)	120	120	160	160
1987 (Est)	130	126	160	155

Table IV.3 (continued)

Actual and Real Prices of
Triple Superphosphate and Diammonium Phosphate 1964 - 1997

	TSP Bulk FOB Florida Actual				DAP Bulk FOB Florida Actual 1986 $		
		1986 $					
Forecasts		Low	Medium	High	Low	Medium	High
1988	(2)	135	145	145	185	195	195
1989	(2)	150	160	160	200	215	215
1990	(2)	155	185	195	205	240	250
1991	(2)	170	210	235	225	290	320
1992	(2)	210	260	320	265	340	410
1993	(2)	260	210	265	325	275	340
1994	(2)	210	195	210	265	260	275
1995	(2)	195	195	190	250	260	260
1996	(2)	195	195	190	250	260	260
1997	(2)	195	195	190	250	260	260

(1) Not available
(2) Not forecasted

Note: All calculations have been made from unrounded numbers, using the official US GNP deflator.

exceptionally low freight rates in recent years. These rates must recover substantially by 1992 or so. However, C&F prices have not been forecasted due to insufficient readily available information to form a 1986-1987 base. In any case, any plausible adjustment on this account would concern only one of the conclusions suggested by the FOB series, namely the competitive status of PHILPHOS, which is taken up in chapter V.

B. Concerns Over Prices and Supplies

The statement of work reproduced in annex 1 stresses (1) problems of severe price instability and supply disruption, (2) the need for guidelines in defining fertilizer emergencies and official responses to them, and (3) the role of stabilization measures. These concerns reflect a variety of experiences and possibilities. Memories of extremely high international fertilizer prices and temporary shortages in 1973-1975 and the domestic problems associated with high interest rates, credit shortages and foreign exchange difficulties of 1984 seem to figure quite prominently. Accordingly, Chemonic's assessment takes note of the following.

- A sudden and sharp rise in the prices of imported finished fertilizers or intermediate materials;
- Longer-term cyclical upswings, as discussed above;
- An unforeseen, sudden and substantial disruption of foreign supplies;
- A similarly unpredicted and prolonged disruption of supplies at PHILPHOS due to a strike or some other reason;
- An interest rate crisis, causing a severe lack of funds in formal and informal markets for farm credit and a substantial fall in demand for fertilizers;
- Severe foreign exchange shortage leading to much reduced fertilizer imports;
- Severely reduced agricultural output due to natural calamity, requiring sharply boosted incentives (including reduced fertilizer costs) to stimulate short-term production;
- A significant fall in farm incomes for some other reason, leading to substantially reduced fertilizer use;
- Diversion of locally manufactured fertilizers, normally sold to Philippine farmers, to foreign markets in response to high international prices; and

- substantially increased marketing margins, following a collapse of competition into collusion among importers/distributors.

However, there are several considerations in deciding whether or not any one of these situations should fall within the remit of practical fertilizer policy, in particular constituting a "fertilizer emergency":

- One must determine if there is an appropriate fertilizer policy instrument that could be effective in influencing the outcome.

- There is likely to be substantial limitation on public funds for meeting emergencies, given primarily the prior claims of other agricultural expenditures, particularly land reform and the support activities needed to ensure its success, but also the longer-term financial needs of other aspects of fertilizer policy stressed in this report.

- Many of the problems that might appear to constitute a fertilizer crisis are due to other causes which require action through other policy instruments, e.g., in the event of a general national shortage of credit or of foreign exchange.

- Much of the pressure on the fertilizer sector is likely to come through the sustained longer-term price influences discussed in section A above and annex 2 and cannot be expected to be managed within the present financial resources available to the GOP.

- As the analyses of chapters II and III and annex 3 show, short-term changes in fertilizer supplies and prices normally will have a weaker effect on the farm sector than may be thought.

When these issues are addressed, a much more restricted definition of "fertilizer emergencies" is found to be desirable.

C. Non-Fertilizer Emergencies

The four situations below have often been construed as fertilizer emergencies in the past, whereas upon closer examination, they do not conform to a more restricted definition of the term.

1. A Severe Shortage in the Foreign Exchange Available for Importing Fertilizers

There are two cases where a foreign exchange shortage might directly affect fertilizer suppliers: (1) a sudden and substantial withdrawal of donor fertilizer aid as world markets come back into balance, and (2) substantial increases in the foreign currency required for fertilizers. Donor aid represented some 8 percent of Philippine plant nutrient supply in 1986. As far as a general rise in international fertilizer prices is concerned, the net increase in foreign exchange required for fertilizers, after taking PHILPHOS exports into account, is likely to more than double in the next 5 years, with much of the increase coming rapidly towards the end of the period.

Neither of these cases, however, presents any particular difficulty for the GOP in financing whatever level of fertilizer imports its farmers demand unless the emergency is caused, as it was in 1984, by a general shortage of foreign exchange.

2. The Role of Fertilizer Subsidy Following a Local or Regional Crop Failure

A localized agriculture may warrant specially-targeted assistance to recover from a crop failure caused by natural forces such as drought or typhoon. General financial aid or farm credit will normally be the most useful forms of support. A similarly targeted, temporary fertilizer subsidy may be useful if the crop prices are too low to justify fertilizer at market prices. A local or regional crop failure represents a general financial emergency in which there is likely not to be a useful opportunity for fertilizer policy.

3. A Fall in Fertilizer Demand Due to an Interest Rate Crisis

A severe lack of funds in the formal and informal credit markets, with resulting high interest rates, might bring about a large fall in fertilizer use. In such circumstances a fertilizer subsidy could appear to be a useful offset for farmers. However, it would do nothing to increase the supply of fertilizer credit, except to the extent that it enabled farmers to pay even higher interest rates to attract credit from other sectors. Thus the subsidy would not be a cost-effective substitute for measures directly aimed at increasing the supply of credit.

4. A Fall in Fertilizer Demand Due to Reduced Farm Incomes

Fertilizer use might be curtailed if farm income falls because of low crop prices. Fertilizer subsidies will do little

for farm income although they might sustain fertilizer use levels. The policy instrument in this case is primarily output pricing.

5. General Conclusion

Care must be taken not to treat as fertilizer emergencies those situations where demand for plant nutrient is adversely affected by powerful general influences, such as changes in farm income or credit, rather than by autonomous changes in fertilizer prices and supply. Fertilizer subsidies may sometimes be useful in such cases, but they should not be regarded as any more than a supplement to policy changes that are directed at the more important, underlying problems.

D. Assessment of the Practicability of Measures Relating to International Supplies and Prices

1. General Background

In the latter 1970s FAO gave considerable attention to fertilizer price stabilization measures, principally through the Commission on Fertilizers. Also, UNCTAD (the United Nations Commission on Trade and Development) held some exploratory meetings for phosphate rock as part of its Integrated Commodities Programme. The interests lay in both bilateral and multilateral contracts.

Apart from an extremely limited scheme to provide fertilizers to the Most Seriously Affected category of countries on concessional terms if international prices were extremely high, in which the only exporter participants seem to have been certain West European countries, nothing was achieved. Discussion in the FAO Fertilizer Commission on long-term contracts ended with no more than a draft indicating how such a contract might be written. Among other arguments, in public discussion or in background briefings, it was contended that long-term price contracts would be difficult to negotiate in view of the residual nature of much of the export market in fertilizers and of the typically wide gap between short-run and long-run costs. (Since the mid-1970s many plants have been built which are almost entirely committed to export sales and the residual element is proportionately less important. Even so, taken together the two points remain as valid as a decade ago.) To all intents, the matter was put to rest in the FAO Commission on Fertilizers at the June/July 1980 Sixth Session, specifically in Price Stabilization Measures (Report of the Consultative Working Group of the Commission on Fertilizers), FERT/80/2.

The UNCTAD endeavors on phosphate rock failed quickly. Two of the largest producers (Morocco and the USSR) did not take part in the two main meetings called for the purpose, while the EEC

and the U.S. opposed buffer stocks and other price stabilization measures.

This brief review serves as a reminder, if it were needed, that there is no established multilateral framework to which the GOP can turn in furthering its interests, other than the ASEAN discussed below.

2. Long-Term Price Contracts

So-called long-term volume and price contracts are, of course, important in the world fertilizer industry, sometimes at fixed prices for the whole contract period or with only occasional review, but commonly with provision for frequent--even 3-6 months or at most annual--price adjustment in the light of the existing situation. Contracts are sometimes not renewed or break down, so that periodically the spot market takes on much greater significance, as is currently the case with sulphur and finished fertilizers. In other cases, the contracting tradition is strong, as for potash, where currently more than half of exports are made on this basis. However, the strongly oligopolistic nature of this sector and the willingness of the principal suppliers (Canada, East Germany and the Soviet Union) to be reasonably flexible on price may be important factors.

International agreements that will give the long-term price security that is sought by the GOP are extremely difficult to negotiate. In theory, the long-term trend in the real price of fertilizer at some clearly defined and well-reported locations or as determined by an independent arbitrator could form the basis of an agreement. But, at least in the eyes of public or private executives with commercial responsibility for any agreement, such a trend is never easy to measure. Moreover, there is rarely a time when buyer and seller have a mutual interest in concluding an agreement. When prices are low, as today, the seller is unwilling because the buyer does not want to move far from present levels, and conversely when markets are tight.

A possible variant on the real trend price as a basis for negotiation might be a contract price equal to the moving average of some number of immediately preceding years, for example, three. This system would smooth out both annual fluctuations, reduce a cyclical peak and raise a cyclical valley. But there remains the problem of finding a mutually agreeable negotiating time for buyer and seller.

3. Long-Term Barter Contracts with Foreign suppliers

PHILPHOS has a small long-term barter contract with the Government of Indonesia, obtaining ammonia in exchange for phosphoric acid. The price conditions of this contract are not known to the consultants.

The largest existing long-term international price and supply contract involves the USSR and the Occidental Petroleum Corporation, a major Florida phosphate producer. It involves the shipment of Soviet ammonia to the U.S. and Oxy phosphoric acid (in a concentrated form) to the USSR. The total annual tonnage is generally well over two million tons of product in all. Prices are not fixed for more than one year or even lesser periods, and there have been some very large periodic changes. The basic strength of the agreement has been the Soviet need to import large quantities of phosphoric acid and Oxy's advantage of having low-cost ammonia (now somewhat restricted by U.S. government limitations on imports of ammonia with "under-priced" natural gas), together with the fact that both parties have made substantial investments to implement the agreement. This contract came into operation in 1976/1977.

4. Buffer Stocks

The possible role for buffer stocks was a matter of some interest in the FAO investigations of stabilization measures in the mid-1970s. Nothing positive emerged. There are no pure buffer stock schemes in fertilizers. This is not surprising. They presuppose an ability to foresee future demand with a precision that cannot be realized in practice. For example, the large variations in stocks in India, public and private, are due to a considerable degree to unforeseen annual variations in the farmer's use of fertilizers. In addition, carrying costs are large.

Further, a stock carrying role by government is likely to lead to less stockholding by the private sector. It is largely or completely self-defeating.

5. Joint Ownership of Foreign Suppliers Production Facilities

The most important joint venture between developing countries outside the ASEAN concerns Industries Chimiques de Senegal, which includes sulphuric and phosphoric acid units near the Taiba phosphate rock mine and storage facilities for phosphoric acid and for ammonia, together with a mixed fertilizer plant and related facilities, at M'Bao near Dakar. The basic daily capacities are 1,900 for sulphuric acid and 780 tons for phosphoric acid. Foreign partners account for 38 percent of the total capital, of which much is held by the government of India and two Indian fertilizer companies. Under a 15-year contract, the Indian partners are contracted to purchase 110,000 tons of phosphoric acid annually. According to FAO (FERT/87/4 of January 1987), production was only 67 percent of design capacity in 1985/86, so that "with this output and the prevailing selling prices, there was only a small margin left for the repayment of

debt." However, the Indian partners have continued to take their contracted tonnage of phosphoric acid.

Through its participation in the ASEAN ammonia/urea plants discussed more fully below, the GOP was originally party to an agreement that required plants in Indonesia and Malaysia to give priority to Thailand and the Philippines after meeting their own domestic needs. However, the Philippines took only some 5% and 14% of its 1985 and 1986 annual urea imports from the Aceh plant, since its prices were higher than those prevailing in the world market. With the 1986 liberalization of Philippine fertilizer and marketing, private importers became free to obtain their urea imports as best they could. However, the GOP has recently used Dutch untied fertilizer aid to buy a total of 75,000 tons of urea from Aceh and Bintulu. At the same time Aceh has not always been in a position to honor its side of the marketing agreement when the government of Indonesia has imposed an embargo on urea exports, as in 1985. Finally, it is understood that docking charges at Bintulu are exceptionally high and constitute a significant disadvantage for material from this source.

It would appear that the Aceh and Bintulu marketing agreements are in abeyance by the mutual and possibly tacit consent of both sides to each contract, without prejudice to their reactivation at some future date.

The equity sharing arrangement with the Government of Nauru in the financing of PHILPHOS in exchange for an assured supply of phosphate rock seems about to be terminated. The government of Nauru has indicated its desire to withdraw its interest and equity participation. PHILPHOS now takes virtually all of its rock from other sources, with Morocco as the predominant supplier. This is apparently simply a question of price, since PHILPHOS stands ready to buy from all suppliers at relative prices strictly related to the P2O5 content of rock, adjusted, if necessary, for any additional expenses that would be required in processing material from any particular source.

E. National Measures

Three major fertilizer policy instruments are evaluated, in particular, their potential for successfully addressing problems of severe price instability and supply disruption in the fertilizer sector.

- Temporary fertilizer subsidies,
- Temporary price control, and
- Measures to promote and maintain competition in the marketing system.

1. Temporary Fertilizer Subsidies

Fertilizer subsidies at times have been a particularly powerful instrument in offsetting the adverse effects of severe increases in the plant nutrient/crop price ratio or decreases in real farm incomes. However, it is difficult to attempt differential treatment among the main crops (e.g., attempting to confine the subsidy to foodgrains only).

In view of the well-known tendency for "temporary" subsidies of any kind to show a remarkably long life and of the fact that other measures are better targeted to some of the important components of a particular agricultural crisis, it should be stressed that: (1) subsidies should be used to stagger the impact of substantial price increases that are inevitable and that they should be recovered as soon as possible; (2) subsidies should be imposed at the level closest to the border; and (3) subsidies should be used on world market prices, not on domestic production costs.

2. Temporary Price Controls

Temporary price controls could be an adjunct of temporary sudsidies if it were felt that the marketing system were not sufficiently competitive to pass on the full financial benefits to the farmer. However, care must be taken with regard to the levels at which they are set, lest they squeeze importer-distributor margins too low to give an economic return, in which case they would probably lead to a rapid run-down of stocks and of imports, especially by businesses that have readily available alternative trading opportunities. In this case, controls would be no more than a temporary and counter-productive expedient.

3. Measures to Promote and Maintain Competition in Marketing

Here the government role is to ensure the largest number of competitors compatible with efficiency at all stages of the marketing system, and to maintain a regular check of the size of margins and, if possible, of the profitability of the principal importers and other major marketers.

F. Short-term Fertilizer Emergencies

1. General Considerations

A fertilizer emergency is regarded as applying only to important disturbances to market prices or supplies of fertilizers which are likely to last for a relatively short period, usually not more than 18 months to two years and

sometimes much less. In principle, such emergencies might include one or more of the following situations:

- o A sharp temporary rise in farm-gate prices of fertilizers due to factors affecting the international market, particularly a major disruption of supply,
- o a period of exceptionally high international fertilizer prices, which will be faced at peak periods of the cycles as already discussed,
- o a severe physical shortage of supplies due to a complete breakdown in the availability of international or domestic supplies,
- o a sharp temporary rise in fertilizer prices due to a collapse of competition in marketing.

However, as indicated in the following review, some of these four cases are generally not serious in practice.

2. A Sharp Temporary Rise in Fertilizer Prices Due to General Demand and Supply Factors in the International Market

Given the considerable excess capacity existing throughout the world fertilizer industry, described in some detail in annex 2, this risk is not given much importance over the next two years in nitrogen, three years for phosphates and possibly longer for potash. Towards the end of these periods for phosphate rock and potash, there may well be a good chance that Morocco and PHOSROCK will establish an effective regime of price leadership in the one, and Canada and the COMECON in the other. If so, these developments will bring forward the timing of cyclical price recoveries.

A prolonged closing of the Straits of Hormuz would have an immediate and substantial effect on the prices of ammonia and urea, and would be particularly severe if it were to occur more than two years from now when excess capacity in nitrogen should be much reduced. This event probably should be given little chance, since it would seem that none of the parties involved have an economic or military interest in such an outcome. (Should it happen, it would be a double blow for the Philippines in view of PHILPHOS' large exports to Iran).

In the event of a sharp rise in international fertilizer prices, the first need will be to establish whether it is likely to be reversed fairly soon, or at worst, level off at a plateau that is likely to be maintained for a year or somewhat longer. In these circumstances, the GOP might employ a temporary subsidy, to be recouped either when prices fall or during the plateau

period. Temporary price controls might complement the subsidies if there were conclusive evidence that the major benefit of the subsidy would not flow to the farmer--subject to the qualification that marketing margins could be maintained at an adequately profitable level.

However, it is much more likely that price rises will be part of the longer-term cyclical recovery, whether or not there is price leadership or cartel-like action in phosphate rock or potash. The upward course will not be smooth and may even include some short downward fluctuations. But the general tendency will be strong, offering no scope for temporary, self-financing subsidies or temporary price controls. It will be important for the GOP not to become locked into subsidies in this case.

3. The Cyclical Peak of Fertilizer Prices

A special case for temporary fertilizer subsidies would be the one-to-two-year period when international prices were approaching and passing through the cyclical peaks discussed earlier. This phase of the cycle will be much more difficult to identify in the hurly-burly of actual political and market conditions than it is in a consultancy report, especially as it will come after a period when the GOP is likely to have been subject to considerable pressure from farmers and importers for financial relief from the substantial increases that will have already occurred as prices recover from their exceptionally depressed present levels. However, the GOP will have one important set of guides, namely its own regular updating of the trend (equilibrium) of C&F actual and inflation-adjusted fertilizer prices, which is a specific recommendation of chapter VIII. It might work according to the rule that the period of cyclical peak is not approaching until prices have been running for several months at more than 15 percent above trend without any expectation of a quick reduction.

4. A Physical Shortage of Importable Materials

Supplies are usually available in the world market, although sometimes at a high price. The only case when a physical shortage might be the fundamental problem has already been noted, a closing of the Straits of Hormuz when the rest of the nitrogen sector is working at or near to capacity. It is regarded as extremely unlikely.

In such a case, however, nothing can be done. Since general physical allocations would be impractical, supplies would need to be rationed by the price farmers were prepared to pay. Temporary subsidies or price controls would be ineffective and would foster a black market. The best that might be done would be for the GOP to persuade marketers to give priority allocations to areas

producing basic foodgrains (unless grain stocks were sufficient to withstand a fall in production)), but such a scheme would be difficult to supervise to avoid the self-evident leakages in it.

5. A Physical Shortage of Domestically-Produced Fertilizers

This eventuality would be caused by a prolonged closure at PHILPHOS, due to a strike or some other factor. It could lead to a situation akin to the previous case under special circumstances, such as a seasonal peak in demand coinciding with unusually low pipeline stocks in the Philippines, prevention of shipment of PHILPHOS factory stocks, and a tight global demand/supply situation causing some abnormal delay in securing additional imports.

In the much more likely case where the world market is able to meet the Philippines' rather limited demand for compounds, and given the short shipping time from foreign suppliers, the GOP could either allow market forces to work unaided or, if international prices were high, abate import duties or provide a temporary subsidy.

6. A Collapse of Competition in Marketing

As described in chapter VI (and in more detail in annex 5), liberalization of the fertilizer sector has seen a dramatic reduction in the share of farm-gate plant nutrient prices taken by marketing and distribution since 1984. This situation has been associated with, and presumably caused by, the emergence of a number of new leading companies in importing and marketing--PHILPHOS and a few general international traders who are also active in a whole range of other commodities. The approximate shares in the primary stages of marketing finished fertilizers for domestic use in January-June 1987 are:

	%
PHILPHOS	31
Three leading groups of international traders	27
Planters Products, Inc.	4
Others	38

At present there seems to be active competition. There are two ways in which it might collapse, at least in theory:

- All or a substantial number of a leading importers might decide to collude, either by agreement or by tacitly accepting the market leadership of one of their group.

- International traders might switch rapidly from handling fertilizers if they become unprofitable, either absolutely or relative to other lines of activity.

Regarding the first of these two cases, international traders are less committed to the long-term marketing of plant nutrient than the two specialized fertilizer companies. Conceivably they could come together if a substantial commercial gain could be made with ease and dispatch, especially if the opportunity arose under the mask of overseas trading pressures, or there was the incentive to recoup some substantial, recent loss (e.g., a serious overestimate of inventory needs and heavy carrying costs). However, they need to be wary of arousing public criticism or providing an opportunity for others to build their shares of total import. Moreover, their share of the market seems too small to give them the necessary influence.

The second case should not prove a serious risk as long as marketing firms are allowed to adjust their margins freely, including changes to recoup any past losses, which should be a tolerable, well-functioning, automatic adjustment process under the present liberalized regime. Perhaps the greatest danger would arise if GOP attempted to control farm-gate prices of fertilizers in an emergency situation to such an extent that marketing margins became seriously unprofitable. In the event of price controls, due regard should be paid to the need for adequate marketing margins.

There is no obvious remedy if effective collusion develops. Unless it were to become manifestly gross, which seems most unlikely, it should be tolerated as the lesser evil on the basis that implicit or explicit commercial understanding would likely break down quite quickly, that the resulting increase in fertilizer prices would probably not be large and, most important of all, that there are no effective alternatives. The creation of public service marketing agencies would almost certainly be expensive and do more harm than good. They cannot be cost-effective one-shot operations and tend to perpetuate themselves in the long run. Nor are agricultural cooperatives sufficiently well developed to be a force for intensifying competition.

7. General Conclusion on the Importance of Fertilizer Emergencies

The difficulties that could arise for Philippine farmers and for fertilizer sector policy makers in the six situations examined could lead to emergency situations in some circumstances, but they are less of a risk than commonly believed. Other emergencies with a fertilizer element belong to general economic or agricultral policy.

G. Measures to Promote Greater Stability in Prices and Supplies of Fertilizers

1. General Considerations

The Philippines must to a considerable degree live with the problems posed by its exposure to changes in world market conditions for fertilizers. However, it may be able to secure some control over short-term changes in the prices of its fertilizer imports and, perhaps more important, find the means to reduce farmers' exposure to major fluctuations in these prices.

2. Normal Long-Term Contracts

PHILPHOS is well placed to make the normal type of contract with foreign suppliers of phosphate rock, potash, sulphuric acid and ammonia, and does so. Planters Products Industries may follow a similar course should it reopen its manufacturing facilities. Importers of urea seem more interested in the opportunities for bargains provided by the spot market, which in the short term is probably to the Philippines' advantage.

Supply contracts give some short-term assurance on prices. But they are subject to frequent renegotiation and do not provide long-term protection from fundamental changes in world market prices.

3. Long-Term Barter Contracts with Foreign Suppliers

Contracts of this sort usually involve some explicit agreement on prices. If not, each party is imputing its own future prices to the commodities to be exchanged in developing its bargaining stance. This type of agreement has exactly the same basic problem of negotiation as a pure long-term price contract. In addition, any barter agreement has its opportunity cost. The product provided by the Philippines (including any phosphoric acid used in its manufacture) could be sold in some foreign market or, if phosphoric acid, could be used for this purpose. Accordingly, possibilities should be at least tentatively explored, while recognizing the low prospects of success and the risk of poor overall economics.

4. Joint Ownership of Foreign Suppliers Production Facilities

a. General Considerations

Schemes of this sort could be along the lines of the Aceh and Bintulu marketing agreements to give the Philippines a specific claim on materials at prices that would fluctuate less than those of the free market. Alternatively, they could aim for

a more indirect form of compensation for these price fluctuations.

b. Aceh and Bintulu Marketing Agreements

Even though the Aceh and Bintulu marketing agreements have not so far provided any assurance of fertilizer supplies at prices acceptable to the GOP or importers, the potential benefits should not be overlooked. The minimum purchase price may be regarded by the GOP as too high, since they are intended to yield an 8 percent return on investment on plants that appear to have exceptionally large capital costs. However, if this is not regarded as a serious problem, the GOP might consider reactivating these agreements.

The aim of such action would be to maintain the interest of the Governments of Indonesia and Malaysia before a substantial recovery occurs in world markets to turn their attention elsewhere. If necessary, the GOP should be prepared to provide some subsidy to ensure its importers' participation while world market prices are depressed below the lower price limit of the agreements. This might be done by a direct payment to importers. Alternatively, the GOP could take ownership of product and sell to its importers by competitive tendering.

c. More General GOP Equity Participation in Foreign Fertilizer Projects

Renegotiation of the Aceh and Bintulu agreements, or the development of new schemes of the same kind, may remain difficult due to the problem of finding a mutually acceptable price formula. If so, the GOP might consider a more radical approach, namely capital involvement in the form of equity participation, by which the GOP does not attempt to insulate itself significantly from world market prices for any supplies it takes from the co-venture, but rather, looks at its share of profits as a hedging operation. The large profits it will secure when world market prices are booming are a substantial offset to its higher fertilizer import prices. When its profits are low, it has the advantage of low world market prices.

The obvious difficulty in extending this approach is the GOP shortage of foreign exchange and its serious international indebtedness. However, as long as GOP involvement were in cost-efficient plants, it would seem to be the type of foreign investment that could legitimately look for support from one of the major international financial institutions, public or even private.

5. Price Stabilization Scheme for Imported Fertilizers

This section requires a note of caution. Chemonics recognizes that a price stabilization scheme raises misgivings over the difficult problems involved, both in securing fertilizer sector support and in implementation. A scheme of the sort presented has not yet been implemented anywhere in the world fertilizer industry. There is a fair track record of failure of similar schemes in the marketing of agricultural export crops. On the other hand, none of the proposals so far reviewed in this chapter are likely to give much relief from the longer-term exposure of fertilizer imports as a whole to price fluctuations. Moreover, there have been a number of successful price stabilization schemes for farmers' export crops in developing countries, involving a more-or-less self-financing system of product taxes when prices were high, and subsidies when they were low. Generally, these schemes have been facilitated by there being a single marketing organization handling the crop.

The same approach could be applied by the GOP to fertilizer imports, especially urea, ammonia and phosphate rock, through its position as the single fiscal authority, imposing surcharges when real CIF prices are below their long run trend and providing subsidies when they are above. The basic idea is described in Figure IV-1, which shows the aim of a self-financing scheme to hold import prices within a stabilization zone, with a levy whenever actual prices fall below the zone and a subsidy whenever they are above.

There would be four principal problems:

(1) The scheme would be unusual and would need to be kept on a sufficiently modest scale to ease the uncertainties in the minds of those who could be intimately involved politically, administratively and commercially.

(2) It would be necessary to ensure that the surcharge/subsidy did not weaken importers' incentives to secure the best prices in world markets and to control their stock levels efficiently.

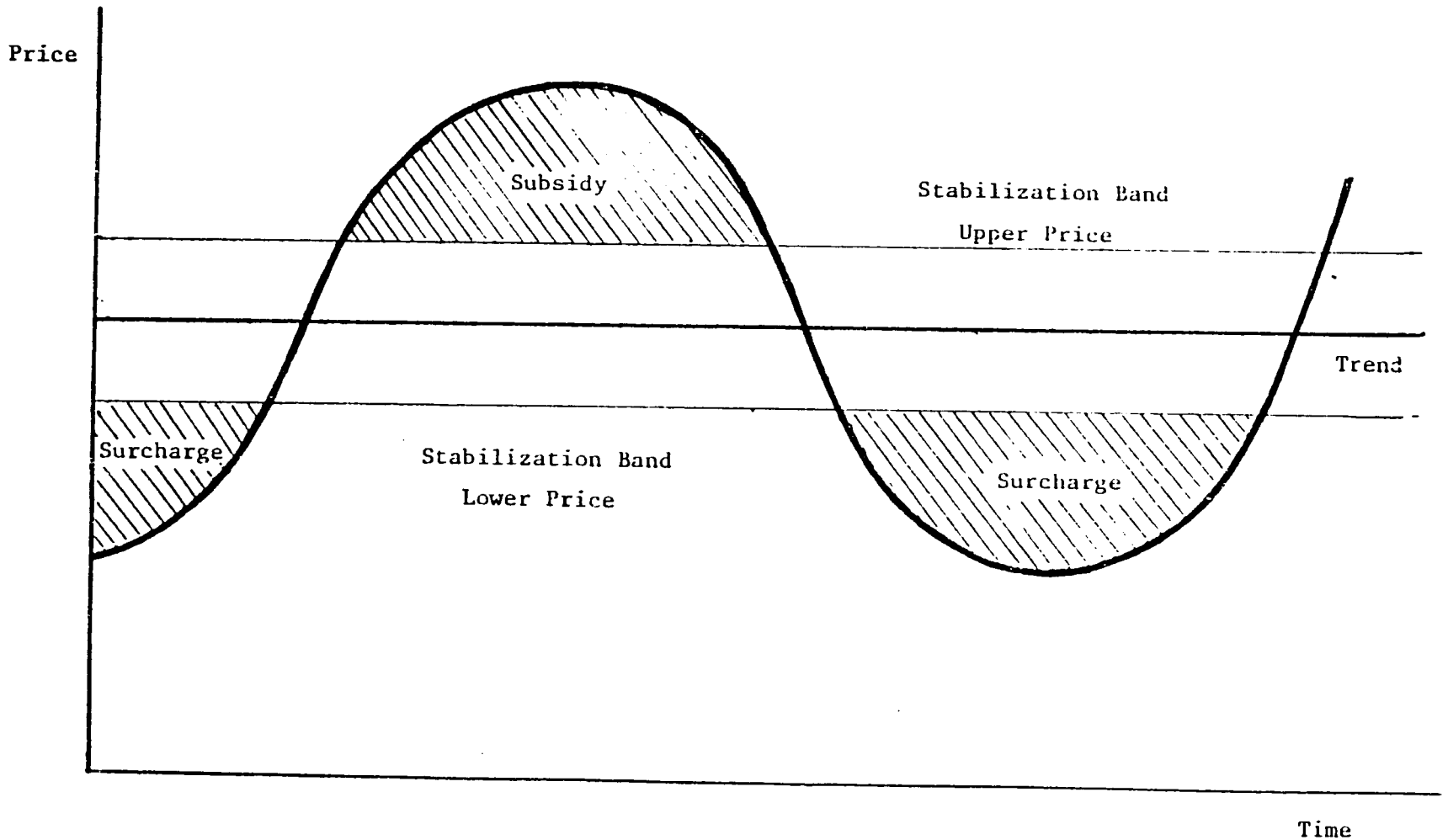
(3) The GOP would have to set "the rules of the games" clearly and not make them liable to arbitrary changes.

(4) The basic staff analysis would best be undertaken in constant dollar values, but it would need regular conversion into current pesos for consideration by the GOP and fertilizer importers.

As regards the first problem, a scheme which attempted to iron out all major fluctuations would be too ambitious. For each

Figure IV-1

Diagrammatic Outline of Price Stabilization Scheme



material covered, it would involve setting a single inflation-adjusted price that would need to correspond, as best as could be forecasted, to the long-run equilibrium price (as discussed in annex 2). If the scheme were started soon, it would mean a sustained period of surcharges of up to five years and a much larger post-surcharge value unit of imports than in a less ambitious scheme.

Over the next price cycle the GOP would need to be content with the more modest aim of leveling out the extremes of fluctuations in international prices.

As regards participants' incentives, each individual importer should be credited with every individual surcharge he had incurred, which would be the principal determinant of his claim to subsidy in a period of high international prices. This credit would need to be a marketable asset that he would be free to sell at any time to other importers, new or well-established, at the going price. There should not be any imputed interest on paid surcharges since the importer would pass them on to farmers, as he would with the subsidies when they arose.

Turning to the "the rules of the game," the essential requirements would be as follows:

- A clearly established inflation-adjusted equilibrium price or target price for at least two years ahead, which would reflect the GOP's best judgment of the long-term real trend in the CIF price for a particular product. For example, if applied to urea and the low price scenario were considered the best working hypothesis, the target price would be $220/ton FOB Northwest European ports as shown in table IV-2 plus, say, $30/ton for freight to Manila. (Of course, materials would not be delivered from Northwest Europe, but from closer sources commanding more or less the same delivered price.)

- The equilibrium price should be adjusted if there was clear evidence that this trend had been identified incorrectly, with however the provision that the previously-determined level should remain in force for its original two years and similarly for any adjustment. There would need to be clear assurance that any change reflect a genuine, impartial reappraisal of the underlying fundamental long-term market forces and not a shifting of the rules to government advantage (e.g., such as raising the target price as a subsidy zone approached).

- The surcharge/subsidy zone should apply whenever the real CIF price was, say, 15 to 20 percent below/above the target price. The surcharge of subsidy would be equivalent to the full size of the zone, with the possible

use of lower values in a phasing-in period. Table IV-4 is intended to illustrate the basic idea. (In a practical scheme, the assumption of a constant freight rate throughout the period would need modification and, as discussed below, the opening surcharges might be scaled down to remove the expected imbalance in receipts and payments.)

Table IV-4

Illustration of Relationship Between Forecast and Target Prices for Urea, Assuming Low Price Scenario At Constant 1986 Dollars per Ton

	Forecast Prices		Target Price	Surcharge/ (Subsidy)
	FOB	C&F	C&F	
1988	$130	$160	$215	$55
1989	140	170	215	45
1990	180	210	215	5
1991	220	250	not applicable	-
1992	280	310	285	(25)
1993	260	290	285	(5)
1994	230	260	not applicable	-
Equilibrium Price	220	250	not applicable	-

- When converted to current peso values all surcharge credits should be adjusted to allow fully for any change in the dollar/peso exchange rate, or for the peso rate of inflation, each from the time the credit was issued and whichever was more favorable to the holder. This provision is to ensure that participants are not expected to hold depreciating paper claims against the scheme.

This scheme would be difficult to operate unless importers/PHILPHOS were willing participants. To secure this result, the stabilization scheme would need to be managed as a joint GOP/fertilizer venture, with importers and PHILPHOS represented according to their respective importance in providing finished fertilizers and importing intermediate products. In addition, the GOP probably would need to give a substantial "donation" to the scheme at its beginning since, assuming it were implemented quickly, it would start in a period when substantial surcharges would be likely and would be seen by importers and PHILPHOS as lasting for a period of many years, whether or not they were correct in that view. Alternatively, there could be a phasing-in period of, say, around one year when the surcharge

could be raised gradually to the full zonal value. This would mean a somewhat weaker scheme, with less accrual of subsidy rights.

Finally, the scheme could be held in reserve until the next period of cyclically high prices, when it could be launched with the temporary subsidies that have been discussed earlier as an emergency action for that period.

H. General Recommendations

1. Fertilizer Emergencies

The concept of "fertilizer emergency" should be restricted to situations where an intervention directly influencing fertilizer prices or supplies is the sole or principal requirement of official policy. As discussed above, these situations are in principle: (1) a sharp temporary rise in international fertilizer prices, (2) as the most likely case of the former, the cyclical peak of prices expected for nitrogen and phosphates in the early 1990s, (3) a physical shortage of supplies in international markets, (4) a physical shortage of domestically produced supplies, and (5) a collapse of competition in domestic marketing. In practice, only the second of these is likely to be serious.

2. Supply/Price Stability

There are three principal possibilities for GOP action:

- o A temporary fertilizer subsidy to mitigate the impact of a sharp rise in international fertilizer prices during the expected cyclical peaks in the early 1990s;
- o Establishment of a long-term fertilizer stabilization scheme, which, as discussed, is quite problematic;
- o Reactivation of the Aceh and Bintulu marketing agreements, subject to renegotiating terms and possible GOP subsidy support as long as world market prices remain below the minimum prices of the agreements;
- o Other GOP equity participation in foreign fertilizer projects.

3. Monitoring

There is need for general monitoring of the demand/supply situations in the Philippine and international fertilizer markets, as will be indicated more fully in chapter VIII and annex 7. Regular national and regional surveys of fertilizer marketing costs should be undertaken as a critical

input in assessing the performance of marketers and the risks of any threat of a collapse in competition.

CHAPTER V

PHILPHOS: INTERNATIONAL COMPETITIVE STATUS AND PROFITABILITY 1987-1997, PROTECTION OF ITS DOMESTIC MARKET

A. Introduction

The review of the competitive status and future profitability of PHILPHOS, which constitutes most of this chapter, is summarized from the detailed analysis in annex 4.

B. PHILPHOS Capacity

The PHILPHOS plant came into operation in 1985 as a large, mainly export-oriented, phosphate-based plant. Apart from an ammonium sulphate unit, which has since been closed as uneconomic and need not be considered further, it has a nominal capacity of 384,000 tons of phosphoric acid (100 percent P205 basis). On a P205 basis, its product mix was originally described as 62 percent DAP (or MAP, which has not yet been produced in significant amounts), 16 percent compounds (14-14-14, 15-15-15 and 16-20-0), and 22 percent merchant grade acid. Most of the DAP/MAP and all of the merchant grade acid were to be, and are, exported. The greater part of the compounds was intended for domestic use. However, as has happened in 1987, the plant's flexibility permits a large increase in total compounds at the expense of DAP to take advantage of changing relative product profitabilities in world markets.

C. The Economic Basis of the PHILPHOS Development

It has always been recognized that the project suffers from one large disadvantage against export-oriented competitors (particularly U.S. producers, mainly in Florida and also North Carolina, Morocco and Jordan) that would determine the long-term levels of world market prices of DAP/MAP, namely the cost of its phosphate rock. The location of the competition alongside or near large, low-cost rock mines enable it (1) to avoid the long distance transport of this material, which is low in P205 content compared with intermediate or finished phosphates, (2) to use lower grades of rock, cheaper per unit of P205 than those that are most economic to ship to the Philippines, and (3) in some cases to make further savings by using semi-beneficiated wet rock. Most other exporters of compounds, if not near to a mine, are increasingly in a position to reduce inward freight by importing phosphoric acid at 54 percent P205 as against 32-35 percent in high grade rock.

These disadvantages were appreciated in the planning of PHILPHOS. They were expected to be offset by exceptionally favorable costs of sulphuric acid and freight to Southeast Asian

markets--which have not been realized to anywhere near the extent expected. This disappointment has been aggravated by the extremely large cost of the plant.

D. Sulphur, Ocean Freight and Capital Costs

1. Necessary Advantage on Sulphur Cost Not Realized Fully

PHILPHOS was planned on the basis that all sulphuric acid would come from cheap local sources and that competitors would face high prices from the main world market suppliers, giving respective costs equivalent to around $80 and $160 per ton of sulphur (by implication in the December 1981 Explanatory Memorandum, at 1986 constant dollars).

The failure of PASAR to build a second copper smelter has meant that at a 90 percent operating rate PHILPHOS must import up to 265,000 tons out of a total requirement, depending on product mix, of up to 1,305,000 tons of sulphuric acid. On this imported acid there is likely to be at best a minor cost advantage against foreign phosphate producers. World market prices of sulphur are expected to remain well below $160/ton (constant 1986 dollars) for most of the next ten years. In 1988 PHILPHOS is likely to be paying the equivalent of around $77/ton of sulphur for its local acid and $109/ton on imports from Japan, while its principal competitors are paying at most $145/ton C&F, with much of their supplies coming from the spot market at under $125/ton. It is only towards the end of the 1988-1997 period, and assuming the high price scenario were realized, that world market sulphur prices might come close to giving PHILPHOS the cost advantage it was expected to have from the beginning. Even then, PHILPHOS will need to import about 10 percent of its requirements at C&F prices not appreciably lower than the costs to its main competitors.

2. Freight Advantage on Exports Likely to Fall Far Short of Expectations

The 1981 Explanatory Memorandum envisaged a freight advantage to the Southeast and East Asian markets of around $50/ton against Florida producers in 1984, again presumably on a constant dollar basis. In the event it seems to have been around $20/ton in 1987, reflecting mainly the importance of the Chinese and Thai markets and the Philippines' favored position to Iran, as long as the Iran-Iraq war means that other major producers can supply that market only by indirect shipments through intermediaries in third countries.

The analysis below allows for this advantage to improve by 1993 to $28/ton of product at 1987 dollars, reflecting a general recovery of dry cargo freight rates and a greater proportion of sales to the nearer Asia markets. However, this is balanced by

the adverse effect of freight charges on the C&F cost of phosphate rock. The analysis makes no allowance for the Philippines' loss of its special advantage to Iran which is likely to follow the end of the Iran-Iraq war, whenever that should be.

3. Extremely Large Capital Costs

PHILPHOS' book value capital is:

Fixed investment	$427 million
Interest expense during construction	119
Other finance	10
Working capital	35
TOTAL	$591 million

Even allowing for PHILPHOS' pyrites plant, this is far in excess of the capital cost of establishing the same amount of capacity, capable of a similar product mix, in 1980-1985 in a location such as Florida, where the total outlay would have been at most $375 million and probably well under $350 million. (As already noted, the investment in pyritic sulphuric acid has not secured the cost advantage originally expected.)

E. Approach to Analyzing the Competitive Position and Profitability of PHILPHOS

It was not possible to get full costs of production directly from PHILPHOS. Accordingly, Chemonics developed its own estimates of costs for production in 1987, which are set out in annex 4 and which, with some minor changes, take tables 4A.9 to 4A.13 as their starting point. They are used in (1) comparing the critical items of cost that will determine the competitive position of PHILPHOS against typical Florida producers, and (2) providing a base for projecting annual costs to 1997.

Estimates have been developed on the basis of a working assumption that the plant produces only DAP, and not its actual product mix. This short cut, necessitated by the lack of full cost data on all lines, is justified as the basis for assessing competitiveness and profitability of the total operation by two considerations.

- The net profit from converting one ton of P205 into DAP will tend to be the same as that from converting it into one or another of the final products. World market competitive forces and the profit-maximizing efforts of management will ensure this outcome, taking one year with another. There may be significant exceptions to this tendency over, say, particular 6-9 month periods,

sometimes in favor and sometimes against DAP. Indeed, it will be stressed below that 1987 has been a year that has been exceptionally favorable for exports of compounds. But, as long as due note is taken of this fact, the analysis may proceed on the basis of the general tendency to profit equality per ton of P205.

- An adjustment must be made for the extra profit per ton of P205 that is obtained on sales of DAP and compounds to the domestic market, resulting from (1) the locational advantage against foreign competitors, even assuming import parity pricing is rigorously applied, and (2) PHILPHOS' full control over the domestic marketing of its product, so that ex-factory prices substantially exceed those obtained on its exports.

F. Comparison with Florida 1987

1. Costs

Considering only those items of cost that are likely to be important in determining competitiveness, table V-1 summarizes a somewhat more detailed analysis from annex 4 (particularly table 4A.4).

Table V-1

Comparison of Costs Critical in Influencing Competitiveness of PHILPHOS Against Florida Per Ton of DAP in 1987 at 90 Percent Operating Rate

	PHILPHOS	Florida
Phosphoric acid (a)	$96	$100
Ammonia	28	28
Energy	19	11
Management/Labor	4	9
Subtotal	147	145
Depreciation	53	37 (b)
Net advantage on		
--Bagging and transport to FOB	(8)	--
--Ocean freight	(20)	--
Total	172	182 (b)

(a) Excluding energy cost in processing pyrites and producing phosphoric acid, which is included under energy
(b) Maximum, as indicated in text.

Since the capital costs, and therefore depreciation, for Florida may well err on the high side, the foregoing result is best interpreted as an indication that PHILPHOS and Florida are roughly equal at this stage of the comparison.

2. PHILPHOS Domestic Sales

The locational advantages of selling in its domestic market are estimated to yield an extra return for PHILPHOS (annex 4, section C.7) equivalent to $6/ton on the total assumed output of DAP in 1987.

3. Return on Capital

At least a 10 percent return on the opening book value is needed to allow an adequate return on capital. This means an additional $80/ton for PHILPHOS as against a maximum of $54/ton for Florida.

4. Net Result

The foregoing comparison suggests that, if it is imputed the same return on capital, PHILPHOS is at a disadvantage of at least $20 per ton of DAP compared with Florida. This is a somewhat less pessimistic conclusion than the comparison of PHILPHOS' projected annual full costs and revenues for 1987-1997 given below, but it underlines that the company is at a substantial competitive disadvantage in world markets.

G. PHILPHOS Profitability 1987-1997

1. Principal Elements in the Calculatioin

The analysis maintains the working assumption that only DAP is produced throughout the period. Two alternative cases are considered, inflation-adjusted to 1987 values, with prices FOB Philippines projected according to the low and medium price scenarios of annex 2.

To prices FOB Florida are added PHILPHOS advantages on (1) bagging and transport and loading FOB vessel, which is put at $8/ton throughout, and (2) ocean freight rising from $20/ton in 1987 to reach $28/ton for 1993-1997. As already noted, the second item may be somewhat optimistic, since it assumes continuance of the Iran-Iraq war through 1997.

The base for projecting annual full costs of production are the 1987 estimates at $223/ton of DAP, breaking down into $170/ton before depreciation and depreciation of $53/ton. (See discussion of table 4A.5 in annex 4. It must be stressed that realized costs per ton of output in 1987 were substantially lower due to the difference between the assumed specialization in DAP and the actual product mix.)

Two important adjustments have been taken into account in making annual projections from the base.

- Changes are projected in real C&F costs of phosphate rock, ammonia and imported sulphuric acid, with all other items apart from depreciation remaining unchanged (annex 4, tables 4A.6 and 4A.7). The particularly critical element is the increase in ocean freight on phosphate rock, which will be avoided by the principal competitors who are located near rock mines, and will offset the extra advantage the Philippines should get in the cost of shipping finished product. The real costs of the other, domestically supplied items are not expected to change in view of PHILPHOS' poor profitability and limited ability to pay. This consideration applies especially to pyrites and to by-product sulphur from PASAR once the current renegotiations are completed.

- Depreciation is reduced by 5 percent annually from 1987-1997, reflecting the assumed fall in the real value of the nominal book value due to inflation.

Finally, profit is adjusted for the estimated contribution per ton of total output from the extra return obtained on sales in the Philippines over that on exports, rising from around $6/ton of DAP in 1987 to $9/ton in 1997, as a greater proportion of sales are diverted to the domestic market, to meet a demand in plant nutrient rising by around 3.5 percent annually. (See annex 4, C7 for details.)

2. Interpretation of 1987 Estimates and 1988-1997 Projections.

Table V-2 summarizes the results of the analysis. Before turning to a general interpretation, two concerns should be anticipated. First, the estimates for 1987 give a pessimistic view of the year's actual financial performance. As noted above, the amount and profitability of exported compounds in 1987 were much above likely normal levels--a major exception to the general and analytically critical rule that, taking one year with another, the profit from converting a given amount of P205 is not expected to be significantly different whether used for DAP or other products. Second, the FOB Florida prices for 1988 are extremely low in relation to those (around $240/ton) that have obtained in the first month of the year. While some of the recent price recovery reflects the fall in the value of the dollar, much is likely to be temporary due to an unexpected surge in Chinese imports coinciding with tight inventories and the seasonal rise in U.S. demand.

The recovery in profits to 1992 (medium scenario) and 1993 (low scenario) reflects the ending of the current cyclical depression which is currently affecting the whole of the international phosphate industry.

The averages of the annual profits for 1988-1997, including the adjustment for the extra returns from sales in the domestic market, are $30 per ton of DAP for the low price scenario and $37 for the medium, with the trend level for the last few years at $38 in each case. This is a less encouraging result than that suggested by the analysis based on table V-1, which gives a trend in profit of around $60/ton.

More detailed investigation could refine these comparisons, perhaps somewhat in favor of the less pessimistic result. Even so, it remains clear that the outlook for PHILPHOS is much less encouraging than for its main competitors and that it cannot

TABLE V-2

Revenues, Production Costs and Profit Per Ton
of DAP at Constant 1987 Prices
Assuming PHILPHOS Produces DAP only 1987 - 1997

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	$/ton										
Low Price Scenario											
Price FOB Florida	165	192	208	213	233	275	337	275	259	259	259
PHILPHOS Advantages over Florida											
---Bagging and Transport to FOB	8	8	8	8	8	8	8	8	8	8	8
---Ocean Freight	20	20	21	23	25	27	28	28	28	28	28
Price FOB Philippines	193	220	237	244	266	310	373	311	295	295	295
PHILPHOS Costs of Production											
---Before Depreciation	170	175	185	203	223	248	248	240	232	232	232
---Depreciation	53	51	48	46	43	41	39	37	35	34	32
---Total	224	226	233	249	266	289	287	277	267	266	264
Profit -- Above	(31)	(6)	4	(5)	-	21	86	34	28	29	31
-- Adjustments [1]	6	6	6	7	7	7	8	8	8	8	9
-- Total	(25)	-	10	2	7	28	94	42	36	38	40
Medium Price Scenario											
Price FOB Florida	165	202	223	249	301	353	285	270	270	270	270
PHILPHOS Advantages over Florida											
---Bagging and Transport to FOB	8	8	8	8	8	8	8	8	8	8	8
---Ocean Freight	20	20	20	23	25	27	28	28	28	28	28
Price FOB Philippines	193	230	252	280	334	388	321	306	306	306	306
PHILPHOS Costs of Production											
---Before Depreciation	170	178	195	217	246	270	249	242	242	242	242
--Depreciation	53	51	48	46	43	41	39	37	35	34	32
--Total	223	229	243	263	289	311	288	279	277	276	274
Profit -- Above	(30)	1	9	17	45	77	33	27	30	30	32
--Adjustment [1]	6	6	6	7	7	7	8	8	8	9	9
--Total	(24)	7	15	24	52	84	41	35	38	39	41

Memorandum Item:
$80/ton required in each year to yield a ten percent return on the initial total investment of $590 million.

(1) Adjustment due to higher prices on domestic sales than on exports.

expect to come close to securing a reasonable return on capital, especially if it loses its preferential position on domestic sales.

H. Protection of PHILPHOS' Domestic Market

The present and prospective costs of protection are large and are carried entirely by the agricultural sector, falling substantially on some of the poorer groups in the Philippines. It is desirable that any future support should come through general national finances rather than via protective devices that enable PHILPHOS to earn more per unit of output on domestic sales than on exports of the same products.

I. Peso/Dollar Exchange Rate

The impact of any fall in the peso/dollar real exchange rate has not been examined. The net gains in terms of pesos probably would not be great, given that most of PHILPHOS financing is denominated in foreign currencies.

CHAPTER VI

FERTILIZER MARKETING AND DISTRIBUTION

A. Introduction

This chapter assesses the constraints to efficient fertilizer marketing by the private sector and recommends specific measures for the GOP to promote the development of a more efficient private sector marketing system, given the objective of minimizing government control over the sector.

This chapter is a summary of annex 5, which describes in more detail the current fertilizer marketing system in the Philippines, comparing it with the system in place prior to liberalization of imports of chemical fertilizers in April 1986. Annex 5 also examines ways of reducing marketing expenses, more especially through distribution. It assesses the constraints affecting the marketing of fertilizers and suggests ways to overcome them.

B. Highlights of Fertilizer Marketing and Distribution in the Philippines

Two groups of importers/local manufacturers (referred to as "importers") now dominate the market. The first is made up of corporations owned by the Chinese ethnic group, which imported 25% of all finished chemical fertilizer brought into the country in 1986, and 44% up to June 1987. The second group consists of state-owned or state-managed corporations, particularly PHILPHOS, that hold a 28% share of all finished fertilizer sold in 1986 (imported and locally produced) and 37% up to June 1987. The marketing channels that link the Filipino farming community at one end, with the local producers and importers of fertilizers at the other, consist of an entirely private-owned wholesale and retail network served by private producer/importer corporations competing with state or quasi-state-owned entities. Specifically, as of October 1987, the system includes:

- Twenty-four importers, of which two are local manufacturers of NP and NPK compounds. Eighty percent of total importers are represented by ten corporations, of which one is the state-owned PHILPHOS. PHILPHOS is also one of two manufacturing concerns.

- Ninety-nine regional distributors, all privately owned.

- 2,564 provincial dealers and retail outlets, all privately owned as well.

The most notable effect of deregulation has been a significant increase in the number of importers. It has resulted in sharp competition at each step of the distribution chain. The outcome of this situation has been a substantial drop in end-user prices and a slimming of gross margins at every level of the distribution channel, resulting among other things in the disappearance of sales promotion and product development activities by marketers.

Inland transportation of the almost one million MT of chemical fertilizers used annually is entirely carried out by the private sector, mostly using the facilities of the fertilizer distribution network itself.

Storage facilities consist of 621 depots scattered around the country, of which 108 warehouses are held by importers (with a capacity of 426,350 MT). Storage facilities are also wholly owned or leased by the private sector distribution network, with the exception of three warehouses (30,000 MT capacity) run by the state-owned PHILPHOS.

Distribution constraints include the poor quality of inter-island shipping and inadequate unloading facilities in some ports. Because of the multiplicity of importers, unnecessary inter-island cross shipment is probably a constraint as well.

C. Historical

Prior to deregulation, five or six enterprises were marketing locally produced and imported fertilizers:

- o Planters Products, Inc. (PPI)
- o Atlas Fertilizer Corporation (AFC)
- o Fertilizer Marketing Company of the Philippines (FERMAP)
- o Maria Cristina Fertilizer Corporation (MCFC), and
- o the last comer, the state-owned enterprise, Philippine Phosphate Fertilizer Corporation (PHILPHOS) established in 1985.

At one time or another, four of these have been engaged in the local manufacture of chemical fertilizer. With the exception of PHILPHOS and AFC, they all stopped fertilizer production between 1976 and 1984 due to uncompetitive production costs.

D. Current Marketing and Distribution System

After deregulation, any enterprise was free to register as a fertilizer importer. As a result, licenses mushroomed from a steady number of around 5 until 1984 to almost as many as the number of distributors (close to 100). Smaller companies, former distributors, agribusiness companies, transporters, and

agricultural produce traders, because of their knowledge of the farmer community and/or their integration in the agricultural sector, have been able to break into the fertilizer import market, sometimes by serving remote areas where the "big boys" cannot yet go because of their larger overhead. On the other hand, only 30 importers used their license in 1986, and only 24 during the first semester of 1987. The figures include importers and manufacturers of organic fertilizers, non-traditional grades, amendments, etc. It would appear that after a large increase, some non-professional enterprises are now being pushed out of the fertilizer importation business, or are forced to adapt to normal business practices like acquiring warehouse facilities.

Import and sales shares as shown in tables 5A.1 and 5A.2 as well as in graph 5A-1 of annex 5 illustrate this spectacular change. Indeed, 9 to 10 marketers are now required to represent around 80% of the tonnage imported or sold, compared with 2 before deregulation.

At the distributor level, dramatic changes have likewise occurred as a result of import liberalization. It can be said that importers can no longer select their distributors and dictate the terms of agreement as they used to prior to 1986. On the contrary, distributors can now obtain the best prices and sales terms by calling on several potential suppliers. Many of them are doing it as often as they replenish their stocks. This new trend has developed to such extent that some distributors have entered, or are planning to enter, into the importer's circle. In this case they generally import in one national port ("disport") only and do not cover more than a few provinces. A few, who were previously large PPI dealers, are now among the larger importers with national coverage.

Moreover, most distributors now hold two licenses granted by FPA, a distributor license and a dealer license. They use the second in areas where there are no dealers or where they estimate that local dealers are weak.

In summary, in many instances, it has become difficult to draw the line between distributors and dealers on one side and between dealers and retail outlets on the other. In addition, it is not always easy to differentiate importers from distributors. Eventually, the distributor/wholesaler level is probably the one that will completely disappear from the market, as is the case in other countries, for cost-saving purposes. It is also the level of the distribution chain importers can easily ignore, as PPI was doing before deregulation.

Because of the low profitability of fertilizers, importers are trying to diversify by marketing other agricultural inputs such as pesticides. Distributors and dealers who are already selling various product lines or are integrated upwards in

produce trading are considering more and more fertilizers as transport backloads. This is especially true in Central Luzon where it is claimed that half of the rice millers and rice traders are also engaged in marketing chemical fertilizers. All over the country, most distributors are trading in other agricultural produce as well as in general trade, supermarket supplies, hardware, cement, etc.

At the retailer level, however, statistics indicate that fewer dealers than before are holding joint fertilizer and pesticide licenses, possibly because of the shortage of working capital.

As before deregulation, most importers are still Manila-based corporations. However, a few importers among the newcomers now have their head offices in national ports ("disports") such as Cebu and Davao.

Today, because of the low profit margins in the industry, importers cannot afford to keep more than a few administrative and commercial staff nationwide. In general, they maintain these staff only in the regional disports where they import fertilizers and operate a warehouse. PHILPHOS, the new market leader, employs 13 regional salesmen who support 42 quasi-exclusive distributors (sectoral accounts). The large teams of professional technico-commercial staff maintained a few years ago, mainly by PPI, but also AFC, have disappeared.

The number of warehouses held by the trade throughout the country has remained roughly the same from 1983 to 1987: 559 in 1983 and 621 in 1987. The number has fluctuated continuously in the past 18 months, however, as a consequence of various rationalization exercises carried out by fertilizer handlers for cost-saving purposes.

Forward stocking has been adopted by PHILPHOS, which claims that of its 42 distributors, 36 are holding consignment stocks, and only only 2 warehouses are owned and run by the company. A few other importers are now using the same strategy, sometimes without asking any collateral securities.

Most conditions of sale, from importers down the commercial chain, have not changed notably from what they were prior to 1986, especially as far as credit terms are concerned. Indeed, 7 days "clean credit" is now normal practice, but distributors with good financial standing and or a good credit repayment record can still obtain 30 days' free credit against domestic suppliers.

Regarding marketing channels, three patterns are used in the Philippines for the distribution of chemical fertilizers, both imported and locally produced. They are by order of importance, the three-tier, two-tier and one-tier systems. Under the three-

tier system, by far the most common, importers have their bagged consignments trucked from one of eleven disports to their local warehouses. From the importer warehouses, fertilizers are generally lifted by the distributors, who truck them to their own inland depots or preferably, to the dealers' premises, where small quantities (less than one truck load) are lifted by the end-user.

An alternative to the three-tier system is when the importer tranships the product from a disport to one of the country's internal (municipal) ports. There, it is either unloaded into importer warehouses, unloaded into a distributor's own coastal depot, or trucked directly into a dealer's depot, where it is lifted by end-users.

When customer orders placed in advance are large enough (truck load sizes), the distributor delivers them directly from the harbor to these large accounts, such as plantations. Since a dealer is not involved, in effect, it is a two-tier system. A two-tier system also exists when the importer is himself a distributor and goes directly to the dealer level. It becomes a one-tier channel when the latter delivers to large accounts.

When supplies emanate from local manufacturers, a two-tier system generally applies, since AFC, fo example, always sells to its semi-exclusive distributors, and PHILPHOS, for 98% of its NP and NPK production, uses forward stocking to its exclusive wholesale distributors.

E. Efficiency of the Past Versus the Current System

The most noticeable effects of the liberalization of imports of non-locally-produced chemical fertilizers have been:

- o a spectacular drop in the price of fertilizer at the farmer level;
- o a substantial reduction of gross margins at every step of the marketing channel;
- o a significant contraction of marketing expenses and in particular of distribution costs.

1. Level of Prices

As deregulation coincided with the decline of world prices of imported chemical fertilizer, it is difficult to evaluate to what extent it contributed to the decrease of wholesale and retail prices in the Philippines. This is particularly true for urea. For Ammosul and MOP, there was a flattening of import costs and subsequently of wholesale prices starting in 1986. However, retail prices continued to drop.

In the case of locally produced chemical fertilizers such as 16-20-0 and 14-14-14, it is noticeable that the decline of wholesale and retail prices was not as deep as for imports. In fact, transfer prices of locally produced chemical fertilizers are entirely caused by the hardening of competition at wholesale and retail levels. Exactly the same reasoning applies to imported MOP where the wholesale and retail prices did not go down as sharply as urea and ammosul despite an increase in import cost from 1985 to 1987. It can be stated that in this case, the lower price to farmers is a result of deregulation and its most obvious consequence, an increase in competition between a larger number of fertilizer traders. (See graphs 5A-2 to 5A-6 of annex 5.)

2. Gross Margins

As one can judge from the graphs, the effects of competition have been relatively severe on gross margins. For instance, table 5A-13 of annex 5 indicates that for urea (63% of total tonnage imported in 1986), the total gross margin, which is shared among importers, distributors (wholesale) and dealer outlets (retail) to cover all their expenses and mark-ups, has sharply declined from 42% of the farmer's price in 1984 to 19% in June 1987. The gross margin between import cost and wholesale price even became negative in the last quarter of 1986 because of the large tonnage of urea that landed at that time in the country. Tables 5A-14 to 5A-17 of annex 5 show the same trends for the major grades consumed in the country.

A comparison between the evolution of the gross margin for the five major grades used in the Philippines (urea, ammosul, MOP, 16-20-0 and 14-14-14) indicates that the average annual gross margin for these five, weighted according to the percentage of their imports in 1986, came down from around 42% in 1984 to around 20% in June 1987. (See table 5A-18 in the annex.) It reveals that for two locally produced grades, 16-20-0 and 14-14-14, the gross margin declined by two-thirds whereas it declined by between one-third and one-half for imported products, urea, ammosul and MOP.

3. Distribution Cost

It is amazing to note how quickly fertilizer handlers have learned to live with the slim margins left to them to cover their distribution costs. It can be observed in table 5A-19 in the annex that when the cost of bags and bagging for urea are deducted, total distribution costs and net margins amounted to 22.8% of wholesale price (ex-importer warehouse price) in 1984 as against only 14.8% in 1987. Bank and landing charges, warehouse handling, and administrative and selling expenses have generally diminished between 40% and 60%.

It must also be stressed that in 1987, distribution expenses (transport, handling and taxes) covering the lower steps (wholesale and retail) of the marketing channel are based on a two-tier system. Therefore any transit of fertilizers through an additional level such as a distributor's premises would imply a net out-of-pocket loss. Moreover, any profit for the wholesaler and the retailer will have to come from the already reduced net margin of the importer (1.87% of the farmer price).

The distribution costs of urea in 1987, compared with those recorded by FADINAP for 1985/86 in selected developing countries of Asia and the Pacific reveal that in 1987 the Philippines is among the lowest in distribution expenses and net margins (mark-ups).

Regarding the possibility of further contraction of distribution costs, the only item that seems capable of improvement is bagging costs, which are lower in other countries than in the Philippines.

F. Marketing and Distribution Constraints

1. General

As discussed in preceding sections, the most important constraints to efficient fertilizer marketing by the private sector can be summarized as follows.

With respect to marketing issues:

- o low profitability of chemical fertilizer marketing;
- o limited range of chemical fertilizers due to high customs duties (32%) on NP and NPK compounds and the restrictive distribution policy of local manufacturers for NP and NPK;
- o high inventories at the importer level due to lack of information on the domestic stock situation for imported fertilizers;
- o unfair competition of poor quality products (product alteration, bag underweight, etc.)

With respect to distribution issues:

- o inter-island shipment deficiency, poor harbor facilities, particularly unloading facilities in some disports, and an inferior barge fleet;

- o difficult access to and/or uneconomical market size for fertilizer in some parts of the country, classified as "remote areas";

With respect to end-user issues:

- o utilization of low analysis grades of NP and NPK compounds;
- o shortage and therefore high cost of credit at the end-user level;
- o inadequacy of the small farmers' advisory service not only in agronomic principles but probably more in fertilizer use economics.

The constraints enumerated above as well as the ways to overcome them are examined in detail below.

2. Low Profitability of Chemical Fertilizer Marketing

This recent development will not encourage newcomers to enter the market. On the contrary, the number of fertilizer handlers has not increased, with the exception of importers. Also, there are signs that the dominant three-tier marketing system might be progressively replaced by two-tier channels, at the expense of the wholesale level.

Under the present circumstances, fertilizers are becoming a sideline, important only to provide backloads to handlers who trade in other voluminous commodities. One can even fear that the number of importers might return to a limited number such that the risk of collusion might appear. Although more remote, the same danger might arise at a lower level of the distribution chain, where completely integrated agricultural traders might control supply of inputs, credit, and output marketing.

3. Limited Range of Chemical Fertilizers

As already discussed, locally produced NP and NPK compounds are excluded in practice from the range of chemical fertilizers available to importers. This is due to the high customs duty barrier (32% on CIF) that is protecting local manufacturers and to the marketing policy whereby local producers sell their NP/NPK grades directly through a semi-exclusive network of wholesalers, completely by-passing the importer level.

Consequently, during the first semester of 1987, the trade had to limit its sales to three products, representing 99% of imports (urea 75%, ammosul 13% and MOP 11%).

4. High Inventories

Opinions expressed during the field visits suggested that the high urea inventories built up to October 1987 were caused to a considerable degree by overly optimistic sales forecasts and inadequate information on national and regional inventories. However, this situation may reflect shrewd and successful forward buying at a time of exceptionally depressed international prices, leading to considerable saving of foreign exchange.

5. Unfair Competition From Poor Quality Products

Unfair competition from unscrupulous fertilizer traders was reported by almost all fertilizer handlers encountered. The most frequently reported practices were bag underweight and adulteration of products with foreign materials. Neither of these allegations could be verified, nor the assertion that FPA provincial co-ordinators do not have the logistical means to carry out systematic checks among traders and only act when illegal practices are brought to their attention. It was also generally affirmed that a provincial co-ordinator's reaction and the subsequent legal procedure are too slow to be real deterrents. As mentioned in the preceding section, this problem could be partly resolved by improving the efficiency of the FPA coordinator. It must also be remembered, however, that FPA co-ordinators are implementing pesticide functions of FPA as well, and that out of a total of 94 co-ordinators for 74 provinces, only 25 are full-time FPA staff.

Another infringement that is widely reported (and visible) is the imitation of PPI's bag labeling pattern and color as well as the proliferation of the use of the word "planters" in the company names of new importers. This is being done in order to benefit from the high brand image of Planters Products, Inc.

6. Shortage and High Cost of End-User Credit

It is generally agreed that less than 5 percent of the agricultural input credit requirements of small farmers without collateral are financed at cheap interest rates from formal institutional funds. The difference of 95% has to come from informal private sources. It is reported that even farmers with access to collateral also borrow from non-institutional sources.

Practically all fertilizer handlers met during the course of the study were of the opinion that the lack of cheap credit for small farmers is one of the major constraints affecting the growth rate of chemical fertilizer demand in the Philippines. With the advent of land reform, another source of informal credit is drying up, i.e., the possibility for the tenant to borrow from his landowner.

7. Inadequacy of Small Farmers Advisory Services

All fertilizer handlers met during the study complained about the poor support received from the extension service, mainly because of the inefficiency of this institution, further aggravated in some areas by the political situation. As mentioned in the preceding section, most of them stressed that the first priority as far as training small Filipino farmers is concerned should be the economics of input use and the importance of credit worthiness, rather than actual fertilizer use.

8. Utilization of Low Analysis Grades

It goes without saying that the utilization of high analysis grades will allow savings in the transport of fertilizer. The prospects for any change are treated in the following chapter on fertilizer use.

9. Inter-island Cross Shipment

In 1985, the total domestic fertilizer trade flow (in + out) after deducting Leyte (PHILPHOS plant) and Cebu traffic (partly AFC plant production) was 430,440 MT, while total sales that year were 710,210 MT. These figures are far too rough to permit an evaluation of the magnitude of the problem and ways to monitor it, but they show that this distribution constraint might be an important one that should be investigated. The multiplicity of importers, however, makes the issue more problematic, especially when it is generally considered uneconomical to unload imported fertilizers in more than two harbors for the lot sizes in question. Cost-saving exercises therefore require a perfect knowledge of market demand as well as inventories per product and per area. FPA's monthly information feedback to the trade on inventory levels, as discussed below, will be essential in this regard.

10. Remote Areas

Based on the few available indicators (presence of fertilizer distributors, dealers and warehouses), the servicing of remote and partially remote areas has not significantly deteriorated as one might have feared following deregulation of the import of non-locally-produced chemical fertilizers. This situation is helped by the activities of the smaller marketers who like to trade in remote areas, whereas the "majors" cannot compete there due to their higher overhead costs.

Upgrading provincial distributors to the importer level, particularly in Cebu, which is strategically located at the geographical center of the country, might also have contributed to the servicing of remote areas in the Visayas, as one can

expect, but also in the Northern Mindanao provinces. Better knowledge of these areas by provincial importers, who are usually integrated upstream in the purchase of agricultural outputs, gives them a distinct advantage over their competitors based in Manila.

11. Port Unloading and Bagging Facilities

Mechanization of unloading can only be achieved with bulk materials. Bulk imports, bagged on shore, reached 74% (346,140 MT) of total imports during the first half of 1987 as against 35% (301,470 MT) in 1986. Savings on demurrage costs could theoretically be achieved by bulk unloading in dump trucks and by bagging in nearby warehouses instead of pier bagging alongside vessels or barges.

This matter is being studied by several importers, also with the possibility of warehouse bulk blending. The resulting savings in the latter case would be a minimum of P 500 per MT depending on the NPK grades and lot sizes involved.

12. Import Lot Sizes

In the present free trade context, centralization of imports does not seem possible anymore, as it would imply restoring strong governmental control over private sector importers. However, available data on import consignments of fertilizers seem to indicate that their sizes have increased compared with 1982. Indeed, 83% of the tonnage imported in the last twelve months consisted of lot sizes over 10,000 MT against 70% in 1982, while average lot sizes increased from 10,490 in 1982 to 12,440 MT in 1986/87. Several of the new small importers have been grouping their imports during the past twelve months.

G. Recommendations

To promote more efficient private marketing with a minimum of government control, the following recommendations should be considered:

- As part of a general improvement in market intelligence, FPA should review its methods of data collection, particularly with regard to inventories. This task might include improvement of field coordinators' capabilities in data collection, or alternatively, a special unit in FPA headquarters for building up a comprehensive statistical system along the lines of the proposals made by IFDC for Bangladesh. (Also see annex 6.)

- FPA should develop a program of marketing studies. In addition to a continuing analysis of margins and profitability, specific studies should be considered for

(a) inter-island cross shipment, (b) warehouse bagging and blending, (3) inter-island shipment and port loading facilities, (4) a study of retailers (profile, business viability, and credit provisions).

- o Dealer training (administrative, financial and general business operations) should be promoted using IFDC methods and extension service courses.

These recommendations are outlined below and considered in more detail in annex 5.

1. Lowering of Fertilizer Prices

One of the specific recommendations listed in the objectives of the study was to provide measures that if implemented, would lead to lower fertilizer prices.

As demonstrated in section E3 above ("Distribution Costs"), a further reduction in end-user prices cannot come from fertilizer handlers' net margins, which are already alarmingly slim. Consequently they can come only from import and/or local manufacturer prices and from a reduction in distribution expenses.

a. Competitiveness of the Marketing Channels

As discussed before, the low profitability of chemical fertilizer marketing might discourage present handlers. Their number might fall to such a low level that the risk of collusion would appear. Should this risk materialize (e.g., product shortage with consequent price increase) the FPA market intelligence unit should be able to detect signs of market disturbance and suggest appropriate measures.

Down the line, as stressed before, the dominant three-tier marketing channel might be progressively replaced by a two-tier channel following the up-and-down-stream integration of the distributor (wholesaler) level. This would be a natural and rational evolution in line with slim marketing gross margins. However, the lower end of the marketing chain, the dealer level, requires the special attention of FPA. An evaluation should be conducted of the viability of business at the dealer level. Its objective would be to determine what actions would best serve the farming community in exchange for a fair return to the retailer.

This study should also investigate the availability of credit for working capital and investment in storage and transport facilities. At this stage it can already be recommended that dealer competitiveness be maintained, if not improved, by training in administrative, financial and

operational aspects of their business, similar to the work of IFDC. This task could be entrusted to FPA.

The training of retailers in fertilization should remain the responsibility of the DA extension service. FPA should monitor the effectiveness of this training and, if necessary, sponsor "train the trainer" courses at the level of the extension service specialist.

b. Inventory Analysis

If a new system is developed for improving market intelligence, FPA is the best agency to fulfill this role, since it already receives from fertilizer importers a monthly report containing data on the importers stock situation in various warehouses. FPA also knows about fertilizer import flows, as it issues import certificates to importers for the opening of L/C's and issues tax exemption certificates upon arrival of fertilizer consignments.

On the field side, FPA collects data at the dealer level through its provincial co-ordinators, who have to make up for missing or inaccurate information. It is claimed that the results of these monthly exercises are unreliable and that the system should be dropped. However, it is generally true that in other parts of the world, retailers can be the source of reliable firsthand market data. It is felt that in the Philippines, the FPA provincial coordinator is well placed in the FPA organization to gather information from dealers, and to interpret them. He should also supplement these data through contacts with other agricultural entities outside the fertilizer sector (DA institutions, farmer cooperatives, grower associations, agricultural produce traders, NFA, agribusiness, transporters, financial institutions, etc.). He can become, if properly trained, an expert on fertilizer market intelligence in his area. Thus, the means to improve his performance must be investigated, possibly by improving his income and mobility. By giving the FPA co-ordinator the appropriate means to perform his responsibilities, his professional satisfaction, and eventually his loyalty to the institution, will increase.

Alternatively, FPA may wish to spearhead the improvement of market intelligence through a full-time specialist group of statisticians and field investigators, along the lines IFDC has proposed for Bangladesh.

In its Makati head office, FPA will have to take every necessary measure to process quickly all information received and to release it to traders as soon as it is available. A fee could be charged for this service, which would be a good way to test its usefulness.

c. Saving on Distribution Expenses

As discussed before, inter-island shipping is possibly the major constraint to fertilizer distribution in the Philippines. Overseas or cross shipment over the archipelago might be responsible for the transport of large amounts of unnecessary cargo. Consequently, FPA should sponsor a survey of this sector.

The study could be part of a larger one concerning the economics of monitoring inter-island shipment as well as port loading, and warehouse blend bulking and bagging. It should be pointed out that in Manila, where 325,000 MT or 40% of the national imported fertilizer traffic was handled in 1986, unloading is entirely done by barges from anchored vessels. If the present rate of bulk urea imports is maintained, it will also be worth investigating the adequacy of the present loading, unloading and bagging facilities in the major harbors since the scale of the operation might justify additional investments. Finally, the study should cover the economics of warehouse bagging as well as the economic, technological, and commercial aspects of warehouse blending. Warehouse blending, if viable, would improve the trader's profitability and might, to some extent, force down the transfer prices of PHILPHOS and AFC NPK grades.

2. Strengthening FPA Coordinators' Efficiency

FPA's field force should be strengthened and trained as market information collectors, as recommended above.

3. Reducing Credit Charges for Small Farmers

FPA should participate in sponsoring a survey to update knowledge of non-institutional credit channels to allow small farmers to finance their agricultural inputs. (If such a study is implemented, attention might be given to the guedan concept.) The availability of less expensive credit might to some extent break the dependency of small farmers on "input/output integrated marketing channels." In addition, the extension service should take responsibility for training farmers in the importance of credit worthiness.

4. Improvement in Servicing Remote Areas

Further improvements in servicing remote areas, if any, will certainly be slow for economic reasons. Improvements might be possible following the establishment of regular liner services, better port facilities in remote islands, and development of the road network in inland areas.

CHAPTER VII

FERTILIZER USE

A. Introduction

1. Background

Fertilizer is one of the most cash-intensive inputs and accounts for some 30 to 40 percent of the cash cost of production of most commodities. Obviously, any attempt to improve the efficiency of fertilizer use would have a significant impact on farm profitability. This chapter attempts to do three things: (a) provide a review of available information on current practices, constraints, and opportunities in fertilizer use; (b) assess the prospects of organic fertilizers and biological nitrogen fixation; and (c) propose specific measures for the GOP to enhance efficient use of fertilizers.

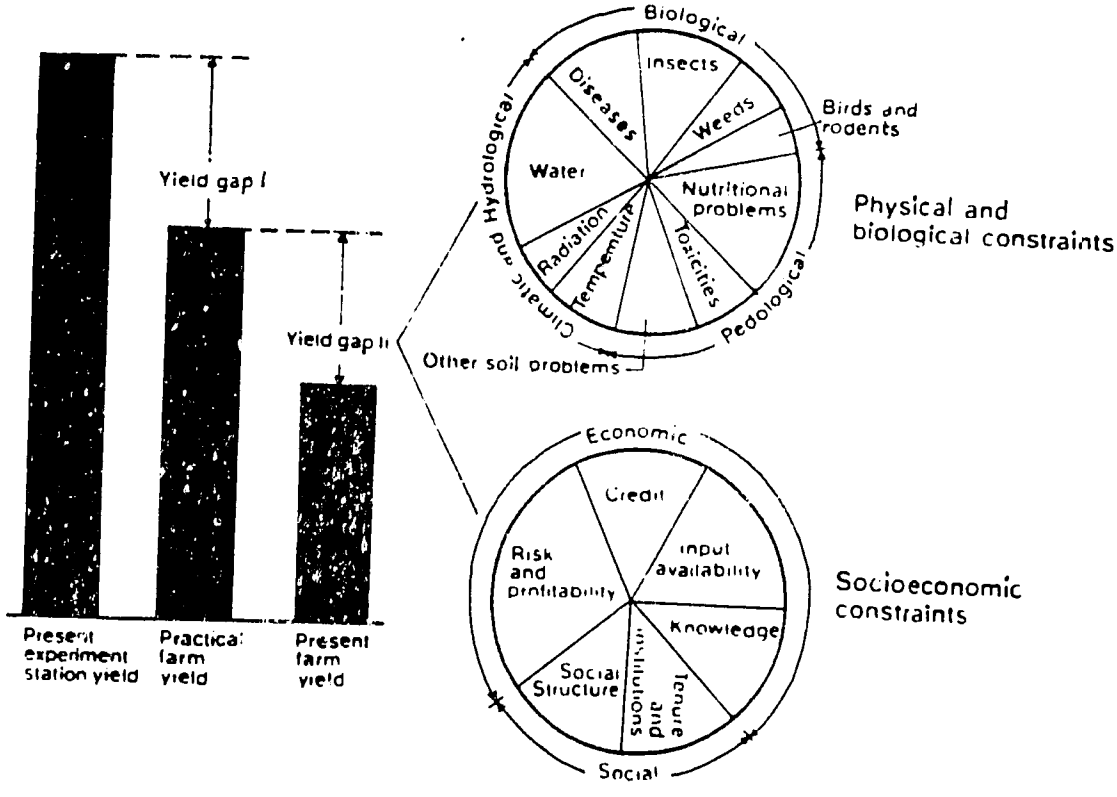
2. Conceptual Framework

The yield that one gets from plants is the result of a multitude of factors related to the fundamental process of photosynthesis. The intensity of the effect of these factors varies depending on the production environment, giving the expected variations in potential yield between different environments. In theory, to characterize an environment in relation to its productive potential, one can envision a production function that describes the greatest possible output from a given combination of inputs. In practice, the yields obtained at experimental fields are used to indicate potential as dictated by the environment. Researchers applying all known technology obtain yield (practical yield) lower than the potential yield due to controllable and/or uncontrollable factors. Ideally, farmers should be getting yields close to the practical yields, but a big gap exists between these levels and those actually obtained. This too indicates the existence of constraints faced by farmers. These constraints are shown in figure VII-1.

Constraints studies have indicated that while researchers are able to increase yield above that of farmers (yield gap II of figure VII-1), the profit is not superior to that of farmers (Mandac et al., 1982). Where farmers' yields are low, it is difficult for researchers to obtain high yields consistently, and where farmers' yields are high, it is difficult for researchers to get much higher yields. In most farm locations, yield gap II is small, and since overcoming the gap entails cost, it has been concluded that efforts may be better off if these are concentrated on raising the yield potential shown by yield gap I (Barber et al., 1980).

Figure VII-1

Factors contributing to the Gap between Present and Practical Farm Yields. Some physical and biological Constraints also contribute to the gap between practical farm yields and experiment station yields.



Thus, research should be aimed at: increasing the potential yield that can be obtained under a given environment, and as far as economically justified, narrowing the overall gap between potential and actual farmers' yields. This yield gap can be due to any one or a combination of the following situations.

a. Mismatch between Technology and Environment

Technologies are, to a certain degree, environment-specific. A mismatch between the technology and the environment faced by farmers can make the technology ineffective. Therefore, one needs a good agro-environmental characterization to enable researchers to define the boundaries of recommended technologies. This problem constitutes one of the biggest barriers to technology adoption in the Philippines, because currently, environments are described in very gross terms.

b. Resources and Socio-Economic Constraints

Even assuming a good match between technology and environment, farmers may still be incapable of exploiting recommended technologies because:

- They lack the resources;
- If resources are available, they lack the managerial ability to use the resources; and
- Even if they have both resources and management ability, the economic environment makes it irrational for them to improve their yields.

In other words, the potential of fertilizer to enhance yields and incomes of farmers is governed among other things by the biophysical environment under which it is used, the management and technical ability of the users, and the prevailing socio-economic environment.

The effect of fertilizer on yield is also closely intertwined with complementary factors affecting yield such as variety and water availability. Maximum effects are obtained if all other factors are at optimum values.

B. Fertilizer Use

Fertilizer use is reviewed in detail in annex 7. The following summarizes the key elements in a rather complex and not yet adequately recorded situation.

In July 1986/June 1987, the Philippines consumed 295,900 tons of N, 51,000 tons of P205, and 46,800 tons of K20. Application rates per hectare of cropped land are low by the

standards of many developing countries in Asia. In 1983 they were 20 kg of N, 4.4 kg of P205 and 5.3 kg of K20. Sugarcane and rice account for around 78 percent of total nutrient use, and corn for some 6 percent.

In the early 1970s, urea accounted for 45-55 percent of total N, as against 20-30 percent from ammonium sulphate. Urea's share had risen to 70 percent in 1983, and to 80 percent by 1987. NP grades account for almost all P205. Muriate of potash supplied 56 percent of K20 in 1986.

There are large differences in rates of use between individual farmers and between regions. Neither can be quantified accurately. The regional differences show considerable disparities in the pattern of total use from one year to the next.

In these circumstances it is impossible to develop accurate output/input ratios on a regional basis. UNICO (1986) attempted such an analysis, suggesting exceptionally high response rates in some areas, which, if correct, point to a fertilizer marketing system seriously incapable of getting plant nutrient to where it can be most productive. The UNICO analysis does not seem to have recognized the difficulties involved in developing accurate regional response functions, however, and its results are misleading. It based its analysis on average relationships for the whole country for each crop, which cannot be justified in such highly heterogeneous farming conditions as are found in the Philippines. (Annex 7 has more detail.)

C. Recommendations

1. Existing Methods of Developing Recommendations

Apart from preliminary use of leaf analysis for coconuts, the Philippines relies on standard soil analysis techniques. Analysis is undertaken principally by the regional laboratories of the Bureau of Soils, although other organizations such as the Philippine Sugar Authority and the agricultural universities have their own testing laboratories. These various units are generally up to the necessary standards of equipment and procedures.

2. Limitations of Existing Methods

The work currently being performed suffers from the inherent constraint of soil analysis itself as a diagnostic tool, since no one has been able to simulate the nutrient-extracting capability of the plant root under natural conditions. The best indicator is still the field fertilizer experiment. However, generalized recommendations have been developed by averaging results of fertilizer trials conducted over wide areas grossly

classified as agro-environmentally homogeneous. Continued reliance on the system of averaging and the failure to adopt values that reflect specific agro-ecological variations and changing economic conditions have resulted in an erosion of farmers' confidence in soil laboratories.

Another basic limitation is the use of nutrient level to maximize yield as the basis for recommendations, without due consideration for the economics of fertilizer use. Steps are now being taken to rectify this weakness through on-farm trials, but there is no systematic effort to coordinate and maximize the benefits of this work.

Finally, the scientific basis for recommendations for phosphate and potash is extremely limited. For example, there has been little work to measure the responses to these two nutrients on sugar. Only a relatively limited amount of land is classified as phosphate deficient, and even here the response to added P is erratic. In the case of K, most Philippine soils are volcanic in origin and still young. So, while there is need for one or another of these two nutrients in some situations, particularly for intensively irrigated areas and coconuts, the value of adding P and K needs a more thorough assessment.

3. Nutrient vs. Grade as Basis for Fertilizer Recommendation

The existing practice for making fertilizer recommendations is to use a nutrient basis. This is further translated to the number of bags of available fertilizer materials. In general, cost on a nutrient basis is cheaper for high-analysis, single-nutrient grade fertilizer compared to low-analysis compound fertilizers such as 14-14-14. For instance, at current prices the cost of a kilogram of N from urea is only 53 percent of the cost of the same amount of nutrient from ammonium sulfate. This is too much of a cost differential to pay for the sulphur content of ammonium sulfate, since gypsum is locally available. The cost advantage widens as transport is included. It is therefore more cost-effective for farmers to use the single-nutrient materials such as urea, TSP and MOP as sources for NPK nutrients.

With the liberalization of fertilizer trade, various fertilizer materials are being marketed. Recommendations on the basis of grade would be very sensitive as they may appear to favor certain suppliers. The argument that less informed farmers will profit from a recommendation on a grade basis may not hold true if the extension service does its job. On the basis of numbers, the Philippines has a very favorable extensionist-to-farmer ratio. The present ratio is one extension worker to 140 farmers. The possibility of small-scale blending (e.g., use of cement mixers) of single-nutrient fertilizer materials, as is

done in the case of plantation crops such as banana and sugar, is feasible for small-scale rice and corn farmers if they can be grouped on the basis of the similarity of their requirements for fertilizer nutrient ratios.

4. Measures to Improve Fertilizer Recommendation Practices

A long-term measure to improve fertilizer use recommendations is discussed below in section D. In the interim, opportunities exist to reduce some of the limitations of current fertilizer recommendation practices. For one, voluminous data exist on fertilizer experiments and soil analyses. Pooling the resources of the Bureau of Soils, the Philippine Sugar Authority, Philippine Coconut Authority, UPLB and other research agencies to collate and process existing data would immediately provide some basis for improving the system. Available data can be aggregated on the basis of soil series, which will permit the spatial delimitation of boundaries of more homogeneous areas on which to base specific fertilizer recommendations.

It is therefore proposed that a standing committee on fertilizer use recommendations be formed to review existing experimental data and fertilizer use recommendations and to implement corrective measures in light of the available information.

This committee should look into recent advances in fertilizer usage and see how the results could be made part of the existing system of fertilizer recommendations. For instance, at IRRI, recently, a method of predicting fertilizer needs based on the empirical relationship between soil N, N uptake, and N soil content appears to show potential for tailoring generalized fertilizer recommendations for rice to site-specific situations (Smith, 1987). Preliminary results indicate that the government recommendation of 80 kg N/ha is adequate for soils of intermediate fertility (0.1% total N). For highly fertile soils (0.2% total N) the fertilizer recommendation can be halved but is too low for low-fertility soils. It has been estimated that annual farm incomes would increase by P 99 to 140 million annually if the Masagana 99's uniform fertilizer recommendation were replaced by tailored rates. These figures dramatize the importance of doing something immediately to rectify the existing scheme.

D. Fertilizer Use Technologies

Numerous studies have been conducted in the past to explore feasible ways to improve fertilizer use efficiency particularly in rice. As a result of these efforts, several fertilizer management technologies have been developed and now form part of the national rice production program of the Philippines. Also, since the bulk of fertilizer consumptions is N fertilizer, a

great deal of attention has been given to the development of management systems to improve its use. Significant advances have been made in the recent past in fertilizer use management such as timing and placement, and the use of fertilizer-responsive crop cultivars.

1. Fertilizer Management in Rice

For rice, improved practices to enhance fertilizer N use are as follows.

a. Use of Nitrogen Efficient Varieties

It has been demonstrated that rice varieties differ in their ability to utilize nitrogen fertilizer efficiently (graph VII-1). This difference in efficiency appears to be related to differences in growth duration, with short-season varieties depending more on fertilizer N than long-duration varieties. What this means is that there are varieties such as IR 36 or 42 that utilize soil N more efficiently and are more appropriate for low-fertilizer inputs. Accordingly, depending on input level, one can choose to use varieties to utilize N fertilizer efficiently .

b. Timing of N Fertilizer

It is important to supply N fertilizer at critical growth stages while minimizing the risks of massive losses due to volatilization, denitrification and leaching. Results have established that minimal losses occur by applying 2/3 of the N fertilizer by broadcasting and incorporating the fertilizer into the soil without standing water, applying the balance of the N as top dress into 5 cm of water at panicle initiation.

Water control during the basal application of N has been found to be critical in affecting N losses. It is recommended that fertilizer N be broadcast and incorporated into the soil without standing water for maximal effect.

c. Placement of N Fertilizer

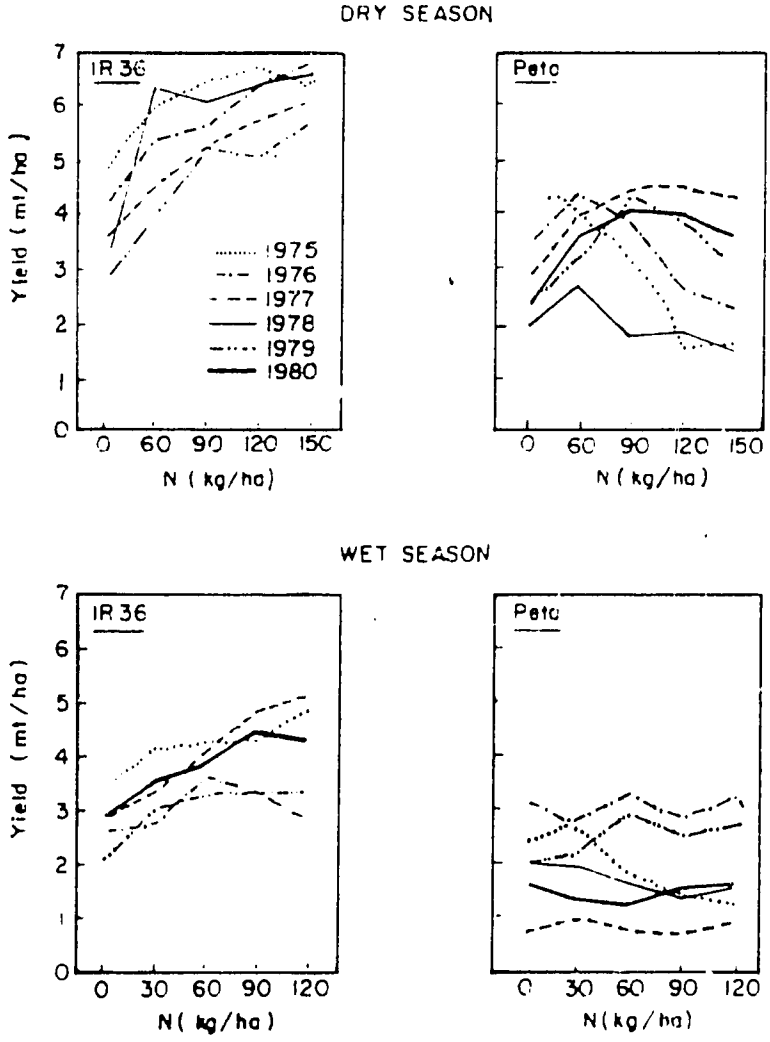
Deep placement of fertilizer in lowland rice has been demonstrated to be the most efficient way to promote nitrogen use by the rice plant. Under development at IRRI is a machine that will facilitate deep and point placement of N fertilizer. A low-cost applicator would facilitate the diffusion of this particular technology.

2. Improved Fertilizer Management for Other Crops

Proper timing and placement of fertilizer materials also improve fertilizer use for other crops. In general, except

Graph VII-1

Nitrogen Response of One Modern(IR36) and One Traditional Rice Variety(Peta) in trials at IRRI 1975-80



for sandy and light soil, it is recommended that fertilizer materials be applied at planting. Planting provides the best opportunity to properly place and cover the fertilizer. Where probabilities of leaching and erosion losses are high (such as sloping and sandy soils), it is recommended that N and K materials be applied in split dose, with all the P requirements applied at planting. For split application, it is important to put in the second dose before the onset of vegetative growth. In sugarcane, delay of N application retards ripening of the cane and results in inefficient fertilizer use.

Top dressing of N, failure to cover the material properly, and erosion are the main causes of fertilizer loss in upland crops such as corn and sugarcane.

3. Liming

Most Philippine soils are acidic. The estimated area of upland soils with pH 5.5 or less is 9.6 million ha (IRRI, 1985). Common problems associated with acidity vary from toxicity of Al and Mn and associated low levels of Ca, Mg P and Mo. Liming to correct acidity brings the nutrient-supplying capacity into a very favorable balance, thereby enhancing efficient use of applied fertilizer nutrient. The effect of acidity on yield is shown in graph VII-2. As shown, corn can tolerate a slightly acidic situation compared to legumes such as mungbean and soybean.

4. Nutrient Ratios in the Soil

Studies point to the importance of nutrient balance to optimize fertilizer response. Some elements are known to influence the behavior of others, such as the well-known P/Zn, Ca/Mg and N/K interactions. In sugarcane for instance, excessive N and rainfall that retards ripening and hence reduces sugar content is offset by adding more K. Some soils are deficient in certain elements such as Zn, and application of P aggravates the deficiency. More studies are necessary to guide farmers concerning the micro-element status of Philippine soils, particularly those in irrigated or sugarcane-producing areas. Due to high fertilizer input levels in these areas, it is probable that other nutrients apart from NPK are already limiting.

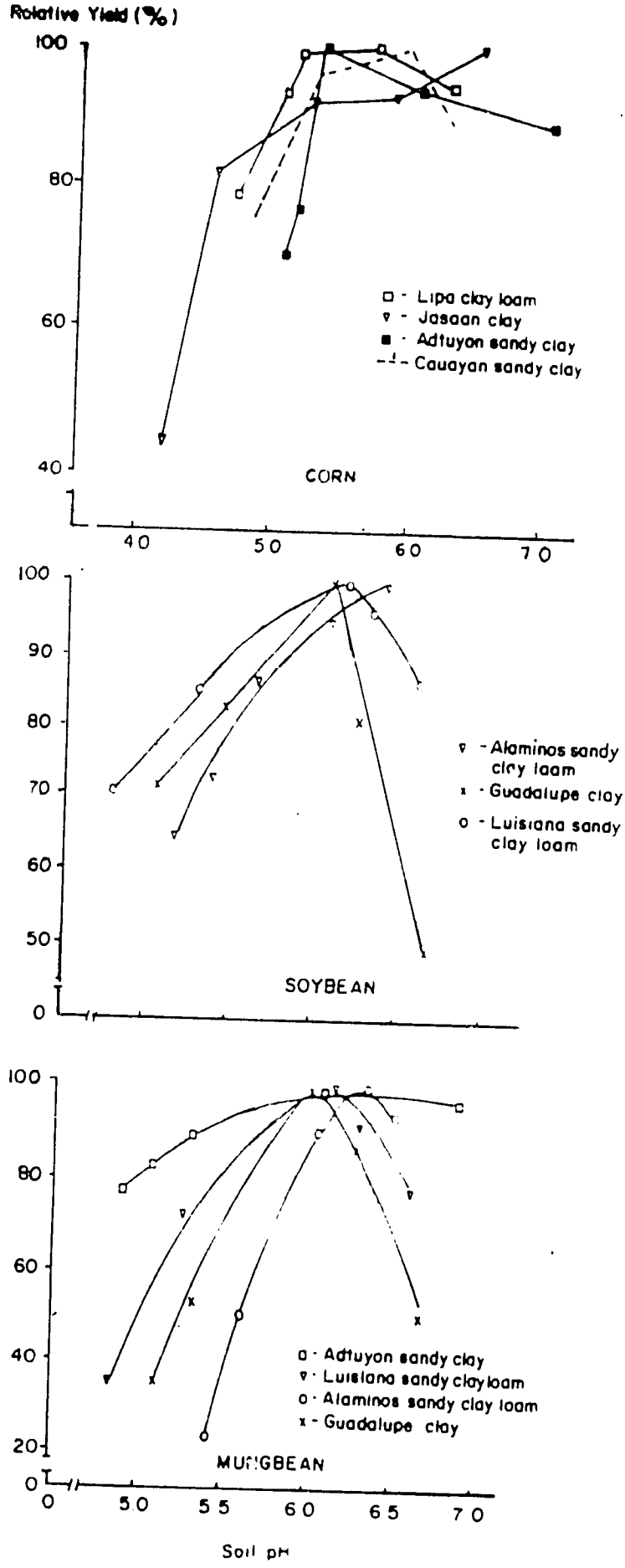
5. Use of Improved Fertilizer Materials

a. Controlled-release Fertilizer

Sulphur-coated urea (SCU) is already available in the market. Earlier IRRI trials showed positive responses under Philippine conditions, and the yield increases obtained justified the 30 percent in additional cost of SCU. Later trials, however,

Graph VII-2

Relationship between Relative Yield of Some Crops and Soil PH in Different Soil Types (Samonte, 1987)



showed no positive benefit over that of improved N timing using prilled urea. Apart from reducing N losses, SCU has been shown to reduce toxicity to rice seedlings, supply the S element, and reduce labor costs because split application is not necessary. At present, however, its use cannot be economically justified.

b. Urea and Nitrification Inhibitors

Some chemicals have been identified as inhibiting nitrification and ammonia volatilization. Local tests indicate that no significant responses in yield over that of improved nitrogen management are obtained. Additional research is still necessary to develop this technique further.

In promoting fertilizer-use efficiency, one should not lose sight of the positive contributions of complementary management factors in crop production. These include:

- Planting at optimum time to expose the crop to adequate solar energy;
- Close spacing and optimum planting geometry;
- Early and thorough weed removal to maximize utilization of water and nutrient;
- Irrigation and proper water management;
- Crop protection to minimize pest damage;
- Use of quality seeds to ensure optimum population; and
- Deep tillage and good land preparation.

These recommended agronomic practices are as important as fertilizers in affecting yield. They are prerequisites to the promotion of fertilizer use.

E. Recommended Strategies to Promote Efficient Fertilizer Use

The continued reliance on soil analysis laboratory reports as the basis for determining yearly fertilizer requirements, and heavy reliance on generalized fertilizer formulas, constitute the singlemost important sources of fertilizer use inefficiencies. Environmental variabilities necessitate more site-specific recommendations for fertilizer rates and accompanying management practices. Also, while technologies to enhance efficient fertilizer use have been developed, there appears to be no clear-cut, efficient mechanism to introduce these technologies systematically into the mainstream of the Philippine extension service.

Furthermore, very limited data exist concerning farmers' practices. The absence of data constrains the development of policies and infrastructures to promote increased and efficient use of fertilizers.

The following measures are proposed to further the role of fertilizer in enhancing the productivity and income of Philippine farmers.

1. Refinement of Fertilization Recommendation Scheme

The refinement of fertilizer recommendation practices to reflect variations in the production environment is expected to have the greatest impact in promoting fertilizer use, and hence increasing farm incomes.

To implement this recommendation, it is proposed that the GOP undertake agro-environmental stratification, developing sets of fertilizer practices for each environment. Initially, a soil series stratification to delimit area boundaries can be used. As more information is generated, the delineation of recommendation domains can be refined further to, say, soil types. Within a homologous zone, further stratification of recommendation domains, inputting socio-economic parameters such as tenure and available capital, can be done. This system would promote fertilizer recommendations consistent with real farm situations. In the long term, user-friendly software is envisioned to enable extension workers to provide advice to farmers on profitable levels of fertilizer usage within a given area by inputting prices and production environment forecasts. The suggested framework is shown in figure VII-2.

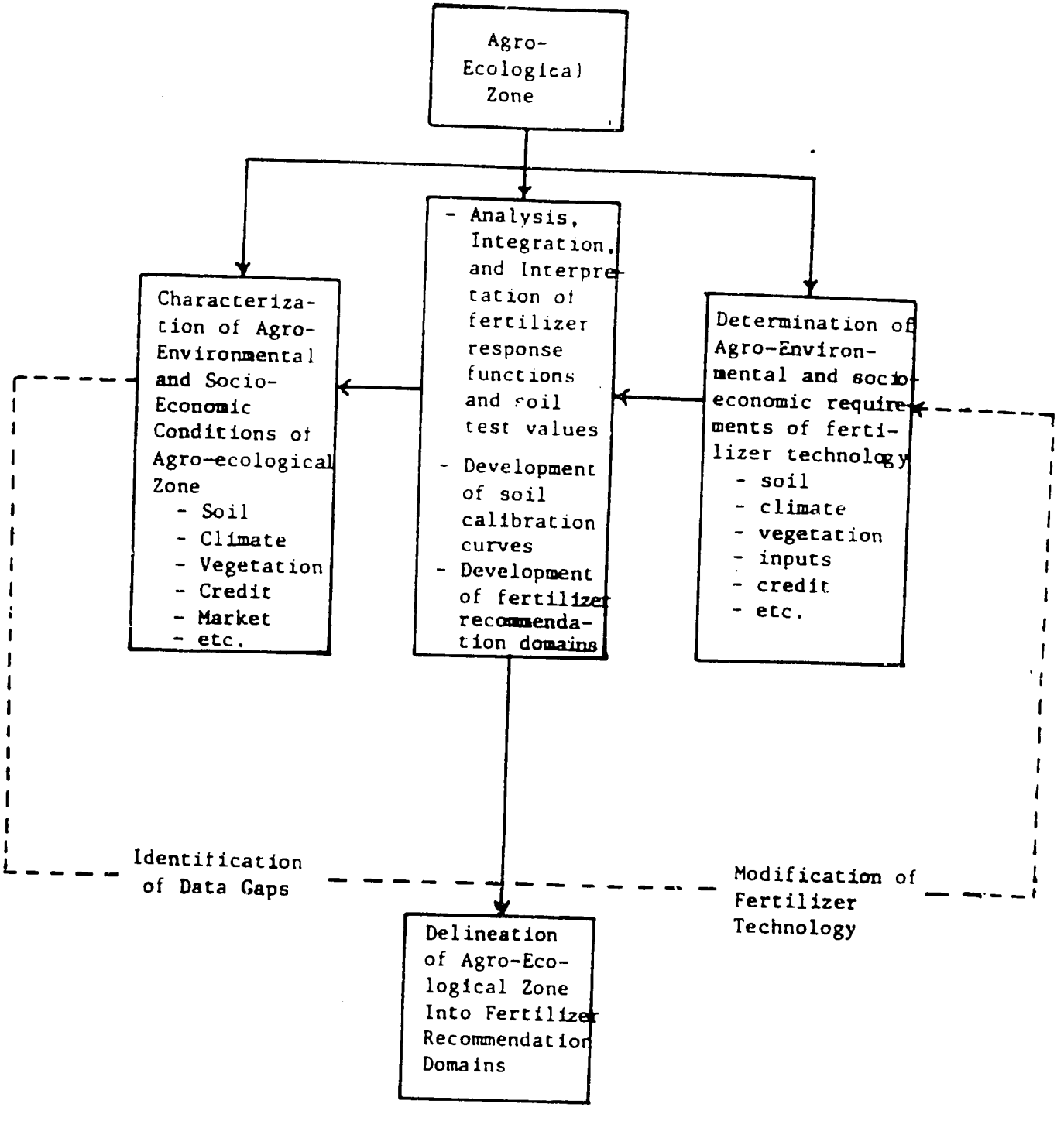
Implementing the recommended program may not necessitate any major research investment. It may merely entail designing a framework within which annual research results and previous work are properly integrated, gathering minimum sets of data from all fertilizer experiments to systematize the characterization of agro-ecological niches, and effectively coordinating activities among research entities.

The Department of Agriculture in the last five years has vigorously undertaken on-farm trials essentially aimed at deriving site-specific agricultural recommendations. The proposed activity can be piggy-backed on these trials, but the experiments, particularly on fertilizer, must be redesigned with the objective of generating specific predictive response models to guide extension workers in packaging sets of recommendations in accordance with the conditions and resources of farmers.

It is recommended that the Bureau of Agricultural Research provide the coordinating mechanism to plan and implement agro-ecological stratification and characterization. Agencies

Figure VII-2

Framework for Fertilizer Technology Generation and Management
(Paningbatan, 1986)



involved in research must be convened to agree on the framework of coordination including details such as minimum sets of data to be gathered, processing of data, and the mechanics of inter-agency collaboration.

The effort to generate site-specific predictive response models is a long-term proposition. It demands continuous data validation and refinement. Accordingly, it is imperative that a multi-agency linkage be firmly established and sustained.

As earlier discussed, in the interim, a standing committee on fertilizer use recommendation may be organized to facilitate the immediate tailoring of generalized fertilizer recommendations to more specific situations.

2. Cropping Patterns/Systems Reorientation of Agricultural Support Services

Present production support services such as research, extension and credit are commodity-oriented. Farmers, on the other hand, are essentially diversified and operate on the basis of cropping patterns. This implies that agricultural support services, to be effective, must assume the same focus. A move in this direction would make it easier to integrate soil enriching practices such as crop rotation, green manuring, composting, and farm wastes recycling into the farmers' own production operations.

The constraints of practices such as labor availability, residual effects on succeeding crops, cash flow constraints, etc., would clearly come into focus if the farmers' cropping patterns were considered instead of a single crop. For instance, a crop that requires mulching, such as garlic, planted after rice would enhance the utilization of rice straw. Also, dry seeding of rice would lengthen the production season, which can accommodate the growing of a green manure crop before the next crop is planted. Integrating livestock into existing cropping patterns can be exploited to promote composting and nutrient recycling or the profitable growing of azolla for feeds. In theory, these practices appear sound, but their viability depends on their impact on the farmers' own cropping pattern and practices.

There is a prevailing tendency of extension workers to view technologies in isolation owing to the heavy commodity orientation in the extension service. This attitude should now be discarded, and the current thrust towards the farming system philosophy should be strongly supported and sustained. Training of extension workers in this approach would provide the necessary orientation to view farmers' activities in a broader perspective. Crop production consists of components and variables that are interdependent, and to change the system one has to consider

these interactions. Promoting fertilizer use efficiency can be achieved by manipulating the management variables, i.e., by utilizing available farm labor for weed control or good land preparation, without necessarily changing the rate of fertilization or the fertilizer materials. The farming system approach thus ensures a critical analysis of farmers' production systems, retooling the technology to fit the resources and constraints at hand.

3. Training of Extension Workers

The effectiveness of an extension worker will be enhanced if he has a good understanding of the characteristics of the area in which he is assigned to work. Accordingly, the GOP must train extension workers to utilize all available information to get to know their area assignments better. In relation to fertilizer use, extension workers should be aware of differences in soil types and corresponding fertilizer response curves. They must be proficient in conducting on-farm trials to test fertilizer recommendations and make adjustments to suit the particular requirements of their area. They must be able to monitor recommended fertilizer rates and utilize the data to increase the precision of future recommendations.

Accordingly, a training program is proposed to develop these skills to immediately enhance the effectiveness of the extension service in promoting fertilizer use.

4. Conduct of Study on Farm-level Use of Fertilizer

To date there is very limited data on factors affecting farm-level fertilizer demand. The fertilizer survey undertaken by UNICO in 1983 is the only comprehensive document available on fertilizer use by crops in the various regions of the country.

It is proposed that the GOP undertake a nationwide study on farm-level use of fertilizer. Such a study should focus on fertilizer use levels by crop, constraints in fertilizer use, practices employed, and farmers' decision-making in the use of fertilizer. Previous studies have already uncovered some important socio-economic determinants of fertilizer use. Accordingly, it is suggested that to obtain more meaningful data, these identified factors be used to pre-stratify respondents in the survey process.

5. Strengthening the Research Service

Research can play a decisive role in promoting both fertilizer usage and effective utilization rate. Accordingly, it is recommended that the GOP work to strengthen the country's research services. Relevant strategies include the following.

a. Implementing a Unified Research Program on Fertilizer Use

This strategy ensures that key areas are properly addressed, costly duplications in research efforts are avoided, research results are maximized, and the coordination of research agencies is enhanced. Improvement of fertilizer use recommendations as discussed in item 1 can very well be the unifying theme for fertilizer use research in the country.

b. Strengthening the Farming System Research Orientation

A farming systems research (FSR) orientation is strategic in focusing on farmers' constraints and must be the centerpiece of development efforts. The use of the Rapid Rural Appraisal (RRA) methodology, developed by the Farming Systems and Soil Resources Institute (FSSRI), would be relevant in this regard. In addition, the very nature of the FSR approach enhances the linkages of the researcher, the extension worker, and the farmer. This linkage is crucial in facilitating effective technology development and adoption. It is therefore recommended that the GOP promote the linkage of FSSR (the national research center in farming systems) with the Regional Integrated Agricultural Research Systems (RIARS). At the same time, the RIARS farming systems team should be strengthened by means of staffing and financial support to enable them to undertake regional verification trials.

c. Areas of Research

The following areas of research should receive funding:

- Agro-ecological stratification of production environments including environmental forecasting to guide farmers in decision making in the use of inputs;
- Biological N fixation;
- Development and utilization of indigenous fertilizer resources;
- On-farm use of organic materials; and
- Soil conservation strategies, among others.

CHAPTER VIII

FERTILIZER AND PESTICIDE AUTHORITY: FUTURE ANALYTICAL, ADVISORY AND MONITORING ROLES TO FACILITATE A COMPETITIVE FERTILIZER SYSTEM

A. Introduction

There are a number of analytical, advisory and monitoring functions required to facilitate the effective working of a competitive fertilizer system, which Chemonics recommends should be undertaken by FPA.

B. Analytical, Advisory and Monitoring Functions of FPA

1. Why FPA?

The Philippine fertilizer sector is much more subject to international market forces beyond its control than are most developing countries. In this respect, it is in much the same position as many developed Western countries, with the important differences that the latter generally have large fertilizer companies capable of undertaking the staff work required for efficient forward planning, and that public bodies (Departments of Agriculture, TVA) and private consulting businesses supplement the companies' in-house work.

It is unrealistic to expect such a division of labor in the Philippines. The work must fall directly on the GOP. In theory, it might seem reasonable to have a division of responsibilities among a number of government departments or sub-departments, with the Department of Agriculture exercising a broad coordinating role. For example, some of the analytical items specified below might seem best allocated to the economic and econometric experts at the National Economic Development Authority. However, such a decentralized arrangement is unlikely to work effectively. Effective work requires a specialist group whose responsibility lies clearly with the fertilizer sector on a permanent basis. A keen and continuing interest in the well-being of the fertilizer sector is essential, and it is likely to be fostered best in a staff organization solely dedicated to it.

Chemonics recommends that FPA should be charged with these responsibilities and that it build the expertise to carry them out over time. It will have two prime purposes:

- To provide the fertilizer sector with timely information on consumption, inventories, production, and price and supply developments in international markets, and

- To develop surveys and analytical studies to further the performance of the competitive system in the fertilizer sector.

Appropriate financial provision will be needed.

2. Inventories

There are two aspects to this work: (1) the rapid dissemination of information on current inventory levels, and (2) the regular analysis of these levels with respect to expected demand and supply conditions.

FPA already collects information from importers and dealers on their inventory levels on a regular monthly basis. This information should be made available in published form as quickly as possible.

The monthly analysis of changes in inventories, production, imports, and exports is a basic tool of analysis, as is recognised already by the FPA. Such analysis can help in estimating optimal inventory levels after taking into account supply conditions in international markets. However, FPA resources need to be strengthened substantially for this purpose, especially for developing appropriate inventory information at the dealer level and extending the general analysis function to the regions. These tasks could be carried out by strengthening the resources of the field coordinators supplemented by a small, specialized team recruited for the purpose.

3. Annual and Seasonal Forecasts of Consumption

FPA should develop and publish its forecast of fertilizer consumption for the coming year, and possibly for the seasons separately, on a timely basis, after taking account of:

- likely fertilizer/crop price ratios,
- the farm credit situation,
- the farmer's financial status, particularly as affected by his real income from recent crops or anticipated income from those about to be harvested,
- pre-season growing conditions, particularly the status of water supply, insofar as they are known, and
- any other factors.

This work would be a revival of FPA's past interest in demand forecasting.

4. International Fertilizer Markets

Here the need is to maintain and interpret a medium-term data base, say for four or five years forward, on prospects for demand and supply, including FOB and C&F prices, for the critical raw materials, intermediates, and finished fertilizers imported and exported. The scope of this work is indicated in annex 2.

FPA may find that the expertise required for this work cannot be maintained within its own organization and that it may need to turn quite extensively to the specialist international consultancy organizations.

5. Fertilizer Emergencies

Here the need would be to anticipate and detect the causes and scale of fertilizer emergencies as discussed in chapter IV, specifying the options for GOP response to any particular situation.

6. The Burden of Fertilizer Protection on Farmers

The present system of import parity pricing imposes serious problems of measurement, partly due to the need to take account of the frequency with which world prices change and, since judgment is never tested by actual competitive tenders and shipments of compounds into the Philippine market, partly due to the difficulties of identifying quotations for appropriate products and measuring freight costs. There is a need for regular review of import price parities, which should seek to reconcile differences between individual assessments of interested parties--domestic manufacturers, representatives of farmers' interests, and marketers--and which should prepare regular reports for prompt publication.

Similarly, information should be prepared and disseminated on what might be called "export parity pricing," i.e., comparison of domestic manufacturers' ex-factory prices to Philippine farmers and to the export market. For commercial reasons, however, publication should normally be delayed several months.

FPA is the appropriate organization to undertake these two pieces of work.

7. Specific Studies for FPA Organization or Sponsorship

There are a number of important areas where studies should be maintained, expanded or initiated.

a. Marketing and Distribution

FPA should build on its existing studies of marketing and distribution costs. In particular, detailed studies are required of the levels and breakdowns of margins between the importer and the farm-gate. The analysis would need to assess marketers' profitability, including any contribution from other product lines (further requirements are indicated in chapter V). These should be undertaken on a regular basis for the principal crop-producing areas, with facilities for ad hoc investigation should be there be serious charges of a breakdown in competition among middlemen. FPA should be able at all times to make an informed assessment of the performance of those engaged in marketing and distribution. In the event studies are performed of the general economic problems of remote areas, FPA should provide the fertilizer component.

b. Patterns of Fertilizer Use

Given the special difficulties facing sugarcane producers and the important changes in cropping patterns and fertilizer use likely to result from land reform, frequent surveys are needed to establish the breakdown of plant nutrient use by crops and use per hectare in representative areas. Ideally these should be on an annual basis until new patterns are clearly established. Presumably FPA would collaborate with the Bureau of Agricultural Statistics in such investigations.

c. Microeconomic Farm-Level Fertilizer Demand Studies

In the past there have been a number of studies that have sought to measure fertilizer/crop response relationships and to assess the influence of plant nutrient prices and non-price factors in determining the farmer's response to his opportunity to increase output and income by greater use of NPK. These studies have been largely concerned with rice only, and they have been confined to Luzon.

FPA should exert its influence in favor of more studies of this kind, but ensuring that other regions and crops are included. Particular attention should be paid to building up data to establish representative fertilizer/crop functions for all major fertilizer-using areas and to determine the prospects for fertilizer demand in coconut areas underplanted with other crops.

As a last resort the decision must rest with the Agricultural Research Council of the Philippines. Chemonics recommends that this influence be exercised through a standing committee on fertilizer use. (This committee would report to the Agricultural Research Council of the Philippines.)

d. Macroeconomic Fertilizer Demand Studies

As annex 3 shows, there has been no recent econometric analysis of the factors affecting the level of aggregate annual fertilizer demand in the Philippines. The last such study seems to have been Rodriguez (1979). Work of this kind, regularly updated, is an important tool in short-term demand forecasting. FPA should sponsor it.

This work can be supplemented by simpler techniques in demand forecasting such as trend analysis and judgmental estimates. It is understood that FPA has done some work of this kind in the past.

8. Quality Control

Arrangements for quality control (checks on bag weight, labeling, adulteration) are at present undertaken by FPA. Staffing, equipment and travel allowances are insufficient for this work to be done properly at present.

C. Guides to Future Work

Annex 3 indicates existing econometric studies of fertilizer demand. Annex 6 reviews sources for developing the data base required for the proposals set out above and provides a starting point for inventory analysis.

ANNEXES

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ANNEX 1

ARTICLE I - TITLE

Accelerated Agricultural Production - Project No. (492-0385)

ARTICLE II - OBJECTIVE

The main objective of the study is to assist the GOP in framing policies and designing programs which favor economically optimal fertilizer use. Such policies and programs are needed in order to enhance fertilizer's contribution to the growth of agricultural productivity and income. The Contractor will provide specific recommendation on measures which, if implemented, should lead to: (a) lower fertilizer prices, (b) relatively stable fertilizer prices, (c) availability of adequate fertilizer supplies to meet demand at all times, (d) provision of the most appropriate grades of fertilizer, and (e) improved efficiency of fertilizer use.

ARTICLE III - STATEMENT OF WORK

A. Background

Fertilizer has long been an important source of growth in Philippine agriculture, especially in rice production. Fertilizer contributed nearly one-third of the rice yield increases which occurred between 1965 and 1980. On the other hand, the growth rate of fertilizer consumption for all crops declined from an annual rate of 9% from 1952-1972 to 5% from 1972-1985, and fertilizer use rates over the past 15 years were, in general, economically suboptimal.

The Government of the Philippines (GOP) recognizes that because land is scarce, achieving increases in farm income, employment, and production will depend crucially on increasing crop yields, especially through optimal use of fertilizer and complementary inputs. Thus, as part of its new agriculture-led development strategy, the GOP has already acted to correct some of the policies which in the past constrained fertilizer use. However, the GOP now wishes to examine further steps it can take to promote greater efficiency and generally improved performance in the sector. It also wishes to understand better the impacts on agriculture and the fertilizer sector of the measures it has already taken.

To meet the GOP's need for information to guide decision-making in the fertilizer sector, the Accelerated Agricultural Production (AAP) Project will finance a study. The study will address issues associated with three general topics: fertilizer

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trade, regulatory, and subsidy policies; fertilizer marketing and distribution; and fertilizer use.

The primary questions to be examined with respect to fertilizer trade, regulatory, and subsidy policies concern: (a) the impacts of different levels of protection of the domestic fertilizer industry on agricultural productivity, farm income, and the rural economy more generally and (b) alternative means the government can employ to minimize the risk of severe fertilizer price and supply fluctuations. The main issue to be addressed with respect to both fertilizer marketing/distribution and fertilizer use is what can be done to improve efficiency and lower costs. For all three topics the study will also consider the most appropriate role for government in an essentially market-based, privately-operated fertilizer sector.

The study is not intended to address all issues related to the fertilizer sector. It will focus on those areas which relate most directly to fertilizer as an agricultural input rather than fertilizer as an earner of foreign exchange or as an output of Philippine industry. Thus, it will not consider financial or technical problems of domestic fertilizer plants, whether or how to privatize government-owned plants, or other industrial issues of this nature. It will, however, consider questions such as how government policies toward domestic plants impact on the profitability of fertilizer use.

Preparation of the study will also not entail a great deal of primary data collection and analysis, since a number of fertilizer studies and reports have been done in recent years. While the study team will need to review and assess the validity of this information, which covers mainly the period up to the initiation of fertilizer deregulations and other major changes in the early 1980's the team will need to concentrate its analytical efforts on the period from about 1984 to 1997.

B. Scope of Work

1. Fertilizer Trade, Regulatory, and Subsidy Policies

a. Assess the economic impacts on the agriculture sector of protecting the domestic fertilizer industry.

(1) Review and assess what is known about the impacts of trade, regulatory, and subsidy policies affecting the Philippine fertilizer sector in terms of fertilizer prices and consumption, crop production, farm income, and general rural development from inception of these policies until the present. Examine also the impacts on agriculture following

removal (in the 1980's) of some protection of the plants then in operation (Atlas and Planters Products). Base these assessments primarily on a review of the literature and discussions with knowledgeable economists and industry and government representatives.

(2) Examine the current and projected cost competitiveness of PHILPHOS with international suppliers. Base this analysis on a comparison of production cost per metric ton for PHILPHOS fertilizers sold in the Philippines with CIF costs per metric ton of imported fertilizers. Use 10-year high, medium, and low cost projections.

(3) Project the annual direct and indirect cost to government over the next 10 years of subsidizing PHILPHOS. This would include the tax and duty incentives, protective tariff rates, and incentives for pioneering and export-oriented firms. Do a series of projections which assume PHILPHOS sales prices ranging from import parity to prices high enough to just cover production costs with and without all or part of the government's subsidy. Assume also that PHILPHOS maintains its monopoly on the fertilizers it produces. Build into these various subsidy projections high, medium and low projections for growth in fertilizer demand.

(4) Project on an annual basis over the next 10 years (a) the reduction in fertilizer consumption and (b) the loss in agricultural output and income which would result at levels of protection ranging from import price plus five percent to the price level which would just cover PHILPHOS' production costs with and without part or all of its government incentives. Assume that PHILPHOS maintains its monopoly on the fertilizers it produces. Use high, medium and low commodity price and fertilizer consumption projections.

(5) Based upon the projections in tasks 1-4 above, select most likely projections of the budgetary and economic costs of various levels of protection of PHILPHOS.

(6) Identify and, if possible, calculate any expected social and economic benefits to

agriculture over the next 10 years to protecting PHILPHOS, and compare these benefits to the costs of protection.

(Note: The contractor may propose modifications to the analytic methodology outlined above if the contractor believes such modifications are required to successfully carry out task A.1)

b. Evaluate the alternatives for minimizing the risk or impact of severe fertilizer supply disruptions and sharp price increases due to such factors as volatility in international markets or a breakdown in competition among domestic distributors.

(1) Evaluate the advantages, disadvantages and feasibility of such stabilizing measures as (a) long-term contracts between Philippine private sector importers and offshore suppliers, (b) temporary direct subsidies to farmers and/or importers, and (c) temporary price controls during periods of crisis. Assess the economic costs and benefits of these and/or other measures in terms of their expected impacts on agricultural productivity and rural income.

(2) Develop guidelines for determining when a fertilizer emergency exists and how government should respond, given the objectives of minimizing government controls on the private sector and promoting efficient fertilizer markets in the country.

c. Recommend a set of policies and actions (short and medium term) which will result in farmers being provided adequate amounts of appropriate grades of fertilizer when needed, at relatively stable prices, and at the minimum economic cost to the nation. Recommend specifically to what extent the GOP should seek to protect farmers from short-term price and supply fluctuations, and how this should be done.

2. <u>Fertilizer Marketing and Distribution</u>

a. Assess the constraints to efficient fertilizer marketing and distribution by the private sector.

(1) Describe the current organization and operations of the fertilizer marketing and distribution system. Specifically, discuss the steps involved at various points from

production/import to wholesale and retail, identify who dominates market channels, and estimate the various marketing costs (transport, storage, handling, distribution, promotion, tariffs, interest, taxes, etc.). Compare the current system with the one in place prior to the deregulation of the system in terms of its organization, operations, and performance. In particular, determine how the number of firms, market shares, marketing costs, profits, prices and servicing of remote areas have changed.

(2) Examine ways to reduce costs of marketing and distribution of fertilizer, e.g. through procurement and distribution of higher analysis fertilizer, reduced levels of inventory and more timely scheduling made possible through better information, volume procurement and bulk imports, and more efficient logistics. Assess the constraints to and feasibility of introducing various means for reducing marketing and distribution costs.

b. Recommend specific measures the GOP should take to promote development of a more efficient private sector fertilizer marketing and distribution system, given the objective of minimizing government controls on the private sector.

3. <u>Fertilizer Use</u>

a. Based upon the existing literature, assess the constraints at the farm level to economically optimal fertilizer use.

(1) Estimate by region the current levels of fertilizer use for each major crop by nutrient and fertilizer type, and compare observed application rates with recommended rates. Identify and analyze major factors constraining fertilizer use. Where data exist, identify by region the relationships that exist between fertilizer use and (a) water availability and control, (b) input/output ratios for major crops, and (c) distance to a fertilizer outlet (or other indicator of a farmer's access to fertilizer).

(2) Review the present fertilizer use recommendations and how they were developed

and assess their adequacy. Focus on N,P,K, and S for major crops grown under various agroclimatic and economic conditions. In addition, assess the feasibility of developing recommendations on a nutrient as well as grade basis.

(3) Review what is known about fertilizer technologies tested in the Philippines and aimed at increasing the agronomic efficiency for fertilizer use, and assess their potential for widespread adoption by farmers. Identify knowledge gaps and needs for further research.

(4) Evaluate research and extension programs on organic fertilizers, combinations of organic and commercial fertilizers, and biological nitrogen situation, and assess their potential to supplement or replace commercial fertilizers in crop production. Identify knowledge gaps and needs for further research.

ANNEX 2

THE OUTLOOK FOR INTERNATIONAL FERTILIZER PRICES 1987-1997

A. Introduction

World market fertilizer prices for both raw materials and finished products fluctuate considerably around their inflation-adjusted long term trends. In the late 1960's and early 1970's prices were severely depressed, only to be followed by an even more extreme upswing in 1974-1976. A less drastic repeat of this pattern followed in 1977-1984. Since then world market prices have fallen well below their long term trends, which on a CIF basis has been accentuated by the oversupply in dry cargo shipping and unusually low ocean freight rates. (Sulphur sometimes follows a course of its own, e.g. being high in 1968-1970 when phosphate price were depressed, but in more recent years its prices have moved generally in the same cycle as phosphates.)

International prices are extremely sensitive to changes in the balances between demand and supply for the various fertilizer materials. In addition, a number of oligopsonistic buying and oligopolistic selling organizations may have sufficient power to drive the price cycle to somewhat further extremes than would be the case otherwise. On the buying side, examples are Minerals and Metal Trading Corporations (MMTC) in India and Sinochem in China, and the Directorate of Fertilizer Imports (FDFI) in Pakistan. Examples among sellers are Phoschem in USA and Canpotex in Canada. (The selling organizations are probably weaker than the state buying companies.)

Accordingly this annex first reviews the demand/supply balances for nitrogen, phosphates and potash to 1991/92 in some detail, and then in broader terms for 1991/92-1996/97. An assessment for sulphur follows for 1987-1997 (calendar years). Three alternative scenarios are described, which form the base for the price forecasts given later in the annex.

B. World Demand/Supply Balances for Fertilizers: Recent Experience and Prospects to 1991/92

1. Basic Sources: Alternative Scenarios

Unless otherwise stated, the dates refer to the fertilizer year July/June. The starting point for this review is the forecasts of demand and supply potential shown in table 2A.1, which is based almost entirely on the analysis of the FAO/UNIDO/World Bank Fertilizer Working Group of Experts. Demand and consumption for 1979/80 and 1982/83-1985/86 are mainly from the Working Group's review of May 1986. The outlook of supply

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Table 2A.1

FAO/UNIDO/World Bank Working Group Estimates/Forecasts of
Fertilizer Supply and Demand 1979/80 - 1990/91

	N		P205		K20		Total Nutrient	
	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
	Million metric tonnes							
1979/80	59.6	57.2	33.3	31.1	25.8	24.0	118.8	112.3
1982/83	63.4	61.1	32.2	30.6	24.4	22.9	120.0	114.5
1983/84	67.8	67.1	35.2	32.9	27.9	25.4	130.9	125.4
1984/85	74.3	70.5	37.0	34.3	28.8	25.9	140.1	130.7
1985/86	73.6	70.0	34.7	33.1	28.7	25.6	136.9	128.7

	Supply Potential	Demand	Balance	Supply Potential	Demand	Balance	Supply Potential	Demand	Balance	Supply Potential	Demand	Balance
1985/86	73.3	70.0	3.3	36.3	33.1	3.2	30.5	25.6	4.9	140.1	128.7	11.4
1986/87	74.2	71.2	3.0	36.8	33.9	2.9	30.3	26.1	4.2	141.3	131.2	10.1
1987/88	75.9	73.5	2.4	37.9	35.3	2.5	29.9	26.7	3.2	143.7	135.5	8.2
1988/89	78.1	75.7	2.4	40.1	36.3	3.7	30.5	27.4	3.1	148.7	139.4	9.3
1989/90	79.3	77.9	1.4	40.9	37.3	3.6	31.8	28.1	3.7	152.0	143.3	8.7
1990/91	80.2	80.1	0.0	41.4	38.3	3.1	32.5	28.7	3.7	154.1	147.1	7.0
1991/92	81.3	82.3	(1.0)	41.8	39.3	2.5	32.7	29.3	3.4	155.8	150.0	4.9

Source. 1979/80 - 1985/86 from FAO, Current World Fertilizer Situation and Outlook 1984/85 - 1990/91, Fert /87/2, November 1986, and FAO, Fertilizer Production Consumption and Growth Rates 1985/86 Preliminary, Fert/87/2 Add. 1, April 1987.
1985/86 - 1991/92 of FAO/UNIDO/ World BAnk Working Group, May/June 1987,

Note: Certain balances show apparent minor errors due to rounding.

potential and demand are taken from its analysis of May 1987, which should be published by FAO in early 1988.

The Working Group has three measures of supply. It starts with annual nominal capacities for each nutrient. These are adjusted to supply capability by applying country specific operating rates, based on past performance and other factors. Estimated processing and distribution losses are excluded, together with some other minor adjustments, to obtain supply potential, i.e. the amount which can be made available to meet demand if required. Non-fertilizer uses are excluded before fertilizer potential is obtained. Further details of the methodology are given on pages 44-46 of FAO Fert/87/2, or in the corresponding sections of earlier issues of this annual publication.)

In passing, it should be noted that the Working Group has made substantial changes in its forecasts between May 1986 and May 1987, the effect being to reduce most of the forecasted annual oversupplies but to extend their total durations.

Table 2A.2

Excess of Supply Potential Over Demand, May 1986 and May 1987 Estimates/Forecasts of Working Group

July/June	Nitrogen		Phosphates		Potash	
	1986	1987	1986	1987	1986	1987
1985/86	3.3	3.3	4.0	3.2	4.8	4.9
1986/87	3.9	3.0	5.1	2.9	4.5	4.2
1987/88	3.8	2.4	5.5	2.5	4.1	3.2
1988/89	2.7	2.4	5.0	3.7	3.6	3.1
1989/90	0.8	1.4	4.1	3.6	2.8	3.7
1990/91	(0.5)	0.0	3.3	3.1	2.4	3.7
1991/92	N.F.	(1.0)	N.F.	2.5	N.F.	3.4

N.F. Not forecasted

Taken at their face value, the Working Group's latest forecasts point to oversupply in nitrogen through to the end of 1989/90 and for phosphates and potash well beyond 1991/92. Since the markets for phosphates and potash were seriously glutted by the beginning of calendar 1985, the forecasts for these nutrients imply sustained oversupply for at least seven continuous years, never before experienced since the 1930's. On balance, this is probably a gloomy prognosis, as will be argued below.

The present analysis uses three alternative scenarios, described in relation to their price implications.

1. Medium Price Projections or Medium Scenario. In this case, the world economy is expected to grow in line with the expectations that reflected the general view of the international economic organizations in 1984 and 1985. These are likely to have set the macroeconomic background to the 1986 FAO commodity projections which, as indicated below, are essential components of the present analysis. The FAO studies are not explicit on the macroeconomics.) The 1985 medium term projections of the International Monetary Fund for the economic growth of the twenty-one industrial nations, shown in the first part of the table 2A.3, are taken as representative of this background element in the FAO analysis. In addition, this Medium Scenario envisages that there will be many more closures of fertilizer plants and much less production potential than envisaged by the Working Group in 1987 (and in 1986).

2. Low Price Projections, or Low Scenario. Here note is first taken of the prospects that by early 1987 the macroeconomic base of the FAO commodity projections had weakened somewhat. (This conclusion may not be immediately obvious due to the shift in country groupings used by the IMF. It can be seen best by comparing the two sets of data for the United States.) In addition, this scenario takes note of the considerable risk that governments fail to deal promptly or adequately with the deflationary effects of the collapse in world stock markets in late October this year. In this case, the overall economic growth of the developed market economies is expected to be pulled down by 1.5 percentage points in 1988 and 1.0 percentage points in 1989 from the projection in table 2A.3, with some repercussions for other parts of the world. These are together equivalent to perhaps the loss of one year's growth compared to the Medium Scenario. Plant closures are taken as slightly more than in the Medium Scenario. The net effect is for more pronounced oversupply in 1987/1988 - 1991/1992.

3. High Price Projections, or High Scenario. There is inevitably a considerable element of judgment in assessing the price effects of a given degree of imbalance in international fertilizer markets. International fertilizer markets are extremely sensitive to small changes in demand relative to supply when the sector concerned is working close to capacity. In addition, as soon as there is evidence of tightness of supply and of substantial price rises ahead, restocking

Table 2A.3

Annual Growth Rates of Gross Domestic Product

	Actual				Projected		
IMF 1985							
	1967-1976	1982	1983	1984	1985	1986	1987-1990
Twenty One Western Industrial Countries	3.7	(0.2)	2.6	4.9	3.1	3.0	3.1
United States	2.8	(2.1)	3.7	6.8	3.4	3.0	2.9
IMF 1987							
	1975-1984	1985	1986		1987	1988	1989-1991
Seven Major Western Industrial Countries	2.6	3.0	2.5		2.4	2.9	3.0
United States	2.5	2.7	2.5		2.3	3.1	(1)

Sources: International Monetary Fund, World Economic Outlook, April 1985 and April 1987

at all stages of the distribution pipeline can give a large short-term boost to demand. Accordingly, the High Scenario has the same underlying assumptions on final demand and supply potential as the Medium Scenario, but it allows for the price on final effects being larger in the tight supply years.

The present analysis must be prepared at a time when it is by no means clear how soon and how successful the immediate international economic difficulties will be resolved. The importance which should be attached to each of the scenarios is, therefore, particularly difficult to assess, and might call for substantial reassessment in the light of the events and decisions of the next three months. In the meantime the following likelihoods are assumed:

Medium scenario	40%
Low scenario	55%
High scenario	5%

The general macroeconomic factors might switch towards either the Low or Medium Scenarios. In any case, whatever view is taken, it will be seen below that the Philippines faces severely adverse price fluctuations in international markets sooner or later in the next five years. The High Scenario is a low risk but merits attention as a worst case which cannot be entirely ruled out.

2. Outlook for Demand under Medium/High Scenarios

As already noted, these scenarios have the same underlying assumption with respect to the final demand for fertilizers. Assuming these scenarios, the Working Group seems to be over-reacting to the stagnation of global demand for plant nutrient between 1984/85 and 1986/87 and to be underestimating the likely recovery by 1991/92. Admittedly, the immediate outlook is not promising. Despite the recent poor harvests in a number of countries, particularly in Asia, world stocks of grain stand at around 22 per cent of consumption, down from the exceptionally high 25 percent and 26 percent in 1985/86 and 1986/87 respectively, but still well above the 19 percent which would represent a balanced market. (FAO, Food Outlook, December 1987). At the same time, the unfavorable terms of trade for most other export crops (e.g. sugar, coffee, tea, cocoa, jute) and the dairy product surpluses in developed countries also depress world fertilizer demand.

However, the excess cereals stocks are held largely in North America and Western Europe. Rice stocks have fallen much more sharply than those for wheat and for coarse grains and by the end of 1987/88 are expected to be at their lowest level since 1983/84. In particular, India has suffered a drought in 1987,

which is generally regarded as the worst in the last century and which has not yet broken. This has been compounded by excessive rains in certain parts of the north east of the country (and in Bangladesh), producing serious crop damage. India's large grain reserve of 23 million tons is likely to be depleted within a year. A recent statement by IRRI Manila Chronicle, on Indonesia, Kampuchea, Laos, Cambodia, Philippines, and Thailand, still regards expansion of agricultural output as a priority. In general, the developed market economies now represent less than 37 percent of world fertilizer demand, and the stimuli to expanded use elsewhere are probably much more important than the adverse effects of depressed conditions in Western markets.

The FAO/UNICO/World Bank Working Group uses the Delphi method of forecasting, in which informed individuals exchange, and where necessary reconcile, their views on the likely effective demand for fertilizers in the countries or areas for which they are individually expert. The method has the considerable merit that the individuals concerned are likely to take account of the major factors determining effective demand in their own particular countries or areas. At the same time, the method contains a large subjective element through which the experts may be unduly influenced by the recent past and immediate outlook in making their longer term forecasts.

The alternative approach is to establish statistical relationships between plant nutrient use and crop output, which become the basis for forecasting the fertilizer needed to realize independently established forecasts of output. Two such sets of projections should be noted:

1. FAO's Agriculture: Towards 200 (AT 2000) developed a country-by-country fertilizer input/crop output matrix for 90 developing market economies, which was last used in 1981 but not yet updated. Its projections in its Alternative A assumed what can now be seen as a much too optimistic overall seven percent annual economic growth rate to 1990 and 2000 for the 90 countries. Its Alternative B assumed much more modest economic growth, more or less in line with the macroeconomics of the Medium/High Scenarios.

2. The Chemonics Team Leader, Mr. George Allen, in a study for FAO in 1986 has regressed total fertilizer use against two alternative measures of agricultural output (cereal production and the FAO index crop production) annually for 1961-1985. This analysis tests three alternative mathematical relationships,and also the effects of introducing so-called dummy variables for either the four or five last years to allow for some apparent recent improvements in crop/fertilizer response rates (e.g. due to farmers using fertilizers

more efficiently when faced by reduced plant nutrient subsidies in many developing countries or by reduced real farm incomes in developed market economies). The analysis was made at the levels of aggregation of the regional, and for Asia sub-regional, groupings of countries in the standard UN classification. With the exception of the centrally planned countries in Asia, the results generally performed well in terms of the normal statistical tests. The preferred regression equations were used in conjunction with the recent FAO commodity projections (Agricultural Commodity Projections to 1990, FAO Economic and Social Development Paper 62, 1986, and K.S. Mulherin, The Economic Importance of Sugar Cane Problems and Perspective, Commodities and Trade Division, FAO, July 1986), to make forecasts of the 1990/91 trend values in the effective demand for fertilizers.

These two approaches and that of the Working Group have been reviewed and their results summarized in Trends in Fertilizer Consumption in Relation to Food Security Requirements, FAO FERT/87/3, January 1987 . The various results, plus the Working Group's 1986 and 1987 projections for 1990/91, are shown in table 2A.4 where it will be seen that the Allen forecasts are considerably higher than (1) those for the Working Group, especially in respect to the latter's 1987 assessment for the developed market economies, and than (2) the AT 2000 projections whose macroeconomic assumptions are reasonably close to those of the medium scenario.

There are two limitations to the AT 2000 projections of alternative B (and also of Scenario A, whose macroeconomic assumptions put it entirely out of consideration). First, they are based on input-output responses derived from the fertilizer field trials of FAO, which are likely to overstate the crop to fertilizer responses obtained by farmers in general. Second, it seems that insufficient allowance has been made for the stimulus to fertilizer demand which has come from the favorable pace of agricultural advance obtained in recent years in many developing countries, especially in Asia.

The results of AT 2000 have been included as one substantial piece of analysis. However, it is considered that they do not call the Allen results into question. The latter are based on a much more comprehensive experience than the input-output coefficients of AT 2000. They should be judged by three considerations.

(1) The regression results have been highly satisfactory for the four sub-groups of developing market economies, with R-sq and R-sq (adjusted) around 0.95 and DW values in a range of 1.75-2.25. The results for the developed

Table 2A-4

Alternative Forecast of Fertilizer Demand in 1990/91, World Excluding Socialist Asia

	Developed Countries			Developing Market Economies					
	Market Economies	Centrally Planned Economies	Sub-Total	Africa	Latin America	Near East	Far East	Sub-Total	Total
	Million tons of nutrient								
Working Group									
1986	50.1	41.8	91.9	2.1	9.8	5.4	20.4	37.7	129.5
1987	46.6	40.3	86.9	2.3	9.8	5.5	20.1	37.7	124.6
Allen - 1	53.2	40.5	93.7	3.0	12.5	6.2	21.9	43.6	137.3
- 2	54.8	37.2	92.0	3.0	13.4	6.3	22.2	44.9	136.9
- 3	56.1	39.9	96.0	3.0	13.3	6.4	22.2	44.7	146.7
- 4	53.2	37.2	90.4	3.0	12.5	6.2	21.9	43.6	134.0
AT 2000									
- A	-	-	-	2.4	10.0	5.2	25.3	43.3	-
- B	-	-	-	1.8	8.2	4.1	20.4	34.7	-

Notes: (1) The alternative Allen combinations (1 to 3) give the results from among many others which were judged to be statistically the most satisfactory. Combination (4) simply records the lowest estimates from the three sets in (1) - (3)

(2) The Allen analysis failed to developed satisfactory results for Socialist Asia
It assumed the same projected value in 1990/91 as that of the FAO/UNIDO/World Bank Working Group

Source: FAO, Trends in Fertilizer Consumption in Relation to Food Security Requirements, FERT/87/3, January 1987

market economies have been adequate, the preferred equation (giving the lowest forecast for 1990/91) having an R-sq (adjusted) of 0.90 and a DW of 2.2. The results for the developed centrally planned economies are, however, weak, with the preferred regression having an R-sq (adjusted) of only 0.72 and a poorish DW of 2.67, with the dummy variable barely significant. Some assurance in using the results for this last group lies in the fact that the most preferred forecast for 1990/91 is virtually the same as that of the 1987 Working Group, while the others are substantially lower.

(2) Other forms of mathematical equation might be introduced which would have equally good statistical properties as those used so far, but which might yield lower forecast results. This is a strong possibility, although on balance probably not a serious weakness.

(3) The FAO commodity projections, which are the other critical element in the analysis, could turn out substantially in excess of what is justified by the Medium and High Scenarios.

The chance that future fertilizer demand may be overestimated in the light of the risks under (2) and (3) can be covered by forecasting 1990/91 at 130 million metric tons, namely somewhat less than the lowest combination of the Allen forecasts shown in table 2A.4 (134.0 million metric tons) as against the Working Group's latest assessment of 124.6 million metric tons, in each case with Socialist Asia excluded. There would be little progress towards this 1990/91 forecast in 1987/88, but thereafter it would be realized steadily.

3. Low Scenario for Demand to 1991/92

The present analysis follows the Working Group through 1988/1989 and thereafter slightly outpaces it.

4. Summary of Demand Forecasts to 1991/92

A comparison of the alternative forecasts for the world, excluding Socialist Asia, are given in table 2A.5. The present analysis agrees with the 1987 Working Group for Socialist Asia.

Table 2A.5

Forecasts of World, Excluding Socialist Asia, Consumption of Fertilizer

	Chemonics		1897 Working Group
	Low	Medium/ High	
	Million metric tons of nutrient		
1985/86	110.5	110.5	110.5
1986/87	112.2	112.2	112.2
1987/88	114.5	115.4	114.9
1988/89	117.9	119.0	117.9
1989/90	121.8	124.0	121.3
1990/91	125.0	130.0	124.3
1991/92	128.5	134.5	127.5

5. Supply Potential to 1991/92 Medium/High Scenarios

a. Working Group Methodology

While the Working Group makes its own independent forecasts of consumption, it adopts a much more passive role towards future changes in production capacity and so in supply potential. It records only those future changes in supply which are already known and it does not attempt to assess others which are likely to be made in response to market conditions. This procedure means that the Working Group usually overestimates future capacity in times of excess supply, and it may also be slow in anticipating future additions when markets return to balance or shortage. (The Working Group probably wishes to avoid the risk that any independent supply forecasts of its own might accentuate the cyclical tendency in changes in total industry capacities.)

b. Prospects for Phosphates

It is highly likely that the Working Group is seriously overestimating capacity and supply potential in the phosphate sector in the next four or five years, partly by not allowing for closure of high cost phosphoric acid capacity in Western Europe and Japan but mainly because it assigns much too large a future role for low analysis phosphatic materials (fused magnesium phosphate, single superphosphate, and ground phosphate rock) and probably for thermal phosphates which, together with secondary rock used in triple superphosphate, are included in the

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"other phosphate" category in table 2A.6. (The Working Group includes nitrophosphates in its "other phosphates". They are shown separately in table 2A.6.)

The first part of table 2A.6 is a restatement of the 1987 Working Group's outlook for supply capability in phosphates and the second gives Chemonics' adjustments for the Medium Scenario. It is necessary to work from supply capability rather than capacity or supply potentials since this is the only level of aggregation shown by the Working Group for those phosphates not derived from phosphoric acid. Socialist Asia is shown separately to facilitate the particular analytical procedure used below. (The Working Group is probably underestimating the annual supply capability of Socialist Asia, virtually all in China, by 0.5-0.7 million tons annually. However, any such bias would probably carry through to consumption, since such additional supply in the Chinese system would create its own extra demand rather than leading to reduced imports of phosphates.)

The 1987 Working Group shows 0.23 million metric tons of phosphoric acid capacity (P2O5 basis) being closed in Western Europe in 1986/87, but none in Japan. For 1987/88 to 1991/92 there are no further changes shown in either area, Western Europe being at 4.77 million metric tons of capacity in 1987/88 and rising to 4.88 million metric tons for the rest of the period, while Japan stays at 0.63 million metric tons throughout. This is an interpretation which does not square easily with the elderly age profile of the phosphoric acid plants concerned, especially in Western Europe, and the intense competition they now face from new export-oriented capacity elsewhere (particularly the United States, North Africa and Jordan) and from the substantial displacement of domestically-produced compound fertilizers (normally based on locally-manufactured acid) by imported bulk blend materials.

In 1980/81-1984/85 Western Europe closed down around 0.60 million metric tons of phosphoric acid. Remaining in operation in 1984/85 it had about 1.0 million tons of annual capacity in single or multi-train units built entirely before 1965, another 0.8 million annual tons in plants where many units were of similar vintage, and around 1.5 million annual tons in plants where a substantial part was built in 1965-1969. (This summary is based on information published by the International Fertilizer Association, Paris).

In 1985/86 and 1986/87 Western Europe has closed 0.22 million annual tons of capacity. Another 0.47 million annual tons are likely to be shut down in the next two or three years, plus some small adjustment in Japan. Capacity for these two areas together is likely to be some 0.5 million annual tons less by 1989/90 than envisaged by the 1987 Working Group. (There might be some closures on a small scale elsewhere, including the USSR.

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Table 2A.6

Comparison of Estimates and Forecasts of World Supply of Phosphates
1985/86-1991/92, 1987 Working Group and Medium Scenario

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Working Group	Million metric tons of nutrient					
(1) Capacity - Phosphoric Acid (Total)	34.70	35.70	36.40	37.30	37.30	37.60
(2) Supply Capability - Phosphoric Acid (Fertilizers)	24.60	25.0	25.90	28.0	28.50	28.90
(3) - Nitrophosphates (1)	3.50	3.50	3.60	3.70	3.70	3.70
(4) - Other Phosphates (2) - Socialist Asia	2.50	2.60	2.70	2.80	2.90	3.00
(5) - Other Countries (3)	7.60	7.70	7.70	7.70	8.00	8.10
(6) - All Fertilizers (4)	38.20	38.70	39.90	42.20	43.0	43.60
Medium Scenario						
(7) Capacity - Phosphoric Acid (Total)	34.70	35.70	35.0	36.80	36.80	37.10
(8) Supply Capability - Phosphoric Acid (Fertilizers)	24.60	25.0	25.60	27.60	28.10	28.50
(9) - Nitrophosphates (1)	3.50	3.50	3.60	3.70	3.70	3.70
(10) - Other Phosphates (2) - Socialist Asia	2.50	2.60	2.70	2.80	2.90	3.0
(11) - Other Countries (3)	7.50	7.30	6.90	6.70	6.40	6.40
(12) - All Fertilizers (4)	38.10	38.40	38.80	40.80	41.10	41.10
Memorandum Items:	Per Cent					
(5) as percent of (1)	21.90	21.60	21.20	20.60	21.40	21.50
(11) as percent of (7)	21.50	20.40	19.30	18.30	17.50	17.20

Notes: (1) Nitrophosphate supply capability is estimated by Chemonics. It is not shown separately in the Working Group's statistics.

(2) Single superphosphates, fused magnesium phosphates, ground phosphate rock, thermal phosphates and secondary rock in triple superphosphates

(3) In years of shortage other phosphates plants may work above the value shown here. See page 2A-14.

(4) Certain totals may not add due to rounding errors.

These have not been included, giving the Chemonics' adjustment a conservative slant). The result is shown in more detail in table 2A.6.

The much more substantial difference between the present analysis and the Working Group arises over supply capability for other phosphates mentioned above for the world excluding Socialist Asia. As seen in table 2A.6, the 1987 Working Group projects this category to rise gradually from 7.6 million metric tons (P2O5 basis) in 1985/86 to 8.1 million metric tons in 1991/92. Even though some developing countries are adding small amounts of new capacity in low analysis materials (e.g., India in single superphosphate), the overall forecast is surprising. In particular, it implies that the large supply capability for these other phosphates in the developed economies (both market and centrally planned), standing at 9.1 million annual tons of P2O5 in 1986.87, will be virtually unaffected by the intense competition from high analysis phosphoric acid based materials. (There is unlikely to be any new threat from nitrophosphates in 1987/88-1991/92.)

There has been a continuing displacement, both relatively and absolutely, of other phosphates since the early 1960's due to the generally more favorable production and marketing economies of high analysis materials. This worked itself out first in North America, which had closed almost all low analysis capacity by the late 1970's. Western Europe was the next to start the adjustment process. It continues in almost all countries which are significant consumers of fertilizers, notably in the USSR and in Western and Eastern Europe to a lesser degree. The first memorandum item of table 2A.6 shows the 1987 Working Group putting the supply capability for these other phosphates at a virtually constant share (around 21-22 percent) of world phosphoric acid capacity. However, unpublished analysis by George Allen shows this relationship with a most strongly determined and declining past trend, falling from around 85 percent in 1970 to 23 percent in 1985. This declining trend should continue, although possibly beginning to level off slightly towards the end of the forecast period, reaching around 17.2 percent in 1991/92. This interpretation is the basis for Chemonics' forecasts for other phosphates shown in table 2A.6.

These adjustments provide the following comparisons:

Table 2A.7

Comparison of Forecasts for World Supply Capability and Potential for All Phosphates

	Supply Capability			Supply Potential (1)		
	Chemonics		Working Group	Chemonics		Working Group
1985/86	38.1		38.2	36.2		36.3
1986/87	38.4		38.7	36.5		36.8
1987/88	38.8		39.9	36.9		37.9
1988/89	40.8		42.2	38.8		40.1
1989/90	41.1		43.0	39.0		40.9
	Trend	Actual		Trend	Actual	
1990/91	41.6	42.0	43.6	39.5	39.9	41.4
1991/92	41.8	42.3	44.0	39.7	40.2	41.8

(1) 95 percent of supply capability

It will be noted that supply capability and potential in the present analysis are increased above their trend values in 1990/91 and 1991/92. In the tight demand/supply situation expected under the Medium/High Scenarios, it is likely that the plants producing low analysis materials, which normally work well below their effective capacity, will quite easily increase their output.

c. Prospects For Nitrogen

The 1987 Working Group seems to have made insufficient allowance for the likely cycle of closure and new plants in the nitrogen sector. In June 1987 permanent closures were announced for ammonia plants in France and West Germany, together representing 850,000 annual tons of capacity in terms of N. The 1987 Working Group may have allowed for some 250,000 tons of this, but no more. Similar cases, although individually and perhaps totally on a smaller scale, are likely to emerge in the future. By contrast, there seems a strong case for expecting more new plants in 1990/91 and 1991/92 than shown by the Working Group. In particular, the unchanged capacity for the Soviet Union between 1986/87 and 1991/92 is open to doubt. While the immediate Soviet priority is to upgrade the poor operating performance of much of its existing plant, various official announcements suggest that some new capacity is under construction, using Czechoslovakian and Russian technology and not requiring the foreign involvement and the publicity which characterized the big expansion of the 1970's and early 1980's. Elsewhere, it should be possible to bring some new plants on

given the large excess capacity in the world chemical engineering industry. The new low pressure ammonia technology, being pioneered by ICI and others, should facilitate rapid investment response by manufacturers once there is sign of recovery in the world nitrogen industry.

To reflect these tendencies, the present analysis puts world fertilizer nitrogen supply potential at 0.60 million metric tons of N less than the 1987 Working Group in 1987/88-1989/90, and higher by 0.60 million tons in 1990/91 and 0.90 million tons in 1991/92. The increase for 1991/92 may prove to be extremely conservative.

6. Supply Potential to 1991/92 Low Scenario

a. Phosphates

The extra pressure to close capacity resulting from prolongation of the present depression in the phosphate sector is assumed to lower supply potential in 1988/89 to 1991/92 by 0.5 million tons of P2O5 annually from the forecasts of the Medium/High Scenarios.

b. Nitrogen

By largely similar reasoning to that for phosphates, supply potential is forecast lower than the Medium/High Scenarios by 0.3 million tons of N annually in 1987/88-1989/90 and less by 0.6 million tons in 1990/91 and 1991/92. These adjustments include an unchanged outlook for the Soviet Union.

7. Potash -- All Scenarios

The outlook for world potash capacity is clouded by uncertainties over the long term effect of water damage in two major mines and by the prospects in Western Europe. The Potash Corporation of Saskatchewan has sealed its Saskatoon mine in January 1987 due to the threat of flooding, although other means of reaching the deposit may be found. There are frequent rumors of serious flooding at the Berezniki complex in the USSR. Finally, closures additional to the 0.1 million annual tons of K2O capacity announced in February 1987 in West Germany are quite likely there and in France (together currently around 4.75 million annual tons of K2O capacity).

Although inevitably somewhat arbitrary, Chemonics puts supply potential at somewhat less than the Working Group, namely lower by 0.6 million tons of K2O in 1987/88 and by 0.4 million tons annually for 1988/89-1991/92.

8. General Conclusions on Demand/Supply to 1991/92

Table 2A.8 summarizes the estimates and forecasts for supply potential and consumption/demand made by the 1987 Working Group and by Chemonics. The comparison of surplus/(deficit) for each of the three nutrients indicates the much more optimistic outlook (from the supplier's viewpoint) taken by Chemonics, especially in nitrogen and phosphates, even in the case of the Low Scenario. In particular, the tightening prospects for supply potential are much more favorable to phosphate producers than is widely believed to be the case, whichever scenario is assumed.

In the case of the Medium/High Scenarios,

- The world nitrogen sector is expected to face shortage of supplies in 1989/90. Indeed, pressure to rebuild inventories in relation to final demand at all stages of the production/marketing system from previously low levels will emerge as soon as the prospects of tight supplies can be foreseen, meaning that disappearance is likely to be well above forecasted consumption in 1988/90.

- Similarly, the converted phosphate sector will move into deficient supply potential in 1990/91. But, with stock rebuilding ahead of this stage, as with nitrogen, markets would become tight in 1989/90.

3. Potash is Expected to Remain in a Substantial Surplus Situation through 1991/92

In the case of the Low Scenario, the demand/supply balances are pushed back about one year. Acute shortages appear in nitrogen by 1991/92, by which time the phosphate sector is back into balance while potash remains critically oversupplied.

9. World Demand/Supply Balances in 1992/93-1997/98

The cyclical shortages envisaged for nitrogen and converted phosphates above are likely to continue through 1992/93 for N and through 1993/94, and possibly one year more, for P2O5 potash should return to market balance by early 1993/94. The Low Scenario would delay all of these adjustments by around one year.

Some cyclical over-response and excess capacity in nitrogen and converted phosphates is quite possible for the remaining years in each scenario. However, it is sufficient to examine the cyclical tendencies through 1992/93 and 1993/94 to highlight the critical policy implications of international prices for policy analysis. Thereafter, as discussed more fully below, it is more useful to concentrate on the underlying long run trends.

Table 2A.8

Comparison of Estimates of World Supply Potential and of Consumption/Demand
1985/86 - 1991/92, Chemonics and 1987 Working Group

	Supply Potential				Consumption/Demand				Surplus/(Deficit) (2)			
	N	P205	K20	TOTAL	N	P205	K20	TOTAL	N	P205	K20	TOTAL
	million tons											
Working Group												
1985/86	73.3	36.3	30.5	140.1	70.0	33.1	25.6	128.7	3.3	3.2	4.8	11.4
1986/87	74.2	36.8	30.3	141.3	71.2	33.9	26.1	131.2	3.0	2.9	4.2	10.1
1987/88	75.9	37.9	29.9	143.7	73.5	35.3	26.7	135.5	2.4	2.5	3.2	8.1
1988/89	78.1	40.1	30.5	148.7	75.7	36.3	27.4	139.4	2.4	3.7	8.7	9.2
1989/90	79.3	40.9	31.8	152.0	77.9	37.3	28.1	143.3	1.4	3.6	3.7	8.7
1990/91	80.2	41.4	32.5	154.1	80.1	38.3	28.7	147.1	0.1	3.1	3.7	6.9
1991/92	81.3	41.8	32.7	155.8	82.3	39.3	29.3	150.9	(1.0)	2.5	3.4	4.9
Chemonics Medium/High Scenarios												
1985/86	73.3	36.2	30.5	140.0	70.0	33.1	25.6	128.7	3.3	3.1	4.8	11.2
1986/87	74.2	36.5	30.3	141.0	71.2	33.9	26.1	131.2	3.0	2.6	4.2	9.8
1987/88	75.3	36.9	29.3	141.5	73.7	35.5	26.8	136.0	1.8	1.4	2.5	5.5
1988/89	77.5	38.8	30.1	146.4	76.2	36.6	27.7	140.5	1.3	2.2	2.4	5.9
1989/90	78.7	39.0	31.4	149.1	79.4	38.0	28.6	146.0	(0.7)	1.0	2.8	3.1
1990/91	80.8	39.9	32.1	152.1	83.2	39.8	29.8	152.8	(2.4)	0.1	2.3	-
1991/92	82.2	40.2	32.3	154.7	86.2	41.1	30.6	157.9	(4.0)	(0.9)	1.7	(3.2)

Table 2A.8 (continued)

Comparison of Estimates of World Supply Potential and of Consumption/Demand
1985/86 - 1991/92, Chemonics and 1987 Working Group

	Supply Potential				Consumption/Demand				Surplus/(Deficit) (2)			
	N	P205	K20	TOTAL	N	P205	K20	TOTAL	N	P205	K20	TOTAL
	million tons											
Chemonics Low Scenario												
1985/86	73.3	36.2	30.5	140.0	70.0	33.1	25.6	128.7	3.3	3.1	4.8	11.2
1986/87	74.2	36.5	30.3	141.0	71.2	33.9	26.1	131.2	3.0	2.6	4.2	9.8
1987/88	75.0	36.9	29.3	141.2	73.3	35.2	26.6	135.1	1.7	1.7	2.7	6.1
1988/89	77.2	38.3	30.1	145.6	75.7	36.3	27.4	139.4	1.5	2.0	2.7	6.2
1989/90	78.4	38.5	31.4	148.3	77.0	37.0	28.0	142.0	1.4	1.5	3.4	6.3
1990/91	80.2	39.4	32.1	151.7	80.6	38.8	28.9	148.3	(0.4)	0.6	3.2	3.4
1991/92	81.6	39.7	32.3	153.6	83.0	39.6	29.6	152.2	(1.4)	0.1	2.7	1.4

(1) When supply potential is less than demand, increases in market prices may boost production somewhat above normal supply potential but the main effect will be to check consumption below the level of projected demand.

(2) Certain totals may not add due to rounding errors.

10. Demand/Supply Balance in Phosphate Rock

Changes in the demand/supply balance for phosphate rock are likely to lag slightly behind those for converted phosphates and to avoid such acute cyclical shortages. Phosphate rock mining normally has fewer constraints to expanding output than are faced by a conversion facility when it is operating near to its nominal capacity. This is particularly the case for the large Moroccan mines (including Bu Craa).

11. Demand/Supply Balance in Sulphur

a. General Background

Sulphur's importance in the costs of phosphatic fertilizers in general, and also in the case of PHILPHOS in particular, requires some consideration of its future demand/supply balance. There are approximately 0.46 tons of sulphur in one ton of DAP, and 0.33 tons per ton of TSP. While the most likely scenario through 1997 envisages no great change in the inflation-adjusted FOB mine/plant of sulphur price, there is a significant risk of a substantial rise due to failure of supplies in the USSR.

Most of the detailed analysis on the outlook for production, consumption and prices is to be found in confidential, multi-client consultant reports not available for the present study. The most recent substantial published study is W.F. Sheldrick, World Sulphur Survey, World Bank Technical Paper No. 24, July 1984. It is used substantially here, supplemented by the monthly reviews on sulphur issued by the Bureau of Mines of the United States Department of the Interior and general press comments. An investigation based on a wider range of recent sources probably would lead to some changes in the statistics given in table 2A.9 below, particularly for the forecasts of supply potential and non-fertilizer uses. However, it is unlikely that the general conclusions would be changed significantly by such revisions.

There are three important features of world sulphur supply.

- The greater part of world consumption, especially in the non-Communist countries, comes as by-product supplies in which changes in output, especially in the short-term, are determined almost entirely by the market conditions facing the principal co-product (e.g. natural gas, copper smelting). By far the lesser proportion comes from sulphur mines (Frasch and open mining) and from the processing of pyrites, where sulphur market conditions determine the levels of output.

Table 2A.9

Sources of Western World Sulphur Production

	Discretionary			Non-Discretionary	Other		Total
	Frasch and Native Sulphur	Pyrites	Sub-Total	Recovered From Oil and Natural Gas		Sub Total	
	iv						
	Percent						
1985	18	12	30	53	17	70	100
Projected							
1987	19	12	31	52	17	69	100
1992	14	13	27	56	17	73	100

Source for projections: W.F. Sheldrick, World Sulphur Survey, World Bank Technical Paper No. 24, July 1984.

- The discretionary sources of sulphur, particularly the US Frasch mines, are responsive to price changes in the short run. For example, the US Frasch mines have reduced their combined annual output from five million tons to three million tons in the last two years. This influence, while important, is not large enough to equilibrate large imbalances in global markets.

- Large inventories of by-product sulphur were accumulated in Canada (Alberta) in the 1970's and have been an important source of supply to this day. They stood at 14.7 million tons at the end of 1983, and at 8.4 million tons four years later. Some other excess inventories have been accumulated recently, particularly in Saudi Arabia which held 0.75 million tons at the end of 1986. In all, there are probably some 10.0 - 11.0 million tons of excess inventories in the non-Communist parts of the industry for use when production falls short of consumption. (Communist producers do not reveal their inventory positions. However, they are unlikely to change the situation described in this paragraph.)

- The West at present takes around 1.5 million tons of sulphur from the COMECON countries. However, its dependence will increase substantially in the 1990's, with prices extremely sensitive to the degree of success achieved by the Soviet Union in bringing on a massive recovered sulphur project in Astrakan.

b. Medium Scenario to 1992

Production potential is estimated from the Sheldrick forecasts of production for 1987 and 1992, the intervening years being interpolated, after making the following adjustments to allow for the less favorable development of the sulphur and natural gas market than could be envisaged in 1984 when this study was completed.

- The USA is reduced from 14.40 million tons to 13.80 million tons for 1992, reflecting slower growth of recovered sulphur from oil and natural gas.

- A similar situation in Canada is taken as reducing the Sheldrick totals by 0.24 million tons in 1987 and 0.40 million tons in 1992.

- Sulphur from pyrites in Western Europe (excluding France and Germany) is put at 3.10 million tons instead of 3.53 million tons in 1992, reflecting the relatively unfavorable short-term outlook for new developments in Spain and Portugal arising from the easy market situation described below.

- The expansion of production of recovered sulphur in Iran is taken from 0.30 million tons in 1987 to 0.70 million tons in place of the Sheldrick 1.00 million tons for 1992, reflecting expected difficulties in financing new facilities due to the Iran-Iraq war and limited access to normal sources of foreign finance.

- Saudi Arabia is reduced by 0.10 million tons in 1986, 0.15 million tons in 1987 and 0.25 million tons in 1992 from the Sheldrick forecasts of 1.20, 1.25 and 1.50 million tons, reflecting less extensive development of sour natural gas.

These adjustments give the following estimates of production.

Table 2A.10

Production of Sulphur

	1986	1987	1992
	----------Million tons----------		
Sheldrick	59.9	61.7	72.9
Present study	59.8	61.3	70.9

Both far exceed likely consumption in 1986-1992. Therefore, they are treated as production potential. Production will be substantially lower, principally due to reduced output by Frasch and other mines and by pyrites producers.

Consumption of sulphur for fertilizer will rise at a slightly greater rate than for phosphate nutrients, reflecting the continuing shift to phosphoric acid based materials. The past trend in the ratio between the total annual weights of fertilizer sulphur to fertilizer P2O5 has been extrapolated to form the basis of the calculation in table 2A.11.

Table 2A.11

Calculation of Fertilizer Sulphur Forecasts

	Ratio of Total Consumption of Sulphur and of Fertilizer P2O5	Consumption P2O5 (1)	Consumption Sulphur
		--Million tons--	
1986	87.9	33.1	29.1
1987	88.3	33.9	29.9
1988	88.7	35.5	31.5
1989	89.1	36.6	32.6
1990	89.5	38.0	34.0
1991	89.8	39.8	35.7
1992	90.0	41.1	37.0

(1) Prior and overlapping fertilizer year (e.g. 1986 for sulphur and 1985/86 for P2O5).

Consumption for other uses is taken from the Sheldrick study. It is possible that these forecasts are slightly high,

since market prospects probably appeared more favorable in 1984 than they do today. If so, the weakness is not serious.

The supply/demand balance to 1992, shown in table 2A.12, indicates that there will be no appreciable net change in stocks from the still substantial levels at the end of 1987.

There is, however, one important risk. By 1992 the Western world will need to import over 4.0 million tons annually from Communist countries, as against some 1.5 million tons in 1986. The additional imports will come almost entirely from the USSR and will depend heavily on its capability to add new capacity successfully, particularly the large Astrakan complex to recover sulphur from sour natural gas, where the first unit started operation in 1987 and is intended to be recovering more than 4.0 million tons annually by early 1990's.

The USSR has a very poor record in developing and running its energy and chemical sector, including fertilizers. Should this state of affairs continue, Soviet sulphur production and exports could be falling short of the targets by, say, one million tons annually from 1991 for several years. In this case, the world market situation would tighten quickly, particularly as the Canadian exporters would see that their stocks had a much enhanced scarcity value, and price their materials accordingly, and since the most readily means of boosting world production, the Frasch mines, would require a substantial price incentive.

On balance, the USSR seems likely to achieve a much improved management performance in its fertilizer and energy sectors, particularly as the present emphasis is more on achieving better operations and less on an ambitious expansion of capacity than was the case in 1970-1985. The Medium Scenario reflects this view.

c. <u>High Scenario to 1992</u>

In this case, there is a shortage of recovered sulphur exports from the USSR for the reason indicated above. Inventories are beginning to fall rapidly by around 1990, with production at the limit of existing production potential by 1992. (The High Scenario would be favorable for PHILPHOS and is discussed in this context in Annex 4.)

d. <u>Low Scenario to 1992</u>

Production remains substantially further below production potential than shown in table 2A.12. Inventories increase significantly, although further reductions in Frasch output probably would be the major adjustment compared with the Medium Scenario.

Table 2A.12

World Supply/Demand Balance for Sulphur - Medium Scenario

	Production Potential	Production	Consumption Fertilizer	Consumption Others	Consumption Total	Net Change In Stocks
	Million Tons					
1981	N.A	53.1	27.7	26.1	53.8	(0.7)
1982	N.A	50.4	26.1	24.1	50.2	0.2
1983	N.A	50.8	27.7	24.9	52.6	(1.8)
1984	N.A	54.2	29.3	26.0	55.3	(1.1)
1985	N.A	54.8	28.3	27.3	55.6	(0.8)
1986	59.8	55.9	28.3	28.6	56.9	(1.0)
Forecasts						
1987	61.3	58.3	29.9	28.1	58.0	0.3
1988	63.4	61.0	31.5	29.7	61.2	(0.2)
1989	65.3	63.3	32.6	30.6	63.6	(0.3)
1990	67.0	65.6	34.0	31.6	65.6	-
1991	69.7	68.5	35.5	32.6	68.1	0.4
1992	70.7	69.9	37.0	33.6	70.6	(0.7)

e. Scenarios for 1993-1997

Apart from allowing for a further period (say two years) while the USSR brings its sulphur recovery operation to planned efficiency in the High Scenario, it is sufficient to consider only the generally tightening trend in world demand/supply as Canadian stocks are finally depleted, with rising prices inducing substantial new capacity which comes on stream outside the review period.

C. The International Value of the US Dollar -- All Scenarios

1. Issues

The US dollar is the only currency in which past fluctuations in world market prices of fertilizers and their critical inputs can be readily examined. Forecasts are most appropriately made on the same basis. Two issues arise concerning the dollar's future value: (1) its trade-weighted value against other major currencies, and (2) the peso/dollar exchange rate. (The trade-weighted average reflects the importance of individual exchange rates against the dollar in terms of general international trade. A fertilizer trade-weighted index probably would, if calculated, differ somewhat from the more comprehensive index. But the general implications would be the same as those based on the more comprehensively calculated index.)

The dollar values of fertilizers are directly affected by exchange rate fluctuations. A change in the value of the dollar probably carries through 85-90 percent to the dollar price of fertilizers within a one year period, but in the longer term there is likely to be almost a one-to-one relationship. During the 1970's the dollar value of fertilizers was boosted somewhat by the steady dollar depreciation following the 1971 Smithsonian Agreement. This was a minor effect compared with those of the last seven years. The strong appreciation of the dollar in 1980-1985 depressed US dollar prices substantially from the levels which would have applied with fixed exchange rates, and conversely since then. By November 1987 the dollar was back to the trade-weighted value ruling seven years earlier. In other words, by late 1987 the international value of the dollar had ceased to be a major factor disguising the historial trend in world market fertilizer prices as they are normally quoted.

2. The Future Peso/Dollar Exchange Rate

The following analysis proceeds on the assumption that the dollar will stay around its late 1987 international value through 1997. Of course, this is unlikely. However, the conclusions developed later will not in general be undermined by any plausible, alternative outcome. (A simplified no-change

scenario for the peso against the dollar cannot be so comfortably employed, for the review of PHILPHOS, as indicated in chapter V.)

D. Price Forecasts: General Considerations

The aims of the price forecasts for critical inputs and for the principal fertilizer materials are (1) to trace the timing and scale of the upward price fluctuations as markets come into balance and then shortage during the upward phase of the price cycles, which are now at or slightly past troughs, and (2) thereafter to identify the long-term trends in these price series. In this way, the analysis will identify both critical aspects for the Philippines fertilizer sector.

The prices of sulphur and fertilizer materials are shown FOB representative shipment points for which official statistics are regularly reported. A review of the outlook for ocean freight then leads to a general consideration for future prices CIF Philippines.

All prices are shown in US dollars. Unless otherwise indicated the inflation-adjusted prices are at constant 1986 dollars, using the official US national income deflator. Historical values through 1985 are taken from the 1986 World Bank review of commodity prices. Prices for 1986 and 1987 are estimated from various trade and industry sources.

E. The Price Outlook for Natural Gas and for Sulphur and Fertilizer Materials FOB Representative Supply Points

1. Natural Gas -- All Scenarios

The cost of natural gas can be a critical item in the production of fertilizers, particularly for nitrogen materials and for sulphur from Frasch deposits.

Many countries are short of indigenous supplies of natural gas, in which cases their actual price or social opportunity cost is high (e.g. Western Europe, Pakistan, India and the Philippines). But there are many "gas rich" countries where natural gas is abundant and where its market and social values are comparatively low (e.g. Saudi Arabia, other Gulf states, Malaysia and Trinidad). This situation is likely to obtain throughout the next ten years. The Low Scenario would show marginally lower prices than for the other scenarios, but the differences are not large enough to warrant special consideration. Representative forecasts for these groups are shown in table 2A.13.

In addition, it should be noted that the USSR has large natural gas reserves which are the basis of its major role in nitrogen exports, currently running at well over 4.0 million

annual tons of N shipped as ammonia or urea. If necessary, it is prepared to price this gas as cheaply as the "gas rich" developing countries.

Table 2A.13

Approximate Natural Gas Prices Delivered to Fertilizer Plants in Major Areas of Production at 1986 US $

	Western Europe (1)	USA	Developing Countries A	Developing Countries B
	US $/MBTU			
1986	4.50	2.10	1.30	0.60
1987	4.50	2.10	1.30	0.60
Forecasts				
1988	4.50	2.10	1.30	0.60
1989	4.55	2.15	1.30	0.60
1990	4.65	2.20	1.40	0.60
1991	4.75	2.25	1.40	0.60
1992	4.85	2.30	1.45	0.60
1993	4.95	2.40	1.45	0.60
1994	5.10	2.50	1.50	0.60
1995	5.25	2.60	1.50	0.60
1996	5.40	2.70	1.55	0.60
1997	5.55	2.80	1.60	0.60

A. Countries with moderate infrastructure and sizable domestic markets for their natural gas (e.g. Mexico and Algeria).

B. Countries with minimal infrastructure and limited sales outlets for their natural gas (e.g. Saudi Arabia). Some developing countries are in an intermediate position between A and B (e.g. Trinidad). A few are somewhat better placed than category A (e.g. Algeria).

(1) A few nitrogen plants are/will be charged substantially less for gas used in producing exported materials.

2. Sulphur FOB US Mine/Plant and FOB US Gulf Ports

US prices FOB Frasch mine or recovery plant are shown in table 2A.14 for 1955-1987 and forecasts to 1997. The long historical series is shown to avoid giving the impression of a strong upward trend in inflation-adjusted prices if the series had been started around 1970. In 1970-1974 prices were exceptionally depressed by the surge in by-product sulphur from Canada which continued to a lesser degree through 1978. Taking the longer 32 year historical perspective there has been a very slightly upward trend in the real price, rising from around $85/ton in the late 1950's to around $100/ton in the mid-1980's.

Taking first the Medium Scenario, the outlook for the world supply/balance suggests that markets will remain weak in 1988 and 1989. A real price of around $80/ton will be sufficient to cover the incremental costs for the US Frasch sector working at around three million tons annually compared with 4.2 million tons in 1982, 3.2 million tons in 1983, 4.2 million tons in 1984, 5.0 million tons in 1985 and 4.0 million tons in 1986. Thereafter, real prices should start to recover. By 1993 there is likely to be a balanced market. This would require around 5.0 million tons annually from the US Frasch producers. Allowing for the small increases in inflation-adjusted natural gas prices already indicated and in the amount of heated water required per ton of sulphur as mines deplete, the necessary price incentive would be around $110-$115 FOB mine at constant 1986 $. Some further small increase is likely, reaching an inflation-adjusted $120 in 1995-1997.

In the event of the High Scenario (resulting from a shortfall in exports from the USSR), prices would probably be some $25/ton more than the Medium Scenario in the early 1990s and as much as $40/ton by 1995. With Canadian stocks much depleted in the previous two or three years, inflation adjusted prices could remain around $160/ton. The Low Scenario envisages a much more prolonged depression of real prices than in the Medium Scenario, only reaching the same trend value by 1996.

3. Phosphate Rock

The world export market for phosphate rock is dominated by four low costs producers (Morocco, Florida, Jordan and Togo) and by two others which have advantages of proximity to markets and high quality of processed product (the Kola deposit in north-west USSR and Oceania).

Table 2A.14

Average Sulphur Prices FOB
US Frasch Mines/Recovery Plants

	Current $	Constant 1986 $		Current $		Constant 1986 $	
1955	$ 27	$ 106	1977	$ 44		$ 74	
1956	26	96	1978	44		70	
1957	24	86	1979	55		80	
1958	23	83	1980	88		116	
1959	23	80	1981	110		133	
1960	22	77	1982	108		124	
1961	22	77	1983	87		96	
1962	22	73	1984	94		100	
1963	19	64	1985	106		109	
1964	20	64	1986	104		104	
1965	22	69	1987	80 (1)		78 (1)	
1966	25	77	Forecasts		Low	Medium	High
1967	32	95			---	------	----
1968	39	112	1988	(2)	80	80	80
1969	26	72	1989	(2)	80	80	80
1970	22	58	1990	(2)	80	90	100
1971	17	42	1991	(2)	85	100	125
1972	16	39	1992	(2)	90	105	130
1973	17	39	1993	(2)	100	110	140
1974	28	58	1994	(2)	110	115	150
1975	44	83	1995	(2)	115	120	160
1976	45	80	1996	(2)	120	120	160
			1997	(2)	120	120	160

(1) Estimates
(2) Not forecasted

Notes: All calculations have been made from unrounded numbers. Long series are shown to avoid a misleading impression of trends if the series were started around 1970.

Table 2A.15

Exports of Phosphate Rock in 1984
million tons

Morocco	15.0
USA	11.7
Jordan	4.7
USSR	4.4
Togo	2.8
Oceania	2.6
Sub-Total	41.2
World	43.7

On a FOB vessel basis Morocco has now overtaken the existing Florida mines as the largest low cost producer, plus considerable freight advantage in reaching Western Europe and some also to much of Asia. Togo has FOB costs some 10 percent lower than Morocco and exports much higher grade rock. Jordan may be around 5 percent lower than Morocco on the FOB basis and has some freight advantage to Asia. USSR Kola rock after processing has very high phosphate content, other technical advantages and proximity to market. Within the USA the North Carolina deposits, while difficult to develop, are probably at some slight competitive advantage to the central Florida fields which, however, continue to supply most US exports.

The future trend in international FOB costs (including return on investment) and prices can be determined on the basis of the situation in Morocco and central Florida. Morocco can make substantial long term additions to its mining potential without appreciably boosting real costs. Central Florida can achieve some small incremental additions to existing mines on the same basis. Table 2A.16 provides perspective on the costs of these two producers.

Table 2A.16

Representative Investment and Production Costs for Phosphate Rock for Mines with Individual Annual Production of 3.0 Million Tons/Year Dry Basis at 1986 US $

	Rock Grade A	B	C
	$ ton		
Fixed and Working Capital per Annual Ton	$ 60.60	$ 69.80	$ 75.50
Operating Costs including Depreciation	19.80	19.90	28.10
Transport, Loading and Export Tax	6.80	6.80	6.80
15 % return on Capital	9.10	10.50	11.30
Total FOB Vessel	35.70	37.20	46.20

(1) For Southern Florida severance tax is included in production costs. Deduct $6.00/ton from FOB vessel total to get FOB mine.

Sources: W.F. Sheldrick , Investment and Production Cost for Fertilizers, FAO Commission on Fertilizers, FERT 75/4, September 1984, "Morocco develops its P2O5 supply capability", Phosphorous and Potassium, March-April 1985, and other fertilizer industry technical literature.

Substantial new developments could be made in Morocco within the estimates for the rock grades A and B, probably towards the lower end. Recent additions to capacity in central Florida fall in the same category. Incremental expansions there would be similar or less depending on the bargaining power of the owners of any reserves which might need to be purchased. Category C represents southern Florida and poorer deposits in Morocco, which there is no need to develop for a very long time. (It was quite widely expected in the late 1970's that it would be necessary to develop the southern Florida deposits and that market prices would need to rise accordingly. There is now not the slightest prospects that market conditions will justify such action until well into the next century).

The projections shown in table 2A.17 are based on the expectation that $32.00/ton at constant 1986 $ will be required to secure the limited available additions to capacity in Central

Table 2A.17

Phosphate Rock Prices FOB Dock Morocco and FOB Mine USA

	Current $		1986 Constant $		
	Morocco	USA	Morocco	USA	Morocco Above USA
	$ ton				
1960	$ 12	$ 7	$ 42	$ 23	$ 19
1961	12	7	41	24	17
1962	11	7	36	24	12
1963	11	7	36	24	12
1964	12	7	38	23	15
1965	13	7	42	24	18
1966	12	7	37	24	13
1967	11	7	34	23	11
1968	11	7	31	20	11
1969	11	6	29	17	12
1970	10	6	27	16	11
1971	11	6	26	15	11
1972	11	6	25	14	11
1973	13	6	29	14	15
1974	51	12	105	31	74
1975	63	25	118	44	74
1976	35	21	63	36	25
1977	30	20	50	35	15
1978	28	20	44	32	12
1979	32	22	46	33	13

	Current $		1986 Constant $						
	Morocco	USA	Morocco			USA			Morocco Above USA
	$ ton								
1980	$ 47	$ 25	$ 60			$ 34			$ 24
1981	50	30	60			36			24
1982	42	28	48			32			16
1983	37	26	41			29			12
1984	38	26	40			28			12
1985 (1)	34	25	35			26			9
1986 (1)	32	24	32			24			8
1987 (1)	(2)	(2)	30			22			8
Forecasts									Low/Medium
			Low	Medium	High	Low	Medium	High	High
1988	(2)	(2)	31	33	33	22	24	24	9
1989	(2)	(2)	35	38	38	24	27	27	11
1990	(2)	(2)	38	42	43	27	31	32	12
1991	(2)	(2)	43	49	51	30	36	38	13
1992	(2)	(2)	47	49	55	34	36	42	13
1993	(2)	(2)	49	46	48	36	33	35	13
1994	(2)	(2)	49	45	45	36	32	32	13
1995	(2)	(2)	45	45	45	32	32	32	13
1996	(2)	(2)	45	45	45	32	32	32	13
1997	(2)	(2)	45	45	45	32	32	32	13

(1) Chemonics estimates
(2) Not estimated/forecasted

Notes: All calculations have been made from unrecorded numbers. The original series for Morocco are for 75% BPL rock to 1975, 72% BPL 1975-1980 and 70% BPL for 1981-1986. They have been standardized to the 1981-1986 basis.

Florida over the 1987-1997 period. In these circumstances Morocco will be able to enjoy a large surplus over its full costs, especially since the recovery in ocean freight rates discussed below will increase its competitive advantage against the US in some markets, especially Western Europe. Accordingly, the Moroccan long-term inflation-adjusted price is expected to be around $45.00/ton. An aggressive programme of expansion by Morocco (or other non-US producers) could drive the long-term real price to a lower level. Such action is considered unlikely through 1997.

For the Medium Scenario these trend conditions are reflected in the 1994-1997 forecasts. Real prices in 1988 and 1989 reflect serious oversupply. In 1990 the market returns to balance towards the end of the year. There are moderate shortages in 1992 and 1993.

The Low Scenario delays the price recovery by about a year and a half. The High Scenario indicates the greater boost to boom year prices which might result from the demand/supply forecasts for the Medium Scenario.

3. Triple Superphosphate (TSP)

The real price of TSP has fluctuated greatly in 1964-1987, the longest period for which published information is available for the international market. The market in 1964-1967 was one of moderate shortage, moving towards balance. By contrast, 1968-1971 were years of serious oversupply, perhaps similar to 1982-1985 on average but not so acute as 1985-1987. Bearing in mind both the cyclical pattern and the considerable longer term changes in the real prices of sulphur, phosphate rock and energy, the apparent trend of real TSP prices is misleading.

On the basis of the real prices FOB US Gulf given in table 2A.18, the trend in the real price in 1964-1967 was around $130/ton. There are two alternative guides to its likely change by the mid-1980's.

First, Sheldrick (1984, as detailed in table 2A-16) estimates in table 2A.19 the price FOB plant required to give a 15 percent return on initial fixed and working capital at 1982 $ in a developed site such as central Florida a recent and more conservative view of phosphate rock and sulphur costs than seemed likely when the original calculation was made.

Table 2A-18

Actual and Real Prices of
Triple Superphosphate and Diammonium Phosphate 1964 - 1997

	TSP Bulk FOB Actual	Florida 1986 $	DAP Bulk FOB Florida Actual	1986 $
1964	$ 46	$ 150		
1965	46	147		
1966	47	145		
1967	47	141	69	226
1968	38	109	66	188
1969	39	106	58	158
1970	43	110	54	140
1971	43	107	62	153
1972	68	160	91	216
1973	100	223	119	266
1974	304	626	333	686
1975	203	381	243	458
1976	91	163	120	215
1977	98	166	133	225
1978	98	154	140	220
1979	142	206	193	280
1980	180	240	222	295
1981	161	195	195	236
1982	138	158	183	209
1983	135	148	184	202
1984	131	139	189	201
1985	121	125	169	173
1986 (Est)	120	120	160	160
1987 (Est)	130	126	160	155

Table 2A.18 (continued)

Actual and Real Prices of
Triple Superphosphate and Diammonium Phosphate 1964 - 1997

	TSP Bulk FOB Actual	Florida 1986 $		DAP Bulk FOB Florida Actual 1986 $		
Forecasts	Low	Medium	High	Low	Medium	High
1988 (2)	135	145	145	185	195	195
1989 (2)	150	160	160	200	215	215
1990 (2)	155	185	195	205	240	250
1991 (2)	170	210	235	225	290	320
1992 (2)	210	260	320	265	340	410
1993 (2)	260	210	265	325	275	340
1994 (2)	210	195	210	265	260	275
1995 (2)	195	195	190	250	260	260
1996 (2)	195	195	190	250	260	260
1997 (2)	195	195	190	250	260	260

(1) Not available
(2) Not forecasted

Note: All calculations have been made from unrounded numbers, using the official US GNP deflator.

Table 2A.19

Adjustments to Sheldrick (1984)

Price of TSP for 15% Return on Capital - 1982$	$207.10
- 1986$	$236.57/ton
less	
Phosphate rock reduced from $40 to $28/ton	19.20
Sulphur reduced from $183 to $145/ton	12.55
Adjusted price for 15% return	$ 204.82

Notes: $1.00 change in rock price changes TSP price by $1.60/ton. $1.00 change in sulphur price changes TSP price by $0.33/ton

The value of by-product heat is around $21 per ton of sulphur used. The lower phosphate rock and sulphur prices reflect a more cautious outlook on the trend in prices than in Sheldrick (1982) and a further saving by the use of partially processed wet rock.

It is quite likely that the Sheldrick calculation somewhat overestimates the fixed capital cost in phosphoric acid and TSP plants, which could represent a further savings of some $20/ton. All considered, the recalculations of Sheldrick (1984) suggest a trend real price of $185-$205/ton of TSP in 1986.

Second, an estimate can be made, starting with the real price at 1986 $ which is likely to have applied in the mid-1960's if there had been a balanced market, namely $130/ton. Then, the following adjustments point to the mid-1980's trend value, bearing in mind that there are two pairs of years within each of which there are broadly similar market conditions, a sellers' market in 1964-1967 and 1979-1981, and one favoring buyers in 1968-1971 and 1982-1985.

- The market price of phosphate rock averaged $23.50/ton in 1964-1967 and $35.00/ton in 1979-1981, a difference of $11.50/ton of rock or $18.40/ton of TSP. For 1968-1971 and 1982-1985 the corresponding estimates are $16.00, $29.00, $13.00 and $23.90. Say, an average increase for each pair of periods of $21/ton of TSP.

- The sulphur cost per ton of TSP rose from $30.95 in 1964-1967 to $49.68 in 1979-1981, an increase of $18.73. The corresponding estimates for 1968-1971 and 1982-1985 are $31.50, $49.74 and $ 18.24. (These calculations are based

on the sulphur costs CIF TSP plant shown in table 2A.20). Say, an average overall increase of $18/ton.

- The energy costs in producing one ton of TSP, including phosphoric acid, was around $20 at 1982 $ according to Sheldrick (1982), giving $24.20 at 1986 $. By contrast, the cost in the mid-1960's before the large increase in energy prices would have been around $6.65. Say, an upward shift in the real cost of energy of $18/ton of TSP.

From this approach the following calculation can be made.

Table 2A.20

	1986
Mid-1960's inflation-adjusted trend price of TSP	130/ton
plus	
Increases in cost	
Sulphur	21
Energy	18
	18
Mid-1980's inflation-adjusted trend price of TSP	$ 187

These two sets of calculations suggest that the trend inflation-adjusted market prices should be set at around $190/ton FOB US Gulf in 1986. Allowing for trend increases in the prices of phosphate rock, sulphur and energy, the corresponding value for 1992 would be $195/ton.

Given the exceptional oversupply which has taken the real price of TSP some $60-$65/ton below its trend level in 1985-1987 and which is expected to continue in large measure in 1988 and 1989, there is likely to be such cyclical under-investment in new capacity that the Medium Scenario sees real prices rising to as much as $260/ton in 1982. The High Scenario is put as peaking at around $320/ton in the same year. The Low Scenario pushes the cycle back around a year and a half. These sets of forecasts were shown in table 2A.18.

5. Diammonium Phosphate (DAP)

Various grades of DAP are produced. By far the most representative is 18-46-0, i.e. 18 units of N and 46 units of P2O5 per ton of product which is analyzed below.

The differences between the inflation-adjusted annual prices of export TSP and DAP, shown in table 2A.21 are the basis for linking the forecasts for the two products.

Table 2A-21

DAP Above TSP Inflation Adjusted Annual Prices per Ton of Product, Bulk Export FOB Florida

1967	$85	1976	$52
1968	79	1977	59
1969	52	1978	66
1970	30	1979	74
1971	46	1980	55
1972	56	1981	41
1973	43	1982	51
1974	60	1983	54
1975	77	1984	62
	---	1985	50
Average	59		---
		Average	56

Note: Differences between estimated prices for 1986 and 1987 are $44/ton and $35/ton respectively.

There is quite a strong tendency for the inflation-adjusted price differential to narrow in periods of phosphate oversupply, and conversely with shortages. But this pattern is somewhat disturbed due to the prices of ammonia varying substantially in relation to those for phosphates.

The projections for the inflation-adjusted DAP prices for all scenarios are made on the basis that the trend values will be $55/ton higher than those for TSP, ranging from $50/ton in years of serious oversupply to $65/ton when shortages are most acute. The results have been shown already in table 2A.18.

6. Urea

The long-term trend in the real price of urea has been raised substantially by the increase in energy costs since 1973, against which must be set a number of mitigating factors from the side of capital costs.

- In 1965-1972 a US Gulf producer with an integrated ammonia/urea plant would have used around 39 MBTU of natural gas at $0.25/MBTU per ton of product, i.e. a cost of $9.70. But, in 1987 a retrofitted or new plant would have required 32 MBTU at 2.10/MBTU for a cost of $67.20 per ton of urea, i.e. an extra $57.50/ton in current dollars or some $20.00-$25.00/ton at 1986 values.

- The real capital cost of new plants rose sharply in the 1970's, attributable entirely or almost entirely to the boom enjoyed by the nitrogen plant construction companies who were also heavily engaged in the oil and natural gas sectors. By contrast, in 1985-1987 these companies have been exceptionally short of orders and some bargain basement contracts have been negotiated for new ammonia plants (e.g. by Saudi Arabia with Toyo Engineering in late 1985). It is not yet clear how far inflation-adjusted contract prices will recover in the building of new ammonia/urea complexes based on the standard technology, but they will certainly remain far below the levels of the 1970's and early 1980's.

- There are, moreover, prospects of new, low pressure technology for ammonia plants which will greatly reduce energy and capital costs, as well as reducing the importance of economies of scale. The pioneer is ICI with its AMV technology, and it is understood that other plant designers have similar developments. Even though the situation is not yet completely clear, some allowance should be made for this new technology, reducing plant capital costs and producing further savings in energy use.

- Most of the next round of expansion in world capacity will take place alongside existing ammonia/urea complexes, which will generally need only limited investment outside battery limits. Plants will be built some 30-50 per cent larger than the plant costed below assuming existing technology is used, giving some economies of scale. At least equivalent savings will be realized if the new low pressure technology justifies the claims made for it.

Table 2A.22 from the Sheldrick (1984) has been recalculated to constant 1986 $, to reflect the present situation for natural gas, and then to allow for a somewhat different perspective on capital costs.

Two locations are considered: (1) a developed country site with ample infrastructure and inexpensive natural gas (an admittedly somewhat hypothetical situation, except for some locations in Western Canada and possibly Norway, but useful as one pointer to the upper limit of long run prices), and (2) a developing country site with some existing infrastructure and abundant, cheap natural gas (e.g. Saudi Arabia, Kuwait, Indonesia and Malaysia). Some important producers in developing countries (e.g. Trinidad) will be in a similar situation to the second category shown above, except that advantages of location will permit a somewhat higher price for natural gas while remaining fully competitive. Of course, many producers in developing countries have much higher costs, such as India and probably Mexico, but their output is intended entirely or largely for a

Table 2A.22

Estimated Investment and Production
Costs for Urea: Daily Capacities
1000 Tons Ammonia and 1650 Tons Bagged Urea

	Developed Country Site Low Cost Natural Gas $ 1982/84	$ 1986	Developing Country Site Very Low Cost Natural Gas $ 1982/84	$ 1986 A	$ 1986 B
	Million $				
Capital Costs					
Plant	$ 231	$ 245	$ 323	$ 343	$ 300
Working Capital	18	18	32	34	30
Total	249	263	355	377	330
	$/ton				
Total Capital Cost	508	537	724	769	561
Cost of Production					
Natural Gas and Other Fuel	96.0	67.2	64.0	19.2	19.2
Other Variable Costs	18.0	19.0	18.0	19.0	19.0
Fixed Costs	70.9	74.9	93.3	98.6	90.0
Total	184.9	161.1	175.3	136.8	128.2
Capital Charge (15%)	76.2	80.6	108.6	115.4	84.2
Price Required to Give 15%	261.1	241.7	283.9	252.2	212.4
Memorandum Items:					
Capacity Utilization	90%	90%	90%	90%	90%
Annual Production (Tons)	490050	490050	490050	490050	588060
Natural Gas-Price ($MBTU)	$ 3.0	$ 2.1	$ 2.0	$ 0.6	$ 0.6
-MBTU/Ton of Urea	32.0	32.0	32.0	32.0	32.0

Notes: (1) Ammonia and urea plants are located together to use by product CO2 from ammonia production in the manufacture of urea.
(2) The developing country site has some infrastructure. As Sheldrick (1984) indicates, a remote location with limited or no infrastructure could have total capital costs up to some $440 million at 1982/1984 $.

Sources: Calculations at 1982/1984 US $ from Sheldrick (1984). Other estimates made for the present study.

protected domestic market and should not be regarded as a major force in determining the long-term trend in the real international price of urea. Finally, there is the enigma of the USSR, which has a large export potential in ammonia and urea (over four million annual tons of nitrogen). So far, its true costs of production must have been exceptionally high, due to poor performance in building new capacity and in its operation. However, its present emphasis on ensuring much more efficient performance and its willingness to accept a price for natural gas well below $1.00/MBTU should give it comparable bottom line economics to those for the developed country site at 1986 $ shown in table 2A.22.

A more serious problem of interpretation for table 2A.22 concerns the two issues on capital costs already noted: (1) the probability that the general perception of plant costs in 1982-1984 did not sufficiently discount the large cyclical element which had taken them well above their long run trend, and (2) the opportunities which may arise with the new technology being developed by ICI and others. The final column of table 2A.22 reflects Chemonics' estimates of the likely effects of these two factors.

On the basis of table 2A.22 and the general comments earlier in this section, the long-term trend in international urea prices, say FOB Trinidad or the Persian Gulf, would lie somewhere between $210 and $260 per ton of bagged urea at 1986 $ throughout the forecast period, given the constant real natural gas cost per unit for these locations indicated earlier. These values are related to forecasts FOB northwest Europe for continuity with the readily available historical data, even though this area will not be an important future exporter. The results are shown in table 2A.23.

The international urea market has been even more severely depressed in 1985-1987 than in 1969-1972. Apart from the general excess capacity, the current international price situation has been made worse by the weak selling of the COMECON producing countries in their search for hard currency and by the recently established barriers to their sales in the USA and the EEC. There are prospects of large increases above the long term trend as the market returns to balance, and even to serious shortages for two years. Price forecasts are given in table 2A.23.

The Medium Scenario shows the international market moving into a shortage situation in 1991, which becomes acute in 1992. By 1994 prices are back to their real trend values, which in this case are assumed at the higher end of the trend suggested by the cost analysis in table 2A.23. In the High Scenario these same market fundamentals are found to have a more severe cyclical effect.

Table 2A-23

Actual and Real Price of Urea
Bagged FOB North West Europe 1963-1997

	Actual	1986$	$/ton		Actual	1986$	
1963	72	239	1981		216	262	
1964	91	295	1982		159	181	
1965	96	305	1983		135	149	
1966	89	275	1984		171	182	
1967	79	238	1985		136	140	
1968	66	188	1986		107	107	
1969	56	153	1987	(Est.)	115	112	
1970	48	125	Forecast		Low	Medium	High
1971	46	114	1988	(1)	130	130	130
1972	59	141	1989	(1)	140	160	170
1973	95	212	1990	(1)	180	210	230
1974	316	651	1991	(1)	220	270	310
1975	198	373	1992	(1)	280	350	420
1976	112	201	1993	(1)	260	280	320
1977	127	215	1994	(1)	230	260	260
1978	145	228	1995	(1)	220	260	260
1979	173	251	1996	(1)	220	260	260
1980	222	295	1997	(1)	220	260	260

(1) Not forecasted

The Low Scenario shows a more delayed price cycle and the more conservative view of real trend prices indicated by the lower end of the range in table 2A.23.

5. Potash

Canada is the dominating factor in world export markets, which are best considered by reference to the non-Communist countries only. The COMECON is self sufficient, while Communist Asia imports hardly any potash.

Table 2A.24

Potash Exports to the Western World 1985

	`000 tons
Canada	6020
German Federal Republic	1317
Other EEC	621
Other Western Countries	2348
German Democratic Republic	1484
USSR	915
Total	12705

Source: British Sulphur Corporation

In the long run the trend in real prices will tend to settle at the level necessary to give the Canadian industry, almost all in Saskatchewan, a satisfactory return. An initial guide is the estimate in Sheldrick (1984) which puts the FOB Vancouver price necessary to yield a 15 percent return on a new mine with a capacity of 1.5 million tons of product annually at US$ 113/ton in both 1982 and 1984 current values, or around $120/ton at 1986 US$.

A real price of $120/ton will seem high by the average of the experience 1960-1987. Energy costs cannot be a significant factor to justify the difference, since Sheldrick puts them at only $5.00/ton with natural gas at US$ 3.00 MBTU. Historical real prices have been low generally as a result of the exceptional excess capacity which developed in the mid to late 1960's, so that a substantial long-term rise in the real price is to be expected. However, it might not be as much as the Sheldrick calculation suggests in view of the many opportunities for substantial incremental expansions once excess capacity ceases to be a problem around the mid-1990's. The present study takes the long-term trend price as around $105/ton FOB Vancouver.

Table 2A.25

Actual and Real Prices of Potash
FOB Vancouver 1960-1997

	Actual	1986 $		Actual		1986 $	
	$/ton			$/ton			
1960	29	98	1979	77		111	
1961	30	103	1980	116		154	
1962	30	101	1981	112		136	
1963	30	99	1982	82		93	
1964	33	106	1983	75		83	
1965	30	94	1084	84		89	
1966	28	85	1985	84		86	
1967	26	77	1986 (Est.)	73		73	
1968	24	69	1987 (Est.)	70		68	
1969	22	60	Forecasts		Low	Medium	High
1970	32	82	1988	(1)	70	70	70
1971	33	80	1989	(1)	70	70	70
1972	34	79	1990	(1)	70	70	70
1973	43	95	1991	(1)	70	80	80
1974	61	125	1992	(1)	75	95	95
1975	81	153	1993	(1)	85	105	105
1976	55	99	1994	(1)	90	105	120
1977	51	86	1995	(1)	105	140	175
1978	56	89	1996	(1)	130	140	160
			1997	(1)	140	125	135

(1) Not forecasted

There is however, another unknown, namely how soon the Canadian export association, Canpotex, will be able to establish effective price leadership in world markets. The arguments are finely balanced, on the one side that there are sufficient other exporters anxious for such a lead, particularly the GDR and USSR, but against this there are a number of small producers keen to expand market share at some sacrifice of price such as Israel and Jordan.

The Medium Scenario expects that Canada will be an effective price leader by 1992, although with real prices still below the long-term trend, and that the market faces shortages by 1995. The High Scenario has the same expectations, except with higher prices in the shortage period. The Low Scenario assumes that Canada is unsuccessful in any attempt at price leadership and that shortages are not appearing until 1996.

F. The Outlook for Ocean Freight and for Sulphur and Fertilizer Prices CIF Philippines

1. Ocean Freight

For some years there has been a chronic oversupply of bulk cargo shipping. Considerable tonnage has been scrapped, but there are no short-term prospects for a significant increase in rates.

Some perspective on developments since the early 1970's is given for wheat in table 2A.26. Comprehensive series do not exist for fertilizer materials or sulphur, nor for shipments into Southeast Asia from the US Gulf or from other major shipment points such as Morocco. In addition, any conclusions based on the table must be made after recognizing that a substantial part of the lower freights in recent years is explained by the steady cheapening of bunker fuel on an inflation-adjusted basis.

2. Fertilizer Prices CIF Philippines

Over the next five to ten years there will be a substantial rise in the dry cargo freights on Philippine imports and exports of fertilizers. On the long distance shipments, such as phosphate rock from Florida or Morocco, this could be an increase of some $6/ton on an inflation-adjusted basis, with the chance of some further rise if the shipping industry reaches a cyclical shortage of capacity at some time. Over smaller distances the adjustments would be less.

Special attention has been given to the implications of freight changes on phosphate rock imports and DAP exports in chapter V and annex 4. Otherwise the forecasts of FOB prices given earlier are sufficient to highlight the critical strategic

Table 2A.26

Ocean Freight Rates for Wheat

	Actual				1986 $			
	US Gulf Ports To		North Pacific Ports To		US Gulf Ports To		North Pacific Ports To	
	Bangladesh	East Africa	China	Japan	Bangladesh	East Africa	China	Japan
July/June								
1972/73	N.A.	N.A.	13	12	N.A.	N.A.	30	27
1973/74	43	39	27	26	89	81	55	54
1974/75	32	32	27	22	59	61	51	24
1975/76	20	19	14	14	36	34	25	26
1976/77	20	18	14	14	34	31	23	44
1977/78	28	19	11	14	44	30	18	22
1978/79	31	21	17	18	45	31	24	26
1979/80	41	42	28	30	54	56	37	40
1980/81	52	49	31	31	63	59	38	38
1981/82	46	44	29	27	53	50	33	33
1982/83	26	35	18	18	28	39	20	20
1983/84	28	37	16	18	29	39	17	19
1984/85	28	38	18	19	28	39	18	20
1985/86	28	37	19	18	28	37	19	18
1986/87	33	29	20	20	45	45	29	29
Average								
June 1987	26	34	15	21	25	30	15	19
July 1987	26	19	15	20	25	17	15	20
August 1987	26	20	15	22	25	18	15	21

Source: International Wheat Council granted in FAO, Food Outlook, September 1987 and earlier editions.

Notes: All calculations from unrounded numbers.
Sizes of vessels: Bangladesh 20,000 - 40,000 tons, East Africa 14,000 - 25,000 tons, China 20,000 - 30,000 tons and Japan 15,000 - 20,000 tons.

issues which may face the Philippines as a result of the vagaries of international markets.

ANNEX 3

FACTORS AFFECTING FERTILIZER DEMAND

A. Introduction

Fertilizer has occupied an important role in the agricultural development strategies of many developing countries, including the Philippines. This is particularly so among the food-deficit, land-scarce countries where fertilizer use has become an important source of food supply growth. In many developing Asian countries, increased fertilizer use has accounted for about a quarter of the total growth in rice production. In the Philippines, the contribution of fertilizer was about one-third of the total rice production growth between the mid-1960s and early 1980s, with the rest contributed mainly by modern rice varieties and irrigation (table 3A.1).

The contribution of increased cultivated area (i.e., the opening up of new lands for cultivation) to total agricultural production growth has dramatically declined from about two-thirds before 1960 to 22 percent in the early 1980s (table 3A.2). The decline is particularly more so when the relative contribution of area expansion is measured on a per-farm-worker basis. Cultivated area per farm worker declined at an annual average of about three percent during the 1970s and early 1980s. The negative effect of this decline on agricultural productivity was, however, mitigated by the rapid gains in land productivity through increases in yields per hectare and expansion of double cropping.

As shown elsewhere in this report, the decline in cultivated area per farm worker occurred in the face of a somewhat constant cultivated area per capita since the 1960s. Apparently, the opening up of new lands for cultivation (i.e., deforested lands) has not been at pace with the growing labor force in the agricultural sector. This may, of course, partly reflect the relatively low labor absorption of the non-agricultural sector over the last two decades.

It appears that much of the increased agricultural production will continue to mainly come from increases in yield. And considering the inclination of the government to achieve self-sufficiency levels of food production in an economy characterized by decreasing agricultural land per farm worker, increased fertilizer use is expected to continue as one major source of this growth. Moreover, the pressure on the country to generate increased foreign-exchange earnings for the financing of much needed economic development is likely to extend to export crops (e.g., banana, pineapple). Increased production from these crops is expected to come mainly from yield-increasing

Table 3A.1

Contribution of Specified Factors to Rice Production Increases 1965 to 1980

Country	Total observed growth in output	Percentage contribution of factors			
		MV effect	Fertilizer effect	Irrigation effect	Other factors (residual)
Burma	1852	35	19	36	10
Bangladesh	5554	8	23	20	49
China	50500	26	23	32	19
India	35152	23	31	32	14
Indonesia	13613	23	20	20	37
Philippines	3274	26	31	24	19
Sri Lanka	1034	23	21	27	29
Thailand	6400	13	11	14	62
Total	117379	23	24	29	24

Source : Herdt and Capule, 1983.

Table 3A.2

Contribution of Area and Land Productivity to Growth in Output and Labour Productivity in Philippine Agriculture, 1948-82 (percentage)

	1948-52 to 1958-62		1958-62 to 1968-72		1968-72 to 1978-82	
	Annual growth rate	Relative contribution	Annual growth rate	Relative contribution	Annual growth rate	Relative contribution
Total agricultural output	5.0	100	3.2	100	6.3	100
Cultivated area	3.3	66	1.4	44	1.4	22
Output per ha of cultivated area	1.7	34	1.8	56	4.8	78
Agricultural output per farm worker	2.0	100	1.9	100	2.2	100
Cultivated area per farm worker	0.3	35	0.1	5	-2.6	-118
Output per ha of cultivated area	1.7	65	1.8	95	4.8	218

Source : Booth, Anne, Cristina David et al., Food Trade and Food Security in ASEAN and Australia, 1986.

technologies, including the use of fertilizer-responsive varieties.

This drives the question of how fertilizer use can be enhanced, if there exists technical and socio-economic constraints to higher fertilizer use. This annex briefly reviews the importance of these constraints in Philippine agriculture and discusses their implications for fertilizer use and policy. Before that, however, growth and change in fertilizer use in the Philippines are briefly described.

B. Growth and Change in Fertilizer Use

Fertilizer consumption in the Philippines grew at an annual average of eight percent during the 1950-86 period (graph 3A.1). This growth was, surprisingly or not, as rapid between the early 1950s and mid-1960s as that between the mid-1960s, when the modern rice varieties were introduced into Philippine agriculture, and the mid-1980s. The growth somewhat slowed down during the 1980-86 period due partly to the foreign-exchange crisis in 1984 and 1985 (which led to the closure of domestic fertilizer plants and created difficulties among fertilizer importers to open letters of credit with the Central Bank) and partly to the difficulties in the sugar sector after 1984.

The growth trends of fertilizer consumption on a crop basis present a somewhat different picture. With the introduction of the fertilizer-responsive modern varieties in the mid-1960s and their rapid diffusion in the 1970s, fertilizer use per hectare increased from 10 kilograms of NPK per hectare in 1965 to almost 40 kilograms by the early 1980s (graph 3A.2). Correspondingly, the share of the rice sector to total consumption grew from about 25 percent in the mid-1960s to about 40 percent in the early 1980s (graph 3A.1). The sugar industry, which was the single most important buyer in the 1960s, had its share decline from about one-half of total consumption to about 40 percent in the early 1980s.

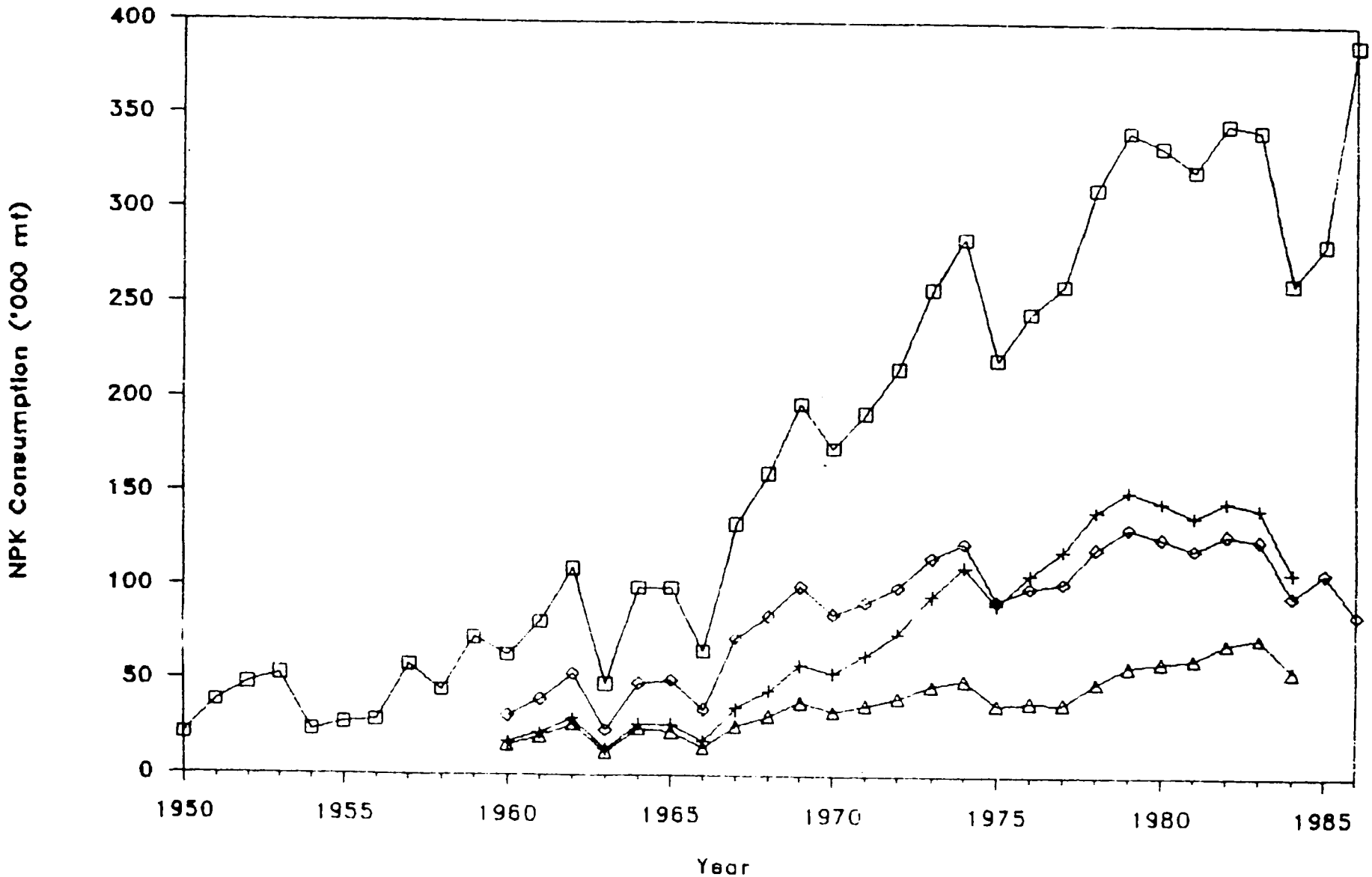
With the unusual budgetary and foreign-exchange difficulties in 1984 and 1985 and the significant cutback in the hectarage planted to sugar in 1985 and 1986 largely because of adverse development in the world market for sugar, the respective shares of each crop might have been different over the last two years. Assuming that fertilizer use per hectare in sugar in 1985 and 1986 remained the same as that in 1983, the share of sugar to total fertilizer consumption could have dropped from about 40 percent in 1983 to about 33 percent over the last two years.

C. Fertilizer Use Efficiency

Conceptually, the efficiency with which fertilizer is used at the farm level is composed of two elements. The first has to

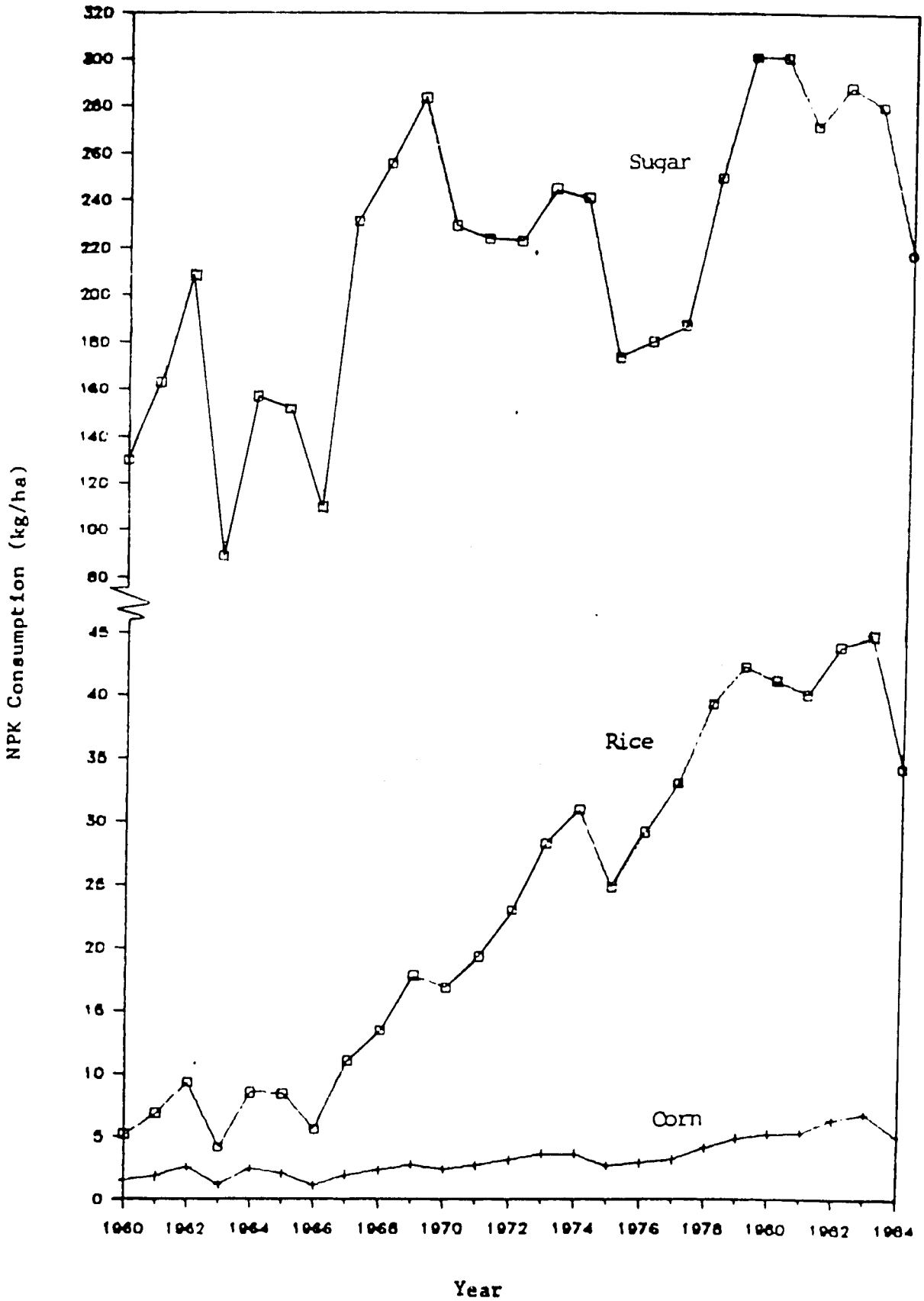
Graph 3A.1

Total Fertilizer Consumption by Crop
Calendar Years 1950-1986



Graph 3A.2

Fertilizer Consumption Per Hectare by Crop
Calendar Years 1960-1984



do with the farmer's ability to produce maximum output from a given set of inputs, i.e., technical efficiency. The other, called allocative (price) efficiency, results from the farmer's success in maximizing profits from the use of inputs, given a production technology. The failure of the farmer to achieve either or both of these conditions results in fertilizer use inefficiency. If the failure is due to the first, the farmer is said to be technically inefficient; if the second, the farmer is said to be allocatively inefficient. These two components are depicted in graph 3A.3.

Curve Y shows the relationship between the rate of fertilizer use and the maximum (potential) yield obtainable from each level of fertilizer application, i.e., the technically efficient fertilizer response function. This function can be thought of as the one that prevails under a controlled environment (i.e., in researchers' experiments on farmers' fields).

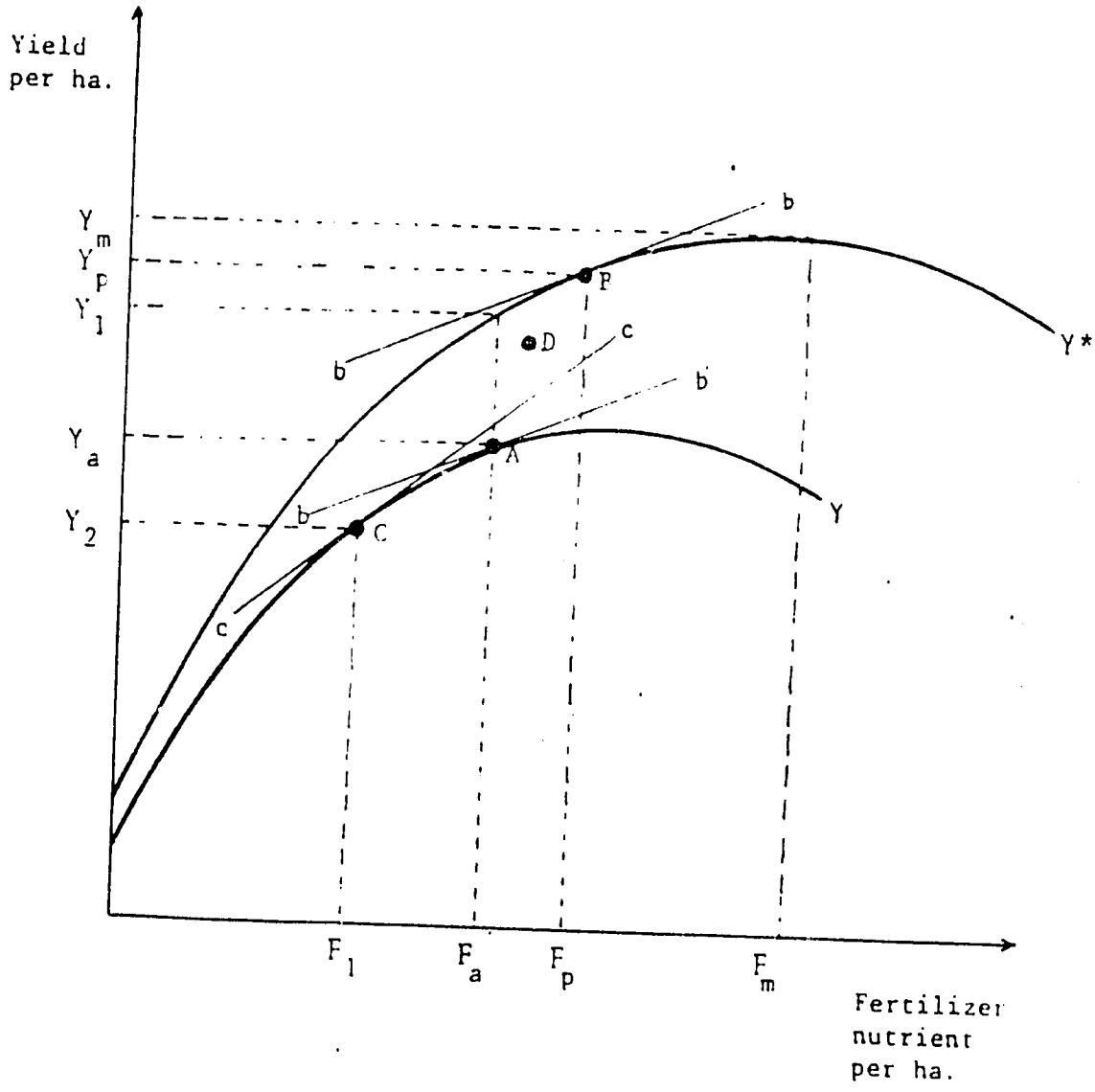
However, due to technical inefficiencies, the farmers' actual yield may fall short of the potential yield for any given level of fertilizer application. The farmers' fertilizer response function is depicted by curve Y. Suppose the economic environment faced by the farmer is such that the fertilizer-rice price ratio is given by line bb. Suppose further that, given this price ratio and the farmer's fertilizer response function Y, actual yield and fertilizer application are Y and F, respectively. The difference between actual yield and maximum potential yield ($Y_p - Y_a$) can then be decomposed into:

- o technical inefficiency ($Y_1 - Y_a$)--the failure to produce maximum output for a given set of inputs; and
- o allocative inefficiency ($Y_p - Y_1$)--the failure to maximize profit from the use of inputs; and
- o residual ($Y_m - Y_p$)--the gap due to the farmer's attempt to maximize profit, not yield.

Inactual empirical work, data limitation prevents the estimation of response functions for each farmer. Instead, the fertilizer response function Y is an "average" response function for a sample of farmers. Hence, some farmers actually lie below curve Y and some above it. Also, there may be differences in the socio-economic constraints facing each farmer, which then affect the <u>effective</u>, not the market, fertilizer-rice price ratio faced by each farmer. For example, high interest rates for credit may result in an effective price of fertilizer that is much higher than the actual retail price. This makes the fertilizer-rice price ratio higher (such as that represented by cc line in graph 3A.3), and hence the optimal fertilizer use lower.

Graph 3A.3

The Fertilizer-Yield Gap



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Or the farmer's goal may not be to maximize profit from the application of fertilizer, but may instead be to minimize the chance that his income falls below a critical (subsistence) level, i.e., to maximize his expected utility. In this case, even if high fertilizer use such as point B will yield a higher expected profit than low fertilizer use such as A, the farmer may choose the low-input level if the variability of profit is lower compared to that of the high-input level.

Also, at any point in time, adjustment lags (e.g., learning lags) may prevent the immediate adoption of the technology. Such lags may imply that the fertilizer response function shifts gradually upward until the technically efficient response function is reached. As such, the short-run or immediate-run response of a profit-maximizing farmer to the changed opportunity is not directly at point B but is, say, at point D.

D. Micro-Aspects of Fertilizer Use

To set the proper background for a formal economic analysis of the factors affecting fertilizer demand, it would be useful to review the empirical evidence concerning the relative importance of technical and allocative inefficiencies in explaining yield gaps in Philippine agriculture. Much of this evidence pertains to rice, for three somewhat obvious reasons: (a) systematically collected farm-level data on rice production are widely available, (b) rice is the single-most important user of inorganic fertilizer since the early 1970s, and (c) rice is the prime staple in the Philippines.

Perhaps the earliest systematic analysis of the relative contribution of technical and allocative inefficiencies in Philippine agriculture is that by Herdt and Mandac (1981). They showed that technical inefficiency in rice production contributes about two-thirds of the total yield gap during the wet season and about one-half during the dry season (table 3A.3). Allocative inefficiency, on the other hand, accounted for about 20 percent and 40 percent during the wet and dry seasons, respectively. It was further shown that when high interest rates were added to fertilizer costs, the proportion of the yield gap attributed to allocative inefficiency fell dramatically (Flinn and Smith 1983).

Defining the yield gap in a slightly different way (i.e., the difference between the potential yield obtainable using the recommended rate of fertilizer application and actual farmers' yield, where the potential yield is not necessarily the maximum yield), Mandac (1984) estimated that about 70 percent of the gap could be explained by differences in production environments, with fertilizer application rate explaining 16 percent (table 3A.4).

Table 3A.3

Factors Contributing to Fertilizer-Yield Gap, Nueva Ecija
1974-77

Season	Yield gap * (t/ha)	Percent contribution to gap			
		Technical inefficiency	Allocative inefficiency	Residual	Total
Wet	0.9	67	22	11	100
Dry	1.6	56	38	6	100

* Yield gap is defined as the difference between maximum yield and actual (farmers') yield.

Source : Herdt and Mandac, 1981.

Table 3A.4

Factors Contributing to the Difference between the Yield at Recommended Rate of Fertilizer Application and Farmers' Actual Yield, Rainfed Farms, Camarines Sur and Tarlac, 1981.

Factor	Percent contribution to gap
Input	(28)
Fertilizer	16
Insecticide	4
Weed control	8
Environment	(72)
Solar Radiation	4
Water stress	16
Landscape	36
Flood	12
Others	4

Source : Mandac, 1984.

Herdt and Mandac's result indicates that the largest contribution to the yield gap was caused by farmers not using fertilizer in as technically efficient a manner as did researchers. This does not, however, imply that economic factors (such as the price of fertilizer or the price of output) are unimportant. On the contrary, they may well be as important in explaining the level of farmers' fertilizer use and, hence, of yield--as opposed to the yield gap--as the technical factors. As can be shown in graph 3A.3, the profit-maximizing level of fertilizer critically depends on the price of fertilizer relative to the price of the output. Consequently, a change in the relative price of fertilizer brought about by economic factors (e.g., the elimination of import taxes or effective implementation of import parity pricing) alters the optimal level of use.

What the Herdt-Mandac finding suggests, however, is that technical factors, in addition to the economic factors, represent an important set of options to increase farmers' yield. The choice among the available options may ultimately depend on the government's objectives and on the constraints (e.g., budgetary limitations) it faces. (Perhaps more important, over time, as farmers adapt to changing technology and production environments, both technical and economic factors become important sources of yield growth.)

In the approach discussed above, the factors that affect the rate of fertilizer use (i.e., fertilizer demand) were derived indirectly. For example, for any given fertilizer-output price relationship, the rate of fertilizer use depends on the fertilizer response function. Conversely, holding the fertilizer response function constant, fertilizer demand becomes a function of the relative price of fertilizer. This approach, however, suffers from at least two limitations. The first stems from the required assumption that farmers maximize profits with no consideration of risk. As discussed below there may be circumstances where this assumption is hardly tenable. The second problem lies in the difficulty in choosing the appropriate fertilizer-response function. To the extent that a sufficiently large number of fertilizer-response functions are reported from farm-level studies and farm experiments, a high degree of arbitrariness is involved in this task.

An alternative approach is to estimate the determinants of fertilizer demand directly. This involves specifying a fertilizer demand function which can be estimated singly or jointly with the output supply and other input demand functions.

Variables normally included in the empirical specifications of fertilizer demand are dictated by economic theory. These variables include the real price of fertilizer (often defined as the price of fertilizer relative to the price of output) and the

shifters which include the prices of other inputs complementary (or substitute) to fertilizer. Other variables are normally included to capture the effects of changing input-output relationships (e.g., the diffusion of MV technology) and production constraints (e.g., irrigation and farm size).

What follows is a brief assessment of the significance or importance of the major variables that have heretofore dominated the empirical research on fertilizer demand.

1. How Elastic (or Inelastic) Is the Price Elasticity of Fertilizer Demand?

The effects of fertilizer price policies on crop production and farm income depend on the responsiveness of farmers' fertilizer consumption to fertilizer price changes, i.e., the price elasticity of fertilizer demand.

There are important sources of confusion in interpreting the results of econometric analysis of the response of fertilizer demand to changes in plant nutrient cost to the farmer (usually measured as the ratio of fertilizer and crop prices). The policy maker concerned with market stabilization needs to make two distinctions regarding this responsiveness: (i) its value in the short-term, say one year, and in the long-term, say three years, to any specified price change sustained over the time in question, where the longer the period, the greater the strength of the response up to some upper value reached within a time limit usually some three to five years; (ii) any difference in the degree of response according to the size of the change in price, not often an important consideration but one which cannot be neglected if annual or cumulative price changes are large, in which case demand may become much more responsive (elastic).

However, the econometrician often works with two expressions which are similar to short-term and long-term but which usually connote different types of economic adjustment, namely short run and long run. In strict economic analysis, short run and long run response refers respectively to those made possible by the farmer adjusting only his variable inputs and those when all inputs, fixed and variable, are changed, in each case assuming that his level of technical understanding and practice are unchanged within a given set of public infrastructural provisions. There can be a further confusion, when some analysts include changes in the technical and infrastructural fundamentals as a long run adjustment.

Clearly, these last three types of response are time related, "short run" taking less time than "long run", and similarly for the more restrictive (and theoretically correct) version of the long run in relation to the other version. However, they are not necessarily closely time related to "short

term" and "long term" adjustments. "Short run" may imply much more time than "short term" and "long run" is even more likely to exceed "long term" substantially. Particular care is required in interpreting results on these accounts. It must be noted that few of the studies for the Philippines correspond to our short term and long term requirements in assessing the more immediate effects of changes in the relative prices of crops and fertilizers on plant nutrient use, although they are important in other parts of the study.

Most econometric studies usually calculate a constant price elasticity of demand whatever the extent of the observed or envisaged price change. For small price changes, for example 10-20 percent, this may be a satisfactory approximation of reality. However, the larger the price change the more elastic demand is likely to become. It will be necessary to make some adjustment on this point after reviewing the more recent studies in the Philippines.

As mentioned earlier, economic theory normally dictates what determinants need to be included in an empirical specification of fertilizer demand. The same, however, is of little help with respect to deciding what specific functional form to use. Without a priori information about the underlying functional relationship between variables, a multitude of functional forms can indeed be alternatively specified. In practice, and not until lately, a major consideration has been the cost of estimation. Another is data availability.

The choice of estimating functional form is important in determining the price elasticity of demand for fertilizer. In linear regression equations specified in natural numbers, the derived price elasticity estimate varies depending on the choice of points in the demand curve. The traditional practice is to compute the elasticity at the mean values of the variables. On the other hand, in a well-specified simultaneous equation system involving Cobb-Douglas profit function approach, it can be (mathematically) shown that input demand elasticities must necessarily be constant and are always price elastic.

Another issue concerning the evaluation of the empirical literature on price elasticity of fertilizer demand is the interpretation of the elasticities derived from cross section and time series data. In time series regressions, (usually) annual data for a given period are used to establish causal relationships between fertilizer consumption and a set of hypothesized explanatory variables, including the price of fertilizer. Where the observations correspond to different economic and environmental differences, and without these factors specified also in the estimating fertilizer demand equation, the estimates of elasticities obtained from these regressions can best be interpreted as long run. Data availability often

precludes the inclusion of these variables in a time series analysis, especially one where a very limited number of observations (as is often the case in fertilizer demand estimation involving time series data) is used in the analysis.

On the other hand, in regressions involving cross section data, data for different groups of farmers within a single period (e.g., one cropping season) are used. Where the sample farmers have different factor endowments or production constraints and where the sample farms have important environmental differences, estimates of short run price elasticities of fertilizer demand will tend to be overestimated (underestimated) unless these factors are also included in the estimating equation.

These considerations underlie the characterization of the various econometric studies on fertilizer demand in the Philippines (table 3A.5).

These studies have mostly concentrated on rice. This stems partly from the fact that rice has, since the late 1970s, been the single most important user of fertilizer, and partly from the availability of sufficiently good-quality data (mainly from IRRI).

In most instances, many of the elasticity estimates reported in these studies do not fall neatly as either short run or long run elasticities. Other relevant factors that affect fertilizer consumption (e.g., supply constraints) are omitted primarily due to data limitations. However, as briefly noted below, these estimates seem to fall closer to being short run elasticities. Elasticity estimates from single-equation models of fertilizer demand tend consistently to yield a value close to -0.5, i.e., fertilizer demand is price inelastic. These results contrast markedly with those obtained from more complex models where input demand and output supply are determined jointly as a subset of a system of equations describing the production process. In those models (all making use of the profit-function approach), estimates range from -0.4 to -1.3, depending on the specific functional form of the underlying equations and, of course, on the data analyzed.

As noted earlier, a Cobb-Douglas formulation of profit function always yields price-elastic demand for the variable inputs. Moreover, in this formulation, all inputs are assumed substitutes (certainly hard to justify in cases where, in practice, fertilizer is a complement of, say, irrigation) and the cross price elasticity of each input with respect to the price of other inputs is constant.

In any case, where large price changes are involved, the use of constant price elasticity (such as the one derived from a Cobb-Douglas specification) is likely inappropriate. One may

Table 3A.5

Estimates of the Price Elasticity of Fertilizer Demand

Source	Commodity covered	Period covered	Estimates		Methodology	Data
			Short-run	Long-run		
1. Cordova and David (1985)	Rice	1966-81	-0.5		Single equation, double-log	Pooled cross-section and time series data of Laguna farmers (typically progressive farmers)
2. Monge (1986)	Rice, irrigated	1983	-1.3		Simultaneous equation system (Cobb-Douglas profit function approach)	Cross-section of rice and corn farmers selected nationwide
	Rice, lowland/ non-irrigated	1983	-1.2			
	Rice, upland	1983	-1.3			
	Corn, hybrid	1983	-1.2			
	Corn, traditional	1983	-1.2			
3. David and Barker (1978)	Rice	1966-71	-0.5		Single equation, double-log	Pooled cross-section and tim series data of 150 farmers
4. Te and Herdt (1981)	Rice	1979	-0.4		Single equation, double-log	Data for 140 farmers in an IRRI wet season survey in Central Luzon
5. Rodriguez (1979)	All crops	1958-72	-0.6		Single equation, linear	Time series
6. Evenson (1985)	Index of aggregate output per farm	1948-84	-0.4		Simultaneous equation system (Quadratic profit function approach)	Time series - cross-section of regional data

Table 3A.5-continued

Estimates of the Price Elasticity of Fertilizer Demand

Source	Commodity covered	Period covered	Estimates		Methodology	Data
			Short-run	Long-run		
7. Bantilan (1987)	Rice	1970-84	-0.4		Simultaneous equation system (translog profit function approach)	Sample size is 85, Laguna (IRRI loop) farmers
	Rice	1970-84	-0.7			Sample size is 344, Laguna (IRRI loop) farmers
	Rice	1978-84	-0.7		"	Sample size is 139, Laguna (IRRI loop) farmers
	Rice	1970	-0.6			Sample size is 42, Central Luzon (IRRI loop) farmers
	Rice	1982	-0.7		"	Sample size is 109, Central Luzon (IRRI loop) farmers
	Rice	1966-84	-1.1		"	Sample size is 374, Central Luzon (IRRI loop) farmers
	Rice	1979-84	-1.2		"	Sample size is 243, Central Luzon (IRRI loop) farmers
8. Kalirajan and Flinn (1983)	Rice	1978	-1.3		Simultaneous equation system (translog profit function approach)	Sample of 73 Laguna (typically progressive) farmers
9. Kalirajan et al. (1981)	Rice	1978	-1.2		Simultaneous equation system (Cobb-Douglas profit function approach)	Sample of 81 Laguna rice farmers

suspect that such changes alter the degree of responsiveness of the input demand.

Other formulations of the profit function (e.g., translog) relax these restrictions. Price elasticities of fertilizer demand obtained from these formulations can be elastic, unitary, or inelastic. These are born by the results obtained by Bantilan (1987) who made use of translog profit function and by Evenson (1987) who employed a normalized quadratic profit function.

In view of the limited conclusions which can be drawn from the studies reviewed above, some further guidance can be sought from the experience of other Asian countries with monsoon-dependent agricultures. It seems reasonable to expect that price elasticities of demand for rice in the Philippines would be similar to those for rice and other foodgrains in these countries. In a recent unpublished study for the World Bank (Allen 1986), the team leader surveyed some 58 studies for these countries (including 11 for the Philippines covering various periods prior to 1980). He stresses the limitations in reaching firm conclusions, but he suggests that the following seem reasonable and mutually consistent:

- The price elasticity of demand in a one-year period is likely to lie in the range of -0.4 and -0.6. (Mainland China might be lower at -0.3 to -0.4.

- For large fertilizer/crop price increases (say, 20% to 30%), the one-year elasticity would be around -0.8, rising to -1.2 over a three-year period.

2. <u>How Important Is Risk in the Optimal Use of Fertilizer?</u>

One recurrent argument in development work for the last two decades has been that risk is an impediment to the realization of the full potential of modern agricultural technologies, particularly fertilizer-responsive modern rice technology. The year-to-year variability in input response resulting from stochastic disturbances such as weather, pests and diseases, the argument goes, makes farmers unwilling to purchase profit-maximizing levels of cash inputs because of the risk of losing their investment.

This argument assumes that there is a conflict between profit maximization and risk aversion. That is, high input levels yield, on the average, higher profit, but this also results in greater variability of profits. Farmers, who are assumed to be risk averse, are therefore willing to accept a lower mean profit in exchange for the lower variability of profit.

This argument is illustrated in graph 3A.4, which depicts the probability distribution of profit at low (l) and high (h) input levels. (The probability distribution associated with low input level can be thought of as that for traditional rice varieties, and the high input level for fertilizer-responsive modern rice varieties.) In panel a, the mean and variance of profit for the low input level are lower than those for the high input level. If farmers were risk neutral, i.e., they maximize expected profits (or are indifferent to risk or profit variability), they would use the high input level because mean profit is higher for h than for l. But if farmers were risk averse, they would be using the low input level, because they would be more anxious to avoid low incomes than to attain high profit levels. And if they do, the lower yield resulting from the suboptimal input levels would represent a social cost.

As noted by Roumasset (1976) and Smith and Umali (1983), the critical point in this argument is how profit variability changes as inputs increase. If the variability of profits does not change with respect to the level of inputs (panel b), even a risk averse farmer would use the high-input level production technique, because the mean profit would be higher for h. In this case, there is no conflict between risk aversion and profit maximization.

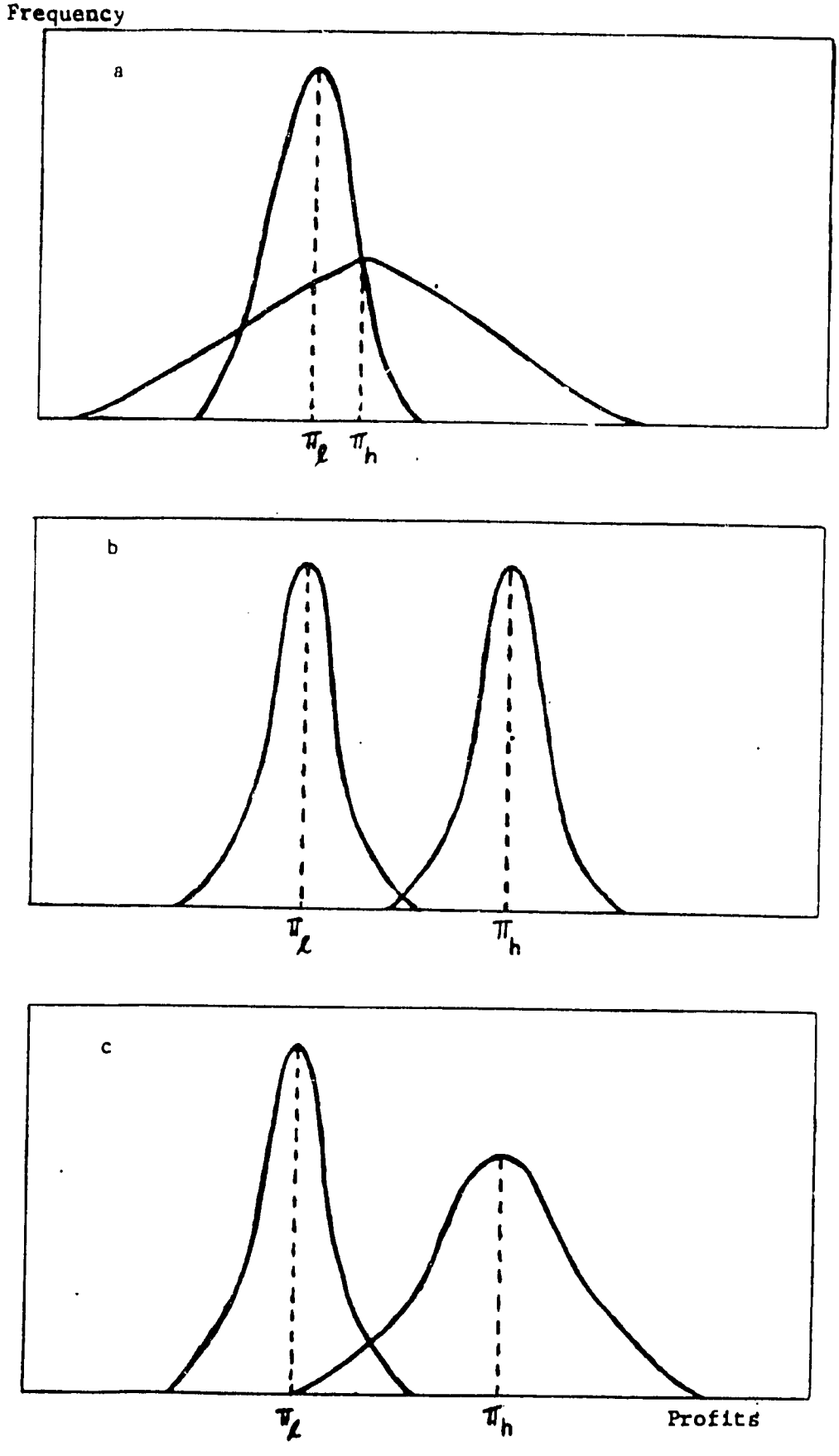
An intermediate case is that shown by panel c, where the variance of profit is higher for the high input level than for the low input level. However, the increase in the variance is less compared to the increase in mean profits. In this case, risk may not significantly affect the optimal level of input use.

Empirical evidence on the importance of risk and the concomitant suboptimality of the level of fertilizer use is scanty and largely limited to irrigated and favorable shallow rainfed rice areas. Nonetheless, what the available literature shows is that, contrary to popular belief, risk accounts for only a small proportion of the underutilization of fertilizer, i.e., the fertilizer-yield gap (Smith and Umali 1985, Smith et al. 1983, Roumasset 1976, Rosegrant and Herdt 1981). That is, the rate of increases in profit variability resulting from higher application of fertilizer was relatively low. Moderately risk averse farmers were observed to apply only 5-10 percent less fertilizer than the profit-maximizing risk neutral optimum (Smith el al. 1983). (One striking aspect of these results is that, although the authors used different methodologies, the conclusion they arrived at is similar.)

One should not, however, generalize these results to mean that they hold true regardless of production environment. These results are obtained from either irrigated areas or rainfed conditions in experiment stations, which are essentially favorable environments. Different results may be obtained from

Graph 3A.4

Probability Distribution of Profits at Different N Rates
(Adapted from Smith and Umali, 1985)



unfavorable environments, such as the flood-prone areas in the Bicol region or the drought-prone areas of the Ilocos region. In these areas, production conditions may be riskier. In rainfed farmers' fields, the occurrence of moisture stress is more frequent. Indeed, the yield-reducing effect of moisture stress has been shown to increase with the rate of nitrogen fertilizer (Aragon and de Datta 1981). This increase in risk can impede fertilizer use, the extent of which remains the object of future research.

3. Other Farm-level Factors Affecting Fertilizer Use

If risk does not account for a large proportion of the fertilizer-yield gap, or the level of fertilizer use, what then explains the gap or the level of fertilizer use? With respect to fertilizer use, one factor is the farm-gate price of fertilizer, the extent of its effect depending on the absolute value of the price elasticity of fertilizer demand. As noted earlier, where large price changes are involved, fertilizer use is quite responsive to the farm-gate price. Indeed, it is fair to say that, as shown elsewhere in this report, the significantly high domestic prices of fertilizer vis-a-vis the world prices (with both prices compared at the same point in the marketing chain) in recent years have contributed to the relatively low level of fertilizer consumption in the Philippines. This has been aggravated by the policy-induced depression in prices of agricultural crops (David 1985). In other words, the fertilizer-output price relationship has generally been unfavorable.

The price of nitrogenous fertilizer relative to that of palay in the Philippines has generally been high vis-a-vis prices prevailing in neighboring Asian countries (table 3A.6). The relative price improved in 1986 when the import restrictions on nitrogenous fertilizers were lifted. (Note that this generally high relative price is mainly due to a domestic fertilizer price that has remained high relative to the border price of fertilizer, with the domestic price of rice more or less close to its border price, at least during the late 1970s and early 1980s.)

Other farm-level factors affecting fertilizer use have been identified in the literature. One economic factor often cited is cash constraint or the availability of credit (Rosegrant and Herdt 1981, Feder et al. 1985, Smith et al. 1983, Mandac and Flinn 1985). It is argued that lack of access to credit prevents farmers, particularly small farmers, from adopting profitable innovations. In their simulation of the impact of credit on Central Luzon rice farmers, Rosegrant and Herdt showed that the impact of fertilizer subsidies in the 1970s would have been higher if more credit were available.

Table 3A-6

Farm Prices of Paddy and Nitrogen from Urea
1980 to 1986

Year	Bangladesh	India	Indonesia	Japan	Korea, Rep.	Malaysia	Pakistan	Philippines	Sri Lanka	Taiwan,China	Thailand
Paddy price (US$/t)											
1980	294	170	165	1254	699	240	118	153	114	456	161
1981	175	n.a.	188	1058	711	282	136	165	135	423	159
1982	219	259	204	912	879	275	109	160	136	471	129
1983	168	292	101	967	855	511	115	137	128	470	136
1984	199	261	164	993	826	337	143	149	120	474	129
1985	173	234	159	1011	815	228	159	174	114	471	104
1986	n.a.	246	155	1432	844	225	182	138	119	495	90
Fertilizer (N) price (US$/t)											
1980	351	477	243	758	525	664	386	644	129	356	588
1981	384	n.a.	241	852	698	674	415	720	259	471	665
1982	373	503	248	714	712	450	397	715	291	542	606
1983	350	500	219	706	693	352	410	588	258	511	561
1984	368	423	192	690	673	410	387	641	243	518	501
1985	398	385	197	681	624	359	330	682	228	512	432
1986	n.a.	413	217	821	561	242	347	280	221	515	276
Fertilizer-paddy price ratio											
1980	1.19	2.81	1.47	0.60	0.75	2.77	3.27	4.21	1.13	0.78	3.65
1981	2.19	n.a.	1.28	0.81	0.98	2.39	3.05	4.38	1.92	1.11	4.18
1982	1.70	1.94	1.22	0.78	0.81	1.64	3.64	4.46	2.14	1.15	4.70
1983	2.08	1.71	2.17	0.73	0.81	0.69	3.57	4.30	2.02	1.09	4.13
1984	1.85	1.62	1.17	0.69	0.81	1.22	2.71	4.31	2.03	1.09	3.88
1985	2.30	1.65	1.24	0.67	0.77	1.57	2.08	3.93	2.00	1.09	4.15
1986	n.a.	1.68	1.40	0.57	0.66	1.08	1.91	2.02	1.86	1.04	3.07

Source : IFDC (except for the Philippines). Farm level prices for major fertilizers and crops (mimeo,various issues).
Philippines : BAEcon and FPA.

This does not, however, imply that credit needs to be subsidized through a reduction in the interest rate. An interest rate reduction may constrain the flow of funds into rural financial markets (Tolentino 1986). What Rosegrant and Herdt showed is that higher interest rates, if they attract substantially more funds into the rural markets, would be preferable to subsidized low interest rates and would not likely reduce fertilizer purchase and agricultural production significantly.

David et al. (1984), however, were less emphatic about the importance of credit in explaining the variation in fertilizer use in rainfed areas of the Philippines, at least between 1971 and 1977. Using dummy variables to represent tenure, credit, and extension in a log-linearly specified fertilizer demand function, they instead showed that fertilizer prices, technology (modern varieties), and knowledge (extension) were more important determinants of fertilizer demand.

The importance of fertilizer price, modern varieties and complementary inputs (mainly irrigation) again showed up in Cordova and David's (1985) analysis of fertilizer demand for rice. The analysis is an update of the earlier fertilizer demand model of David (1976). They further concluded that fertilizer price becomes statistically significant only when the other variables are specified in the function, implying that the price elasticity of fertilizer demand is quite sensitive to specification of the estimating equation of fertilizer demand.

The distance from the farm to the place where the farmer can buy fertilizer is also noted to strongly influence fertilizer use (see, e.g., Mandac and Flinn 1985). This variable may reflect a number of factors, including the difficulty in obtaining fertilizer and the nominal market price of fertilizer. However, when the <u>effective</u> price of fertilizer, as opposed to the actual market price at the retail outlet, is used in, say, regression analysis, the effect of this variable may have already been captured by the price variable. Nonetheless, what this finding shows is that a combination of policies that would bring fertilizer inputs closer to the farmers would improve the fertilizer-output price ratio.

In development literature, it is often argued that farm size constrains the adoption of fertilizer-responsive modern varieties and, hence, the incidence and intensity of demand for fertilizer. The arguments that have been presented are quite complex, and so is the empirical evidence to support or dismiss these arguments (Feder 1985). In Philippine agriculture, the accumulated empirical evidence points to the conclusion that there does not seem to be farm-size bias in the adoption of fertilizer-responsive modern varieties (Herdt 1987, Hayami and Ruttan 1985). In the initial stage of the diffusion of MV technology, small

farms are indeed observed to lag behind larger farms in their adoption, but they eventually catch up.

It is important to point out that farm size is a surrogate for a large number of potentially important factors such as access to credit, capacity to bear risk, access to scarce inputs (water, seeds, fertilizer, insecticides), wealth, access to information, and so on (Feder 1985). Since the importance of these factors varies in different areas and over time, so does the relationship between farm size, on the one hand, and adoption behavior and fertilizer use, on the other.

Technical and environmental factors represent another set of determinants of fertilizer consumption. The importance of fertilizer-responsive modern varieties and irrigation has been mentioned. The environmental constraints or the "ecosystems" are no less important. They define the physical, biological, and economic limits to a wider adoption of fertilizer. These constraints include the prevalence of pests and diseases, adverse soils, adverse environment, and crop and resource management (Barker and Duff 1986). These constraints are elaborated elsewhere in this report.

E. Some Macro-Aspects of Fertilizer Consumption

So far, what has been discussed are the factors that influence the adoption (and the intensity of adoption) of fertilizer at the farm level. Most of the studies reviewed focused on specific crops, mostly rice. That is, little reference has so far been made regarding the determinants of the aggregate demand for fertilizer. This is the focus of the present section.

The available literature is very limited on the factors affecting fertilizer demand at the national level. Nonetheless, based on this literature, it is possible to identify some of these major factors. These are "land scarcity," transportation (or, generally, marketing) infrastructure, extension support services, irrigation development, and national food and agricultural policy. Some of these factors are interrelated, and the effect of each one on fertilizer demand reinforces (or offsets) that of the other.

Agricultural land scarcity (measured, e.g., in terms of agricultural land per farm worker) constrains the growth of agricultural production. A government that is averse, for any reason, to food imports needs to rely on a more intensive cultivation of available agricultural land in order to meet the national food requirements of a growing population. (In this regard and in the short to immediate run, a more appropriate measure of food production constraint is cereal land per worker).

One option the government has is to develop irrigation infrastructure and enhance agricultural support services (extension, marketing, credit). Because these are complementary to fertilizer and modern varieties, they in effect enhance fertilizer consumption. Another option is for the government to subsidize fertilizer or to increase the farm price support of food crops, or both. In varying degrees, the Philippine government has, over the last two decades, used both options, but it is fair to say that its tendency to use the latter spans the history of agricultural price policy in the Philippines. The reason for this is partly political: the impact of infrastructural and support services development on food supply is necessarily long run while that for price support is short run.

The impact of rice land scarcity on fertilizer consumption is particularly emphasized by Cordova and David (1985) and of agricultural land scarcity by Suleman (1986). Suleman, in particular, noted that national irrigation development (indexed by the percentage of irrigated land to total arable land), together with an efficient marketing system seems to hold the key to fertilizer-use development in the developing countries of the Asia-Pacific region.

The tendency to substitute fertilizer-use cum irrigation and modern biological technology development for scarce land is consistent with the economic history of the now-developed, land-scarce countries such as Japan and Taiwan (Hayami and Ruttan 1985).

In what is perhaps a more complete analysis of the interactions of fertilizer use (and other inputs) and infrastructural support services, Evenson (1986) showed that improvements in transport and extension services would have substantial positive impact on agricultural output and input use, including fertilizer. The finding on the importance of transport infrastructure on Philippine agriculture is significant in light of the increasing evidence that transport costs in the Philippines are high by international standards. Indeed, the observation that transport costs of corn from Bangkok or from ports in the U.S. to Manila are much less than those from Mindanao to Manila is an indication of the poor state of rural transport, including inter-island shipping, and infrastructure (Cabanilla 1987).

The high complementarity of fertilizer, on the one hand, and modern varieties, irrigation, and support services on the other hand, is evident in the cross-country comparison of fertilizer use among the newly developed countries of East Asia and the developing countries of South and Southeast Asia. In East Asia, where high complementary inputs exist and where agricultural price policies are favorable to increased production, fertilizer

application exceeds 200 kg/ha (graph 3A.5). This contrasts markedly with that prevailing in South and Southeast Asian countries where complementary inputs are low and where agricultural price policies tend to create disincentives to increased production. In these countries, fertilizer application is mostly less than 60 kg/ha.

It is therefore misleading to suppose that a developing country like the Philippines need only increase fertilizer inputs to achieve an increase in yield comparable to the yields prevailing in East Asian countries. That is, the response function Y (dashed line) in graph 3A.5 is irrelevant because it does not represent the actual situation in any given country. To move to the high yield-input level, complementary inputs and policies must all change along with fertilizer application rates.

Unfortunately, in the Philippines, neither the public provision of these complementary inputs nor price policies have been favorable to agriculture. Over the last five years, the share of real public expenditures on agriculture to total government expenditures has been that prevailing in the early 1960s (table 3A.7). The same picture can be depicted when government expenditures on the sector are expressed as a percent of the gross value added in agriculture. Between 1980 and 1986, these shares have been declining at about 15 percent annually. These declines have tended to be larger during the crisis years (1983-1986), i.e., the sector has suffered more from budget cuts relative to the rest of the economy. In particular, real government expenditures on agricultural research and extension, irrigation, and rural roads have declined by more than 10 percent annually during the crisis years of 1983-1986 (table 3A.8).

The poor state of rural transport, including inter-island shipping, can largely explain the relatively high costs of marketing and distribution in the Philippines. Transport costs alone account for about 30-40 percent of the total costs of agricultural products (PCCI 1986). For fertilizer, these costs account for about 42 percent of its total retail costs (table 3A.9). These are high in relation to the neighboring Asian countries at somewhat the same stage of economic development.

Earlier, it was noted that what is more crucial to agriculture is the availability of credit commensurate with its share of the Gross Domestic Product, and not so much with interest-rate reduction on credit. The previous government's agricultural credit policies, which provided for loan quota schemes and required commercial banks to provide loans to farmers at an interest rate set by the government, resulted in a decline in the flow of loanable funds into agriculture (Lamberte and Lim 1987). Moreover, access to subsidized credit tended to be in favor of large farmers and less so for small farmers who were the avowed major clientele of the credit subsidy program (Esguerra

Table 3A.7

Trends in Real Public Sector Expenditures in Agriculture
1960 - 1987

Average Growth Rate (p.a., %)	Public Sector Expenditure on Agriculture (million P, 1972 prices)	Public Expend. on Agric. as % of	
		Gross Value Added in Agriculture	Total Government Expenditures
1960	179	1.9	6.3
1961	182	1.8	6.1
1962	206	2.0	6.4
1963	355	3.2	9.9
1964	306	2.8	8.4
1965	265	2.2	7.3
1966	264	2.2	7.1
1967	296	2.4	7.2
1968	416	3.1	8.8
1969	435	3.2	8.3
1970	361	2.5	7.1
1971	452	3.1	8.5
1972	567	3.8	8.9
1973	767	4.9	9.0
1974	1354	8.5	13.0
1975	1135	6.7	9.9
1976	1,209	6.1	10.0
1977	1,312	6.4	11.6
1978	1,300	6.0	10.0
1979	1,703	7.5	12.7
1980	1,501	6.3	11.4
1981	1,636	6.6	10.8
1982	1,504	5.9	10.6
1983	1,325	5.3	9.6
1984	810	3.2	7.3
1985	747	2.8	6.2
1986	848	3.1	5.4
1987 a/	1,238	4.4	7.4
Average Growth Rate (p.a., %)			
1960-86	8.14	3.82	0.91
1960-70	7.18	3.97	1.80
1970-80	14.44	8.66	4.15
1980-86	-13.93	-15.91	-13.30

a/ Appropriation basis
Sources:
1960-75: David, C., "Philippines: Food Policy in Transition," IRRI, Agricultural Economics Department Paper No. 87-03, IRRI
1976-87: National Economic Development Authority (NEDA)

Table 3A.8

Annual Real Growth Rates of Agricultural Expenditures
by Subsector
1976 to 1986

	76-82	83-86	76-86
Extension	2.4	-11.1	-3.5
Research	13.8	-17.9	1.8
Irrigation	4.9	-14.8	-4.6
Price and Income Stab.	2.4	-11.1	-3.5
Agrarian Reform	-7.4	-9.8	-7.0
Forest Dev. and Mgmt.	-0.2	-4.6	-2.8
Rural Roads	11.9	-11.1	-0.1

Source : National Economic Development Authority (NEDA)

Table 3A.9

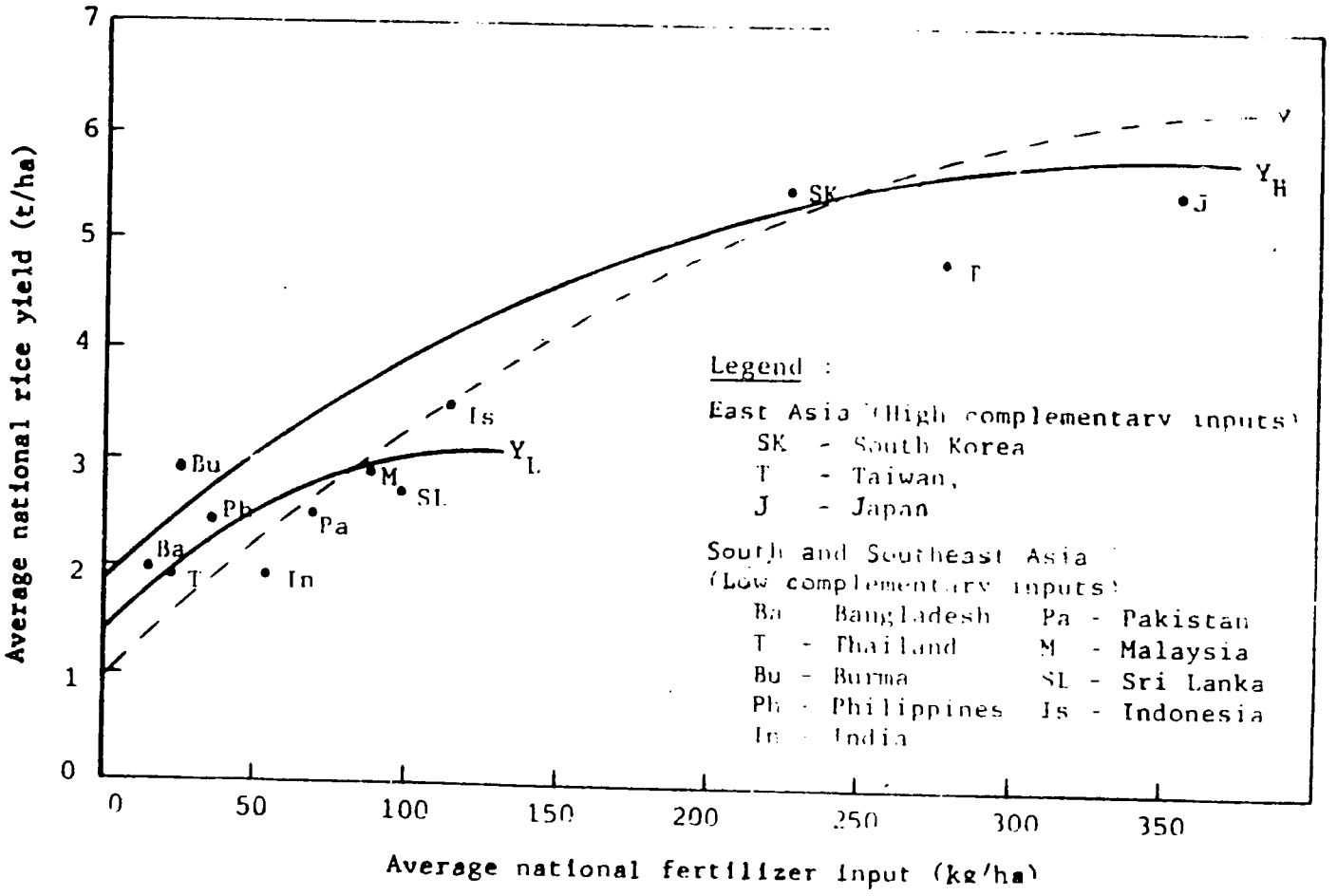
Marketing costs and margins for urea in selected developing countries of Asia and the Pacific, 1985-86
(in $US per ton)

Country	Distribution channel	C.I.F. import price	Ex-factory price	Marketing costs	Marketing margins	Marketing costs and margins	Total costs	Marketing costs as percentage of total costs	Marketing margins as percentage of total costs	Marketing costs and margins as percentage of total costs
India	public		256.53	44.11	11.32	55.43	311.96	14.1	3.6	17.8
	private		232.52	40.78	10.51	51.29	283.81	14.4	3.7	18.1
Indonesia	public		90.77	50.98	13.95	64.93	155.70	32.7	9.0	41.7
Malaysia	public		130.00	30.35	6.00	36.35	166.35	18.2	3.6	21.9
	private	128.00		36.35	9.00	45.35	173.35	21.0	5.2	26.2
Nepal	public	95.00		56.32	9.06	65.38	160.38	35.1	5.6	40.8
Philippines	private	178.12		90.18	40.00	130.18	308.30	29.3	13.0	42.2
Republic of Korea	public		262.10	41.63	9.52	51.15	313.25	13.3	3.0	16.3
Sri Lanka	public	115.40		33.44	11.88	45.32	160.72	20.8	7.4	28.2
Thailand	private	170.00		41.64	17.88	59.52	229.52	18.1	7.8	25.9

Source : Coster, R., 1987.

Graph 3A.5

A Stylized Set of Fertilizer Response Functions Contrasting East Asia with South and Southeast Asia



1981). Numerous cases of this experience have also been observed in other countries (Braverman and Guasch 1986).

Finally, a short note is in order on the interpretation of short-run and long-run price elasticities in the context of macro-models of fertilizer demand. It has often been assumed in micro-analysis of fertilizer demand that the short-run price elasticity is, in absolute terms, less than the long-run price elasticity. As discussed earlier, this is due to the lag in farmers' adjustment to new (exogenously determined) prices. However, in macro-models, the value of the long-run price elasticity can be less in absolute size than the short-run price elasticity. This tends to be so in a close economy, i.e., where there is no external (foreign) trade for the commodity in question. In this setting, a decrease in the price of fertilizer would induce an increase in fertilizer application, with the resulting increase in production (or supply) leading to a decline in the price of the commodity, all other things remaining the same. The decline in the price of the commodity would raise the price of fertilizer relative to the price of output, which would then decrease the demand for fertilizer. When all the adjustments are completed (i.e., when the new long-run equilibrium is reached), it can be shown that the increase in fertilizer demand is less than the corresponding increase in the short run (Timmer 1974).

This feedback effect is, however, inoperative either in the short run before the equilibrium is established or in the long run if the price elasticity of demand is perfectly elastic. The latter is relevant when the country is open to international trade in the commodity concerned and is small enough to be considered a price taker in the world market.

In countries where self-sufficiency in basic food is an important government objective and where the price elasticity of food demand is low, this feedback mechanism may be too powerful to ignore. As shown by Timmer, in the extreme case where consumers refuse to alter their food consumption when the price of food changes (i.e., when the price elasticity of food demand is zero), fertilizer applications may not in fact change, no matter what happens to fertilizer price.

Unfortunately, not one of the empirical studies on fertilizer demand reviewed here has looked at the extent of this feedback effect. The main reason is simply that these studies have been micro-oriented and ignored the possibility that the prices of the commodities under investigation are not entirely exogenous.

F. What Has Been Learned?

Although there still remain unresolved conceptual and empirical issues surrounding the empirical analysis of the major determinants of fertilizer demand, the available literature has provided valuable information for policy. The distinction between the micro-(i.e., the farm-level) and the macro-(i.e., the aggregate) aspects of fertilizer use also provides important policy implications.

At the farm level, one important economic factor influencing the decision of farmers to adopt fertilizer or to increase their use of fertilizer is the effective price of fertilizer, the components of which may include the market price of fertilizer, interest cost of capital, marketing and distribution costs, and application cost. Of these, marketing and distribution costs deserve critical attention in view of the large share (about 42 percent) of these costs to the total retail costs of fertilizer. Indeed, marketing costs in the Philippines are high in relation to neighboring Asian countries at somewhat the same stage of economic development.

Of course, high effective fertilizer price does not necessarily imply low profitability of using fertilizer. The effect of the high price of fertilizer on farmers' profits can be partly or fully offset by increases in the farm prices of crops. However, in the Philippines, as in many developing countries, government price policies have tended to depress the prices of agricultural crops relative to what they would have been otherwise. In other words, the relative price of fertilizer (expressed as the ratio of the price of fertilizer to the price of crops) in the Philippines has been high vis-a-vis neighboring Asian countries.

Technical and environmental factors have also consistently proved to be important farm-level determinants of fertilizer use. Indeed these factors contribute about two-thirds of the fertilizer (yield) gap during the wet season and about one-half during the dry season, with the gap measured as the difference between the farmers' fertilizer application (yield) and the researchers' yield-maximizing fertilizer application (maximum yield). In particular, the availability and proper management of complementary inputs (such as irrigation and fertilizer-responsive modern varieties) and the farmers' ability to hedge against adverse environmental conditions arising from severe drought, flood, pests and diseases tend to increase farmers' adoption of yield-increasing innovations.

What has often been overlooked in the literature is that fertilizer use at the farm level is partly, if not largely, an influence of national policies involving the pricing of agricultural products and the public provision of rural

infrastructure and support services (irrigation, agricultural research and extension, rural and inter-island transport infrastructure, post-harvest facilities, agricultural credit). Concerning the latter, although it is apparently recognized that increases in farmers' production and incomes will largely depend on the provision of adequate agricultural-rural support services, government expenditures in these areas have declined at an annual average of 5.5 percent over the last ten years. Considering that these are vital complementary inputs to fertilizer, much of the future sources of growth in yield and in the aggregate demand for fertilizer will likely come from increased provision of these infrastructure and support services. Simply providing a subsidy on the price of fertilizer is not going to accomplish much in raising yield and farm incomes.

Annex 3

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ANNEX 4

THE COMPETITIVE STATUS AND FUTURE PROFITABILITY OF PHILPHOS

A. Constraints on the Present Analysis

The analysis of PHILPHOS required by the terms of reference in annex 1 presupposed detailed costs of production from the company. Chemonics made the appropriate request in discussion and writing with the managing director and senior management of PHILPHOS early in the consultants' assignment. By around the sixth week of the consultancy there was considerable doubt whether this information would be available in time, given the company's apparent concern over its sensitivity. (It might be pertinent to note that, coincident with Chemonics' request, the GOP was engaged in critical discussions with the governement of Nauru concerning the latter's continued participation in PHILPHOS.)

Accordingly, Chemonics has developed its own cost analysis, with the intention of providing a document to form a basis for discussion with PHILPHOS and at the Fertilizer Advisory Committee's review of the draft report. Although PHILPHOS provided help on some points of detail, it is in no way responsible for the orientation and general organization of the analysis, which were determined entirely by Chemonics.

The results are set out in tables 4A.9 - 4A.13 at the end of the annex. It will be seen that they have been calculated as if PHILPHOS used all of its capacity to produce diammonium phosphate rather than its actual product mix of compounds, DAP (and MAP if required) and merchant grade phosphoric acid. The justification for this short-cut, determined by pressure of time, comes later in the annex.

It must be stressed that the Chemonics' team, although with some experience in using the type of analysis shown in these tables (which illustrate standard project appraisal and planning techniques in the fertilizer industry), was not formed with a view to developing the basic data involved, which requires a chemical engineer/fertilizer plant economist. As a further limitation, the GOP considered that the results should not be released in the draft report, which meant that they could not be discussed in the final meeting of the Fertilizer Advisory Committee, nor with PHILPHOS until the team's last days in Manila, which left insufficient time for a comprehensive review and follow-up on initial comments.

The analysis has been modified on various points in light of the final meeting with PHILPHOS. No doubt, other improvements

could be made, both on points of detail and to reflect the company's actual product mix in place of the simplified assumption that only DAP is produced. Even so, the information is considered sufficiently reliable as one element in assessing PHILPHOS' current international competitiveness and as a starting point in forecasting changes in its annual profitability over the next decade. In addition, Tables 4A.9 - 4A.13 provide substantial detail as a starting point for anyone undertaking a more comprehensive review.

B. General Background on PHILPHOS

PHILPHOS is a joint venture between the GOP and the government of Nauru, although in December 1987 the latter indicated its desire to withdraw from the venture. PHILPHOS was set up in 1980 by the governement-owned National Development Corporation at a total cost of $590 million, of which $490 million were GOP-guaranteed loans (demoninated mainly in dollars, yens, Spanish piesta and Belgian francs), with the balance as equity divided into GOP, $60 million, and the government of Nauru, $40 million.

The large-scale plant came on stream in late 1985, primarily to produce ammonium phosphates (DAP and MAP), other compound fertilizers (16-20-0, 14-14-14, and 15-15-15) and merchant grade phosphoric acid, but also ammonium sulphate. Nominal capacity is 384,000 tons of phosphoric acid (100 percent P205 basis), with an originally-intended product mix of:

	Tons of Material	Tons of P205	Percent of Total P205
	-------- 000	-------	
DAP/MAP	510	236	62%
Compounds	340	62	16
Merchant Grade Phosphoric Acid	160	86	22
Total	1010	384	100

However, the design permits considerable flexibility in the actual mix. Diammonium phosphate and merchant grade acid are entirely for export. Production of compound fertilizers originally had been intended mostly for Philippine agriculture, but in terms of P205 content, exports have been more important than the domestic market in 1987. Product flexibility has been demonstrated in 1987, with exports of DAP little more than 300,000 tons of material as against total sales of compounds probably in excess of 490,000 tons.

The ammonium sulphate capacity was planned to supply the export market, although presumably some output would have been sold in the Philippines. In the event, it has proved uneconomic,

which is not surprising, given the limited and stagnant market worldwide and in Asia for this product and the competition from urea both at home and abroad. Production has been discontinued and, even if ammonium sulphate should be manufactured from time to time, the margin over raw material and other variable costs will be slight and will not contribute significantly to total profits.

PHILPHOS should be analyzed purely in terms of its economics as a producer of NPK's ammonium phosphates and merchant grade phosphoric acid.

C. The Competitive Status of PHILPHOS as an Exporter, General Considerations

1. The Exceptional Economic Basis of the PHILPHOS Development

PHILPHOS was planned on the stated basis that its severe locational disadvantage with respect to low-cost phosphate rock would be offset by exceptionally favorable costs of sulphur and ocean freight in its Asian export markets. (Its nearby sources of rock are sold under the price umbrella set by Morocco, Florida and North Carolina, Jordan and other producers in North and West Africa.) Most of the export-oriented phosphoric acid/ammonium phosphate complexes built in the last fifteen years have been located alongside or nearby low-cost phosphate rock mines. Apart from their obvious advantage in avoiding the long distance ocean transport of phosphate rock (low in phosphate content compared with intermediate and finished products, i.e., around 32-35 percent P205 in the grades normally traded internationally), their location commonly favors the use of raw material which on an FOB mine basis is cheaper per unit of P205 than the most economic product for PHILPHOS to ship, namely lower grade materials and in some cases semi-beneficiated wet rock.

Admittedly, many compound fertilizer plants depend on an imported phosphatic raw material, as in the case of the USSR and Western Europe, and also increasingly throughout Asia. Such Asian plants will increasingly be a factor influencing PHILPHOS' international competiveness. However, they will reduce their inward freight per unit of finished nutrient by importing phosphoric acid at 54 percent P205 content rather than phosphate rock. (The USSR makes extensive use of superphosphoric acid at 69-72 percent P205, a practice which will not be a significant influence in PHILPHOS' market area for at least the next decade.)

The unusually large capital cost of PHILPHOS' facilities per ton of processed P205 was either implicitly assumed to be covered by the expected sulphur and freight advantages, or it was overlooked. In the event, the offsets to this item and to

expensive phosphate rock have fallen far short of expectations, and are likely so to do throughout the next decade.

2. Necessary Advantage on Sulphur Cost Not Realized Fully

It was originally expected that PHILPHOS would obtain all of its sulphuric acid from cheap local sources. Assuming operation at full annual capacity, it was to produce 495,000 tons in its own plant from pyrites, with two planned, adjacent copper smelters of PASAR providing the balance of 935,000 tons (810,000 tons excluding the 125,000 tons no longer required for the closed ammonium sulphate unit). In the event, the pyrites unit may have an annual capacity output of 460,000 tons of acid, while 450,000 tons come yearly from PASAR, which has built only one smelter. Depending on the product mix and assuming capacity working, PHILPHOS must meet up to 395,000 tons of its annual needs for acid by imports from Japan, from which it gains at best a minor cost advantage against its major competitors. (Table 4A.13 shows the annual requirement for imported acid as 202,000 tons at capacity operation. However, the assumed total specialization on DAP reduces considerably the requirement per ton of P205 produced. Some 2.9 tons of sulphuric acid are required to produce one ton of P205 in DAP, but 5.6 tons are required in the case of 15-15-15 and similar amounts for other compounds.)

At a 90 percent operating rate for final output with the originally planned product mix and the pyrites unit at full stretch, some 265,000 tons of imported sulphuric acid would be required annually.

PHILPHOS was planned with the expectation that it would come into operation in 1985 with the average cost of its sulphuric acid at $28/ton as against twice that level for most of its competitors (i.e. $80 and $160 per ton of sulphur respectively). One can only infer that this relationship was expected to be more or less maintained over the life of the investment, implying a cost difference equivalent to around $85/ton of sulphur at 1987 constant dollars.

The price of PASAR acid is currently being renegotiated from $18/ton against an asking price of around $28/ton, and the outcome might be expected to be $24/ton for 1988. (Tables 4A.9 - 4A.13 show $24/ton in 1987. This is corrected to $18/ton in the analysis later in the annex.)

Pyrites (42 percent sulphur) cost P 450.00 C&F PHILPHOS, i.e. $21.42/ton which is equivalent to $17.85/ton of sulphuric acid. Net processing costs (power, water, labor, maintenance and depreciation, less steam credit) should be around $12-$15/ton. Say, an overall full cost of $30/ton of sulphuric acid from pyrites in 1988.

In 1988 PHILPHOS full costs of sulphuric acid from both domestic sources should average around $27/ton, equivalent to $77/ton of sulphur. Incremental acid from Japan is $38/ton C&F ($109/ton of sulphur). Together, these come nowhere near yielding the expected favorable margin of $85/ton of sulphur at 1987 constant dollars. Currently, principal competitors are paying at most $145/ton C&F their plants on long-term contracts, and probably significantly less, and they are getting much of their supplies on the spot market for under $125/ton.

On the basis of 1987 constant dollars, PHILPHOS' major competitors are likely to be paying at most $156/ton in the early 1990s, rising to around $165/ton in 1997. It is only towards the end of the review period that inflation-adjusted international sulphur prices will reach a level to yield the cost advantage from domestic supplies which PHILPHOS was expected to secure from the beginning. Even so, it will continue to depend on imported material to meet at least 10 percent of its requirement, obtained at C&F prices not appreciably lower than those faced by its competition.

3. PHILPHOS Ocean Freight Advantage on Its Exports Likely to Fall Far Short of Expectations

PHILPHOS stated in an Information Memorandum of December 1981 that the minimum freight advantage it would enjoy over the Florida industry in the Southeast and East Asia markets would be around $50/ton in 1984, presumably continuing on an inflation-adjusted basis on this scale throughout the life of the project. This expectation has proved to be much too optimistic, and is likely to remain so.

From unpublished FPA data covering some 930,000 tons of Philippines' DAP and from press reports of US Gulf FOB prices, it seems that PHILPHOS has averaged only some $20/ton more FOB than Florida producers in 1985-1987, without any evidence of an improving trend. Consideration of PHILPHOS' principal markets, as indicated in table 4A.1, supports this conclusion.

Table 4A.1

Percentage Distributions of PHILPHOS
Exports by Destinations

	1986	1987
DAP		
China	46%	57%
Thailand & Other SE Asia	12	16
Iran	23	27
More distant markets	19	-
	100	100
Compounds		
China	86	66
Thailand	14	34
	100	100

Memorandum items: DAP as percent of total nutrients exported as finished fertilizers, 1986 90%, 1987 62%.

Taking the principal market, Florida can ship in bulk to major Chinese ports at some $25/ton in vessels carrying around 30,000 tons, although some recent quotations about $20/ton have been noted. There is then need for bagging at perhaps $2/ton more than at the PHILPHOS plant, for on-shipment for most of the product at around $5/ton in much smaller vessels to the Chinese ports which are the final delivery points. PHILPHOS ships directly to these destinations at around $12/ton, giving Florida a net average disadvantage marginally under $20/ton.

Shipments to Thailand should leave Florida at a somewhat greater disadvantage due to the need to use smaller vessels to Bangkok (a river port) than to China.

For Iran, any Florida (or Moroccan) product would need to go in large, bulk shipments through an intermediary, typically in Antwerp, where bagging would take place at about the same cost as for PHILPHOS. Freight to Iran would be about the same from Antwerp and from the Philippines. Florida's net disadvantage would be the Tampa-Antwerp freight and unloading and reloading charges at Antwerp, some $16 - $22/ton.

During the next decade PHILPHOS should gain some additional advantage from greater demand in the Southeast Asian markets,

permitting reduced shipments to the more distant outlets, and from the strengthening of dry cargo freights which seems likely in the 1990s. At constant 1987 dollars these gains could be some $2/ton and $6/ton respectively 1992-1997. However, there could be a major offset, namely the loss of PHILPHOS' special advantage with Iran, which presupposes the continuation of the Iran-Iraq war or some other political factor still excluding the principal Western DAP producers from direct shipping access to the Iranian market.

The analysis later in the annex will increase PHILPHOS net advantage on ocean freight in constant 1987 dollars from $20/ton in 1987 to $28/ton by 1983, which more likely errs towards generosity.

PHILPHOS has some advantage in moving product from plant to FOB vessel and in in-plant bagging compared with Florida. Excluding the bagging cost on shipments to China or Iran, which have been covered already, these may be a net gain to PHILPHOS of around $8/ton averaged over all exports and remaining at this 1987 constant dollar level throughout the next decade.

4. PHILPHOS' Extremely High Investment Costs

The capital costs for PHILPHOS break down as follows.

Table 4A.2

PHILPHOS Capital Costs

Fixed investment	$425.7 million
Interest expense during construction	118.5
Other financing	10.3
Working capital	35.0
Total	$590.5 million

This is an exceptionally large total, far in excess of the outlay likely to have been required by any of the major exporters to build a plant at the same time capable of producing and processing the same amount of phosphoric acid with a similar product mix. On the basis of the World Bank studies by W.F. Sheldrick cited in annex 2 and of certain unpublished analyis, such a competitor would have had a maximum total outlay of $375 million, and probably well under $350 million.

Some of the PHILPHOS excess is due to the considerable capital tied up in the pyrites unit (intended to be offset more than it has by low-cost sulphuric acid) and in above-average investment outside battery limits, which the typical competitor would avoid. The interest expense is excessive. Other inflating influences must have been important.

But, whatever the reason, PHILPHOS is saddled with a total capital burden which severely undermines its competitive position.

5. Relative Profitabilities of Ammonium Phosphates and Compounds in Export Markets

This section is concerned with the relative profitabilites of phosphoric acid into either DAP/MAP or compounds such as 15-15-15. It is important to stress that all calculations are expressed per ton of P205 processed, so that the comparisons are between producing 2.17 ton of DAP or alternatively 6.67 tons of 15-15-15, and not between one ton of each product. In addition, the already noted lack of complete cost data makes the following assessment less factually comprehensive and more dependent on general reasoning than it should be. Even so, it is considered sufficient to support the final conclusions of the section.

In a large, competitive fertilizer market such as the United States one ton of P205 will yield more or less the same net profit whether converted into DAP or a compound such as 15-15-15, taking one year with another and averaging out the much shorter-term differences which commonly occur. Whether or not the same conclusion applies to the Southeast Asian market is critical to the profitability of PHILPHOS with its proven large capability to produce compounds, and to this annex's methodology.

On the basis of FPA statistics for FOB export prices of DAP and 15-15-15 and for the C&F import prices of ammonia and potash, average net FOB values of contained P205 are estimated on total 1987 Philippines exports. Nitrogen and potash are deducted from the average product prices according to their import values, with the remainder representing contained P205. Adjustment is then made by excluding the costs of sulphuric acid, much larger per ton of P205 in 15-15-15 (5.6 tons used as against 2.98 tons in DAP), to give net values of contained P205. Similar calculations are made for December 1987 and January 1988, assuming that 15-15-15 prices per ton of product were unchanged from the 1987 annual averages but with DAP approximated on the basis of the recent surge in U.S. export values.

Finally, some calculations are shown for the United States. Although these are based on retail prices for the two products, their significance lies in the absolute differences between the

two pairs of net values (April and October respectively), which can be expected to carry back almost completely to FOB plant if DAP and 15-15-15 are produced in the same general locality.

The results are shown in table 4A.3.

Apart from phosphoric acid, the values of contained P205 net of sulphur cost cover all costs related to granulation, bagging, transport and loading. Per ton of product, granulation costs are much greater for 15-15-15 than for DAP, while the other items are the same. Per ton of P205, therefore, they are very much more for 15-15-15 than for DAP.

The value of contained phosphate per ton of P205 in 15-15-15 exceeded that in 18-46 by $291 for the whole of 1987 FOB the Philippines, as against $169 in April 1987, and $179 in October 1987 for the South Central U.S. Even with some small allowance for greater energy costs in PHILPHOS granulation than in the United States, the extra $110 - $120 for the Philippines points to much larger net profit per ton of P205 from compounds than from DAP. The estimates for December and January suggest that this favored position for compounds is starting to erode.

Table 4A.3

Average Export Prices of 15-15-15 and DAP and
The Average Values of Their Contained P205 per Ton
of P205 in 1987

	Per Ton of Product FOB		Per Ton of Contained P205 FOB	
	Price	Gross Value of Contained P205	Gross	Net (Excluding Value of Sulphur)
Philippines:				
Calendar 1987				
15-15-15	$153	$108	$719	$506
18-46	178	151	328	215
December 1987				
15-15-15	153	108	719	506
18-46	190	165	359	246
January 1988				
15-15-15	153	108	719	506
18-46	210	200	435	322
US Domestic Market:				
April 1987				
15-15-15	155	106	707	455
18-46	222	193	420	286
October 1987				
15-15-15	160	111	740	488
18-45	233	204	443	309

Notes: (1) Sulphuric acid is valued at the C&F import price of around $38/ton. The calculations shift further in favor of 15-15-15 if acid is valued at the cost of domestic pyritic or by-product supplies.

(2) As indicated in annex 2, the exceptional surge in DAP prices in December 1987 and January 1988 is in some measure due to the weakening of the U.S. dollar, but largely reflects a temporary shortage of material due on the one side to large Chinese imports and some recovery of U.S. demand and on the other to tight inventory control by U.S. producers.

(3) Philippines calendar year prices are from estimates made in early November and may be subject to minor revision, while December and January prices are Chemonics' "guestimates".

(4) U.S. product prices are the official reported prices of the USDA for the east south central states of Alabama, Kentucky, Louisiana, Mississippi and Tennessee. Chemonics' assumptions of U.S. manufacturer's ingredient prices are ammonia $135/ton, potash $100/ton and sulphuric acid $45/ton, all of which are somewhat higher than the corresponding values for the Philippines.

In the short run, say over a six to nine month period, the export market for compounds in Southeast Asia may be much less competitive than that for DAP. Relative profitabilities for PHILPHOS may well get significantly out of line over such a time frame, the advantage oscillating between the one and the other product. But any one-sided difference is unlikely to persist over a longer period. There is sufficient competition--South Korean exporters and domestic producers in China and Thailand, European and North American exporters with no significantly greater freight disadvantage than for DAP--and PHILPHOS and its competitors will always be tempted to shift product mix towards the temporarily more profitable means of converting phosphoric acid. The apparent exceptional profitability on compounds enjoyed by PHILPHOS in 1987 gives no basis for undermining the basic premise of the financial analysis which follows--namely that the longer-term profitability of exporting DAP provides a good indicator of the profitability of PHILPHOS' total exports of ammonium phospates and compounds.

6. Relative Profitabilities of Ammonium Phosphates and Merchant Grade Phosphoric Acid in Export Markets

The last conclusion applies equally for DAP as an indicator of changes in profitability of exporting merchant grade phosphoric acid.

7. Relative Profitabilities of Domestic and Export Sales

Even if import parity pricing is applied rigorously, PHILPHOS' domestic market is protected by foreign suppliers' freight costs and the heavy landing expenses arising from the poor port facilities of the Philippines. On the basis of FPA data for granulated product covering 204,100 tons sold in the Philippines and 386,000 tons exported (respectively 43,600 tons and 134,000 tons of P205) in 1987, sales to the domestic market netted an extra $129.50 per ton of P205. Prorated over total output at a 90 percent operating rate, this becomes $16.40 per ton of P205 or $7.54 per ton of DAP.

The analysis does not cover all exports, which were probably some 600,000 tons of granulated product and a large amount of merchant grade acid. The omission of the acid does not influence the calculation, but the absence of about one-third of the other materials seems to have led to a slight understatement of their overall export value. Accordingly, as a working assumption, it is assumed that the domestic market contributed an extra profit in 1987 equivalent to $6.00 per ton on the total output of DAP over that suggested by FOB export prices.

Taking the growth of the domestic market at around 3.5 percent annually 1987 to 1997 and the concomitant shift of PHILPHOS sales from exports, the profit adjustment increases steadily to around $9/ton of DAP by the end of the decade.

D. PHILPHOS' International Competitiveness and General Profitability, 1987-1997

1. General Basis of Analysis

For the reasons already indicated, the financial analysis is based on the working assumption that PHILPHOS produces only one end product, DAP.

2. PHILPHOS' Current Competitive Position in Relation to Florida DAP Producers

PHILPHOS' international competitive status can be broadly measured by identifying the critical differences in its current costs of production of DAP against those for a similar unit in Florida. Therefore, the following comparison includes only those items which are important in this respect, but is not a comprehensive review of all costs. The comparison proceeds in four stages; (1) factory operating costs before depreciation, (2) depreciation, (3) adjustment for PHILPHOS' net advantage on bagging, transport and loading FOB and ocean freight, and (4) additional revenues required for a 10 percent return on investment. The two plants are assumed to work at 90 percent operating rates.

For one ton of phosphoric acid (100 percent P205 basis), there are two critical items determining differences in manufacturing costs before depreciation (apart from energy, which is shown under DAP), as shown in the first section of table 4A.4. Phosphate rock is 72 BPL from Morocco for PHILPHOS and 67-68 BPL (wet rock) for Florida. The rock price for PHILPHOS is based on its latest contract price, as provided by the company, rather than the $46/ton shown in table 4A.8, which approximates the annual average for 1987. PHILPHOS' sulphuric acid price is, as described earlier, an average of $27/ton for domestic sources and $38/ton for the 10 percent or so from Japan. The input prices for Florida are Chemonics' estimates. Figures for sulphur may

overstate its current situation somewhat, depending on the importance of purchases in the spot market.

Carrying through to the second section, we have the critical plant operating costs before depreciation of one ton of DAP, showing but a marginal disadvantage for PHILPHOS. The PHILPHOS cost of energy is much more than Chemonics' estimate for Florida, reflecting the high cost per unit and the additional demand of the pyrites plant.

Table 4A.4

Comparison of Costs Critical In Influencing Competitiveness of PHILPHOS

	PHILPHOS		Florida	
	$/ton of product			
Phosphoric acid:				
Phosphate rock	3.1 tons @ $40/ton	$124	3.4 tons @ $22/ton	$75
Sulphuric acid	2.9 tons @ $28/ton	81	Sulphur 0.98 tons @ $140/ton	137
Total		$205		$212
DAP				
Phosphoric acid	0.47 tons @ $205/ton	$96	0.47 tons @ $212/ton	$100
Ammonia	0,22 tons @ $127/ton	28	0.22 tons @ $125/ton	28
Energy		19		11
Management/labor		4		9
Sub-total		147		145
Depreciation		53		37 (a)
Net advantage on bagging, transport and ocean freight		(28)		-
Total		172		182 (a)

(a) Maximum

At the sub-total for operating costs before depreciation, there is no significant overall difference between PHILPHOS and Florida. However, PHILPHOS is at a great disadvantage on depreciation. When straight line depreciation is taken over 15 years for PHILPHOS and over 14 years for Florida, the respective charges per ton of DAP are $53 and a maximum of $37/ton. (These periods have been used after discussion with PHILPHOS, the one-

year difference reflecting its larger component in long-lasting infrastructural investments. It may be noted, however, that a twelve-year period is a common assumption in assessing comparative plant economics in the converted phosphate sector, as in many World Bank studies, and was used on all but minor items in the 1981 PHILPHOS Explanatory Memorandum. For these reasons, depreciation in table 4A.13 was calculated on a twelve-year period. On this basis PHILPHOS would be at a greater disadvantage, namely $67/ton against a maximum of $42/ton.) On bagging, and outward loading and freight, the net advantages are with PHILPHOS, as discussed above.

Bearing in mind that the estimates of Florida capital costs and depreciation may well err on the high side, it seems best to interpret the result as an indication that PHILPHOS is roughly on a competitive par with Florida as long as return on capital and the extra contributions from PHILPHOS' domestic sales are ignored.

Allowance for an adequate return on capital, say, at least 10 percent before tax on the initial capital value (a commonly used rule-of-thumb in place of a thorough DCF analysis), weakens the company's position substantially, requiring it to earn an additional $80/ton of DAP as against a maximum of $54/ton for Florida. The contribution of domestic sales to overall profits, namely equivalent to $6/ton DAP in 1987, rising to $9/ton in 1997, reduces the disadvantage somewhat, but leaves most of it.

These conclusions and their supporting analysis are an important element in PHILPHOS' competitive status, complementing the projections of 1987-1997 profits given later.

3. PHILPHOS Cost and Revenue per Ton of DAP in 1987

Turning to the financial analysis of tables 4A.9 - 4A.13, the price assumptions do not differ to any significant extent for phosphate rock and ammonia from reported annual realizations, although for rock (C&F from Morocco) they are apparently some $6.00/ton higher than the end-of-year level. PASAR sulphuric acid seems to have been overestimated by $6.00/ton, or around $3.70/ton of DAP when averaged over all production at a 90 percent operating rate. Operating expenses and electric power ($25.73/ton and $17.31/ton respectively with production at 90 percent of capacity) may have been overestimated somewhat, but probably by not more than $5.00/ton and $4.00/ton. Straight line depreciation over 12 years in table 4A.13 has been recalculated to 15 years for the reasons given above.

In the light of these considerations, operating costs per ton of DAP have been adjusted from table 4A.13 to give the following base in 1987.

Table 4A.5

Recalculation of Table 4A.13at 90 percent Operating Rate

	As Stated	Adjusted
	$/ton	
Operating costs before depreciation	$183.06	$170.00
Depreciation	66.78	53.00
Total	$249.84	$227.00

It must be stressed once again, even at the risk of undue repetition, that these calculations reflect the working assumption that total capacity is devoted to DAP. Given the actual product mix in 1987, actual costs per ton of total output will be substantially lower.

4. Annual Changes in PHILPHOS DAP Costs and Prices 1987-1997

a. General

The costs of production for 1987 have been adjusted for annual absolute real changes at constant 1987 dollars in the prices of phosphate rock, ammonia, and imported sulphuric acid and for the declining real burden of book value depreciation due to inflation. All other items are assumed to maintain their 1987 values shown in table 4A.13, excepting PASAR sulphuric acid which is put at $24/ton, reflecting Chemonics' assumption that the negotiation taking place at the end of 1987 will be resolved quickly at this level. Detailed estimates are made for the low and medium price scenarios. The implications of the high price scenario for sulphur is discussed briefly in general terms.

b. Cost Calculations

The starting point is the FOB prices of Moroccan phosphate rock, West European urea (as a proxy for ammonia) and US Gulf sulphur (as a proxy for Philippine imported sulphuric acid) given in annex 2, to provide indices for adjusting the corresponding cost per ton of DAP in table 4A.13. The FOB prices for urea and sulphur are used without further adjustment, on the basis that they will provide reasonable indices of the changes from PHILPHOS' actual levels of ammonia and imported sulphuric

acid in 1987. However, in view of its particular importance in total costs and its sensitivity to changes in dry cargo freight, phosphate rock has been adjusted to a CIF basis.

Table 4A.6

FOB and CIF Prices of 72 BPL Phosphate Rock from Morocco, Low and Medium Price Scenarios at 1976 Constant US Dollars

	FOB		CIF		Ocean Freight
	Low	High	Low	High	Low/High
	$/ton				
1987	$31	$31	$46	$46	$15
1988	31	33	46	48	15
1989	35	38	51	54	16
1990	38	42	55	59	17
1991	43	49	61	67	18
1992	47	49	67	69	20
1993	49	46	70	67	21
1994	49	45	70	66	21
1995	45	45	66	66	21
1996	45	45	66	66	21
1997	45	45	66	66	21

Note: Since these prices are being used to provide indices, there is no need to convert to a 1987 base.

As with all price projections in this study, the annual fluctuations are followed to and through the next cyclical peak but thereafter only the expected trends are used.

The following projections are derived, giving the aggregate absolute annual change to apply to the 1987 estimate of $170/ton for production costs before depreciation. All calculations have been made from unrounded numbers. Certain totals do not add for that reason.

Table 4A.7
Costs per Ton of DAP at Constant Dollars

	Phosphate Rock	Ammonia	Imported H2S04	Total	Change in Total from 1987
	$/ton of DAP				
Low Price Scenario:					
1987	$71	$30	$5	$106	-
1988	71	35	5	111	5
1989	79	37	5	122	15
1990	85	48	6	139	33
1991	95	59	6	159	53
1992	104	75	6	185	78
1993	109	69	6	184	78
1994	109	61	6	176	70
1995	102	59	7	168	62
1996	102	59	7	168	62
1997	102	59	7	168	62
Medium Price Scenario:					
1987	71	30	5	106	-
1988	74	35	5	114	8
1989	84	43	5	132	25
1990	92	56	6	153	47
1991	104	72	6	182	76
1992	107	93	6	206	100
1993	104	75	6	185	79
1994	102	69	6	178	72
1995	102	69	7	178	72
1996	102	69	7	178	72
1997	102	69	7	178	72

The fifteen year straight line depreciation is calculated by reducing the 1987 value of $53.42/ton by 5/0 percent annually, reflecting the effect of the assumed corresponding rate of inflation in terms of dollars on the real burden of the nominal book value.

c. DAP Prices

The annual DAP prices FOB Philippines are those for FOB US Gulf in annex 2, adjusted to 1987 constant dollars,

plus PHILPHOS' advantages on bagging and transport by ocean freight.

5. Changes in PHILPHOS Profits 1987-1997

Table 4A.8 brings together the cost and revenue estimates for 1987 and forecasts to 1997 for the two main price scenarios. The following points should be recalled in interpreting the results.

- Taking one year with another, the profit from converting a given amount of phosphoric acid is not expected to be significantly different whether exported as DAP, merchant grade acid, or compounds.

- Particular years may differ either way from this norm. Such differences cannot be forecast. However, it has been seen that DAP prices by themselves give a substantially pessimistic pointer to the overall profitability of exports in 1987 and to the fact that compounds were exceptionally profitable.

- Even assuming rigorous application of import parity pricing, sales to the domestic market should yield a much larger net profit per ton of converted P205 than exports, which has been calculated as equivalent to $6/ton on the total assumed DAP production in 1987, rising to $9/TON in 1997.

- The 1988 Florida annual DAP price is extremely low in relation to that for January 1988, which has been around $240/ton. While some of the recovery is due to the recent decline in the US dollar, part reflects a temporarily tight market. The dollar may have overshot its shorter-term equilibrium value. Immediate shortages of DAP do not reflect the underlying potential supply. They were created first of all by an unexpected surge in Chinese imports which depleted inventories, and they are likely to ease once supplies are in place to meet the US spring demand.

- Table 4A.3 has shown the average 1987 DAP price FOB Philippines as $178/ton, noting that it was a November estimate which might require minor upward revision. Moreover, sales seem to have been contracted largely in the earlier months of the year when world prices were generally lower than the annual average.

- Above all, table 4A.8 should be interpreted against the background of section D.2, which has argued that PHILPHOS has an intrinsic disadvantage against Florida DAP producers of at least $20/ton of DAP. World market prices

are likely to settle through competitive forces at levels, taking one year with another, which will do no more than give Florida an adequate return in terms of the opportunity cost of capital.

Table 4A.8 shows a disappointing outlook for PHILPHOS with either scenario, even ignoring 1987. In each case there is only one year in which profit exceeds the postulated and possibly conservative 10 percent return on initial book investment. The averages of the annual profits for 1988-1997, including adjustments for the extra profitability of selling P205 in the domestic market, are $30/ton of DAP for the low price scenario and $37/ton for the medium, with the last few years showing the trend level as $38/ton in each case.

These results take a more pessimistic view of the long-term outlook than the PHILPHOS/Florida comparison of section D.2. About half of the difference is explained by the projections of table 4A.6. By 1997 PHILPHOS must absorb additional ocean freight on phosphate rock equivalent to a real increase of $8 - $9/ton on DAP, which Florida (and other main competitors) will avoid by virtue of their lcations close to mines. Taking this adjustment into account and while recognizing that further investigation might refine the comparison towards a somewhat more optimistic conclusion (or equally, one which is less comforting), it remains clear that the long-term outlook for PHILPHOS is much less encouraging than for its main competitors and that it cannot expect to come close to securing a reasonable return on capital.

Even so, the important cyclical element in PHILPHOS' present difficulties will be clear from Table 4A.8.

6. High Price Scenario for World Sulphur Prices

The high price scenario for sulphur given in annex 2 gives a real cost of this raw material for major foreign phosphate producers some $40/ton higher than implicit in the previous comparisons. This would work through to an increase of around $18/ton in the real world market price of DAP. Given local supplies of pyrites and by-product acid for about 90 percent of its output, PHILPHOS should be able to avoid a major cost increase, transferring most of the extra price to profits. Unfortunately, this scenario is given a 5 percent chance.

7. Supplementary Financial Tables

The remaining tables set out the details of the financial calculations made as the 1987 starting point of annex 4. As already noted, several changes have been made in deriving the actual estimates used above. In addition, the tables are provided as one guide for anyone who should wish to make a more comprehensive analysis.

Table 4A.8

Revenues, Production Costs and Profit Per Ton of DAP at Constant 1987 Prices
Assuming PHILPHOS Produces DAP Only 1987 - 1997

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Low Price Scenario											
Price FOB Florida	165	192	208	213	233	275	337	275	259	259	259
PHILPHOS Advantages over Florida											
- Bagging and Transport to FOB	8	8	8	8	8	8	8	8	8	8	8
- Ocean Freight	20	20	21	23	25	27	28	28	28	28	28
Price FOB Philippines	193	220	237	244	266	310	373	311	295	295	295
PHILPHOS Costs of Production											
- Before Depreciation	170	175	185	203	223	248	248	240	232	232	232
- Depreciation	53	51	48	46	43	41	39	37	35	34	32
- Total	224	226	233	249	266	289	287	277	267	266	264
Profit											
- Above	(31)	(6)	4	(5)	-	21	86	34	28	29	31
- Adjustment (1)	6	6	6	7	7	7	8	8	8	8	9
- Total	(25)	-	10	2	7	28	94	42	36	38	40
Medium Price Scenario											
Price FOB Florida	165	202	223	249	301	353	285	270	270	270	270
PHILPHOS Advantages over Florida											
- Bagging and Transport to FOB	8	8	8	8	8	8	8	8	8	8	8
- Ocean Freight	20	20	20	23	25	27	28	28	28	28	28
Price FOB Philippines	193	230	252	280	334	388	321	306	306	306	306
PHILPHOS Costs of Production											
- Before Depreciation	170	178	195	217	246	270	249	242	242	242	242
- Depreciation	53	51	48	46	43	41	39	37	35	34	32
- Total	223	229	243	263	289	311	288	279	277	276	274
Profit											
- Above	(30)	1	9	17	45	77	33	27	30	30	32
- Adjustment (1)	6	6	6	7	7	7	8	8	8	9	9
- Total	(24)	7	15	24	52	84	41	35	38	39	41

Memorandum Item:
$80/ton required in each year to yield a 10 percent return on the initial total investment of $590 millions.

(1) Extra profit on domestic sales prorated over total output.

- Table 4A.9 gives the estimated or assumed unit costs of the various raw material inputs (and certain price data on compounds).

- Tables 4A.10 and 4A.11 give the technical requirements for all inputs and their total costs at four levels of operation--100 percent, 90 percent, 80 percent and 70 percent of nominal capacity.

- Table 4A.12 sets out the landed costs for imported raw materials. Apart from showing what would have been the impact of the import duties and associated taxes from which PHILPHOS has a five-year exemption (renewable for another five), this table gives the build-up from FOB to full landed costs as used above.

- Table 4A.13 gives the estimated costs per ton of DAP, assuming all phosphoric acid is used for this purpose, at the four levels of operation. The 90 percent rate should be taken as the norm.

Apart from any corrections might be made to the basic data, particularly on unit costs of inputs, development of the analysis shoud include breakdowns to show individually the three main compounds, DAP/MAP, and merchant grade phosphoric acid, and to show both average and incremental costs. The FOB plant returns for export sales should be distinguished from those going to the domestic market. Incremental costs per unit of contained P205, netting out the other critical ingredients (nitrogen, potash and sulphur) at their market values, as indicated earlier in this annex, should be related to FOB export prices to show the opportunities for increasing total profits by changing product mix.

TABLE 4A.9

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

CURRENT FERTILIZER AND RAW MATERIAL PRICE INDICATIONS

MATERIAL	F.O.B.	ORIGIN	FREIGHT	C & F	REMARKS
FERTILIZER					
1. 16 - 20 - 00	MT	Ex-PHILPHOS		$136.90	C & F Thailand - Aug. 87
				$141.30	Bagged C & F Thailand - Aug. 87
		Ex-Korea		$136.15	Bulk C & F Thailand - Aug. 87
				$147.26	Bagged C & F Thailand - Aug. 87
2. 16 - 16 - 16	MT	Ex-Hungary		$151.62	Bagged C & F Thailand - Aug. 87
3. 15 - 15 - 15	MT	Ex-Korea		$145.00	Bulk C & F Thailand - Aug. 87
		Ex-Italy		$186.62	Bagged C & F Thailand - Aug. 87
		Ex-Germany		$183.86	Bagged C & F Thailand - Aug. 87
RAW MATERIALS					
1. Phosrock, 72 BPL	MT $31.00	Ex-Morocco	$15.00	$46.00	C & F Manila
72 BPL	MT $32.00	Ex-U.S.A.	$16.00	$48.00	C & F Manila
2. Potash	MT	Ex-Vancouver		$80.00 - 90.00	C & F Manila
3. Anhydrous Ammonia	MT			$122.00 -126.00	C & F Manila
4. Sulfuric Acid	MT $24.00	Ex-Japan	$14.00	$38.00	C & F Manila
	MT $18.00	Ex-PASAR			1986 Transfer Price
	MT $28.00	Ex-PASAR			1987 (Under Negotiation)
	MT $24.00	Ex-PASAR			1987 (Assumed)
5. Pyrite, 42 %S	MT	Ex-Local		P450.00	C & F PHILPHOS
FUEL & POWER (PESOS PER U.M.)					
1. Ind'l Diesel Oil	KLI 4918.20				Current Wholesale Posted Price
2. Ind'l Fuel Oil	KLI 2785.60				Current Wholesale Posted Price
3. Electricity	MWH 1780.0(Estimated Ave. Cost at Current Power Rates of National Power Corporation for Luzon)				
OTHERS: (PESOS PER U.M.)					
1. Filler Sand	MT			120.94	
2. Lime, 100% CaO	MT			1700.00	
3. Defoamer	LI			19.34	
4. Chlorine	KG			24.20	
5. Dolomitic Lime	KG			2.48	
6. Magnesium Oxide	KG			39.60	
7. Industrial Salt	KG			1.20	
8. D-66 (O2 Scavenger)	KG			36.30	
9. LP-659 (Dispersant)	KG			51.55	
10. D-250 (Sludge Cond.)	KG			79.75	
11. WPP Bags	PC			6.00	
12. P.E. Liners	PC			3.00	
13. Sewing Threads	PC			0.08	

TABLE 4A-10

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

MATERIAL BALANCE BASIS	USAGE RATE (THEO.)	EFFICIENCY BASIS	EFFECTIVE USAGE RATE	QUANTITY	QUANTITY	QUANTITY	QUANTITY
CAPACITY UTILIZATION (AS % OF GUARANTEED CAPACITY)				100	90	80	70
1. P205 Output @320 Days	MT			384,000	345,600	307,200	268,800
2. Equivalent DAP (18-46-0)	MT 0.4600	98	0.469	818,087	736,278	654,470	572,661
MATERIALS REQUIRED							
A. FOR P205 PRODUCTION				384,000	345,600	307,200	268,800
1. Phosphate Rock, 72 BPL	MT 3.0495	97	3.144	1,207,216	1,086,495	965,773	845,052
2. Sulfuric Acid, 98%	MT 2.8646	98	2.923	1,122,449	1,010,204	897,959	785,714
3. Defoamers	LI 0.1560	100	0.156	59,904	53,914	47,923	41,933
4. Diatomaceous Earth	KG	100	0.000	0	0	0	0
B. FOR DAP PRODUCTION				818,087	736,278	654,470	572,661
1. Phos-Acid (100% P205)	MT 0.4600	97	0.469	384,000	345,600	307,200	268,800
2. Ammonia, 100%	MT 0.2186	93	0.235	192,269	173,042	153,815	134,588
3. Sulfuric Acid, 98%	MT 0.0000	97	0.000	0	0	0	0
4. Defoamers	LI	100	0.000	0	0	0	0
C. TOTAL 98% CONC. SULFURIC ACID REQUIREMENT	MT			1,122,449	1,010,204	897,959	785,714
1. From PASAR	MT (Estimated current available)			450,000	450,000	450,000	450,000
2. From Own Production	MT (Based on actual capability)			470,000	470,000	470,000	470,000
3. Short-Fall Ex. Import	MT			202,449	90,204	(22,041)	(134,286)
D. FOR SULFURIC ACID PRODUCTION				470,000	470,000	470,000	470,000
1. Sulfur Requirement	MT 0.3200	93	0.344	161,720	161,720	161,720	161,720
2. Equiv. Pyrite, 42% S	MT 0.7619	93	0.819	385,049	385,049	385,049	385,049

Table 4A-11

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

(BASES FOR ESTIMATE OF OTHER MANUFACTURING COSTS)

CAPACITY UTILIZATION, PERCENT OF DESIGN					100	90	80	70
	UNIT COST			TOTAL QUANTITY USAGE	ANNUAL COST ($ 000's)	ANNUAL COST ($ 000's)	ANNUAL COST ($ 000's)	ANNUAL COST ($ 000's)
	U.M.	PESO	U.S.$					
FOREIGN CURRENCY EXCHANGE RATE		21.00	1.00					
A. RAW MATERIALS					110,534	97,734	84,585	70,007
B. CREDIT FOR EXCESS SULFURIC ACID PRODUCTION (Based on F.O.B. Export Value)	MT	588.00	28.00	0	0	0	617	3,760
C. FUEL AND POWER								
1. Ind'L Diesel Oil	KLI	4918.90	234.23	350	82	82	82	82
2. Ind'l Fuel Oil								
- for Granulation	KLI			1,636				
- for Steam Boilers	KLI			30,413				
- for Sulfuric Acid	KLI			150				
TOTAL IFO	KLI	2785.60	132.65	32,199	4,271	4,249	4,228	4,206
3. Electricity								
- Sulfuric Acid Plnt	MWH			2,000				
- Granulation Plnt	MWH			40,904				
- Phos-Acid Plnt	MWH			85,807				
- NH3 Storage	MWH			2,000				
- Water Treating	MWH			11,052				
- Compressed Air	MWH			2,383				
- Fuel Storage	MWH			326				
- Pier/Bag'G/Conveyors	MWH			5,000				
- Salt Water Pumps	MWH			7,000				
- Raw Water Pumps	MWH			1,100				
- Others	MWH			4,000				
TOTAL ELECTRICITY	MWH	1780.00	84.76	161,574	13,695	12,748	11,802	10,855
TOTAL FUEL AND POWER					18,048	17,080	16,111	15,143

Table 4A-11 (continued)

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

(BASES FOR ESTIMATE OF OTHER MANUFACTURING COSTS)

CAPACITY UTILIZATION, PERCENT OF DESIGN					100	90	80	70
	UNIT COST			TOTAL	ANNUAL	ANNUAL	ANNUAL	ANNUAL
	U.M.	PESO	U.S.$	QUANTITY USAGE	COST ($ 000's)	COST ($ 000's)	COST ($ 000's)	COST ($ 000's)
FOREIGN CURRENCY EXCHANGE RATE		21.00	1.00					
D. PROCESS CHEMICALS								
1. Boiler Chemicals		1.057	0.05	873,200	44	44	44	44
2. BFW Chemicals		2.582	0.12	174,640	21	21	21	21
3. Salt Water Chemicals - Chlorine		24.200	1.15	64,000	74	74	74	74
4. Defoamers		3.017	0.14	384,000	55	50	44	39
TOTAL PROCESS CHEMICALS					194	189	183	178
E. PACKAGING MATERIALS								
1. WPP Bags	PCS	6.00	0.29	16,458,236	4,702	4,232.12	3,761.88	3,291.65
2. P.E. Liners	PCS	3.00	0.14	16,523,700	2,361	2,124.48	1,888.42	1,652.37
3. Sewing Thread	Bags	0.08	0.00	16,433,654	63	56.34	50.08	43.82
4. Bagging Labor Cost	MT	2.77	0.13	818,087	108	96.99	86.21	75.44
TOTAL BAGGING COST					7,233	6,509.93	5,786.60	5,063.28
F. OPERATING EXPENSES								
1. Salaries and Wages		37,500	1,786		1,786	1,786	1,786	1,786
2. Matls and Supplies, M&R		247,800	11,800		11,800	11,800	11,800	11,800
3. Matls & Supplies, Non-M&R		20,000	952		952	952	952	952
4. Purchased Services & Rent		10,000	476		476	476	476	476
5. Utilities and Power			0		0	0	0	0
6. Insurance Premiums		61,950	2,950		2,950	2,950	2,950	2,950
7. Advtg. Promo. and Pub.			0		0	0	0	0
8. Depreciation/Amort.			0		0	0	0	0
9. Community Re/Contr. & Memb.			0		0	0	0	0
10. Travels, Conf. & Meetings		5,000	238		238	238	238	238
11. Taxes, Fees, & Licenses		9,000	429		429	429	429	429
12. Other Expenses			0		0	0	0	0
13. Business Rel. Expenses		1,000	48		48	48	48	48
TOTAL OPERATING EXPENSES		392,250	18,679		18,679	18,679	18,679	18,679

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TABLE 4A-12

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

LANDED COST ESTIMATE FOR IMPORTED RAW MATERIALS

	PHOSROCK, EX - U.S.A.			PHOSROCK, EX - U.S.A.			ANHYDROUS AMMONIA			IMPORTED SULFURIC ACID		
SHIPMENT VOLUME, MT	60,000			60,000			10,000			10,000		
PESO EXCHANGE RATE, P/$	21.00			21.00			21.00			21.00		
	COST/RATE	AMOUNT	PESO LANDED COST	COST/RATE	AMOUNT	PESO LANDED COST	COST/RATE	AMOUNT	PESO LANDED COST	COST/RATE	AMOUNT	PESO LANDED COST
A. IMPORT VALUE												
1. F.O.B., $/MT	$30.00	$1,800,000		$31.00	$1,860,000		$102.00	$1,020,000		$24.00	$240,000	
2. Freight, $/MT	$14.00	$840,000		$15.00	$900,000		$20.00	$200,000		$14.00	$140,000	
3. C & F, $/MT	$44.00	$2,640,000	55,440,000	$46.00	$2,760,000	57,960,000	$122.00	$1,220,000	25,620,000	$38.00	$380,000	7,980,000
B. BANK CHARGES												
1. Opening commission	0.0025	$6,600	138,600	0.0025	$6,900	144,900	0.0025	$3,050	64,050	0.0025	$950	19,950
2. Doc. stamps, opening	0.0010		55,440	0.0010		57,960	0.0010		25,620	0.0010		7,980
3. Doc. stamps, closing	0.0010		55,440	0.0010		57,960	0.0010		25,620	0.0010		7,980
4. Cable/telex			700			700			700			700
5. Transaction tax	0.0100	$26,400	554,400	0.0100	$27,600	579,600	0.0100	$12,200	256,200	0.0100	$3,800	79,800
6. Bank commission	0.0175	$46,200	970,200	0.0175	$48,300	1,014,300	0.0175	$21,350	448,350	0.0175	$6,650	139,650
C. CUSTOMS CLEARANCE												
H C V, $/MT	$33.00	$1,980,000		$34.10	$2,046,000		$112.20	$1,122,000		$26.40	$264,000	
Dutiable value, peso		$41,580,000			$42,966,000			$23,562,000			$5,544,000	
1. Customs duty, %	20	$8,316,000	8,316,000	20	$8,593,200	8,593,200	10	$2,356,200	2,356,200	10	$554,400	554,400
2. Ad valorem tax, %	5	$2,079,000	2,079,000	5	$2,148,300	2,148,300	5	$1,178,100	1,178,100	5	$277,200	277,200
3. Wharfage fee, P/MT	11.75	$705,000	705,000	11.75	$705,000	705,000	11.75	$117,500	117,500	11.75	$117,500	117,500
4. Arrastre charges, P/MT	0.00	$0	0	0.00	$0	0	0.00	$0	0	0.00	$0	0
5. Superintendence /shpmt	9,606	$0	9,606	9,606	$0	9,606	9,606	$0	9,606	9,606	$0	9,606
6. Custom guard	9,424	$0	9,424	9,424	$0	9,424	9,424	$0	9,424	9,424	$0	9,424
7. Checkers, P/MT	2.92	$0	175,200	2.92	$0	175,200	2.92	$0	29,200	2.92	$0	29,200
8. Brokerage fee, P/shpmt	1,350	$1,350	1,350	1,350	$1,350	1,350	1,350	$1,350	1,350	1,350	$1,350	1,350
9. Agency fee	337.50	$0	338	337.50	$0	338	337.50	$0	338	337.50	$0	338
10. Documentary stamps	31.5	$32	32	31.50	$32	32	31.50	$32	32	31.50	$32	32
11. Miscellaneous	2,119	$250	2,119	2,119	$250	2,119	353	$250	353	353	$250	353
D. INSURANCE												
1. Marine insurance	0.003384	$231,848	231,848	0.003384	241,822	241,822	0.003384	$102,003	102,003	0.003384	$31,253	31,253
2. Local insurance	0	$0	0	0	0	0	0	$0	0	0	$0	0
SUBTOTAL		$52,681,632	68,744,697		54,414,132	71,701,810		$27,215,432	30,244,645		$6,494,732	9,266,715
E. COMP./ADV. SALES TAX												
1. % Mark-up	25	$13,170,408		25	$13,603,533		25	$6,803,858		25	$1,623,683	
2. % Sales tax	10	$6,585,204	6,585,204	10	$6,801,766	6,801,766	10	$3,401,929	3,401,929	10	$811,841	811,841
F. TAX PAID LANDED COST, AMOUNT			75,329,900			78,503,576			33,646,574			10,078,557
TAX PAID LANDED COST, P/MT			1,255.50			1,308.39			3,364.66			1,007.86
		PER MET			PER MET			PER MET			PER MET	
G. TAX EXEMPTIONS												
1. Customs duties		$138.60	8,316,000		$143.22	8,593,200		$235.62	2,356,200		$55.44	554,400
2. Ad valorem tax		$34.65	2,079,000		$35.81	2,148,300		$117.81	1,178,100		$27.72	277,200
3. Comp/adv. sales tax		$109.75	6,585,204		$113.36	6,801,766		$340.19	3,401,929		$81.18	811,841
SUBTOTAL		$283.00	16,980,204		$292.39	17,543,266		$693.62	6,936,229		$164.34	1,643,441
H. TAX FREE LANDED COST, AMOUNT			58,349,697			60,960,310			26,710,345			8,435,115
TAX FREE LANDED COST, P/MT			972.49			1,016.01			2,671.03			843.51

Table 4A-13

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

CAPACITY UTILIZATION, PERCENT OF DESIGN 100 90 80 70

	UNIT COST			TOTAL QUANTITY	ANNUAL COST	ANNUAL COST	ANNUAL COST	ANNUAL COST	U.S. $ COST COMPONENT PER MT DAP			
	U.M.	PESO	U.S.$	USAGE	($ 000'S)	($ 000'S)	($ 000'S)	($ 000'S)	100%	90%	80%	70%
FOREIGN CURRENCY EXCHANGE RATE		21	1									
A. RAW MATERIALS (TAX FREE)												
1. Phosrock, 72 BPL (M)	MT	1,016.01	$48.38	1,207,216	$58,407	$52,566	$46,725	$40,885	$71.39	$71.39	$71.39	$71.39
2. Anhydrous ammonia	MT	2,671.03	$127.19	192,269	$24,455	$22,010	$19,564	$17,119	$29.89	$29.89	$29.89	$29.89
3. Pyrites (100% S)	MT	1,127.82	$53.71	161,720	$8,685	$8,685	$8,685	$8,685	$10.62	$11.80	$13.27	$15.17
4. Sulf. acid-98% conc.												
- Pasar	MT	504.00	$24.00	450,000	$10,800	$10,800	$10,800	$10,800	$13.20	$14.67	$16.50	$18.86
- Imported	MT	843.51	$40.17	202,449	$8,132	$3,623	$0	$0	$9.94	$4.92	$0.00	$0.00
- Excess sulfuric acid prodn. credit	MT	504.00	$24.00	0	$0	$0	$617	$3,760	$0.00	$0.00	$0.94	$6.57
SUB-TOTAL NET SULF. ACID				652,449	$18,932	$14,423	$10,183	$7,040	$23.14	$19.59	$15.56	$12.29
5. Defoamers/D. earth	LI	19.34	$0.92	59,904	$55	$50	$44	$39	$0.07	$0.07	$0.07	$0.07
TOTAL RAW MATERIAL COST					$110,534	$97,734	$85,202	$73,767	$135.11	$132.74	$130.18	$128.81
B. FUEL CONSUMPTION												
- IFO/coal, (IFO equiv.)	KLI	2,785.60	$132.65	32,199	$4,271	$4,249	$4,228	$4,206				
- IDO	KLI	4,918.90	$234.23	350	$82	$82	$82	$82				
TOTAL FUEL COST					$4,353	$4,331	$4,310	$4,288	$5.32	$5.88	$6.59	$7.49

Table 4A-13 (continued)

CHEMONICS ESTIMATES OF PHILPHOS' COST OF PRODUCTION

CAPACITY UTILIZATION, PERCENT OF OESIGN 100 90 80 70

	UNIT COST			TOTAL QUANTITY	ANNUAL COST	ANNUAL COST	ANNUAL COST	ANNUAL COST	U.S. $ COST COMPONENT PER MT DAP			
	U.M.	PESO	U.S.$	USAGE	($ 000'S)	($ 000'S)	($ 000'S)	($ 000'S)	100%	90%	80%	70%
FOREIGN CURRENCY EXCHANGE RATE		21	1									
C. ELECTRIC POWER CONS.	MWH	1,780.00	$84.76	161,574	$13,695	$12,748	$11,802	$10,855	$16.74	$17.31	$18.03	$18.95
D. RAW WATER	CU.M	1.50	$0.07	17,086,640	$1,220	$1,103	$985	$867	$1.49	$1.50	$1.50	$1.51
E. PROCESS CHEMICAL COST					$194	$189	$183	$178	$0.24	$0.26	$0.28	$0.31
F. OPERATING EXPENSE (EXCL. DEPRECIATION)					$18,679	$18,679	$18,679	$18,679	$22.83	$25.37	$28.54	$32.62
SUB-TOTAL MANUFACTURING COST					$148,676	$134,784	$121,160	$108,633	$181.74	$183.06	$185.13	$189.70
G. ANNUAL DEPRECIATION COST @ 12 YRS. STRAIGHT LINE RATE ($590 MM PLANT COST)					$49,167	$49,167	$49,167	$49,167	$60.10	$66.78	$75.12	$85.86
H. CAPITAL CHARGE @ 10% P.A. OF PLANT COST					$59,000	$59,000	$59,000	$59,000	$72.12	$80.13	$90.15	$103.03
Net Production Cost for DAP					$256,843	$242,950	$229,326	$216,800	$313.96	$329.97	$350.40	$378.58
Equiv. Cost of Bulk DAP Per MT					$314.96	$329.97	$350.40	$378.58	$313.96	$329.97	$350.40	$378.58
I. BAGGING COST PER MT					$8.84	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84
Cost of Bagged DAP Per Mt					$322.80	$338.81	$359.24	$387.42	$322.80	$338.81	$359.24	$387.42

ANNEX 5

FERTILIZER MARKETING AND DISTRIBUTION

A. Introduction

Chapter VI and annex 5 are designed to assess the constraints to efficient fertilizer marketing (and more specifically distribution) by the private sector and to recommend specific measures the GOP should take to promote the development of a more efficient private sector fertilizer marketing system (particularly the distribution system), given the objective of minimizing government controls on the private sector. For this purpose, it was requested in the terms of reference of the study:

- o to describe the current organization and operations of fertilizer marketing and in particular the distribution system. Specifically:
- o to discuss the steps involved at various points from production/import to wholesale and retail;
- o to identify the dominant market channels;
- o to estimate the various marketing costs;
- o to compare the current system with the one in place prior to deregulation (April 1986) in terms of its organization, operations and performance;
- o to determine how the number of firms, market shares, marketing costs, profits, prices, and servicing of remote areas have changed.

N.B. "Remote and partially remote as defined later are those where the marketing of fertilizers is not yet profitable (e.g. because of its small size) or those which are not readily accessible (e.g. in reason of deficient communication infrastructures such as ports, roads, etc. or the absence of interisland regular shipping line service).

In conclusion it was further requested in the terms of reference:

- o to examine ways to reduce costs of marketing (specifically distribution) of fertilizer;
- o to assess the constraints to and feasibility of introducing various means for reducing these costs.

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B. Methodology

A review of the existing literature at FPA was used to describe the organization of the marketing of fertilizers prior to deregulation. The current organization was assessed from recent statistics available at FPA and from information gathered during visits to the major importers in Metro Manila and to distributors, dealers and retail outlets in the provinces. For this purpose four 24-hour visits were paid to Nueva Ecija, Iloilo, Cebu and Davao. In the short time available there was no opportunity to tour the remote areas.

C. General

The role of marketing is to put at the disposal of the end user the product that he requires, at the right place and time, at the lowest price. In exchange the marketer must obtain a fair return on his investment, otherwise he will direct his attention to more rewarding businesses. It is important to realize that the marketing and in particular the distribution of fertilizers require important investments, namely in transportation and storage facilities as well as in working capital which must be provided by the marketer. If the private sector is involved in the marketing and distribution of fertilizer it will, of course, provide its contribution of the expenditure. However, it remains the responsibility of the public sector to develop the transportation infrastructure to permit an easy flow of the hundreds of thousands tons of fertilizers but also of the subsequent increase in harvest. It is also the state responsibility to prevent bottlenecks in the future and to develop the infrastructure in accordance with fertilizer demand projections. If the trader has to convince the farmer to buy the fertilizer brand that he sells in preference to one of his competitors, it is the role of the state institutions, research and extension, to develop appropriate fertilizer use recommendations and to convince the farmer of their soundness.

Marketing of fertilizers cannot generally be dissociated, for profitability reasons, from the marketing of other inputs such as pesticides, seeds, tools, machinery and petroleum products. An upstream integration with the purchase of the farmer's production occurs mainly for profit reasons and for securing the recovery of input credit extended by fertilizer marketers to farmers.

These two rules seem to be well understood and applied in the Philippines.

D. Marketing Channels

1. General

The enterprises involved in the marketing of fertilizers in the Philippines, or fertilizer handlers, are classified in four categories, namely:

- o the importers/producers,
- o the distributors,
- o the dealers,
- o the retailers/outlets.

They must register and apply for a license from FPA renewable every year for the importers and distributors, and valid for three years in the dealer's case.

2. Importers

a. General

Importers of finished fertilizer and local manufacturers of fertilizer are defined in the Philippines as "importers." In many countries importers are often confused with "distributors." This is not the case in the Philippines where the word distributor describes the wholesale level in the marketing of agricultural inputs.

b. Number and Importance

Prior to the deregulation only a few enterprises were marketing locally produced and imported fertilizers. The majors ones were:

- o Planters Products, Inc. (PPI),
- o Atlas Fertilizer Corporation (AFC),
- o Fertilizer Marketing Company of the Philippines (FERMAP),
- o Maria Cristina Fertilizer Corporation (MCFC), and the last comer, the State-owned enterprise
- o Philippine Phosphate Fertilizer Corporation (PHILPHOS) since 1985.

At one time or another, these five companies, with the exception of FERMAP, have been engaged in the local manufacturing of chemical fertilizer.

AFC and PHILPHOS are the only manufacturers left producing NP and NPK compounds--for which they benefit from a 32% customs

tariff protection against import. Chemphil, MCFC and PPI (for urea) stopped all fertilizer production in 1976 due to uncompetitive production cost against imported finished fertilizers. PPI was also forced to shut down its NPK operations in 1984 because of financial difficulties. AFC temporarily ceased operations in 1982 for the same reason but resumed production in 1986. The PHILPHOS plant was commissioned in 1984.

Table 5A-1

Number and Importance of Fertilizer Importers
(number of importers required to total around
80% of annual imports expressed in M.T.)
from 1978 until June 1987.

Year	No. of Importers	No. of Importers Representing 80% of Imported Tonnage		
1978	6	2	82%	(PPI & MCFC)
1979	7	2	81%	(PPI & AFC)
1980	9	2	79%	(PPI & AFC)
1981	4	2	87%	(PPI & MCFC)
1982	6	2	76%	(PPI & AFC)
1983	4	2	79%	(PPI & AFC)
1984	7	2	87%	(PPI + AFC + PITC)
1985	19	5	84%	(PPI + New Agrix + AFC + PITC + Fertiphil)
1986	30	10	81%	
June 1987	24	10	82%	

Source: Prepared from FPA's confidential data.

Regarding the importation of fertilizers, PPI was by far ahead of any competitor until 1984. Its share culminated at around 73% (almost 400,000 metric tons) of all imports in 1978. From that year on, it came down steadily until 1983 when it still reached 45%. AFC was a steady second with shares ranging during the same period between 9% and 26%, except in 1978 and 1981 when it was overtaken by MCFC. The latter's share varied from 9% up to a maximum of 20 % (1981). FERMAP was always the smallest of the four major importers with import shares varying between 2% and 7% (1981). Both FERMAP and MCFC disappeared from the importer list in 1987. However, sister companies of MCFC, namely Phil-Asia Agro Industries and Marcelo Steel Corporation, imported small quantities in 1987.

In May 1986, following the decision of the new Administration of President Corazon Aquino to liberalize the

imports of fertilizers not produced in the country, the FPA withdrew its direct intervention in the sector starting with the elimination of fertilizer imports quotas and allocations. Likewise, the FPA discontinued its direct importation of fertilizers. From that time on, as any enterprise was free to register as a fertilizer importer, the number of licences granted by FPA mushroomed from a steady amount of around 6 until 1984 up to 87 in 1987, almost as many as the number of distributors (98 in 1987) to whom they were selling their fertilizers. As shown in Table 5A-1, only 30 of the 87 registered importers have used their licenses in 1986 and only 24 during the first semester of 1987. It must be pointed out that the above figures include as well importers and manufacturers of organic fertilizers, non traditional grades, amendments, etc. When traditional chemical grade fertilizers only are retained, the number of importers/manufacturers involved dips to 60 in 1987.

After the large increase in the number of importer license brought about by deregulation, pure speculators, non-agricultural enterprises and mere end-users are now being pushed out of the fertilizer importation business, or are forced to adapt to normal business practices like acquiring facilities such as warehouses. Smaller companies, former distributors, agribusiness companies, transporters, agricultural produce traders, because of their better knowledge of the farmer community and/or of their better integration in the agricultural sector, have been able to break into the fertilizer import market, sometimes by serving remote areas where the "big boys" cannot (yet) go because of their larger overhead.

As reflected in table 5A-1, it should be noted that in 1984, the government had to authorize some enterprises, of which two were state-owned companies, to import fertilizers in order to compensate for the financial difficulties encountered at that time by the market leader. In 1985, five importers out of a total of 19 represented 84% of the imported tonnage. PPI and AFC shares dropped respectively to 24% (around 135,000 M.T.) and 15% (85,000 M.T.). AFC was in fact preceded and surrounded by three newcomers, namely New Agrix (18%) and PITC (10%), respectively state-managed and state-owned, and Fertiphil (9%). In 1986 10 out of a total of 30 importers were needed for reaching 81% of total imports, the shares of each ranging between 3% and 19% (165,000 M.T.). Furthermore, PPI lost the leadership to Isabela Agro (19%), a new private company, and was relegated to the third seat (12% with around 105,000 M.T.) behind New Agrix (12% also with around 110,000 M.T.) and before PHILPHOS (7%) both state concerns. If the imports of PITC are added to the two latter companies, the state, with a 21% share, was the major importer of chemical fertilizers in 1986. For the first half of 1987, Isabela Agro and Philippine Planters (owned by the same group) occupy first place with 27% of total imports well ahead before PHILPHOS with 16%. Seven other firms, sharing each 3% to 7% of

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he total imports were required to reach 82% of total imports. During the first half of 1987, the former importer leaders, until two years ago PPI and AFC, did not import more than 1% and 6% of the total, respectively. This evolution of import shares is illustrated in graph 5A-1.

c. Sale Shares of Importers

The sale shares of enterprises engaged in the marketing of imported and locally manufactured chemical fertilizers were roughly the same as those mentioned before for imports as can be seen in the table 5A-2 below.

Table 5A-2

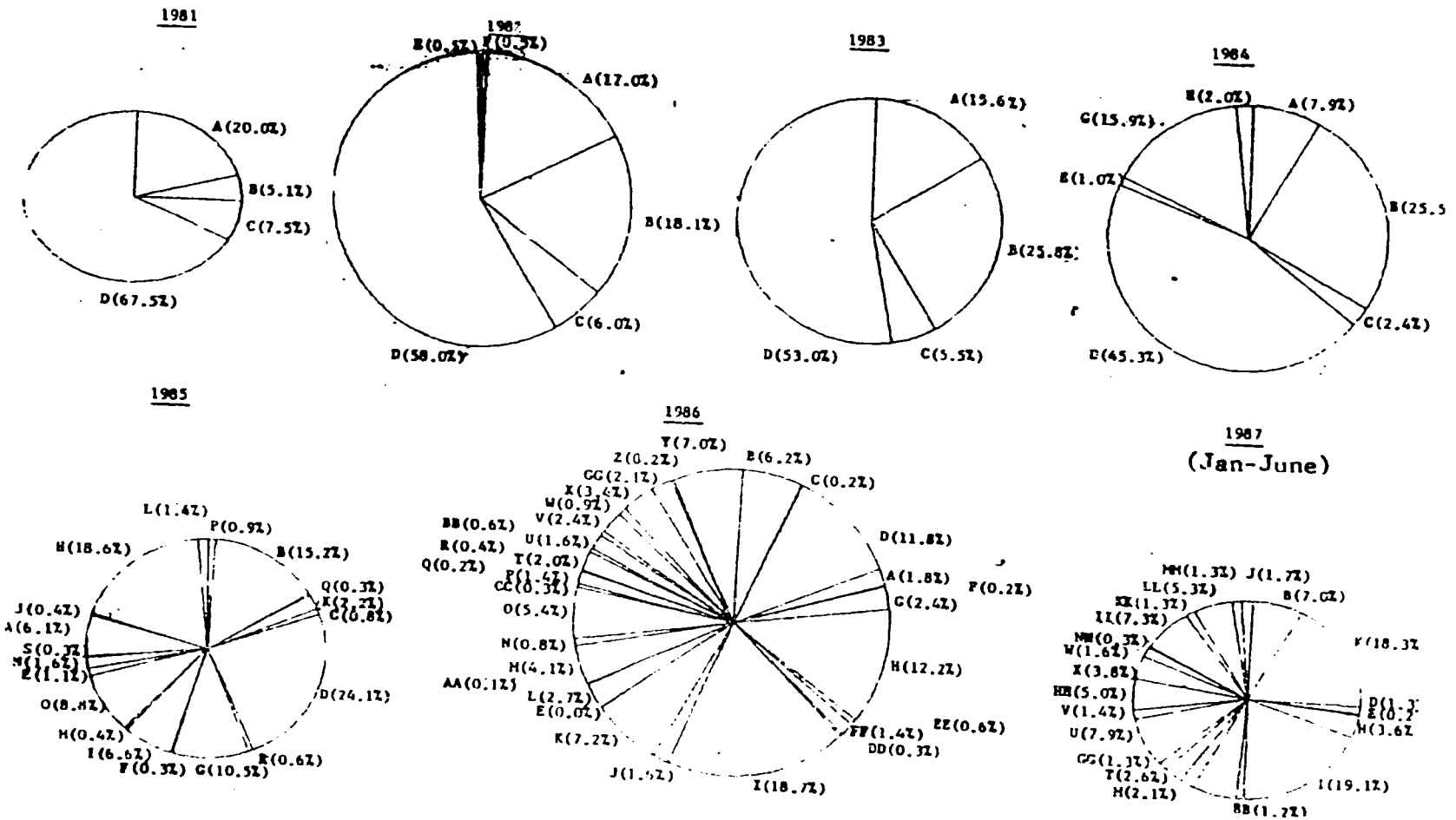
Number and Importance of Enterprises Involved in the Marketing of Fertilizers (Number of Marketers Required to Total around 80% of Annual Sales Expressed in Metric Tons) from 1978 until June 1987

Year	No. of Firms	No. of Firms Representing 80% of the Sales Tonnage			
1978	7	2	=	86%	(PPI & AFC)
1979	7	2	=	85%	(PPI & AFC)
1980	7	2	=	80%	(PPI & AFC)
1981	6	2	=	83%	(PPI & AFC)
1982	5	2	=	82%	(PPI & AFC)
1983	4	2	=	84%	(PPI & AFC)
1984	7	2	=	83%	(PPI & AFC)
1985	14	6	=	84%	
1986	17	8	=	82%	
1987	17	9	=	80%	

Source: Prepared from FPA data.

Until 1984, the two major marketers, representing more than 80% of total sales, were the two major importers, PPI and AFC. Their shares ranged between 58 and 69% (representing around 385,000 up to 580,000 M.T.) for PPI and 13 to 25% (representing around 110,000 up to 180,000 M.T.) for AFC. In 1985, six enterprises represented 84% of the total sales tonnage. That year PPI and AFC shares dropped drastically to 21 and 18% of the total sales tonnage, respectively. They were closely followed by New Agrix (15%), PITC (13%) and Fertiphil (10%). In 1986, 8 enterprises were needed to reach 82% of the total sales tonnage, the shares of each ranging between 6 and 17%. Furthermore, PPI lost the leadership to Isabela Agro, (17% of total sales tonnage)

Graph 5A-1
Import Shares of Chemical Fertilizer Importers
(1981-June 1987)



Source: Prepared from data available at FPA
(See Annex 4-4), November 1987

and had to share the second seat with New Agrix and PHILPHOS, each with 12% share of the total. For the first half of 1987 PHILPHOS occupied the head with 31% followed by Isabela Agro (11%) and Philippine Planters (5%) which are owned by the same group. Seven other firms, each holding 4 to 6% of the total sales tonnage were required to reach 80% of total sales, two of them being PPI and AFC with 4 and 6% shares, respectively.

In fact, although it is claimed that the marketing of fertilizers is now in the hands of the private sector it should be pointed out that since 1986 the leadership has been held by the state, followed by New Agrix, PHILPHOS and PITC (respectively 12%, 12%, and 4% representing in total around 265,000 M.T.). For the first half of 1987, the state-owned (or managed) companies are far ahead with an aggregate of 31% + 6% for PHILPHOS and New Agrix, respectively, while PITC has disappeared from the scene. New Agrix is following the same course since in reality, its 1987 sales tonnage represents the selling of its entire stock to another firm before its retirement from the fertilizer business.

d. Major Activities of Importers

Before deregulation, all 6 or 7 fertilizer importers could be described as agricultural input professionals since none of them was engaged in the marketing of any other products than fertilizers and pesticides. Only the two majors, PPI and AFC, handled pesticides as well. Moreover, as already mentioned, four of them were, at a time or another, also engaged in the local production of fertilizers, i.e. PPI, AFC, MCFC and PHILPHOS.

After May 1986, the scene changed drastically. Groups of end-users, such as banana plantations, provincial fertilizer distributors and dealers joined the game as well as non-agriculturally related enterprises such as banks, general traders and speculators, who were attracted by this US $ 90 million market. They are trying to adapt to this now low-profit business by obtaining the national distributorship from foreign manufacturers of their specialty pesticides, vegetable seeds, animal feedstuff and/or veterinary products, etc. Others are importing commodity pesticides or have them formulated locally by pesticide handlers and/or are complementing their range of products with non-traditional fertilizer grades, soil amendments and conditioners, organic fertilizers, etc. Some of the "old professionals" such as AFC are also diversifying in agriculturally related projects such as fruit production and fish/prawn farming.

e. Marketing Organization of Importers

Prior to deregulation, all importers' head offices were located in Manila. This situation has only slightly varied

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since then. However, few importers among the newcomers now have their head offices in disports such as Cebu and Davao. In contrast the regional set-up of the fertilizer marketing sector has dramatically changed after the liberalization of non locally produced fertilizers. Large teams of professional technico-commercial staff who were maintained a few years ago by PPI mainly, but also AFC, have disappeared. Prior to deregulation, PPI's regional organization was divided into 4 districts, with 18 warehouses serving their dealers. Districts consisted of seven sales territories split further into sales areas handled by around 220 sales representatives and supervisors helping dealers with their administrative needs and assessing market demand, number and kind of dealers needed, business profitability as well as planning and implementing market development activities. In addition, to support their market development program, PPI employed a technical field force of 19 extension service advisers and supervisors (17 in 1975). At that time AFC maintained a sales organization of about 40 people distributed in 5 sales offices, each equipped with a warehouse to provide product and service to a network of 56 distributors and approximately 500 dealers. The country was further divided into 10 areas of operation, each with area managers helping the company's distributors and dealers to reach their sales targets.

Today, most of the large importers including PPI and AFC cannot afford, because of the low profitability standing of the industry, to keep more than a few administrative and commercial staff nationwide. In general, they do it only in the regional "disports" where they import fertilizers and operate a warehouse. PHILPHOS, the new market leader with at present around 30% share of domestic sales of chemical fertilizers, employs 13 regional salesmen. Each covers a defined sector where he runs the company commercial activities by supporting some of the 42 company quasi-exclusive distributors (sectoral accounts). He estimates his distributors sales targets, controls once a week their consignment stocks and tries to limit their level. He looks as well after the invoicing and settlement of what has been sold during the previous week.

f. Distribution Facilities of Importers

As shown in Table 5A-3 the number of warehouses held by chemical fertilizer importers has increased from 82 in 1985 (prior to deregulation) to 108 during the first quarter of 1987 (Q1/1987). However, their total capacity has dropped by almost 25% from around 563,000 M.T. down to 426,000 M.T. over the same period. This difference of almost 137,000 M.T. is partly due to the closure of warehouses which were handled by the "older companies." Indeed if one examines the changes which took place in the distribution facilities of the 12 importers who were in business in 1985, the number of warehouses that they handled at that time dropped from 82 in 1985 to 42 in 1987, i.e. from around

563,000 MT down to 238,000 MT, which represents a reduction of 325,000 MT. During the same period "the 1986 newcomers" (i.e. those who were not yet involved in fertilizer importation in 1985) established 45 new warehouses representing 180,000 M.T. in 1986. However, by Q1/87 the latter reduced the number of their warehouses to 41 with a storage capacity of 100,000 M.T. to which an additional capacity of almost 88,000 M.T. from the "1987 newcomers" did not compensate for the previous reduction in storage facilities.

Table 5A-3

Registered Fertilizer Warehouses and Storage Capacity by Importers - 1985 to End of First Quarter of 1987 (Q1/1987)

	1985		1986		Q1/1987	
	No.	M.T.	No.	M.T.	No.	M.T.
12 "older" importers	82	563,164	75	441,409	42	238,069
8 "1986 newcomers"	-	-	45	180,950	41	100,425
9 "1987 newcomers"	-	-	-	-	25	87,853
	82	563,164	120	622,359	108	426,347
Total no. of active importers	12		19		23	

Source: Prepared from data available at FPA.

These contractions were probably due to some rationalization in the utilization of available warehouses, namely by the forward stocking of a part of some importer's inventories on the premises of their distributors and dealers (consignment stocks invoiced after delivery to the farmers). As already indicated, this is the policy which has been adopted by PHILPHOS, the new market leader. In effect, they claim that of their 42 distributors, 36 are holding consignment stocks for them, with only 2 warehouses owned and run by the company. It is understood that other importers are now using the same strategy, sometimes without asking any collateral securities. It certainly allows savings on storage expenses which have risen recently from 15 to 18 P/m-sq to 20 to 25 P/m-sq in Manila because of the competition of other bulky products such as cement and soya (for animal feedstuff milling) in Manila and Iloilo and in other "disports", and because of the presently high inventories of urea (6 months consumption).

Table 5A-4

Comparison of the Distribution of Importer Warehouses
Between 1985 and 1987

	1985	1986	1987
Total importer capacities (MT)	563,164	622,359	426,347
No. of registered importers*	24	49	60
No. active registered importers	19	30	24
of which			
No. holding at least 1 warehouse	12	19	23
No. holding at least 20 warehouses	-	1	1
No. holding at least 15-19 warehouses	1	-	-
No. holding at least 10-14 warehouses	-	3	-
No. holding at least 5-9 warehouses	7	7	8
No. holding at least 1-4 warehouses	4	8	14
No. holding no warehouse	7	11	1
Average capacity /importer**	29,640	20,745	17,764
Average No. of Warehouse/Importer	4.3	4.0	4.5

Source: Prepared from data available at FPA.

*Excluding organic fertilizer importers.
** Active importer of chemical fertilizers.

As far as the location of importer warehouses is concerned as summarized in table 5A-4 (a) below, around 85% of them are situated in the 11 "disports" and the balance, either inland or in other municipal ports. The location of these warehouses prior to and after deregulation are illustrated in maps 5A-1 (1983) and 5A-2 (1987).

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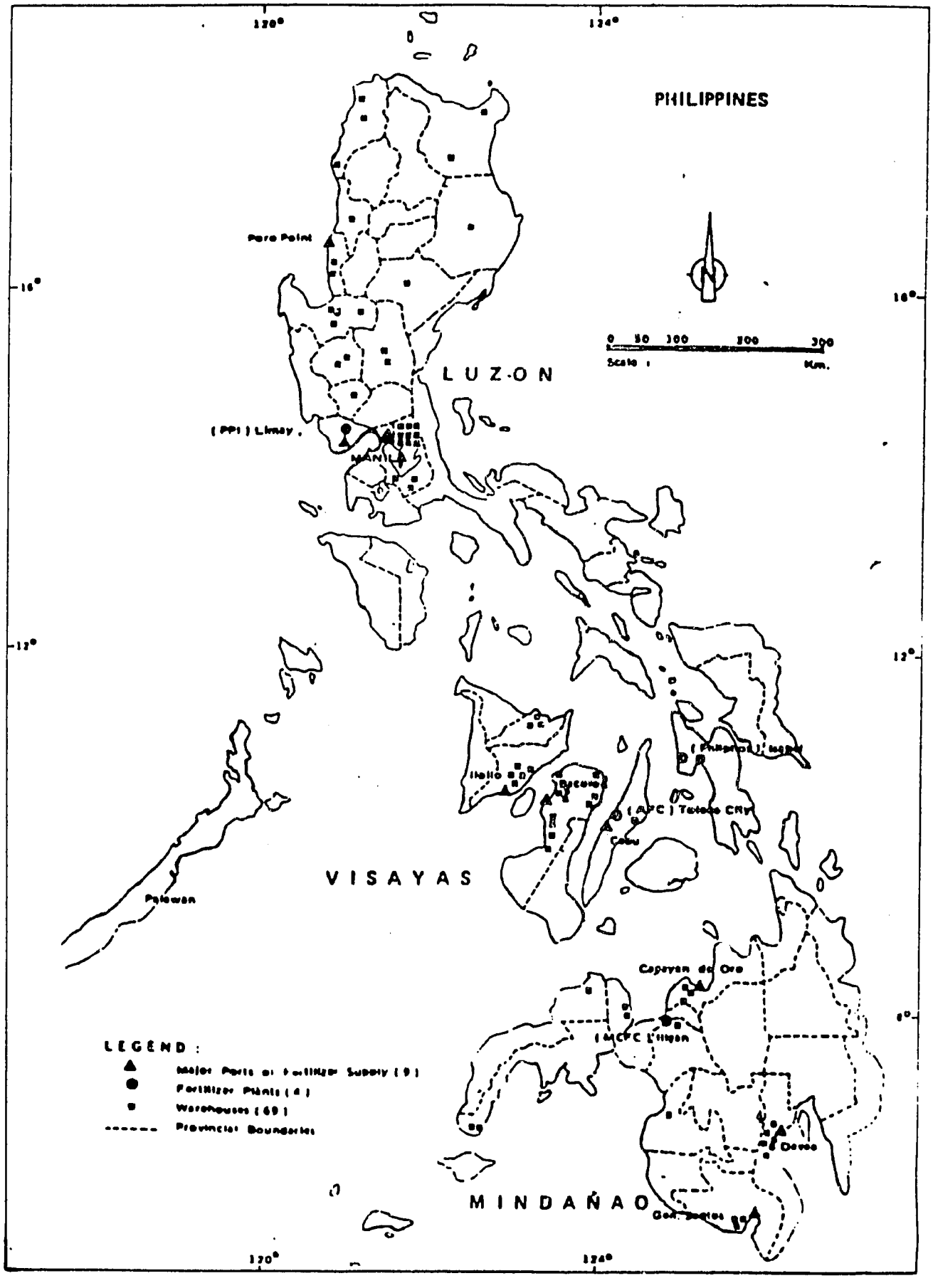
Map 5A-1

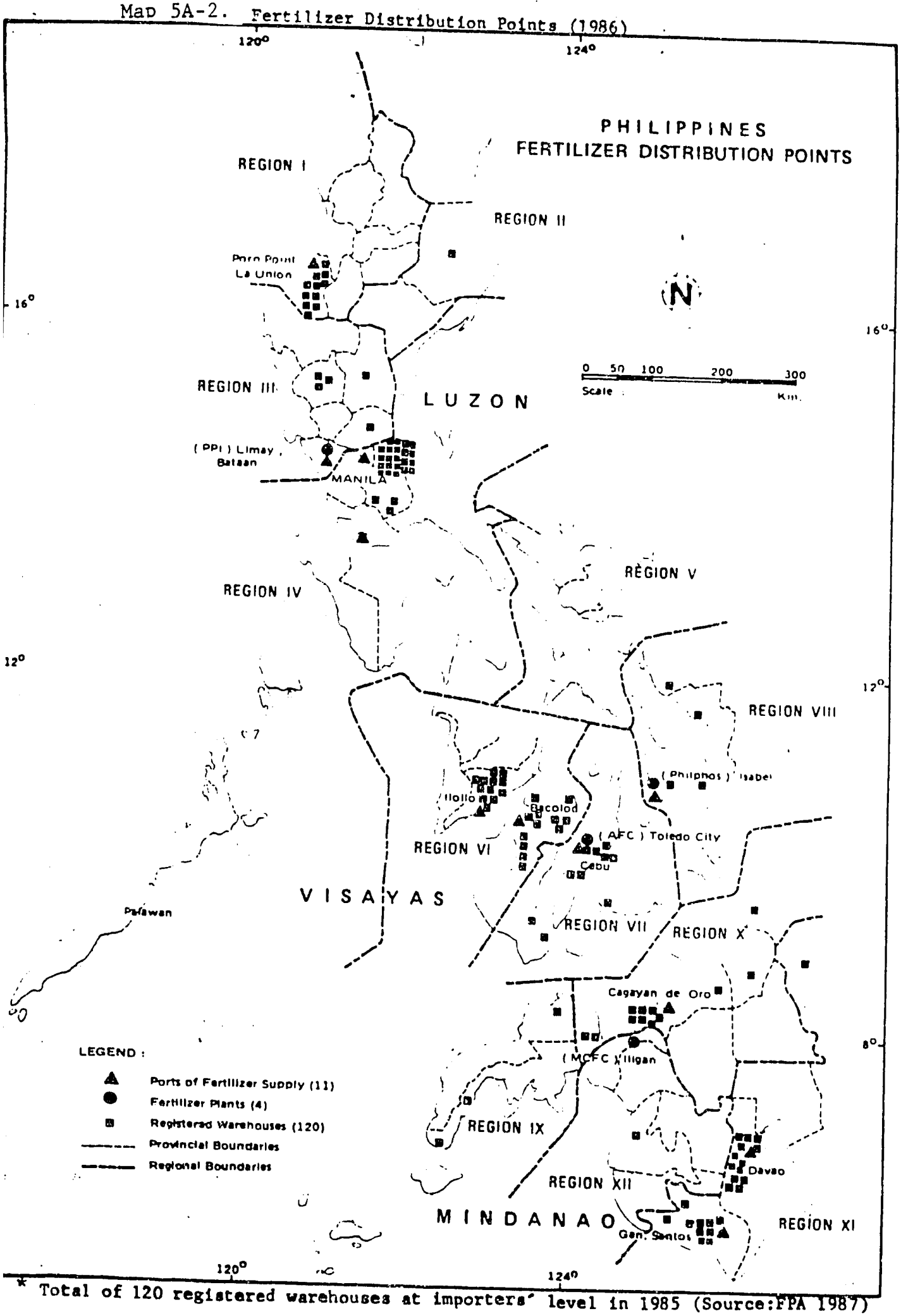
Fertilizer distribution points

(1983)



Source: FADINAP, July 1985

Map 5A-2. Fertilizer Distribution Points (1986)



* Total of 120 registered warehouses at importers' level in 1985 (Source:FPA 1987)

Table 5A-4 (a)

Geographical Repartition of Importer's Warehouses between Disports and other Locations (Inland or other Municipal Ports) 1985-1987

YEAR	DISPORTS		OTHERS		TOTALS	
1985	72	88%	10	12%	82	100%
1986	101	84%	19	16%	120	100%
1987	91	84%	17	16%	108	100%

Source: Prepared from data available at FPA.

The 11 authorized import harbors (called "disports") are Poro, Manila, Batangas in the Luzon islands, Iloilo, Bacolod, Cebu, Isabela in the Visayas, Cagayan de Oro, Davao, General Santos in the Mindanao. Limay, Sangi, Tabaco and Iligan are private "disports."

Before deregulation importers were generally not delivering inland. Today, with the upgrading of new provincial distributors at the importer level, some of whom own fleets of vehicles (mainly in Luzon and Mindanao), they are delivering fertilizers to dealers, retail outlets and large end-users.

g. Importer's Market Promotion And Development Activities

What can be described as sales promotion (as opposed to advertising), namely field demonstration, farmers open days and training, dealer incentives and training, which was actively developed by PPI prior to 1985, has entirely disappeared from the activity of the companies (private and state-owned) engaged in the import and marketing of fertilizers. Importers' activities in this field are limited nowadays to signboards on distributors' and dealers' premises. Even product sales promotion, if any, is left to the initiative of distributors and dealers.

Because of its great influence in the growth of national consumption of fertilizers, it is worth reporting in a rather detailed form, the outstanding performance achieved in the past by PPI in this field. As described by FADINAP, PPI's corporate objective up to 1984 was "to provide the Filipino farmer with a full range of quality products and services in the advancement of Philippine agriculture." Their strategy for achieving this objective was the maintenance of a network of exclusive dealers spread all over the country, supported by a field force of around 220 technico-commercial professionals. In 1982, 57% of PPI sales volume went to individual farmers through its dealer network, 28% to cooperatives and 15% to plantation accounts. This PPI dealer network is described further below.

The sales promotion program of PPI directed to the farmer, through dealers and supported by the PPI sales force, consisted of the following.

- Farmers' training classes, composed of 25-30 farmers and lasting 3-4 hours, were held on soil fertility, plant nutrition, input uses, fertilizer economics, financing and marketing. By the end of 1982, 7,359 classes had been held, with 147,000 farmers participating;

- Each dealer had to conduct three one-hectare farm demonstrations per cropping season on rice, corn, vegetables, etc. in a conspicuous site (two per season for new dealer). Since this program started in October 1975, until the end of 1982, 20,910 farm demonstrations on rice and corn (maize), covering more than 9,000 barangays in 2,000 municipalities, had been conducted. Significant changes were observed by PPI as a result of this program, namely: a) increase in N/NP/NPK fertilizer consumption in rice from 2.81 bags/hectare to 4.98 bags per hectare or a 77% increase; b) a corresponding increase in rice yields from 3.8 MT/hectare to 5.4 MT/hectare, or a 42% increase; c) an increase in fertilizer consumption in corn from 2.72 bags per hectare to 3.68 bags/hectare, or a 35% increase; and d) a corresponding increase in corn yield from 2.1 MT/hectare to 2.8 MT/hectare, or a 33% increase.

- Dealers had to conduct or participate actively in product promotional activities directed to farmers such as product use demonstrations.

- PPI was sponsoring since 1975 a daily 15-minute radio farm program, broadcast by 18 stations in major provinces. Topics covered ranged from local farm news to new crop practices and the economics of fertilizer use.

- o A monthly agricultural magazine containing semi-technical and reference material for government technicians, teachers and farmers, was published by PPI.

In addition to these promotional activities addressed to the farmers, PPI, up to 1984, was also supporting its exclusive 400-dealer network through an array of training programs and incentive grants.

- o Four dealers' management courses were offered covering such areas as product knowledge, profit opportunities, retail pricing strategies, consumer promotions, sales planning and forecasting, and basic agronomy, particularly for farm demonstrations;

- o Recognition awards were given annually to outstanding dealers in order to encourage participation in the company's market and sales development program;

- o Annual dealers' conferences were held early in the year to assess previous year's performances against forecasts and reasons for deviation. Forecasts for the current year were also agreed upon taking into account prevailing conditions. Special conferences were organized when required;

- o PPI also subsidized a storekeepers' promotion scheme for its dealers' staff with a large range of prizes given away at the end of specified sales periods;

- o PPI's dealers were provided with promotional items such as posters, streamers, buntings, mobiles, counterstands, display racks and building signboards.

To support this outstanding market development program, PPI employed in 1975 a staff of 27 extension service advisors and supervisors (reduced to 19 by 1983).

Also prior to deregulation, AFC's promotional strategy consisted of participation in various government food production programs and setting-up of field demonstration plots to help farmers make best use of fertilizers and chemicals. The other few companies involved at that time in the import and marketing of fertilizer maintained a low profile in market and promotion development. Nevertheless, even FERMAP (6% share of the market) had a market development program more elaborate than all of the present fertilizer handlers put together. They used to define application rates and product mix to optimize fertilizer efficiency through field tests, in co-operation with government and private research bodies. They used to disseminate results from such tests to the distribution network and farmers through informal meetings and farm demonstrations. FERMAP's distributors

and dealers had to actively support the company's promotion activities such as farmers meetings, rice and corn production contests, as well as to conduct farm demonstrations and product trials.

h. Conditions of Sales to Wholesale

Prior to deregulation, sales from importers to the following steps of the commercial chain (distributors/wholesalers, dealers/retailers) were generally on a cash basis. Up to 30 days interest-free credit ("clean credit") was extended in special circumstances, usually through domestic letters of credit (L/C), bank drafts/promissory notes secured by real estate mortgages, cash bond or surety bonds deposited with the sellers. MCFC was apparently giving as much as 60 days' credit to its distributors. Sales by importers directly to end-users were generally transacted on a cash-and-carry basis as well as on cash before delivery. Credit was sometimes extended to plantation accounts on the same terms as for distributors and dealers.

From discussions with importers and distributors, it is understood that most conditions of sale from importers down the commercial chain have not changed notably from what they used to be prior to 1986 especially as far as credit terms are concerned. Indeed, 7 days "clean credit" is now a normal practice, but distributors with good financial standing and/or a good credit repayment record can still obtain 30 days' credit against domestic L/Cs (at 17% interest p.a. + 0.25% bank charge) from their suppliers. It should be noted that apparently, 60 days "clean credit" is generally granted by pesticides importers to their distributors. As was the case prior to the deregulation, prices are at ex-importer warehouses, and importers generally do not deliver inland since most distributors have their own trucks. There are, however, a few exceptions in the case of former distributors who are now importing their own requirements and can deliver to their dealers since they are often truckers themselves. Importers generally unload into some of the eleven major "disports" of the country. Usually they call to two ports per shipment. From the disports, importers tranship parts of the shipment to various internal ports where distributors receive the product generally on CIF terms. Chartered barges of 700 to 750 MT capacity are hired. For smaller shipments liner services are used. PHILPHOS claims that they deliver to 42 ports utilizing barges or liner service. Philphos distributors and dealers lift their requirements directly from the ports.

3. Distributors

a. General

The distributors, or wholesale level, constitute the second step in the distribution of fertilizers throughout the

Philippines. They generally cover a part of a province, composed of several municipalities in which they sell to dealers or retailers.

Prior to deregulation, PPI did not use this level in their distribution system. Their policy was to by-pass the wholesale level by going directly to retailers (dealing with small farmers) and to larger accounts such as co-operatives and plantations. As already mentioned, 57% of PPI sales volume in 1982 went to dealers, 28% to co-operatives (mainly sugar) and 15% to plantation accounts. On the contrary, AFC used to market its fertilizers through an exclusive network of around 60 distributors (56 in early 1985) spread over the the archipelago and serving approximately 500 dealers.

AFC's exclusive distributors were appointed through annually renewable distributorship agreements on the basis of qualifications, capability and potential, which included adequate capitalization, warehousing, transport facilities and sales organization to mobilize inventories and meet sales quotas. Distributors were also requested to maintain an adequate network of dealers for serving the fertilizer requirements of their territory. AFC defined the territory of all its distributors to enable more effective monitoring of prices in line with government ceilings. Realistic sales projections by distributors were the basis of sales quotas, inventory control and the annual operating budget.

Still prior to deregulation, FERMAP, which was consistently holding 6-8% of the market, was distributing its fertilizers through around 90 medium and small-scale distributors who maintained an average of ten dealer-outlets each. FERMAP did not demand exclusivity from their distributors and dealers but they were required:

- to have access to sufficient capital to serve adequately their assigned market base;
- to provide delivery vehicles and auxiliary warehouses to widen availability of products particularly during peak months;
- to support actively FERMAP's promotion activities (farmers meetings and production contests) and conduct farm demonstrations and product trials;
- to prepare sales plans and forecasts.

Although MCFC (10% of the domestic market demand in 1983 through their sister company Polaris Marketing) used to maintain a network of distributors, the majority of their sales came from

large institutional and plantation accounts in the Visayas and Mindanao.

PHILPHOS, when its plant came on stream in 1985-86, was initially selling to the existing fertilizer importers the part of its production that was destined for the domestic market. PHILPHOS still does so (and calls them "corporate accounts") for its NP and NPK local production range but, as described further below, it is now establishing its own exclusive distributor network ("sectoral accounts").

At the distributor level, dramatic changes have likewise occurred as a result of the import liberalization of non-locally-produced fertilizers. It can be said that importers can no longer select their distributors and dictate the terms of the agreement as they used to do prior to 1986. On the contrary, distributors are now making the choice and can obtain the best prices and sales terms by calling on several potential suppliers. Many of them are doing it as often as they replenish their stocks. This new trend has developed to such an extent that some distributors have entered, or are planning to enter, into the importers' circle. In this case they generally import in one "disport" only and do not cover more than a few provinces. A few, who were in reality large PPI dealers, are now among the larger importers with national coverage.

Moreover, most distributors now hold two licences granted by FPA, one a distributor license and one a dealer license. They use the second in areas where there is no dealer or where they estimate that local dealers are too weak.

In spite of these developments, PHILPHOS is trying to create a network of exclusive distributors ("exclusive sectoral accounts") holding consignment stocks for their account (36 of of 42 in total). Although each distributor has a defined sector, PHILPHOS authorizes them to sell as well in their surrounding territories "in order to control price increases when product inventories are low." PHILPHOS distributor's capital varies from 0.2 to 5 million pesos.

AFC is still selling its locally produced NP-NPK compounds (90,000 M.T. sales target for 1987) through its "old" 70 semi-exclusive distributor network, each supplying 10 to 15 dealers. AFC sells to these distributors on a non-reciprocal exclusivity basis in the sense that distributors are allowed to purchase their urea requirements from competitors. AFC trades directly with dealers in very special circumstances only (such as during storage, transport or credit shortages). As long as it is not the distributor's fault, AFC pays the distributor a commission.

b. Number and Importance of Distributors

The number of distributors has not varied greatly throughout the country between 1984 and 1987, as seen in tables 5A-5 and 5A-6. It went up from 98 in 1984 to 129 in 1985, diminished to 73 in 1986 and came back to 99 in 1987, i.e., the same level as in 1984. There was no dramatic change on the regional level either during the same period with the exception of region VI where it doubled from 11 to 21 (Iloilo from 6 to 10, and Negroes Occidental from 1 to 6), and region VIII where it has increased from 0 to 2 (in Leyte). It has diminished from 21 to 15 in region III (namely in Nueva Ecija Province from 11 to 7) and from 19 to 15 in region IV (Metro Manila from 9 to 7 and Romblon Province, classified as "remote areas" from 2 to 0).

As already mentioned for importers, the above figures also include distributors handling fertilizer substances other than chemical fertilizers such as organic fertilizers, soil amendments, etc.

Therefore the variations which have appeared in the recent months cannot be attributed solely to the emergence of a free market for non locally manufactured chemical fertilizers. It is also worthwhile to note that the number of registered importers has grown in 1987 to the same order of magnitude as the number of registered distributors, i.e., 87 importers versus 99 distributors, while it was 7 versus 98 in 1984.

Table 5A-5

Number of Registered Distributors By Region - 1984 to 1987

Region	1984 a/	1985 a/	1986 a/	1987 b/
I	3	4	4	2
II	4	5	5	4
III	21	23	15	15
IV	19	17	19	15
V	5	5	4	4
Sub-Total Luzon	52	54	47	40
VI	11	15	15	21
VII	8	11	8	5
VIII	0	0	2	2
Sub-Total Visayas	19	26	25	28
IX	2	3	2	1
X	11	25	19	15
XI	12	17	10	11
XII	2	4	8	4
Sub-Total Mindanao	27	49	39	31
Total Country	98	129	111	99

a/ as of December 31.
b/ as of June 30.

Source: FPA, October 20, 1987.

Table 5A-6
Number of Registered Fertilizer Distributors
in Remote Areas (RA) 1984 to 1987

Provinces (Region)	1984 e/	1985 e/	1986 e/	1987 e/
Luzon				
Abra (I) a/	0	0	0	0
Mt. Province (I) a/	0	0	0	0
Ifugao (II) a/	0	0	0	0
Kalinga Apayao (II) b/	0	0	0	0
Bataan Island (III)	0	1	0	1
Aurora (IV)	0	0	1	0
Palawan Island (IV) d/	0	0	1	0
Quezon (IV) a/	1	1	1	1
Romblon Island (IV) d/	2	1	0	0
Masbate Island (V) d/	0	0	0	0
Sub-Total Luzon	3	3	3	2
No. of Serviced R.A.	2	3	3	2
Visayas				
Siquijor Island (VII)	0	0	0	0
Eastern Samar (VIII) c/	0	0	0	0
Sub-Total Visayas	0	0	0	0
No. of Serviced R.A.	0	0	0	0
Mindanao				
Basilan Island (IX) c/	0	0	0	0
Zamboanga N. (IX) a/	0	0	0	0
Zamboanga S. (IX) a/	1	2	0	0
Tawi-Tawi Island (IX)	0	0	0	0
Sulu Island (IX)	0	0	0	0
Agusan S. (X) a/	0	0	0	0
Surigao S. (XI) a/	0	0	0	0
Lanao N. (XII) a/	0	0	1	0
Lanao S. (XII) a/	0	0	0	2
Sub-Total Mindanao	1	2	1	2
No. of Serviced R.A.	1	1	1	1
Total Country	4	6	4	4
No. of Serviced R.A.	3	4	4	3

a/ partially remote area, b/ mountainous area, c/uneconomical market size, d/ island(s) with no liner service, e/ as of Dec. 31 f/ as of June 30.

Source: From FPA data.

c. Major Activities of Distributors

There are no statistics to develop typical distributor profiles and to compare them before deregulation. It is generally understood that practically all fertilizer distributors are trading in several lines of agricultural inputs such as pesticides, seeds, animal feedstuffs, veterinary products, tools, automotive spare parts, and lubricants. Most have a fleet of vehicles to truck supplies from importer warehouses to their own warehouses or directly to their customers. Some are integrated further, especially in the rice-growing areas, where they are often paddy millers and rice traders. In this case, fertilizers bring them additional opportunities for truck backloads. This is especially true in Central Luzon, where it is claimed that half of the rice millers and traders are also engaged in marketing chemical fertilizers. Apparently, this system was launched in 1973 as the credit component of the fertilizer program run by the FAO and the National Food and Agriculture Council (NFAC)--now the National Agriculture and Fishery Council (NAFC)--in the rice and corn growing areas, where there were none or few organized fertilizer marketing channels.

One gained the impression during the interviews conducted for this study that fertilizers, because of their presently low profitability, are now considered by distributors as service products to other lines of agricultural inputs, in particular pesticides, or as backloads. This impression is confirmed by the statistics available at FPA on the joint and sole licenses for fertilizer and pesticide distributors. These data are summarized in table 5A-7 for the period 1984-1987. It indicates that the total number of licenses has increased by 13% and joint fertilizer/pesticide licenses have increased by 43% while holders of a sole fertilizer license have decreased by 11%.

Table 5A-7

Number of Distributors Holding a Fertilizer (F) or a Pesticide (P) License or both (F&P) from 1984 to 1987

YEAR	F	P	F&P	TOTAL
1984	79	18	21	118
%	67	15	18	100
1985	107	32	24	163
%	66	19	15	100
1986	93	30	25	148
%	63	20	17	100
1987	70	33	30	133
%	53	25	22	100
% + or - 1987/1984	-11%	+83%	+43%	+13%

Source: Prepared from data available at FPA.

d. Marketing Organization of Distributors

There are no statistics available regarding the marketing organizations of distributors before or after deregulation. Among those met during the study, several claimed that they employ salesmen to visit dealers, retail outlets and large accounts such as plantations in Mindanao and sugarcane cooperatives in the Visayas. As already mentioned, it seems that there is a trend among distributors to hold a dealer license as well. It allows them to by-pass the dealer level and to enhance the otherwise slim margin available to the wholesale level. Most distributors claim that by doing so they are not competing against their own customers but covering areas where dealers are not available or are incompetent.

e. Distribution Facilities of Distributors

The number of warehouses held by distributors is included in the global figures readily available for the whole industry, i.e., including importers, distributors and dealers. Their capacity is unknown. Table 5A-8 shows that the number of these warehouses throughout the country has remained roughly the

same from 1982 to 1987 (361 as of December 31, 1982, 1/and 599 as of December 31, 1983, compared with 621 as of October 31, 1987). The breakdown of warehouses among the various levels of the distribution chain (importers, distributors and dealers) has fluctuated continuously during the recent 18 months. This is one of the many consequences of cost-saving rationalization exercises carried out by fertilizer handlers as a result of the highly competitive climate. For instance, PHILPHOS' domestic marketing policy has evolved from a strictly manufacturer position in 1986, selling to importers only, to a completely integrated distribution system. Consequently, PHILPHOS increased the number of its warehouses from 9 in 1985, with a capacity of 82,000 M.T. scattered in the 11 disports of the country, to 13 (75,000 M.T. capacity) in 1986. Meanwhile as the company has adopted a forward stocking strategy, with consignment stocks held by their distributors, the number of PHILPHOS warehouses has dropped to three in 1987, representing less than 30,000 M.T. capacity.

No statistics are available concerning the transport facilities owned by distributors before or after deregulation. However, when interviewing distributors during the course of the study, it was frequently pointed out that the only profit made at present in the marketing of fertilizers is achieved in inland transportation. It is therefore understood that successful distributors today are those who are integrated further in the marketing of agricultural produce, possess their own fleet of vehicles and can always insure backload trucking.

f. Market Promotion And Development Activities of Distributors

Prior to deregulation, AFC (15% to 20% market share), FERMAP and MCFC (6% to 8% market share each) were the only marketers using distributors (wholesale level) for marketing their range of fertilizers. The marketing strategy of PPI, the market leader (65 to 70% share), was to by-pass the wholesale level to work directly with dealers. Therefore, as the market promotion and development programs of the minor importers were modest compared with PPI's, it is true to say that distributors were not very much involved in this activity prior to liberalization, any more than they are now. Prior to 1986, only AFC and FERMAP distributors were assisting their principals in a few farmer demonstrations, meetings and product trials.

From the few distributor interviews conducted it was gathered that at present no more market promotion and development program are performed at any level of the marketing chain. Product promotion and advertising at points of sales are the only promotional actions performed by distributors when they are themselves integrated downstream into the retailing of fertilizers.

1/ N. B. Warehouse registration began in October 1982.

Table 5A-8

Comparison in Number of Fertilizer Importers/Distributors/Dealers' Warehouses for Calendar Years (CY) 1982 and 1987

	DISTRIBUTORS AND DEALERS				WAREHOUSES		
	CY-1982 a/		CY-1987 a/				
Region	Dist.	Dealer	Dist.	Dealer	CY-82b/	CY-83c/	CY-87d/
I	8	356	3	316	42	51	26
II	2	314	5	265	12	28	39
III	10	407	16	406	15	62	39
IV	19	329	16	336	60	86	121
V	5	208	4	162	18	28	21
Sub-Total	44	1 616	44	1485	147	255	2464
VI	5	371	21	418	66	89	115
VII	6	182	5	167	5	21	32
VIII	-	66	2	57	1	3	11
Sub-Total	11	619	28	642	72	113	158
IX	2	88	1	74	3	6	4
X	13	224	16	193	19	26	44
XI	56	267	11	212	79	130	123
XII	3	210	4	154	41	69	46
Sub-Total	24	789	32	633	142	231	217
Grand Total	79	3024	104	2760	361	599	621

a/ as of December 31, 1982 & October 31, 1987.
b/ warehouse registration started in October 1982.
c/ as of December 31, 1983.
d/ as of June 30, 1987.

Source: FPA, November 1987.

N.B. - Figures for calendar year 1987 (CY-87)
- Dealer licences are valid for 3 calendar years.

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g. Conditions of Sales to the Retail Level

From distributors' interviews, it is estimated that the conditions of sales from the distributors to the dealers have not changed substantially with deregulation. It is understood that credit from distributor to dealer, as in the past, rarely exceeds 7 days, with a maximum of 15. Prices are generally established ex-distributor premises. Most distributors run their own delivery service.

4. Dealers and Retail Outlets

a. General

Together with the retail outlets, the dealers, or the retail level, constitute the last step in the marketing of agricultural inputs. They are directly in contact with the end-users. This level has always been used by all fertilizer importers in the Philippines to reach small farmers, not only because of the absence of cooperatives but also to avoid exposure to the high credit risk involved.

As explained, the marketing strategy of PPI, which held at one time a 70% share of the market, was to work exclusively with dealers and to by-pass completely the distributor/wholesale level. They used their 400 exclusive dealer network to spearhead their outstanding fertilizer demonstration program for the small farmer community. In order to develop and maintain this strategy, they used a highly sophisticated and elaborate array of dealers' training programs and incentive grants. This network was supported by a large field force of around 20 market development advisors and 220 salesmen. In exchange, PPI had instituted a set of minimum requirements for its exclusive dealers such as:

- having sufficient capital;
- confining sales to their designed area;
- establishing a strategically located store of minimum 10 M.T. with PPI signboard and product display set up according to company specifications;
- providing delivery facilities;
- conducting three one-hectare farm demonstrations per season;
- residing in their market area;
- attending trainings, conferences and meetings organized by PPI.

AFC, holding a 15 to 17 percent market share prior to deregulation, was using a two-step sales network of around 60 exclusive distributors and 500 dealers supported by a field force of about 40 technico-commercial professionals.

FERMAP, with a 2 to 4 percent market share before 1983, also maintained a network of exclusive dealers. Both AFC and FERMAP demanded the same kind of minimum requirements already described for PPI dealers, such as availability of capital, store location and capacity, delivery facilities, residence and confinement in assigned territory, sales plans and forecasts, target achievements, and support for the company's promotional activities.

As a consequence of the aggressive competition which resulted after import liberalization of non-locally produced chemical fertilizers, the present 2,600 dealer community has likewise disengaged itself from its exclusive allegiance to its suppliers.

A second consequence is the sharp decline of margins. An understandable corollary to this decline is that importers have abandoned all promotional activities that are not immediately profitable, both at the dealer level (dealer training and promotional schemes, etc.) and at the end-user level (farmer demonstration and training, etc.).

A third consequence of deregulation is that in many instances, it has become difficult to draw the line between distributors and dealers on one side and between dealers and retail outlets on the other. Nor is it easy to differentiate, sometimes, importers from distributors.

b. Number and Importance of Dealers

As with distributors, the number of dealers and retail outlets has not markedly changed. Their number has been fluctuating between 2,500 and 3,100 during the past ten years. More precisely, the number of licenses registered by FPA was 2,564 as of June 30, 1987, against 2,691 in 1978, a reduction of 5%. As in the case of importers and distributors, these figures also include dealers who handle fertilization substances other than chemical fertilizers, such as organic fertilizers, and soil amendments. The interpretation of some of the fluctuations occurring in the number of dealers cannot, therefore, be entirely attributed to chemical fertilizers and, specifically, to the changes that have occurred in the past 18 months.

When the total number of dealers in the country is broken down on a regional basis, as in table 5A-9, one notices that during the past four years, it has increased in each of the three

provinces of the Visayas from 482 (i.e., + 26%) to 609, and decreased slightly during the same period in Luzon and Mindanao (by 8% each). The most significant reductions have taken place in regions I and II. In region I, the decrease in the number of dealers was 29% (from 410 in 1984 to 294 in 1987), particular in La Union Province (from 99 to 37) and Ilocos Sur (from 71 to 30). In region II, it declined from 281 to 246 during the same years, mainly in the Isabela Province (from 151 to 104).

In the Mindanao provinces, the heaviest set-backs have taken place during the 1984-1987 period in Lanao del Sur (from 89 to 23) and Bukidnon (from 62 to 38). Large increases were noted during the same period in the Visayas (from 482 up to 609, or a 26% growth) in practically every province but especially in Negros Occidental (from 78 up to 141). In the Mindanao provinces, the largest increase was registered in North Cotabato (from 13 to 58), and in the Luzon provinces, in Camarines Sur (from 71 to 89).

An analysis of these fluctuations is not easy and requires a perfect knowledge of each area in order to decide whether they are due to market rationalization and/or development, infrastructure improvements (such as harbors), and/or political unrest.

Table 5A-9

Number of Registered Fertilizer Dealers/Outlets By Region From 1984-1987

Region	1984 a/	1985 a/	1986 a/	1987 b/
I	410	374	354	294
II	281	294	295	246
III	370	396	413	370
IV	279	321	329	308
V	154	163	168	155
Sub-Total Luzon	1494	1548	1559	1373
IV	291	355	412	396
VII	142	162	171	158
VIII	49	58	60	55
Sub-Total Visayas	482	575	643	609
IX	59	58	67	66
X	186	193	189	179
XI	214	223	227	194
XII	171	169	155	143
Sub-Total Mindanao	630	643	638	582
Total Country	2606	2766	2840	2564

a/ as of December 31,
b/ as of June 30,

Source: FPA, November, 1987.

The average volume of fertilizer handled by dealers is compared in table 5A-10 with that of neigboring ASEAN countries that have reached about the same stage of economic development as the Philippines.

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Table 5A-10

Average Volume of Chemical Fertilizers Distributed Annually per Retailer Outlet in Neighboring Countries of the Philippines

Countries (Years)	No. of Outlets	Total Volume Distributed	Average Vol. per Outlet
India (1986-87)	155,740	21,593,400	140
Malaysia (1981-82)	3,877	1,037,000	267
Pakistan (1986-87)	2,400	1,400,000	590
Sri Lanka (1979)	5,410	157,300 a/	29
Philippines (1986-87)	2,564	956,350	373
Totals above countries	169,991	25,144,050	148

Note: a/ excluding 215,000 MT delivered directly by importers to end-users.
Source : See further paragraphs.

As shown in table 5A-10, the number of dealers and retail outlets handling chemical fertilizers in the Philippines seems relatively low compared to its neighboring countries, with the exception of Pakistan. In 1985, the 2,564 chemical fertilizer dealers and retail outlets registered by FPA handled an average of 373 MT each as against 590 MT in Pakistan where the retail level is wholly private as in the Philippines. In other countries, the participation of the state, and farmers cooperatives and associations is generally important if not dominant, compared to that of private retailers. This situation is described in further detail in the following paragraphs.

In India, it is claimed by the Fertilizer Association of India that 21,593,400 MT of fertilizers were distributed in 1986-87 to 30 million farmholds by a network of 155,740 retailers, of which 35% are cooperative-owned and 65% are private. These figures indicate that on the average, each retailer handles annually around 140 MT of fertilizers.

In Malaysia, according to FADINAP, the number of importers, local producers, small-scale and other part-time traders and distributors was estimated to amount to approximately 100 in 1981-82. However, it is claimed that only a few of them provided the bulk of the material.

FADINAP states in the same report that 1,277 outlets (218 farmers organizations, 559 land development and rehabilitation agencies, and 500 private retailers/dealers) distributed around 1,037,000 MT of fertilizers. It is also stated that 2,600 estate-owned outlets and 500 private retailer/dealer outlets handled around 500,000 MT of fertilizers. The average volume of chemical fertilizers handled by retail outlets was computed as follows to compare with other countries' records.

Ownership of Retail Outlets in Malaysia	No. of Outlets	Total Volume Distributed (MT)	Average Volume per Outlet (MT)
Farmers Organization	218	145,000	665
State Agencies	559	392,000	701
Private Ret. a/	500	370,000	740
Estates	2,600	130,000	50
Totals	3,877	1,037,000	267
Totals excluding Estates	1,277	907,000	710

a/ Estimated according to number of farmers served.

Source: FADINAP, March 1984.

In Pakistan, according to Chemonics International Consulting Division, fertilizers were distributed in 1983-84 by 8 agencies, 5 state-owned and 3 private. As in the Philippines, they reach end-users through a network of 10,505 private dealers. However, it is understood that according to a recent investigation performed by the National Fertilizer Development Centre, the number of active fertilizer dealers does not exceed 2,400 for a total estimated offtake of 1,400,000 MT in 1986/87 or an average of around 590 MT annually per dealer. It is interesting to note that, as in the Philippines today, these dealers are not exclusive to any particular marketer and that they handle in general several lines of agricultural inputs and other commodities.

Also, according to FADINAP, in Sri Lanka, 6 enterprises were importing fertilizers in 1979. Half were state-owned and handled 80% of the total volume (380,600 MT). During the same year, an estimated 215,000 MT (56% of total 1979 imports) were delivered directly from importers to end-users (mainly to government and private estates, i.e., to large accounts). The remaining 166,000

MT were distributed through cooperatives, state (Agrarian Services Centres) and private retail outlets, as follows.

Ownership of Retail Outlets in Sri Lanka	No. of Outlets	Total Volume Distributed (MT)	Average Volume per Outlet (MT)
Cooperatives	4,500	48,900	10.9
State	360	28,700	79.7
Private	550	79,700	144.9
Total	5,410	157,300 a/	29.1
Totals Excluding Cooperatives	910	108,000 a/	119.1

a/ excluding 215,000 MT delivered directly by importers to end-users.

Source: FADINAP, May 1981.

In conclusion, it is generally reckoned in the trade that Filipino dealers by and large receive a mark-up of 3 to 5 Pesos per 50-kg bag, representing a gross margin of 22,380 to 37,300 Pesos per annum for fertilizers. It is not possible to qualify this income without knowing more about dealers' expenses and investments. A study of typical dealer profiles would allow one to evaluate the profitability of such a business and whether or not the number of dealers should be encouraged to increase at a faster rate than the demand forecast.

c. Major Activities of Dealers

There is likewise no readily available information with which to draw typical dealer profiles and to compare them liberalization. It is generally understood, for example, that practically all fertilizer dealers are increasingly trading in several lines of agricultural inputs such as pesticides, seeds, animal feedstuff, veterinary products, tools and appliances. However, available statistics at FPA on joint and sole dealer licenses for fertilizers and pesticides do not confirm this. On the contrary, these data seem to show greater dealer specialization towards fertilizers or towards pesticides, as shown in table 5A-11. However, the proportion of dealers holding both licenses is still by far the largest (65%). This number has gone down steadily from 2,332 in 1978 (77% of licenses) to 1,999 in 1987 (65%), while the total number of licences (including those bearing a sole license for fertilizers or for pesticides) has slightly increased from 3,008 to 3,087 (+ 3%). During the

same 1978-1987 period, the number of solely fertilizer dealers increased from 356 to 565 (+59%), while the number of fertilizer licences (solely or jointly with pesticides) has decreased from 2,688 to 2,564 (-5%). This tendency could be attributed to a shortage of working capital at dealer level.

Table 5A-11

Number of Dealers Holding a Fertilizer (F) Or a Pesticide (P) License or Both (F&P) from 1978 to 1987

Year	F		P		F & P		TOTAL	
1978	356		320		2332		3008	
		12%		11%		77%		100%
1979	384		355		2684		3423	
		11		10		79		100
1980	419		408		2973		3423	
		11		11		78		100
1981	285		361		2383		3029	
		9		12		79		100
1982	313		407		2696		3416	
		9		12		79		100
1983	428		592		2998		4018	
		10		15		75		100
1984	456		573		2362		3391	
		13		17		70		100
1985	594		617		2175		3386	
		18		18		64		100
1986	631		587		2216		3434	
		18		17		65		100
1987	565		523		1999		3087	
		18		17		65		100
% + or - 1987/1978		+ 59%		+ 63%		- 14%		+ 3%

Source: Prepared from data available at FPA.

d. Marketing Organization of Dealers

There are also no statistics available regarding the marketing organization of dealers. A few of them were interviewed during the field part of the study to draw a valid picture of that level of the distribution chain. Those met sometimes owned several other retail outlets run by employees and visited them daily. Among those met, none visited farmers and limited themselves to shop sales.

e. Distribution Facilities of Dealer

All dealers own one or several retail shops selling various "over the counter" agricultural input lines as described in previous sections.

As far as the storage capacity of dealers is concerned, available statistics are consolidated with those for the whole industry. They are recorded in table 5A-8 and have remained roughly at the same level from 1983 (599 storage depots) to 1987 (621 as of Oct. 31, 1987). Generally, dealers do not deliver, with the exception of those integrated up-stream in agribusiness (e.g., paddy millers) or in agricultural produce trading.

As far as the servicing of remote areas is concerned, one should refer to the comparison and comments made for distributors (wholesale level) since, as mentioned earlier, related statistics are consolidated for the whole distribution chain.

f. Market Promotion and Development at Dealer Level

As already described, a few years ago before import liberalization, some dealers, particularly the 400 exclusive PPI dealers, were actively involved in market promotion and development programs for small farmer communities. As explained, these schemes have been completely abandoned since deregulation, and there is little chance that they will ever be resumed because of the low profitability prevailing in free trade fertilizer.

g. Condition of Sales to Farmers

When the dealer is not involved in informal money lending, his sales to high-credit-risk, individual small farmers are on a cash-and-carry or cash-before-delivery basis. However, it is understood that dealers can also be an important source of credit for small rice farmers, since agricultural input dealers are frequently acting as paddy buying stations for rice millers. Credit to farmers will be further discussed below.

5. Dominant Marketing Channels

The analysis in the four previous sections shows that the marketing channels that bind the Filipino farming community at one end, with the local producers and importers of fertilizers at the other, consist of an entirely privately-owned wholesale and retail network served by privately-owned producer/importer corporations competing with state or quasi-state-owned ones.

As of October 1987 this is achieved by:

- 24 importers, of which two are local manufacturers of NP and NPK compounds. 80% of total imports are represented by 10 corporation of which one is state-owned, PHILPHOS, and is also one of the two manufacuring concerns:

- 99 regional distributors, all privately owned;

- and 2564 provincial dealers and retail outlets, all privately owned as well.

The inland transportation of the almost one million MT of chemical fertilizers used annually is entirely carried out by the private sector and mostly by the fertilizer distribution network's own facilities. Storage facilities, consisting of 621 depots scattered around the country (of which 108 warehouses are held by importers, with a capacity of 426,350 MT) are also wholly owned or leased by the private sector's distribution network, with the exception of three warehouses (30,000 MT capacity) run by the state-owned company PHILPHOS.

Changes that have occurred as a result of the liberalization in May 1986 can be summarized as follows:

- large increase in the number of importers (from 4 to 24 active importers, of which 10 are important ones);

- emergence of the state as the market leader as far as sales are concerned, i.e., when sales of locally produced fertilizers (NP, NPK) are added to those of imported grades (mainly N);

- insignificant changes in the total number of distributors (still around 100) and dealers (still around 2,500)

- signs of intermingling between the two lower levels of the marketing chain, i.e., between wholesale (distributors) and retail (dealers & retail outlets), which might entail a possible reduction of the number of distributors for cost-saving purposes.

In conclusion it can be asserted that it is at the importer level that the most spectacular changes in the marketing channels have occurred.

Three patterns of operation are used in the Philippines for the distribution of chemical fertilizers, imported and locally produced. They are by order of importance, the three-tier, two-tier and one-tier systems. Under the three-tier system, by far the most common, importers have their bagged consignments trucked from one of 11 national ports ("disports") to their local

warehouses. If fertilizer arrives in bulk (35% in volume of 1986 imports of finished chemical fertilizer), it is bagged on shore alongside the vessel or alongside the barge when unloaded at anchorage (such as in Manila where at least 40% of fertilizers are imported) by one of six Filipino bagging firms. From the importer warehouses, fertilizers are generally lifted by distributors, who truck them to their own inland depots or preferably, to the dealers' premises, where small quantities (less than one truck load) are lifted by the end-user.

An alternative to this three-level system is when the importer tranships the product by chartered 750 MT ocean barges, or by regular inter-island liner services if the quantity is smaller, to one of the internal ports (municipal ports) of the country. There, it is either unloaded into the importer warehouses, or unloaded into a distributor's own coastal depot or trucked directly into a dealer's depot where it is lifted by end-users. Of course when customer orders placed in advance are large enough (truck load sizes), direct delivery occurs by the distributor from the harbor to these large accounts. Commissions are paid to the distributors and/or to the dealers when they are involved in the ordering of the consignment. If the dealer is not involved, then a two-tier system emerges. It also happens when the importer is himself a distributor and goes directly to the dealer level. It becomes a one-tier channel when the latter delivers directly to large accounts.

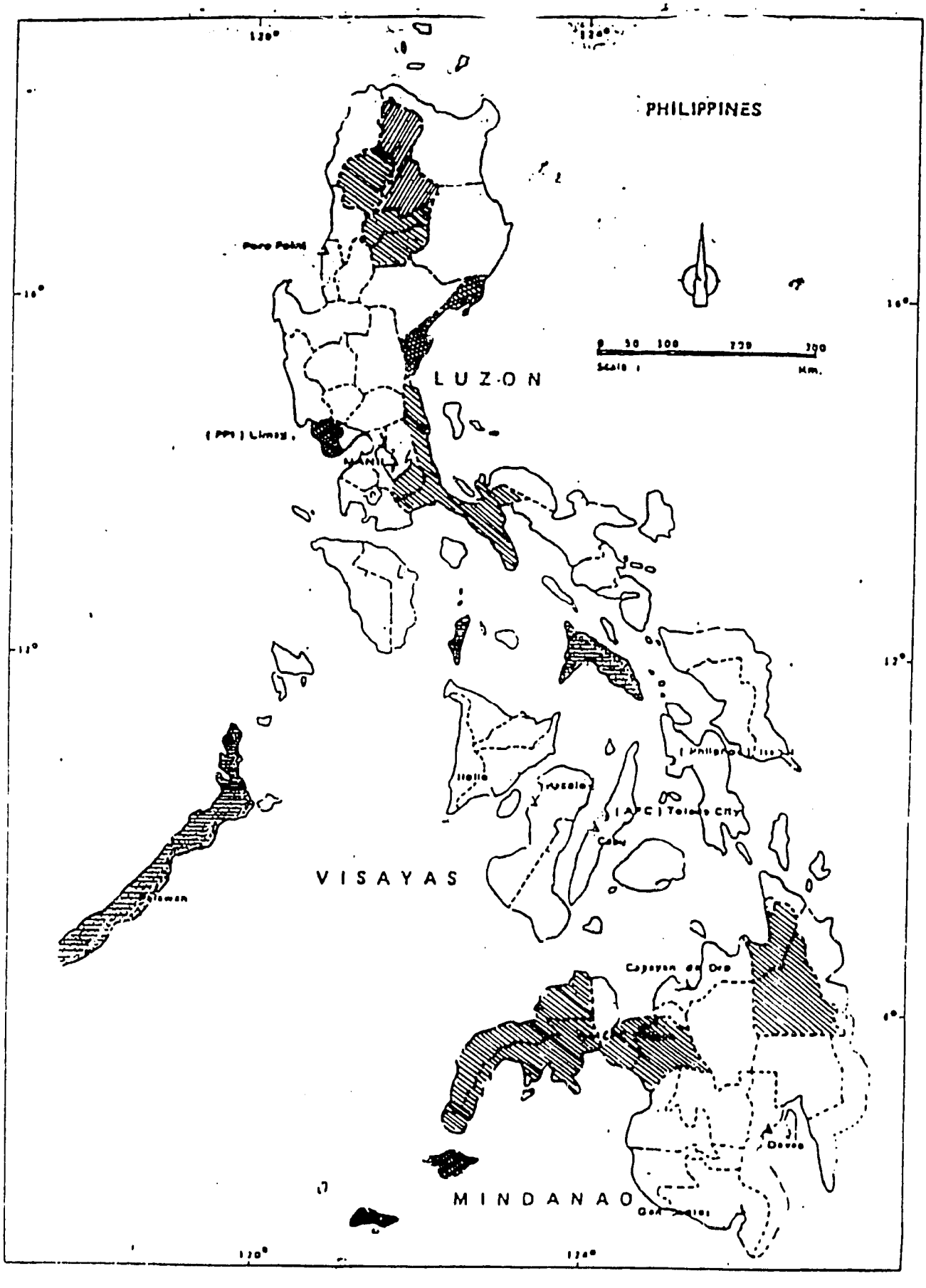
When supplies emanate from local manufacturers, two patterns might appear. In the case of PHILPHOS, when "importers" (or "corporate accounts", i.e., 2% of tonnage sold during 1987 first semester) intervene, it comes back to exactly the same three previous patterns. If not, as is almost always the case, a two-tier system applies, since it is understood that AFC always sells to its semi-exclusive distributors (wholesalers) and that PHILPHOS for 98% of its NP and NPK production operates forward stocking to its exclusive wholesale distributors.

A one-tier system appears when PHILPHOS or AFC supplies directly to large end-user accounts, by-passing completely the wholesale and retail steps. It happens as well as when local distributors, such as in Davao, import themselves and deliver directly to large plantation accounts.

6. Servicing of Remote Areas

The number of distributors located in the 21 provinces classified as "remote and partially remote areas" (r.a.) (see table 5A-6 and map 5A-3) has not changed from 1984 to 1987. It has increased from four in 1984 to six in 1985 and dropped again to four in 1986 and 1987. The number of provinces which do not have any distributor has not varied either and is still 18.

Map 5A-3 REMOTE AND PARTIALLY REMOTE AREAS



LEGEND:

A- Partially Remote Area

B- Mountanous Area

C- Uneconomical Market Size

D- Island(s) with no service Liner

Regarding dealers, their number has decreased from 273 in 1984 to 223 in 1987 (a 19% decline) as shown in table 5A-12; however, there has not been any variation in the number of remote areas served (still 18 provinces out of 21).

The major changes have taken place in the Mindanao provinces of Lanao and in the Mountain Province of Luzon. In Lanao del Sur, the number of dealers plunged from 89 in 1983 to 23 in 1987 (a 76% reduction) while in Lanao del Norte and in the Mountain Province the number dipped respectively from 26 to 14 (a 46% decrease) and from 9 to 2 (78% drop) during the same period. For the same 1984 to 1987 period, increases in the number of dealers located in r.a. have been registered in the Luzon provinces of Palawan (from 11 to 23, a 109% increase) Aurora (from 11 to 17, + 55%) and Quezon (from 16 to 20, + 25%) and in Mindanao provinces of Agusan del Sur (from 13 to 21, a 60% increase) and Zamboanga del Sur (from 38 to 43, + 13%). Increases in the number of dealers in these areas still did not compensate for the decreases in other areas.

The number of distributors' and dealers' warehouses located in r. a. has increased from 15 in 1982 to 24 as of October 31, 1987. As table 5A-13 indicates, out of 21 provinces classified as remote or partially remote, eight were serviced in 1982 as against nine in 1987. Among the three archipelagoes of the country, it can be estimated that Luzon is the only area where the storage situation seems to have deteriorated since deregulation. In 1987, seven out of the 37 Luzon provinces do not have any storage facilities at all as agianst five in 1982. There is no change in the Visayas where only two out of a total of 16 provinces classified as r.a. still do not have any warehouses. Apparently, this is due to the fact that the Visayas is the most central group of islands in the Philippines and consequently, possesses better established trade routes. According to this indicator it is in Mindanao that the storage situation seems to have significantly improved, since out of nine r.a., six are now equipped with 12 warehouses while, in 1982, three provinces counted a total of five warehouses. Only three Mindanao provinces out of 9 do not have storage facilities at the present time.

Table 5A-12

Number of Registered Fertilizer Dealers/Outlets In Remote Areas (R.A.) - 1984 to 1987

Provinces (Region)	1984 e/	1985 e/	1986 a/	1987 f/
LUZON				
Abra (I) a/	3	3	4	2
Mountain Prov. (I) a/	9	7	4	2
Ifugao (II) a/	2	4	2	2
Kalinga Apayao (II) b/	12	17	16	12
Bataan Island (III)	13	13	15	12
Aurora (IV)	11	15	11	17
Palawan Island (IV) d/	11	16	20	23
Quezon (IV) a/	16	20	19	22
Romblon Island (IV) d/	4	4	3	2
Masbate Island (V) d/	1	3	3	3
Sub-Total LUZON	82	102	97	97
Number of Serviced R.A.	10	10	10	10
VISAYAS				
Siquijor Island (VII)	5	4	5	3
Eastern Samar (VIII) c/	0	0	0	0
Sub-Total VISAYAS	5	4	5	3
Number of Serviced R.A.	1	1	1	1
MINDANAO				
Basilan Island (IX) c/	1	1	1	1
Zamboanga N. (IX) a/	16	16	14	15
Zamboanga S. (IX) a/	38	37	46	43
Tawi-Tawi Island (IX)	0	0	0	0
Sulu Island (IX)	0	0	0	0
Agusan Sur (X) a/	13	14	21	21
Surigao Sur (XI) a/	3	2	4	6
Lanao N. (XII) a/	26	17	13	14
Lanao S. (XII) a/	89	93	63	23
Sub-Total MINDANAO	186	180	162	123
Number of Serviced R.A.	7	7	7	7
Total Country	273	286	264	223
Number of Serviced R.A.	18	18	18	18

a/ partially remote area, b/ mountainous area, c/ uneconomical market size, d/ island(s) with no liner service. e/ as of Dec. 31, f/ as of June 30

Source: From FPA data.

Table 5A-13

Comparison of Number of Distributor and Dealer Warehouses in Remote Areas (R. A.) for 1982 and 1987 (as of Oct. 31)

Provinces (Region)	As of Dec. 31, 1982	As of Oct. 31, 1987
LUZON		
Abra (I) a/	0	0
Mountain Province (I) a/	0	0
Ifugao (II) a/	0	0
Kalinga-Apayao (II) b/	3	0
Bataan Island (III)	0	1
Aurora (IV)	0	0
Palawan Island (IV) d/	1	1
Quezon (IV) a/	4	10
Romblon Island (IV) d/	1	0
Masbate Island (V) d/	1	0
Sub-total Luzon	10	12
Number of Serviced R.A.	5	3
VISAYAS		
Siquijor Island (VII)	0	0
Eastern Samar (VIII) c/	0	0
Sub-total Visayas	0	0
Number of Serviced R.A.	0	0
MINDANAO		
Basilan Island (IX) c/	0	0
Zamboanga del Norte (IX) a/	1	2
Zamboanga del Sur (IX) a/	1	1
Tawi-tawi Island (IX)	0	0
Sulu Island (IX)	0	0
Agusan del Sur (X) a/	0	1
Surigao del Sur (XI) a/	0	0
Lanao del Norte (XII) a/	3	5
Lanao del Sur (XII) a/	0	2
Sub-total Mindanao	5	12
Number of Serviced R.A.	3	6
Total Country	15	24
Number of Serviced R.A.	8	9

a/ partially remote area, b/ mountainous area, c/ uneconomical market size, d/island(s) with no liner service.

Source: Prepared from data available at FPA.

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7. Salient Features of Fertilizer Manufacturing in the Philippines

It can be said that as far as fertilizer importers are concerned, two new kinds of company ownership have emerged since deregulation in May 1986. They consist of corporations owned by the Chinese ethnic group, and state-owned or state-managed concerns.

The first, which accounted for 25% of imports in 1986 and 44% in 1987, consists of the following enterprises:

- Isabela Agro-World Trading and Philippine Planters Consumers Inc. (19% in 1986 and 27% in 1987),
- Swire Agricultural Products, Inc. and Gerico Trading (Phils.) Inc. (2% in 1986 and 8% in 1987),
- Puromines (2% in 1986 and 7% in 1987),
- Makati Agro Trading Inc. (2% in 1986 and 1987).

The sale of fertilizers (imported and locally produced) is dominated by state companies (PHILPHOS and New Agrix) with a total share of 28% in 1986 and 37% in 1987, while Chinese-owned companies reached a total share of 18% in 1986 and 31% in 1987. Even if New Agrix performance is deducted, since it has recently pulled out of the fertilizer business, PHILPHOS is still the sales leader in the first half of 1987 with a 31% share.

It could also be claimed that the two local fertilizer manufacturers are dominating the market. Indeed, if PHILPHOS and AFC shares were consolidated it would give them a 20% sale share in 1986 (PHILPHOS 12% + AFC 8%) and a 37% share in the first semester of of 1987 (PHILPHOS 31% + AFC 6%). It can also be noted that whatever the methods of ranking, the state-owned PHILPHOS is always among the leaders.

Some rationalization has already taken place in the number and professionalism of fertilizer importers left today in the business after the big rush of the second semester of 1986. Further pruning can be expected if PPI succeeds in reconquering a part of its former leadership by giving away its profits to the farmers in the form of market promotion and development services such as those they were providing up to 1985. The re-entry of PPI as a third marketing power, to counter-balancing any monopolistic threat and to provide services that are normally the responsibility of the specialized public sector institutions (research and extension), is an attractive concept. However, it is difficult to visualize its re-entry in the present free trade environment. Indeed, competitiveness in price is such that it does not leave enough margin as in PPI's golden days, to cover

high expenses incurred in recruiting, training and maintaining a large field force. In the present low profitability context, these costs could only be met from the premium price (5 P/bag of urea at end-user level) that the farmer would still be prepared to pay for products bearing the outstanding brand image of "Planters Products." However, it remains to be seen how long PPI's products would enjoy this privilege and to what extent non-exclusive dealers will be prepared to devote time, effort and part of their margin for such strenuous development work. At present, they can obtain the same products at lower prices from as many as twenty other importers.

As in the past, PPI could use margins accruing from pesticides to subsidize fertilizer expenses. In addition, field personnel dealing with crop protection aspects could be expected to cope as well with fertilization matters that are less complex. Unfortunately, PPI now holds less than 10% share (against 30% in 1983) of the pesticide market.

The distributor/wholesale level is probably the one that will completely disappear from the market as is already the case in other countries for cost-saving purposes. There is already some evidence of up-stream and down-stream integration, i.e., distributors importing their own requirements, and distributors possessing their own retail shops and transport to deliver directly to large end-user accounts. It is also the level of the distribution chain that the importers could easily ignore as PPI was doing before deregulation.

The dealer level of the distribution system, which in the recent past enjoyed the favors of the importers because of its outstanding importance in reaching three million small farmers, is now left to itself. The technical and administrative assistance they received before deregulation, mainly from PPI, has now completely disappeared and will be very unlikely to be restored by the private sector. Fertilizers are commodity products and market promotion and development programs are not rewarding, and certainly not profitable, if the investor does not have a quasi-exclusivity as PPI did a few years ago.

FPA could play a major role by taking over at a national level part of the past activities of PPI by training dealers in administrative, financial and operational aspects of their business. The International Fertilizer Development Center (IFDC-Alabama-USA) training program for fertilizer dealers in developing countries could be adopted for this purpose.

The transfer of fertilization technology to small farmers and to dealers remains, of course, the responsibility of the agricultural research and extension service.

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The possible undercapitalization of the retail level should also be investigated, as suggested below.

E. Costs and Margins

a. General

As stressed several times before, the most notable effect of the deregulation of non-locally produced chemical fertilizers has been the significant increase in the number of importers. It has resulted in sharp competition at each step of the distribution chain. The outcome of this situation has been a substantial drop in end-user prices and the slimming of gross margins at every level of the distribution channel.

b. Level of Prices

However, it should be noted that, since liberalization has coincided with the decline of world prices of imported chemical fertilizers, it is difficult to evaluate to what extent deregulation contributed to the decrease of wholesale and retail prices in the Philippines. This is particularly true for urea.

For Ammosul and MOP, there was a flattening of the import costs and subsequently of the wholesale prices starting in 1986. However, retail prices continued to drop. In the case of locally produced chemical fertilizers such as 16-20-0 and 14-14-14 it is noticeable that the decline of wholesale and retail prices was not as deep as for the imported ones. In fact, transfer prices of locally produced chemical fertilizers from local producers, PHILPHOS and AFC, have continued to increase as compared with previous years. It can therefore be stated that the decline in wholesale and retail prices for locally produced chemical fertilizers is entirely due to the hardening of competition at wholesale and retail levels. Exactly the same reasoning applies to imported MOP where wholesale and retail prices did not go down as sharply as urea and ammosul despite an increase in import cost from 1985 to 1987. It can be stated that in this case, the lower price to farmers is a result of deregulation and its most obvious consequence, the increase of competition. This is illustrated in graphs 5A-2 to 5A-6 which show the evolution of the national averages of import costs, wholesale and retail prices, from 1979 to June 1987 for urea, sulfate of ammonia, muriate of potash, 16-20-0 and 14-14-14 expressed in pesos.

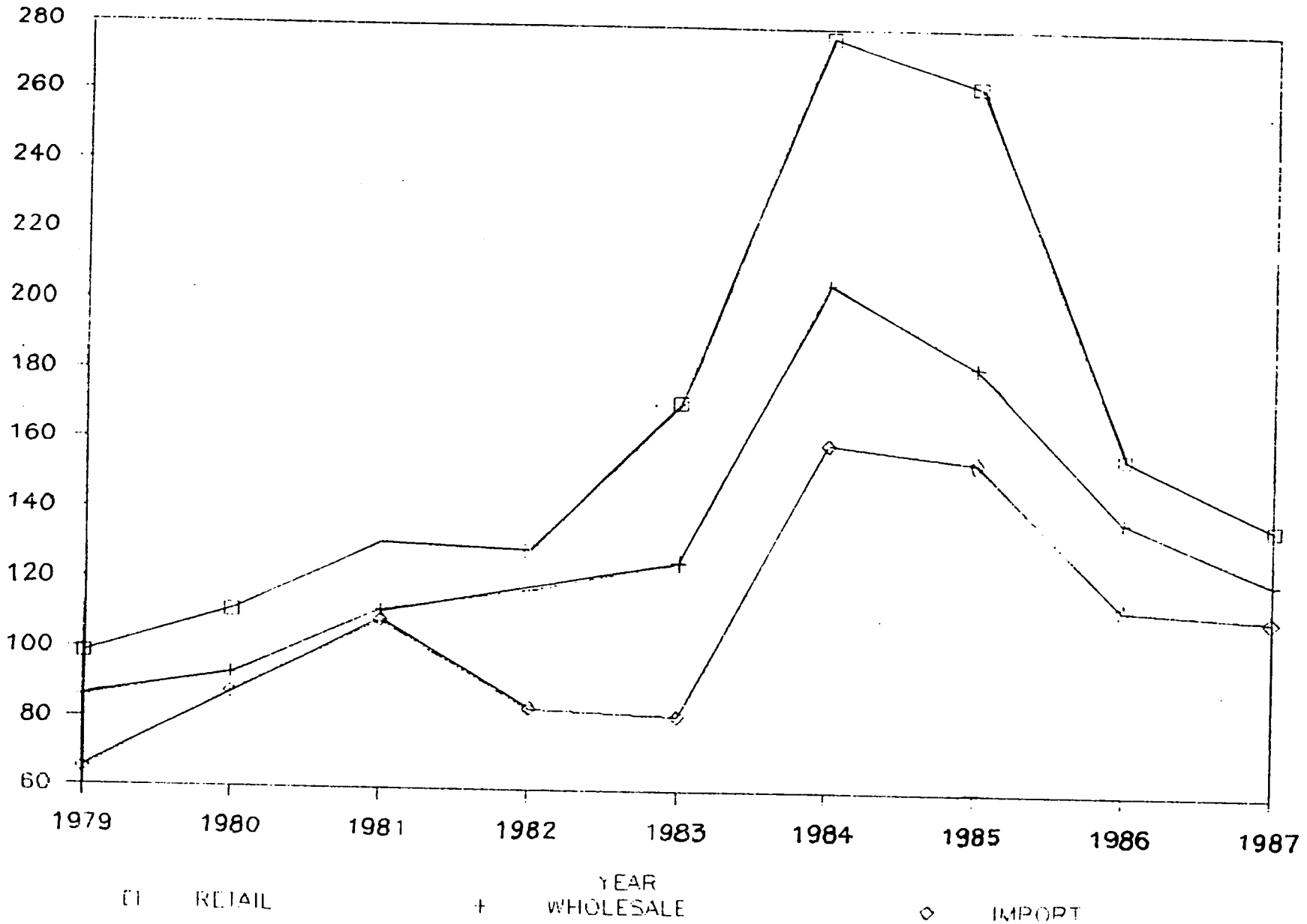
c. Gross Margins

As one can expect and judge from graphs 5A-2 to 5A-6, the depressing effect of competition has been relatively more severe on marketing gross margins than it has been on prices to farmers.

Graph 5A-2

UREA: Import Costs, Wholesale & Retail Prices (Pesos/50-kg BAG)

1979-June 1987

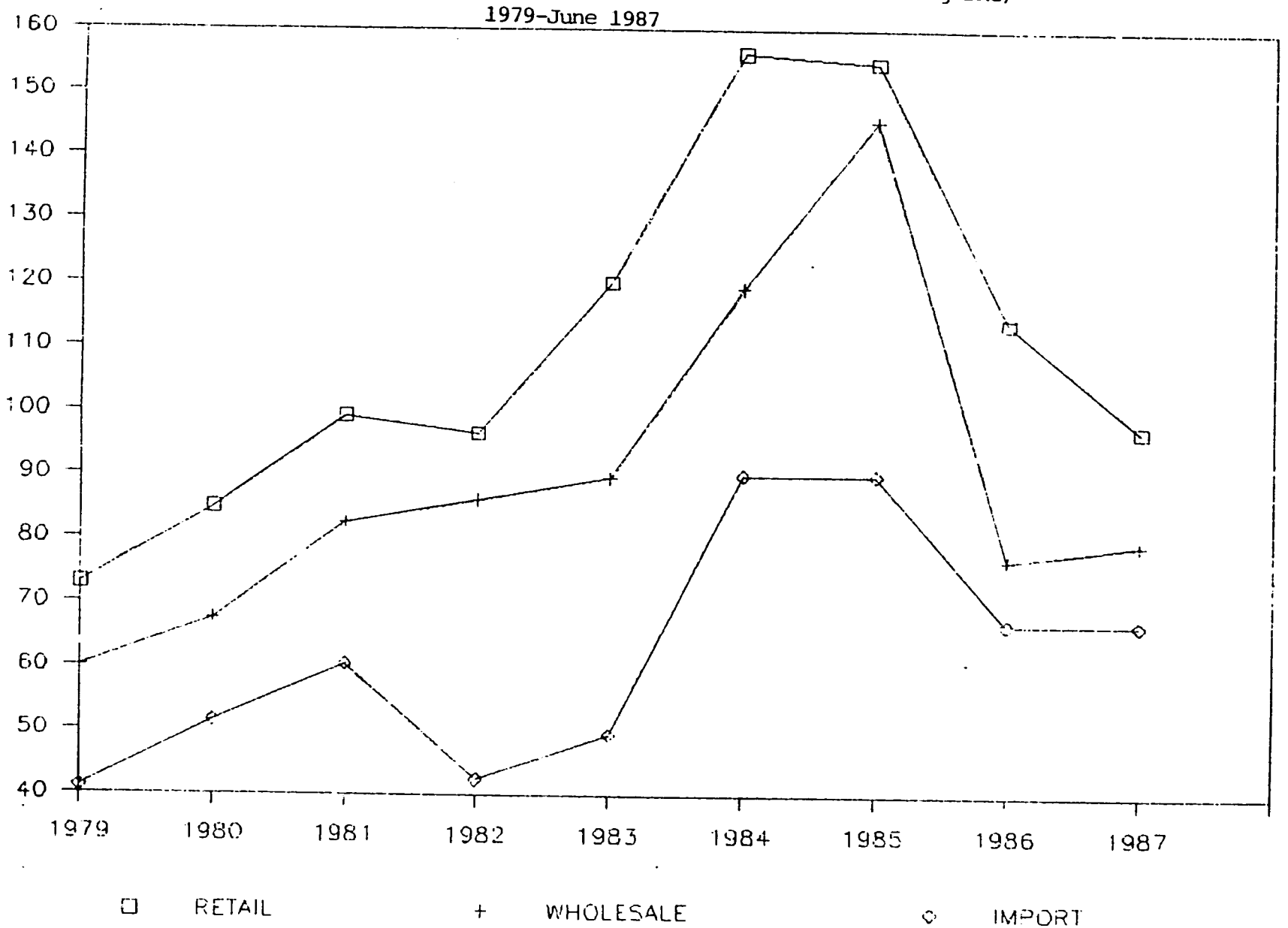


Note: 1979-1985 Wholesale prices are the average maximum ex-warehouse price approved by FPA while 1986-1987 figures refer to actual ex-warehouse average.

Graph 5A-3

AMMOSUL: Import Costs, Wholesale & Retail Prices (Pesos/50-kg BAG)

1979-June 1987



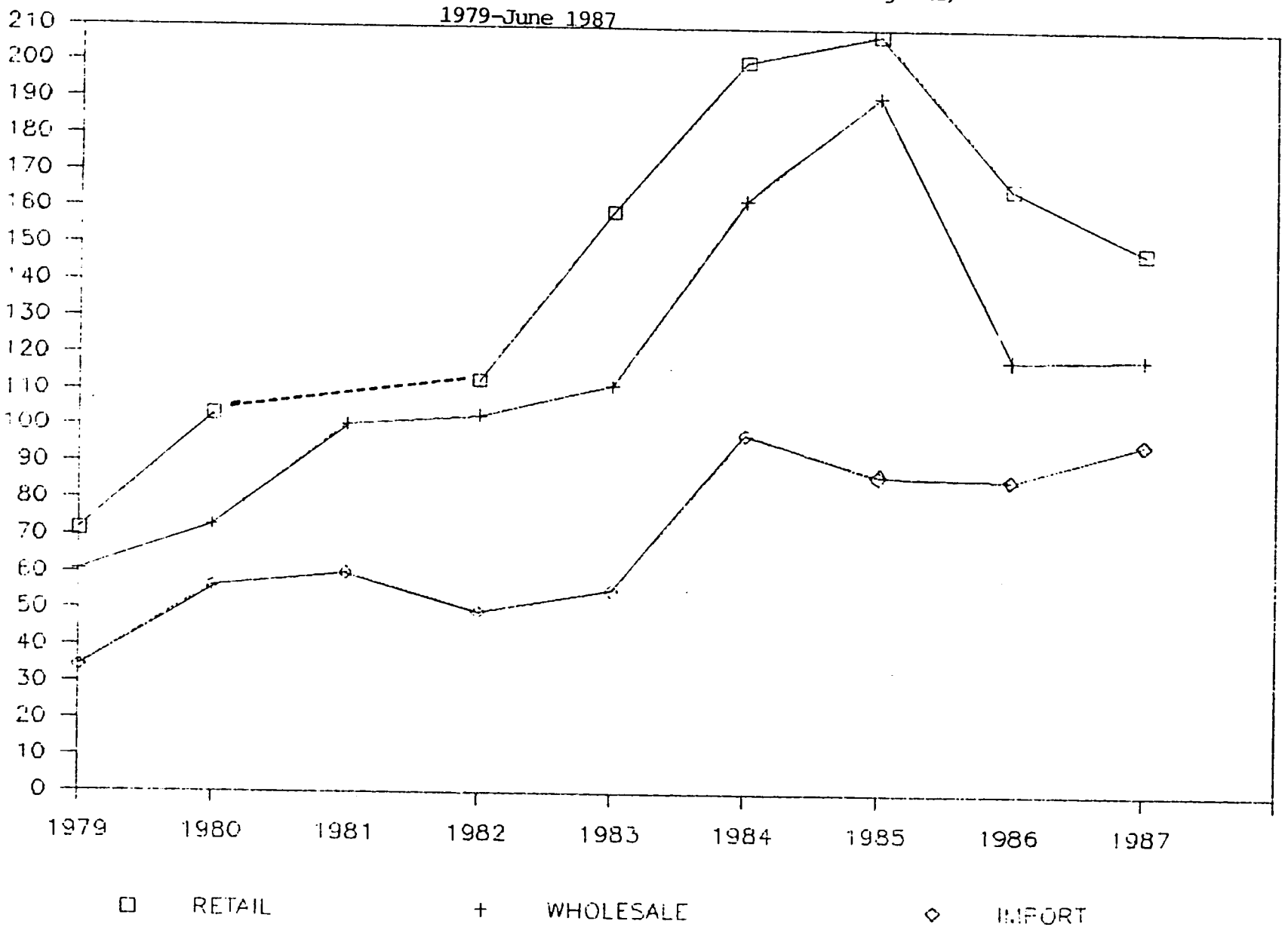
Note: 1979-1985 Wholesale price is the weighted maximum ex-warehouse price approved by FPA while 1986-1987 figures refer to actual ex-warehouse

Source: Prepared from the data available at FPA

Graph 5A-4

MOP: Import Costs, Wholesale & Retail Prices (Pesos/50-kg BAG)

1979-June 1987

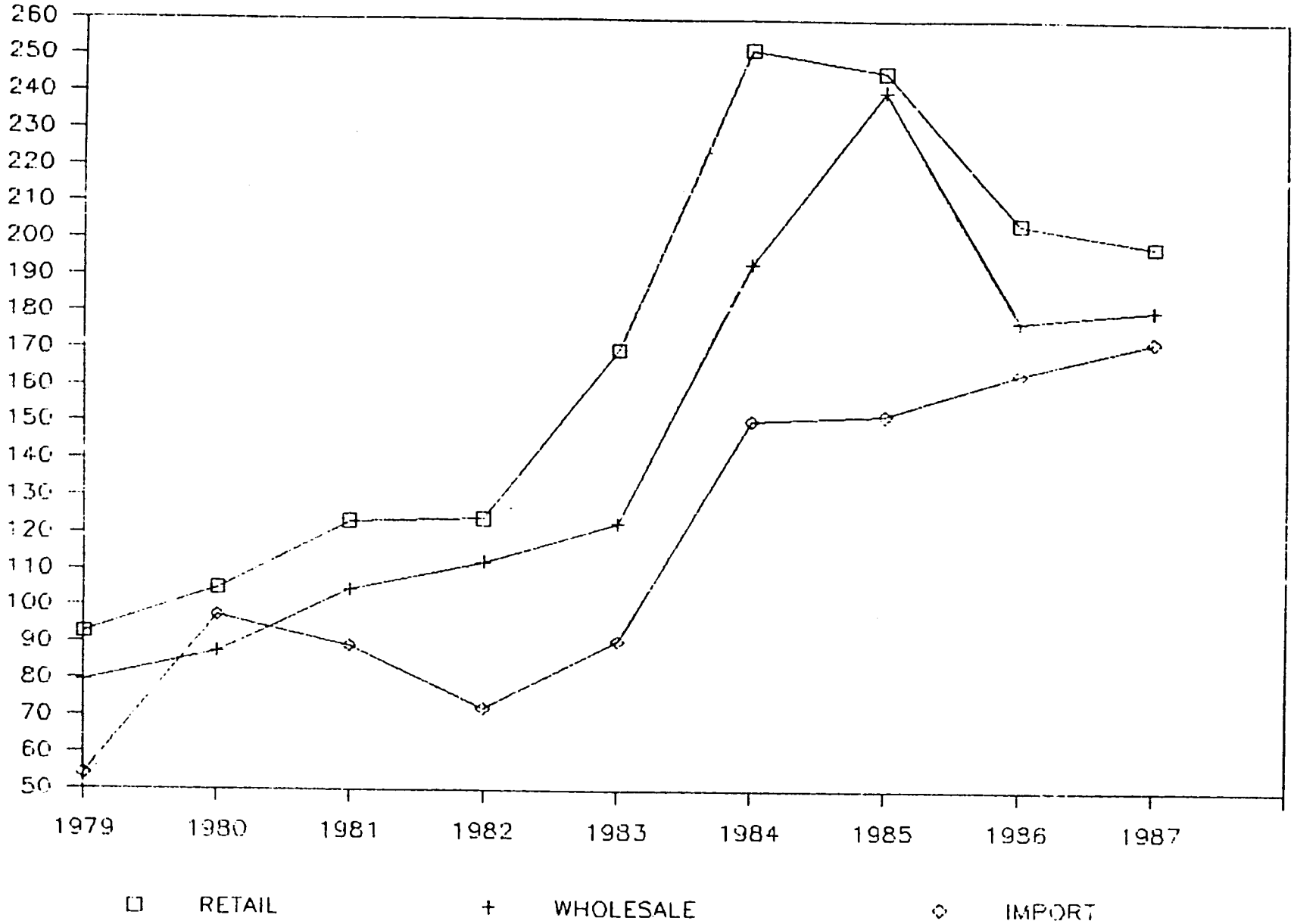


Note: 1) ---- not available in 1981

2) 1979-1985 Wholesale price is the weighted maximun ex-warehouse price approved by FPA; while 1986-1987 figures refer to actual ex-warehouse

Graph 5A-5

16-20-0: Import Costs, Wholesale & Retail Prices(Pesos/50-kg BAG)
1979-June 1987

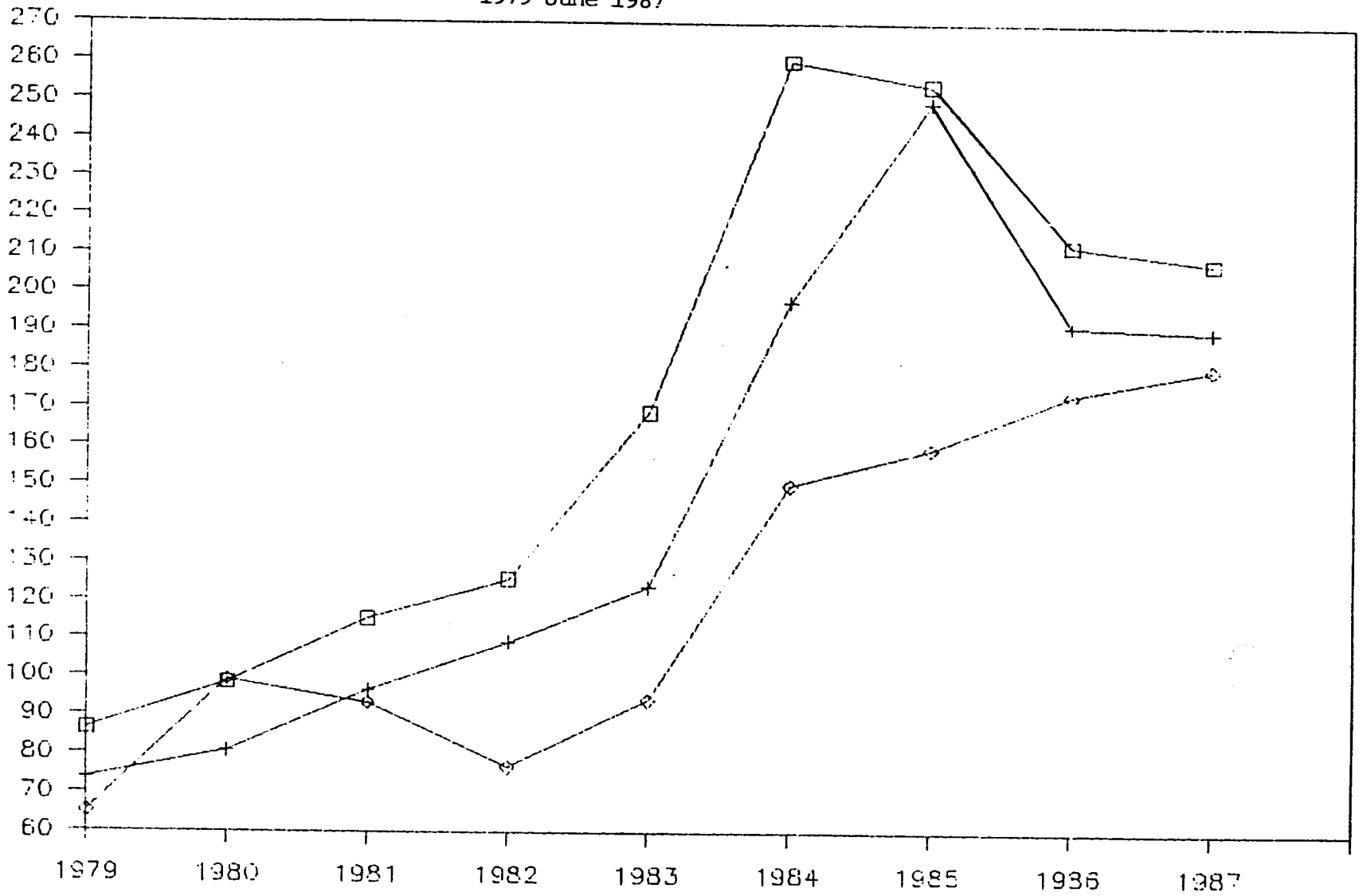


Note: 1) 1979-1985 Wholesale price is the weighted maximum ex-warehouse price approved by FPA;while 1986-1987 figures refer to actual ex-warehouse

Graph 5A-6

TIPLE 14: Import Costs, Wholesale & Retail Prices (Pesos/50-kg BAG)

1979-June 1987



□ RETAIL + WHOLESALE ◇ IMPORT

Note: 1979-1985 Wholesale price is the weighted maximum ex-warehouse price approved by FPA; while 1986-1987 figures refer to actual ex-warehouse

For instance, table 5A-14 indicates that for urea (63% of total tonnage imported in 1986), the total gross margin that has to be shared among importers, distributors (wholesale) and dealer outlets (retail) to cover all their expenses and mark-ups has sharply decreased from 42% of the farmer price in 1984 to 19% in June 1987. The gross margin between import cost and wholesale price even became negative during the last quarter of 1986 because of the large tonnage of urea landed at that time in the country. The following tables 5A-14 to 5A-18 show the same trends for the major grades consumed in the country.

Table 5A-14

Urea Average Prices, Mark-up and Gross Margins at Importer, Distributor and Dealer Levels from 1984 to 1987 expressed in Pesos of the Year per 50 kg. bag.

	1984	85	86	June 87
(1) Import cost a/	160.00	155.0	113.50	111.0
Mark-up in % of (1)	+29.0	+18.2	-	+9.6
(2) Wholesale Price	206.50	183.31	112.81	121.72
Mark-up in % of (2)	+34.3	+43.6	+38.2	+12.7
(3) End-User Price	277.30	263.27	156.84	137.18
(4) Total Mark-up in % of (1)	+73.3	+68.8	+38.2	+23.5
(5) Total Gross Margin in % of (3)	42.3	41.1	27.6	19.1

a/ converted at prevailing US$ average exchange rate for the year 1984: @ P. 6,699; 1985: @ P. 18,607; 1986: @ P. 20,386; Jan.-June 1987: @ P. 20,459;
b/ ceiling price authorized by FPA.

Source: FPA, Nov., 1987.

Average annual import costs are computed from actual total year import proceeds in US$ and total year import tonnage and converted into pesos at the prevailing exchange rate as indicated in a/; wholesale and retail prices, except when actually stated, are actual average regional ex-warehouses prices without any

weighting factor (i.e. without taking into account the importance of the actual consumption of each region).

Table 5A-15

Ammosul Average Prices, Mark-up and Gross Margins at Importer, Distributor and Dealer Levels from 1984 to 1987 expressed in Pesos of the year per 50 kg. bag

	1984	1985	1986	Jan. to June 1987
(1) Import Cost a/	90.00	90.00	67.00	67.00
Mark up in % of (1)	+29.50	+55.50	+10.00	+12.50
(2) Wholesale Price	119.50 b/	145.40 b/	77.00	79.50
Mark-up in % of (2)	+36.70	+9.32	+37.19	+17.71
(3) End-User Price	156.20	154.82	114.19	97.21
(4) Total Mark-up in % of (1)	+73.56	+72.02	+70.43	+45.09
(5) Total Gross Margin in % of (3)	42.38	441.87	41.33	31.08

For a/ and b/ notes, as well as for notes on evaluation of averages, please refer to footnotes in table 5A-13.

Source: Prepared from FPA data, Nov. 1987.

Table 5A-16

MOP Average Prices, Mark-up and Gross Margins at Importer, Distributor and Dealer Levels from 1984 to 1987 expressed in pesos per 50 kg. bag

	1984	1985	1986	Jan. to June 1987
(1) Import cost a/	98.00	87.00	86.00	96.00
Mark-up in % of (1):	+64.50	+104.00	+33.00	+23.50
(2) Wholesale Price	162.50 b/	191.00 b/	119.00	119.50
Mark-up in % of (2)	+38.02	+17.14	+47.06	+29.54
(3) End-User Price	200.52	208.14	166.06	149.04
(4) Total Mark-up in % of (1)	104.61	139.24	93.09	55.25
(5) Total Gross Margin in % of (3)	51.13	58.20	48.21	35.59

For a/ and b/ notes, as well as for notes on evaluation of averages, please refer to footnotes in table 5A-13.

Source: Prepared from FPA data, Nov. 198[illegible].

Table 5A-17

16-20-0 Average Prices, Mark-up and Gross Margins at Importer, Distributor and Dealer Levels from 1984 to 1987 expressed in Pesos of the year per 50 kg. bag

	1984	1985	1986	Jan. to June 1987
(1) Import cost a/	150.50	152.00	163.50	172.50
Mark-up in % of (1)	+43.00	+88.50	+14.00	+ 8.50
(2) Wholesale Price	193.50 b/	240.50 b/	177.50	181.00
Mark-up in % of (2)	+58.10	+ 5.28	+27.17	+17.59
(3) End-User Price	251.60	245.78	204.67	198.59
(4) Total Mark-up in % of (1)	67.18	61.70	25.18	15.12
(5) Total Gross Margin in % of (3)	40.18	38.16	20.12	13.14

For a/ and b/ notes, as well as for notes on evaluation of averages, please refer to footnotes in table 5A-13.

Source: Prepared from FPA data, Nov. 1987.

Table 5A-18

14-14-14 Average Prices, Mark-up and Gross Margins at Importer, Distributor and Dealer Levels from 1984 to 1987 expressed in Pesos of the year per 50 kg. bag

	1984	1985	1986	Jan. to June 1987
(1) Import cost a/	150.00	159.50	173.50	180.50
Mark-up in % of (1):	+47.5	+90.00	+18.00	+ 9.50
(2) Wholesale Price	197.50 b/	249.50 b/	191.50	190.00
Mark-up in % of (2)	+62.69	+ 4.42	+21.02	+17.88
(3) End-User Price	260.19	253.92	212.52	207.88
(4) Total Mark-up in % of (1)	73.46	59.20	22.49	15.17
(5) Total Gross Margin in % of (3)	42.35	37.18	18.36	13.17

For a/ and b/ notes, as well as for notes on evaluation of averages, please refer to footnotes in table 5A-13.

Source: Prepared from FPA data, Nov. 1987.

The comparison between the evolution of the gross margin for the five major grades (urea, ammosul, MOP, 16-20-0 and 14-14-14) used in the Philippines are recorded in table 9-19. It indicates that the average annual gross margin for these five grades, weighted according to the percentage of their imports in 1986, came down from around 42% in 1984 to around 20% in June 1987. It reveals that for urea, amounting to 51% of total national consumption in 1986, margins dropped from 42.3% in 1984 to 19.1 during the first half of 1987, i.e., a fall of more than 50%.

In the case of Ammosul and MOP, the other two imported products which represent 18% and 5% respectively of total domestic consumption in 1986, gross margins slimmed only by around one-third (26% for Ammosul and 30% for MOP). For the two locally produced grades, 16-20-0 and 14-14-14, the gross margins available to the trade slimmed by two-thirds, from around 40% in 1984 when they were still imported, to 13% in 1987. This deep plunge started in 1986, i.e., as soon as supplies to the trade

originated entirely from the local production of PHILPHOS and, to a lesser extent, AFC. It must be remembered that this extreme contraction in the gross margins of locally produced grades occurred in spite of steadily rising transfer prices from PHILPHOS and AFC to traders. This apparent contradiction can be explained by PHILPHOS' policy of selling 98% of the total volume of its NP and NPK compounds directly through a network of exclusive distributors through forward stocking, and only 2% in volume (first half 1987) to other importers ("corporate accounts").

Table 5A-19

Evolution of the Gross Margins of the Five Major Chemical Fertilizers used in the Philippines from 1984 to June 1987, expressed in % of retail price

	a/ % of 1986 consumption	1984	1985	1986	June 1987
Urea	51%	42.3	41.1	27.6	19.1
Ammosul	18%	42.4	41.9	41.3	31.1
MOP	5%	51.3	58.2	48.2	35.6
16-20-0	13%	40.2	38.2	20.1	13.1
14-14-14	13%	42.3	37.2	18.4	13.2
	--- 100%				
b/ Weighted average for above grades		42.5	41.2	28.9	20.5

a/ Percentages of total tonnage of the above grades consumption in 1986 (876,640 MT) as per FPA's Annex 9-4-20.
b/ The weighted gross margin averages computed on the basis of 1986 consumption as under a/.

Source: Prepared from data in tables 5A-14 to 5A-18.

AFC likewise by-passes completely the first step of the distribution chain and sells directly to the wholesale level (semi-exclusive distributors). Consequently, it can be assumed that any further price reduction to the farmer can only come from the local manufacturers. In order to force them to reduce their prices, customs duties (32% on CIF) should be abolished, as in

the case of non-locally produced chemical fertilizers, to allowing similar imported compounds to compete with local ones.

d. Distribution Costs

It is amazing to note how quickly the fertilizer handlers have learned to live with the slim margins left to them to cover their distribution costs. This can be done by comparing the FPA estimate of the breakdown of the present distribution costs with that reported in UNICO's 1984 Fertilizer Sector Study. It will be interesting also to see how the 1987 distribution cost breakdown has evolved compared to those reported by FADINAP for 1985-86 in neighboring countries.

(1) Comparison Between 1984 and 1987

The breakdown of FPA's estimated costs for urea as of October 1984 and October 1987 are compared in table 5A-20. It should be noted that this comparison applies also to the UNICO Fertilizer Sector Study's estimate of distribution costs as of November 1984 since they are exactly the same as FPA 1984 estimates. (UNICO's data are expressed in pesos per 50 kg bags whereas FPA's figures are in pesos Per MT).

It can be observed in table 5A-20 that when the cost of bags and bagging (10.6% of wholesale price in 1987) are deducted, total distribution costs and margins amounted to 22.8 % of wholesale price (ex-importer warehouse price) in 1984 as against 14.8 % in 1987. It is therefore extremely unlikely that these costs, with the exception of rebagging, can be further reduced.

Indeed, it can be noticed that:

- bank charges have gone down from 9.8% of wholesale price in 1984 to 3.6 % in 1987 mainly due to a reduction in bank interest charges from 12.2% of CIF cost in 1984 to 4.5% in 1987;

- landing charges have likewise gone down from 134.60 P/MT down to 82.50 or a 39% drop;

- warehouse handling expenses (referred to as "transhipment" in FPA's 1984 figures and UNICO's Study) have diminished from 200.00 P/MT to 78.73 P/MT, i.e., a 61% plunge;

- administrative and selling expenses (referred to as "operating expenses" in FPA's 1984 figures and UNICO's Study) have gone down by 41% from 143.54 P/MT in 1984 down to 85.00 P/MT in 1987. This is a result of the fertilizer company moves to limit their sales force and other unnecessary administrative and selling expenses in order to survive in the market.

Table 5A-20 - Comparison of FPA's Estimated Breakdowns of Gross Margins (Marketing Costs + Net Margins) of Urea in 1984 and in 1987 expressed in Pesos per MT

	October 1984		October 1987	
- CIF Costs	4,231.13	(77.2%)	1,994.45	(74.5%)
C&F Costs	4,168.60		1,982.55	
Insurance Costs	62.53	(1.5%) d/	11.90	(0.6%) d/
- Bank Charges	537.51	(10.0%)	97.73	(3.6%)
L/C opening			4.99)	
Documentary Stamps	20.84	(0.4%)	2.99) 7.98	(0.3%)
Interest Charge a/	516.60	(12.2%) e/	89.75	(4.5%) e/
- ADB/WB Charges	125.06	(2.3%)	-	-
- Landing Charges	134.60	(2.5%)	82.50	(3.1%)
Wharfage			17.47	
Brokerage			1.00	
Barging			20.54	
Arrastre/Stevedoring			33.11	
Surveying			3.92	
Checking			2.60	
Customs Charges			3.86	
- Bagging and Bags			285.02	(10.6%)
Bagging			162.02	
Cost of Bags			123.00	
- Warehouse landing b/	200.00	(3.6%)	78.73	(2.9%)
Trucking to warehouse			34.73	
Handling in/out			14.00	
Warehousing			30.00	
- Administrative & Selling c/	143.54	(2.6%)	85.00	(3.2%)
TOTAL COST EX-IMPORTER WAREHOUSE	5,371.84		2,623.43	
- Importer Mark-up (2%)	107.44	(2.0%)	52.47	(1.96%)
EX-IMPORTER WAREHOUSE PRICE (WHOLESALE)	5,479.28	(100.0%)	2,675.90	(100.0%)
- Inland Supply Costs	186.00		108.50	
Transportation	156.00)		102.00)	
Handling	30.00)	286.00	6.50)	108.50
- Mark-up (1.75%)	100.00)		-)	
- Local Taxes	30.00		13.38	
EX-RETAILER SHOP PRICE (END-USER)	5,795.00		2,797.78	

a/ referred in UNICO Study as "Interest on Capital "
b/ referred in FPA 1984 figure and UNICO Study as "Transhipment"
c/ referred in FPA 1984 figures and in UNICO Study as "Operating Expenses"
d/ figures between () are expressed in % of C& F Costs
e/ figures between () are expressed in % of CIF Costs NB Except when otherwise stated such as in notes d/ and e/, figures between ( ) in third and fifth column are expressed in % of the ex-importer warehouse price (wholesale price). The Peso exchange rates to the US$ were of P20 @ US$ in 1984 and P20.50 @ US$ in 1987.

As mentioned earlier and explained in the following sections, the only possible savings on the above expenses could be achieved by bagging bulk consignments in warehouses rather than on harbor quays.

It must also stressed that distribution expenses (transport, handling and taxes) at the wholesale and retail levels have been based on a two-tier system. Any transit of fertilizers through an additional (distributor) level would imply a net out-of-pocket loss. Indeed, the P108.50 per MT in 1987 for transport and handling between importers' warehouses and retail outlets represents a cut of 42% from P186.00/MT in 1984. It is most probably not sufficient to cover actual supply expenses entirely. It does not allow any profit for the wholesaler and the retailer, which will have to come from the already reduced net margin of the importer (P52.47/MT in 1987 as against P107.44/MT at the importer level + P100.00/MT at the retailer level, i.e., 1.87% of the farmers' price in 1987 as compared with 3.6 % in 1984).

It must be pointed out that 1984 estimates are not inflated since it was FPA policy at that time to adopt the cost of the two most efficient companies--AFC and MCFC--as ex-warehouse costs in order to fix the ceiling prices at which fertilizers could be sold by the trade.

It must also be noted that in the above figures, there are no provisions for losses of product during handling. They are apparently less than 1%.

The same comparison as for urea could be made for other imported fertilizers such as ammosul and with similar conclusions.

(2) Comparison of Filipino Marketing Costs with Those of Neighboring Countries

The FPA estimated breakdown of distribution costs of urea in 1987, as detailed in table 5A-19, are compared with those recorded by FADINAP for 1985/86 in selected developing countries of Asia and the Pacific in tables 5A-20 and 5A-21.

Table 5A-21 reveals that in 1987 the Philippines is among the lowest in marketing expenses and net margins (mark-ups) when compared with 1985/86 costs in other countries:

Table 5A-21
Comparison of Breakdown of Gross Margins (Marketing Costs + Net Margins)
in Developing Countries of Asia and the Pacific in 1985/86
and in the Philippines in 1987, expressed in US Dollars Per MT

Country Channel	PHILIPPINES Private 1985/86	PHILIPPINES Private Oct. 1987	NEPAL Public	REPUBLIC OF KOREA Public	SRI LANKA Public	THAILAND Private	INDIA Public	INDIA Private	INDONESIA Public	MALAYSIA Public	MALAYSIA Private
Cost Items		d/									
1. Import	178.12	97.29	95.00		115.40	170.00					
Ex-factory				262.10			256.53	232.52	90.77	130.00	128.00
2. Marketing costs and margins e/	130.18	39.18	65.38	51.15	43.32	59.52	55.43	51.29	64.93	36.35	45.35
3. Total costs	308.30	136.47	160.38	313.25	158.72	229.52	311.96	283.81	155.70	166.35	173.35
4. Retail price for farmers	250.00	136.47	187.32	279.94	108.72	229.52	190.13	190.13	111.91	0.00	166.00
5. Subsidy (3-4)	58.30	0.00	0.00	33.31	50.00	0.00	121.83	93.68	43.79	166.35	0.00
Breakdown Marketing Costs											
a. Transport costs	7.50	10.50 d1	39.08 a	11.64	5.70	6.67	22.25	18.93	29.31	4.80	10.00
b. Storage costs	1.71	1.46 d2	0.75	4.84	0.92	3.48	2.75	2.75	3.19	2.50	3.50
c. Bagging costs	0.00	13.90 d3	0.00	0.12	0.00	8.52	7.69	7.69	0.00	0.00	0.00
d. Handling costs	2.00	1.00 d4	0.00	2.87	0.63	7.81	1.94	1.94	5.30	8.96	8.96
e. Physical losses	2.70	0.00	0.65	0.06	0.67	1.70	1.54	1.54	0.00	1.20	1.20

Table 5A-21 (continued)
Comparison of Breakdown of Gross Margins (Marketing Costs + Net Margins)
in Developing Countries of Asia and the Pacific in 1985/86
and in the Philippines in 1987, expressed in US Dollars Per MT

Country Channel	PHILIPPINES Private 1985/86	PHILIPPINES Private Oct. 1987	NEPAL Public	REPUBLIC OF KOREA Public	SRI LANKA Public	THAILAND Private	INDIA Public	INDIA Private	INDONESIA Public	MALAYSIA Public	MALAYSIA Private
f. Taxes, levies, customs duties	58.67	0.92 d5	1.20 b	0.00	10.63	4.24	f	f	0.78	0.00	0.00
g. Interest charges	15.60	4.78 d6	7.60	22.10	8.04	1.42	2.02	2.02	12.12	12.89	12.69
h. Promotional expenses	0.00	0.00	0.00	0.00	0.15	n.a	0.00	0.00	0.00	0.00	0.00
i. Other costs	2.00	4.14 d7	7.04 c	0.00	4.70	7.80 g	5.91	5.91	0.28	0.00	0.00
j. Marketing margin (mark-up) e/	(40.00)	(2.48)	(9.06)	(9.52)	(11.88)	(17.88)	(11.32)	(10.51)	(13.95)	(6.00)	(9.00)
Importers' margin e/	15.00)		0.00	0.00	6.88	1.37	0.00	0.00	0.98	0.00	5.00
Wholesale margin e/	15.00)	2.48	0.00	1.90	0.00	6.95	0.00	0.00	7.60	6.00 d	2.00
Retail Margin e/	10.00)		9.06	7.62	5.00	9.56	(11.32)	10.51	5.37	0.00	2.00
Total marketing (and distribution) costs	130.18	39.18	65.38	51.15	45.32	59.52	55.42	51.29	64.93	36.35	45.35
Exchange rate US$1 =	P21.00	20.50	NRs 21.30	Won 890.20	SLRs 27.18	Bht27.00	RS 12.36		Rp 1,117	$M 2.50	

a Includes clearing and forwarding
b Bank commission for L/C
c Administrative costs
d As per Table IX-19
- d1 includes landing charges less customs but includes transport to coastal and inland depot
- d2 includes coastal warehousing only
- d3 includes cost of bags also
- d5 includes customs and local charges
- d6 includes all bank charges
- d7 are administrative & selling expenses

e margins = mark-up = net margins
f no excise duty is levied on fertilizer. However, local taxes have to be paid, like sales tax. The incidence of sales tax varies from state to state from 2.2 to 5 percent
g Bank commission for L/C

Sources: FADINAP, July 1987 (see Annex 9-1, notation 9-9) for 1985/86 data
FPA, November 1987 for d/

Table 5A-22

Comparison of Breakdowns of Gross Margins (Marketing Costs and Net Margins) in Selected Developing countries of Asia and the Pacific 1985-86 and In the Philippines in 1987, expressed in US$ per MT and in Percentages

Country	Distribution Channel	C. I. F. Import Price	Ex-Factory Price	Marketing Costs		Marketing Margins	Marketing Costs and Margins	Total Costs	Marketing Costs as Percentage of Total Costs		Marketing Margins as Percentage of Total Costs	Marketing Costs and Margins as Percentage of Total Costs
India	Public		256.53	44.11	36.42	11.32	55.43	311.96	14.14	11.67	3.63	17.77
	Private		232.52	40.78	33.09	10.51	51.29	283.81	14.37	11.66	3.70	18.07
Indonesia	Public		90.77	50.98	50.98	13.95	64.93	155.70	32.74	32.74	8.96	41.70
Malaysia	Public		130.00	30.35	30.35	6.00	36.35	166.35	18.24	18.24	3.61	21.85
	Private	128.00		36.35	36.35	9.00	45.35	173.35	20.97	20.97	5.19	26.16
Nepal	Public	95.00		56.32	56.32	9.06	65.38	160.38	35.12	35.12	5.65	40.77
Philippines	Private	178.12		90.18	90.18	40.00	130.18	308.30	29.25	29.25	12.97	42.23
(Oct. 1987)	Private	97.29		34.06	20.16	2.48	36.54	133.83	25.45	15.06	1.85	27.30
Republic of South Korea	Public		262.10	41.63	41.51	9.52	51.15	51.15	81.39	81.15	18.61	16.30
Sri Lanka	Public	115.40		33.44	33.44	11.88	45.32	160.72	20.81	20.81	7.39	28.20
Thailand	Private	170.00		41.64	33.12	17.88	59.52	229.52	18.14	14.43	7.79	25.30

(1) less bags & bagging costs

Source: - FADINAP, July 1987
- FPA, November 1987 for October 1987 Philippines data

- for total marketing costs (inclusive of mark-ups) the Philippines is second best (39.18 US$/MT) in 1987 after Malaysia's public sector (36.54 US$/MT), whereas it was the worst by far (130.18 US$/MT) in 1985/86; if rebagging and bags costs are excluded, the Philippines becomes a comfortable leader;

- for net margins (mark-ups), the Philippines are the lowest by far with 2.48 US$/MT of urea in 1987--but the highest in 1985/86 with 40.00 US$/MT--preceding the Korean public sector (6.00 US$/MT in 1985/86) and the Thai private sector (11.88 US$/MT);

- as far as marketing costs are concerned (i.e., excluding the traders' net margins or mark-ups), the Philippines in 1987 becomes the third best performer (39.18 US$/MT) behind Malaysia and Sri Lanka; when the costs of bags and bagging are deducted, the Philippines take the lead with 25.28 US$/MT, well ahead of the Malaysian public sector (30.35 US$/MT) and the Indian private sector (33.09 US$/MT).

Regarding the possibility of further contraction of distribution costs, the only item that seems capable of improvement is bagging costs which are lower in other countries. It is not known, however, exactly what is included under this item in other countries:

- 0.12 US$/MT by the Korean public sector,
- 7.69 US$/MT in India,
- 8.52 US$/MT in the Thai private sector,
- as against 13.90 US$/MT in the Philippines.

Table 5A-22 contains the same comparison for the same selection of ASEAN countries as table 5A-21 but expressed in percentages. It shows that the 1987 Philippines' net margin to the trade (mark-ups) of 1.82% is the lowest when expressed as a percentage of total costs (retail price to the farmer), followed by the Korean public sector (3.04%), the Malaysian public sector (3.61%) and the Indian private sector (3.63%).

In 1982 FAO classified countries in three groups according to the level of marketing costs, the most efficient ones being those with costs between US$5 and 50/MT, the medium group between US$50 and 100/MT and the worst between US$100 and 170/MT. The Philippines at that time was included in the medium group with Korea, Tanzania, Thailand and Sri Lanka.

Finally, it should be remembered that the above marketing costs do not include any provision for losses of product or any interest on working capital tied up in stocks. It is understood that at the beginning of October 1987 the inventory of urea held

by the Filipino trade was large enough to satisfy the following six months of consumption. It is therefore almost certain that the chemical fertilizer importers are losing money at the present time. As quoted by FAO, interest on capital tied up in stocks is a major item. It amounts in a number of countries to 20-50% of the total marketing cost (US$ 2-38/MT). In fact, high inventories, particularly urea, were mentioned by all importers encountered during this study as the major constraint in the fertilizer trade. Some were even suggesting the re-establishment of FPA's monitoring of fertilizer imports. Without going that far, it is certainly one of FPA's major roles to inform the fertilizer trade monthly of the stock situation by aggregating and feeding back information received from the local fertilizer industry as well as information collected daily through the registration of import permits.

Transport is another major cost item that is probably not sufficiently well documented in the distribution cost breakdown and should require more attention. This aspect will be covered in the next section on market constraints.

F. Marketing Constraints

a. General

The most important constraints to efficient fertilizer marketing by the private sector can be summarized as follows.

As far as marketing issues are concerned:

- low profitability of chemical fertilizer marketing;
- limited range of chemical fertilizers due to high customs duties (32%) on NP and NPK compounds and local manufacturers' restrictive distribution policy for NP and NPK;
- high inventories at the importer level due to lack of information on the domestic stock situation;
- unfair competition of poor quality products (product alteration, bag underweight, etc.).

Regarding distribution issues:

- interisland shipment deficiency, poor harbor facilities particularly unloading facilities in some "disports," and an inferior barge fleet;
- difficult access to and/or uneconomical market size for fertilizer in some parts of the country, classified as "remote areas".

Concerning end-user issues:

- o utilization of low analysis grades of NP and NPK compounds;
- o shortage and therefore high cost of credit at the end-user level;
- o inadequacy of small farmers' advisory services not only in agronomic principles but probably more in fertilizer use economics.

The constraints enumerated as well as the ways to overcome them will be examined in the following paragraphs. Most recommendations will require further investigation, which could not be carried out in the time available for the study.

b. Low Profitability of Chemical Fertilizer Marketing

This recent development, which was a result of deregulation in May 1986, has been fully documented in previous sections and does not need further comment. However, one can imagine that this situation will not encourage newcomers to try to enter the market. On the contrary, the number of fertilizer handlers has not increased, with the exception of importers, whose number has likewise decreased in 1987 from its 1986 level. Also, there are signs that the present three-tier marketing system might be progressively replaced by two-tier channels at the expense of the wholesale level.

Under the present circumstances, fertilizers are becoming a sideline important only to provide backloads to handlers of other voluminous agricultural commodities. One might even fear that importers might fall to such a limited number that the risk of collusion could appear. Although more remote, the same danger might arise at a lower level of the distribution chain where completely integrated agricultural traders might control supply of inputs, credit and output marketing. As already suggested, it can be assumed that the presence of the state-owned PHILPHOS, which holds according to the latest records around 30% of the market, can be a deterrent to any cartel formation. If PHILPHOS is privatized as is apparently the intention, the farmer-owned PPI could play this role as well if it succeeds in reconquering a part of its former market share. Finally it should be remembered that FPA still has the legal authority to import directly and inject products in the market place.

The increased availability of less expensive credit might, to some extent, break the dependency of small farmers on "input/output integrated marketing channels."

Any measure resulting in marketing cost savings will, of course, help the trade to live with the present low profitability and help it, hopefully, to wait for better days.

c. Limited Range of Chemical Fertilizers

As already discussed, NP and NPK compounds produced locally are excluded in practice from the range of chemical fertilizers available to the trade. This is due to the high customs duty barrier (32% on CIF), which is protecting the local manufacturers and to producers marketing policy of selling their NP/NPK grades directly through a semi-exclusive network of wholesalers. Only 2% of PHILPHOS production and none of AFC's are sold through importers.

Consequently, during the first semester of 1987, the trade had to limit its sales to three products representing 99% of imports (urea 75%, ammosul 13% and MOP 11%).

It could be argued that the State-owned manufacturing company, PHILPHOS, should not have been authorized to market its producion directly but instead should have gone through the existing three-tier marketing channels. It would have saved them the costs involved in building and maintaining their own field force.

The proposed solution already suggested would be to liberalize imports of all chemical fertilizers including NP and NPK compounds.

d. High Inventories

According to opinions expressed during field investigations, the high urea inventories held by importers are not entirely due to the drought (and political unrest) of the recent months but also to importers' optimistic sales forecasts. These estimates might have been more realistic if the importers had had better knowledge of the market in general and of the stock situation by area in particular (including quantities ordered and on sea).

As already suggested, FPA is the best agency to fulfill this informer role since it receives from fertilizer importers a monthly report containing various data, among which are the importers' stock situation in various warehouses. FPA also knows about the fertilizer import flows as it issues import certificates to importers for the opening of L/C's and issues a tax exemption certificate on arrival of the fertilizer consignment.

On the field side, FPA collects information at the dealer level, which is assembled by its provincial co-ordinators, who

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have to make up for missing or inaccurate data. It is claimed that the results of these monthly exercises are unreliable and that the system should be dropped. However, it is generally true to say that in other parts of the world, it is from the retailer and end-user levels that reliable, firsthand market data can be obtained if the correct approach is used. The provincial co-ordinator is the best placed in the FPA organization to gather information from dealers and to interpret them. He should also reinforce or establish contact with other agricultural sectors outside the fertilizer industry (DA institutions, farmer cooperatives, grower associations, agricultural produce traders, NFA, agribusinesses, transporters, and financial institutions.) He can become, if properly trained, an expert on fertilizer market intelligence in his area. For this purpose, the means to improve his performance must be investigated. This can be achieved possibly by improving his income and his mobility. As discussed later, reinforcement of FPA co-ordinator efficiency is also required to fulfill the product regulatory function of FPA.

By giving the FPA co-ordinator the appropriate means to perform his responsibilities, his work satisfaction and eventually his loyalty to the institution to which he belongs will increase. In its Makati head office, FPA will have to take every necessary measure to process quickly all information received and to release it as soon as available among traders. A fee could be charged for this service, which would be a good way to test its usefulness.

e. Unfair Competition From Poor Quality Products

Unfair competition from unscrupulous fertilizer traders was reported by almost all fertilizer handlers in the course of this study as a serious constraint of the business. The claims most frequently reported were bag underweight and adulteration of products with foreign materials. Neither of these allegations could be verified during the study nor the assertion that FPA's provincial coordinators did not have the means to carry out systematic checks among traders and were only acting when illegal practices were brought to their attention. Also, it was generally affirmed that a coordinator's reaction and subsequent legal procedures were too slow to act as a real deterrent. As mentioned in the preceding section, this problem could be partly resolved by improving the efficiency of the FPA coordinators. It was reported by importers that FPA coordinators had to use public transport, or ask for lifts from input traders, to cover areas of several thousand square kilometers comprising several dozens of retailer outlets. It must also be remembered that all FPA coordinators are also implementing at the field level the other pesticide functions of FPA and that of a total of 94 coordinators for 74 provinces, only 25 are full-time FPA staff. The others are D.A. officers who devote only part of their time to FPA activities.

Another infringement that is widely reported (and visible), is the imitation of PPI's bag labeling pattern and colors as well as the proliferation of the use of the word "planters" in the company names of new importers. This is done in order to benefit from the high brand image of Planters Products, Inc. among farmers. This type of unfair commercial practice does not fall under FPA jurisdiction.

f. Shortage and High Cost of End-User Credit

It is generally agreed that less than five percent of the agricultural input credit requirements of small farmers who cannot offer collateral are financed at cheap interest rates from formal institutional funds. The difference of 95% therefore has to come from informal private sources. It is reported as well that even farmers with access to collateral also borrow from non-institutional sources.

Although this opinion is not shared by fertilizer sector economists, practically all fertilizer handlers met during the course of the study were of the opinion that the lack of cheap credit for small (non-bankable) farmers is one of the major constraints affecting the growth rate of chemical fertilizer demand in the Philippines. On the other hand, it is generally agreed that this statement cannot be substantiated by recent statistics, since information on the informal credit market is old and incomplete. Only local and fragmentary observations can be reported. As a distributor put it: "In the rice producing areas, the small farmer will not be able to find more than a part of his credit requirements to finance his crop expenses no matter what rate he is prepared to pay. The money lender, generally the local rice miller, will use a few middlemen to whom he will lend money for the three-month rice-growing season at only 2% per month since they are a good credit risk. The middlemen will lend it to the farmer at a minimum additional rate of 8% per month, which will now cost the farmer 40% for 120 days or 120 % p.a." This statement was confirmed as a normal practice in discussions at various levels of the distribution chain. As a dealer reported: " In the agricultural input trade, it is normal that the interest charge paid by the small farmer exceeds the principal." It was also understood in the course of these discussions that usually, small rice growers cannot obtain credit to cover more than 25% of their recommended fertilizer requirements (i.e., at the usage level recommended by the Department of Agriculture) at 120% p.a. interest, since the money lender sets a ceiling on the amount he is prepared to lend. With the advent of land reform, another source of informal credit is drying up, namely the possibility for the tenant to borrow from his landowner. This was apparently the lowest available rate in the informal money market for non-bankable borrowers. In this case the 5/6 system (six reimbursed for five borrowed) was used,

equivalent to 20% interest rate for 3 to 4 months or 60 to 80% p.a. The usury rates are apparently a lot higher. In the Nueva Ecija province, the main rice-growing area, they take the following forms:

- o the "talindua"--where the interest rate is 50% in one cropping season. If the money loaned is P1000 the usurer would receive P1500 in return.
- o the "takipan" where the interest rate is 100% in one cropping season,
- o the "porsiyentohan" where every P100 borrowed will be charged 15% interest rate/month, and
- o the "taling giik" for which a borrower would repay P1300 or P1400 after harvest for every P1000 loaned.

The loans are often recovered by the palay threshers who receive, in addition, 6% of the crop for their service.

Money lenders argue that the high rates charged on loans are not exorbitant when one considers the high default risk involved and the disastrous repayment rates of large subsidized credit schemes in the past. In the Masagana 99 and Maisagana programs for rice and corn, respectively, carried out in the seventies, an important component was the availability of subsidized credit for growers. Of 800,000 farmers included in the scheme, approximately 90% were denied further access to credit because of failure to repay. As a consequence, a large proportion of rural banks are now experiencing serious financial difficulties with a high risk for some of being forced to close. Out of more than 1000 rural banks operating in the seventies, less than 200 would be still viable today.

Among the proposed solutions to overcome this situation, practically all fertilizer handlers from importers to retailers stressed that the training of small Filipino farmers in fertilization should first be dedicated to economics and in particular to the importance of credit worthiness. One way of increasing the credit worthiness of the small farmer would be to adopt the quedan financing system, an old concept that is used only on a small scale in the Philippines, namely by

non-governmental organizations 1/, in spite of the existence of the Quedan Guarantee Fund Board (QGFB). Michael M. Alunan, in a recent article in the Manila Bulletin, proposes the adoption of this system to stabilize rice prices and help the National Food Authority (NFA) overcome its budgetary shortages. As explained in this article, "farmers' quedan financing is a system wherein a farmer, instead of selling all his palay at a low price during the harvest season, turns over his stocks to NFA or any accredited private warehouse for safekeeping. In reality this farmer does not sell his palay but simply holds on to a warehouse receipt or a quedan certifying his stocks. He holds on to it until prices get better, but he can also use his quedan as collateral for obtaining a guaranteed loan from a commercial bank, which is about 80 per cent of the quedan value equivalent to P 2.80 per kg."

In short, quedan financing enables the farmer to obtain credit for his family's needs and for production inputs for the next crop cycle. It also allows him to pay back his P 2.80 per kilo debt plus interest, and he even earns a supplemental income by selling high during lean months.

In the areas where there is no bank, the Manila Bulletin article suggests that the NFA could come in and lend to farmers at an interest rate of 14 percent, which is still much lower than the 240 percent per year rate slapped on by loan sharks. NFA could then go to a commercial bank and discount the loan paper at 12 percent, making a profit spread of two percent.

With quedan financing, the NFA, the farmer and the trader benefit. In fact, this warehousing concept was also proposed by the Confederation of Filipino Rice and Corn Associations, Inc. The Manila Bulettin article added that some traders are even willing to offer free storage so long as they are assured that farmers will eventually sell or have their palay milled with them.

g. Inadequacy of the Small Farmers Advisory Service

All fertilizer handlers met during the study complained about the poor support received from the extension service, mainly because of the inefficiency of this institution further aggravated in some areas by the political situation. As mentioned in the preceding section, most of them stressed that the first priority as far as the training of small Filipino farmers is concerned should be the economics of input use and the importance of credit worthiness rather than on actual fertilizer use.

1/ Such as the Mother Rosa Memorial Foundation run by the Assumption Sisters' Alumna Association in San Simon, Pampanga Province.

h. Utilization of Low Analysis Grades

It goes without saying that the utilization of high analysis grades will allow savings on the transport of fertilizer. The prospects for any change are treated in the chapter on fertilizer uses.

i. Interisland Cross Shipment

The elimination of interisland cross shipment is, as one can expect, one of the recommendations made in the 1983 UNICO Fertilizer Study as a means of reducing fertilizer distribution costs in the Philippines. The fact that the Philippine archipelago consists of 7,100 islands might appear at first sight as an advantage, providing cheap waterways to reach the most remote areas of the country. In reality, it is not the case, since only eleven ports are classified as import harbors (national ports or "disports") and three more as private disports, where annual discharge of fertilizer varied from 13,000 MT (Batangas) to 325,480 MT (Manila) in 1986. Regarding the municipal ports of the country, even if their unloading facilities were adequate, the fertilizer market that they serve is generally not important enough to justify economical vessel calls. Therefore, the requirements of areas with no access to a "disport" must be supplied from one of the disport warehouses by small interisland liners or chartered 700-750 MT barges. Such transhipment represents, of course, double handling at rates that are not negligible. These incremental costs can vary from 120 to 330 P/MT. In table 5A-20, P 108.50 per MT was the average cost for inland movement on a total gross margin of P 803.33 per MT for urea (i.e. 13.5% of gross margin and 4.0% of end user price). It can be computed that interisland shipment for these rates increases the average farmer price of urea from 2,797.78 P/MT up to 3,019.28 P/MT, or an 8% increase in price rate and a 27% increase on gross margin from P 803.33 to P 1,024.83 per MT of urea.

In 1985, the total domestic fertilizer trade flow (in + out) after deduction of Leyte (PHILPHOS plant) and Cebu traffic (partly AFC plant production) was 430,440 MT, while total sales that year were 710,210 MT. These figures are far too rough to permit an evaluation of the extent of the problem, but they show that this distribution constraint might be important enough to investigate further. The multiplicity of importers involved, however, makes the issue of savings more problematic, especially when one knows that it is generally considered uneconomical to unload imported fertilizers in more than two harbors for the lot sizes generally imported. Cost-saving exercises for this matter require a perfect knowledge of market demand as well as of the inventories per product and per area. FPA's monthly information

feedback to the trade on inventory levels, as discussed in preceding sections, will be essential.

It is also understood that the fleet capacity is not sufficient to cope with the present high volume of commodities that has to be transported, especially from Manila. In addition, it is claimed that barges are slow and in poor condition. To help resolve the matter, according to Pal L. Ravina in the Manila Bulletin, "Phase II of the Standard Shipdesign Project for the domestic shipping fleet renewal, a joint project between the Philippine and Norwegian governments, was launched in November.

"The project, which is expected to be completed in a period of one year, is funded by the Norwegian Assistance for Development (NORAD) in the amount of six million Norwegian kroners."

"The study, which involves a comprehensive water and land transportation survey based on the needs and desires of local shipowners, calls for short-term and long-term development plans based on the following: 1) updating of the present situation of the interisland shipping industry; 2) analysis of present cargo and passenger movements; 3) preparations of economical considerations regarding modernization of the domestic fleet, particularly competitive vessels that are adapted to local conditions instead of second-hand vessels procured from overseas sources ; 4) analysis of the market for second hand vessels; and 5) preliminary design for three types of interisland vessels."

In conclusion, interisland shipping is possibly the major distribution constraint in the fertilizer market in the Philippines. Any step to improve it and to eliminate cross traffic should contribute to reducing distribution expenses.

j. Remote Areas

As demonstrated in previous sections, and based on the few available indicators (presence of fertilizer distributors, dealers and warehouses), the servicing of remote and partially remote areas (r.a) has not significantly deteriorated as one might have feared following deregulation. It is understood from discussions with fertilizer handlers that this situation is due to the activities of the smaller marketers who like to trade in r.a. Indeed, end-user prices are higher in r.a., which are neglected by the "majors" because of their small size and/or because they cannot compete in such areas due to their higher overhead costs. The upgrading and growth of provincial distributors at the importer level, particularly in Cebu, which is strategically located at the geographical center of the country, might have contributed as well to the maintenance of the servicing of the r.a. in the Visayas, as one might have expected, but also in the Northern Mindanao provinces. Better

knowledge of these areas by provincial importers, who are usually integrated upstream in the purchase of agricultural outputs, gives them a distinct advantage over their competitors based in Manila.

Further improvements in the servicing of r.a., if any, will certainly be slow for economical reasons. Improvements might follow the establishment of regular liner services, port facilities improvements in remote islands, and development of the road network in inland areas. However, for socio-political purposes, state- or quasi-state-owned enterprises, such as PHILPHOS and PPI, might decide to service such areas even at a loss. The private sector cannot be expected to do so without prospects of recovering their losses within an acceptable time frame.

k. Port Unloading and Bagging Facilities

As specified in the UNICO Study, the mechanization of unloading can only be achieved with bulk materials. Bulk imports, bagged on shore, reached 74% (346,140 M.T.) of total imports during the first half of 1987 as against 35% (301,470 M.T.) in 1986. This large increase is due to the decrease in the importation of small tonnage products following deregulation, and the increase in imports of bulk urea (80% imported in bulk during the first semester of 1987 against 38% in 1986).

All eleven national import harbors ("disports") are equipped with mobile hoppers owned and handled by seven private bagging companies. The present rate of bagging (25 kg bags) is 300 MT per 24 hours per hatch (or per hopper) or 1200 MT/24 hours for a four-hatch vessel. Substantial savings on demurrage cost could therefore theoretically be achieved by bulk unloading in dump trucks and by bagging in nearby warehouses. Estimated demurrage costs vary on the average as follows:

Lot Sizes	Estimated Costs per day (US$)
5,000	2,000
10,000	2,500
15,000	3,000
20,000	4,000 to 5,000

It is understood that this matter is being studied by several importers, also with the possibility of warehouse bulk blending. The resulting savings in the latter case would be a minimum of P500 per MT depending on the NPK grades and lot sizes involved. This is possible because of the relatively high end-user prices of NPK fertilizers and the use of light investment equipment such as concrete mixers.

If the present rate of bulk urea imports is maintained, it will be worth investigating the adequacy of the present unloading and bagging facilities in the major harbors since the scale of the operation might now justify additional investments.

This study could be part of a larger one concerning the possible economics of monitoring interisland transshipment, which would cover port unloading, warehouse blend bulking and bagging. It should also be pointed out that in Manila, where 325,000 MT, representing 40% of the national imported fertilizer traffic, were handled in 1986, unloading is done entirely by barges from anchored vessels.

1. Import Lot Sizes

The 1983 UNICO Fertilizer Sector Study mentioned the centralization of imports as a way of reducing costs. In the present free trade context, this proposal does not seem possible anymore as it would imply restoring strong governmental control over private sector importers. However, the available data on import consignments of fertilizers as shown in table 5A-23 seem to indicate that their sizes have increased during the past 12 months (July to June 1987) compared with 1982. Indeed, 83% of the tonnage imported during the last twelve months consisted of lot sizes over 10,000 MT as against 70% in 1982, while the average lot size increased from 10,490 MT in 1982 to 12,440 MT in 1986/87. It should be pointed out that several of the new small importers have been grouping their imports during the past twelve months.

G. Recommendations

The terms of reference specify that as far as marketing is concerned, the study should "recommend specific measures the GOP should take to promote the development of a more efficient private sector fertilizer marketing and distribution system, given the objective of minimizing government control on the private sector."

The recommendations listed below are a summary of those made in chapter VI and annex 5 dealing with the marketing of chemical fertilizers in the Philippines. Distribution receives special attention as it absorbs a large share of marketing expenses and therefore of gross margins. Most of these recommendations will require further investigation.

1. Lowering of Fertilizer Prices

One of the specific objectives of the study was to provide measures which, if implemented, would lead to lower fertilizer prices.

Table 5A-23

Comparison of Import Size Lots of Urea in 1982 and 1986/87

Ranges (MT)	1982					July 1986 to June 1987				
	Lot Numbers		Total Volumes			Lot Numbers		Total Volumes		
		Cumul	M.T.	%	Cumul		Cumul	M.T.	%	Cumul
30,001 and above	-	-	-	-	-	1	1	39,260	6.3	6.3
25,001 - 30,000	1	1	25,666	8.7	8.7	3	4	82,368	13.3	19.6
20,001 - 25,000	3	4	67,240	22.9	31.6	5	9	106,546	17.1	36.7
15,001 - 20,000	4	8	73,673	25.1	56.7	6	15	111,463	17.9	54.6
10,001 - 15,000	3	11	38,850	13.2	69.9	15	30	178,016	28.6	83.2
5,001 - 10,000	8	19	59,514	20.3	90.2	12	42	71,839	11.6	94.8
0 - 5,000	9	28	28,751	9.8	100.0	9	51	32,461	5.2	100.0
Total	28		293,694	100.0		51		621,953	100.0	
Volume Increase in % 1986/87 over 1982			-					112%		
Average Lot Size (MT)			10,489					12,439		

Source: Prepared from data available at FPA, November 1987

As demonstrated in the discussion of costs and margins, further reductions in end-user prices cannot come from the fertilizer handlers' net margins, which are already alarmingly slim. They can consequently come only from the removal of customs duties on imports and from a reduction of distribution expenses, over time.

a. Competitiveness of the Marketing Channels

The low profitability of chemical fertilizer marketing might discourage present handlers. Their number might consequently fall to such a low level that the risk of collusion would appear. As already suggested, deterrent measures could be taken should this risk materialize (e.g., product shortage with consequent price increase) by concerted actions of FPA in conjunction with one of the state-owned or private corporations. Indeed, the proposed FPA market intelligence unit should be able to detect any premonitory sign of market disturbance and react to it by suggesting appropriate measures. For instance, in the case of product shortage, FPA could use its own right to import the likely-to-be-missing grade(s) or better, ask another agricultural concern to do it. Down the line, the dominant three-tier marketing channel might be replaced progressively by a two-tier channel following the up-and down-stream integration of the distributor (wholesaler) level. This would be a natural and rational evolution in line with the prevailing slim marketing gross margin. However, the lower level of the marketing chain, the dealer level, requires the special attention of FPA. As suggested earlier, an evaluation of the viability of business at the dealer level should be carried out. Its objective would be to determine which actions should be taken to give the best possible service to the farming community in exchange for a fair return to the retailer. This study should also investigate the availability of credit for working capital and investment in storage and transport facilities. At this stage it can already be recommended that dealer competitiveness should be maintained if not improved by training in administrative, financial, and operational aspects of their business. This task could be entrusted to FPA. The training of retailers in fertilization should remain the responsibility of the DA extension service. FPA should monitor the effectiveness of this training and, if necessary, sponsor "train the trainer" courses at the level of the extension service specialists.

b. Lowering of Import Costs

The cost of imported fertilizers have come down after deregulation, whereas transfer prices to the trade of locally produced grades (NP and NPK) have continued to increase. Consequently, it is advisable to consider liberalizing all chemical fertilizers to force local manufacturers to lower their prices in the face of foreign competition. As explained earlier,

this measure should also increase the profitability of all traders not involved in marketing PHILPHOS and AFC fertilizer by giving them a larger range of products.

c. Saving on Inventories

Savings on inventories could be achieved by improving importers' market intelligence. This role should be entrusted to FPA. By having prior access to this information, FPA could also react against product shortages.

d. Savings on Distribution Expenses

Interisland shipping is possibly the major distribution constraint of fertilizer marketing in the Philippines. FPA should, consequently, sponsor a survey of this sector. It should also cover the economics as well as the technological and commercial aspects of warehouse bulk blending and bagging economics. If the large increase in bulk imports, which is noticeable in 1987, is confirmed, port unloading facilities should also be investigated.

All these measures should allow savings on vessel demurrage expenses. Warehouse blending, if viable, would improve the trader's profitability and might, to some extent, force down the transfer prices of PHILPHOS' and AFC's' NPK grades.

2. Strengthening of FPA Coordinators' Efficiency

Control of product quality and bag weight would improve the efficiency of fertilizer use. A strengthening of the FPA field force is recommended. Their training as market information collectors is also recommended.

3. Reducing Credit Charges for Small Farmers

FPA should participate in the sponsoring of any survey aimed at updating knowledge of non-institutional credit channels for small farmers finance their agricultural inputs. If such a study is implemented, it is suggested that special attention be given to the quedan concept as a means to provide cheaper credit to the small farmer. Emphasis should be put on training farmers in the economics of fertilizer use and the importance of credit worthiness.

4. Improvement of the Servicing of Remote Areas.

Improvements in the servicing of remote areas in agricultural inputs which are justified for socio-political rather than economical reasons should be entrusted to state-owned or quasi-state-owned enterprises such as PHILPHOS and PPI.

ANNEX 6

INFORMATION BASE FOR FPA ANALYSIS AND MONITORING, SELECTED METHODS AND SOURCES

A. Purpose of Annex

This annex is not intended to be a comprehensive review of methods and sources. In each case, much is well known to FPA and the Philippine fertilizer sector or has been indicated at various points in the present report. The purposes are to review (1) some aspects of inventory analysis, and (2) a few other issues of sources and analysis.

B. Inventory Analysis

1. Measurement of Demand

As in many other countries, estimates of final demand for fertilizers may be subject to considerable short-term errors since they are measured by warehouse sales. In consequence, apparent changes in annual or seasonal demand often include quite significant variations in pipeline inventories at the final stages of marketing. It is desirable that a system for monitoring inventory changes at this level in the system be developed so that more precise measures of monthly, seasonal and annual demand can be made. This might be done through FPA field coordinators or through a specialist monitoring team established in FPA along the lines of a recent proposal by IFDC for Bangladesh (see chapter VI.)

2. Rapid Dissemination of Inventory Data

FPA collects inventory information from the principal marketers. This should be collated and disseminated back to the industry as aggregate raw data as quickly as possible, without waiting for detailed analysis, by striking a balance between the desire for complete accuracy initially and the need to make corrections subsequently. It should have such regional and product breakdowns as are consistent with the confidentiality of information from individual marketers and manufacturers.

Annually or at the beginning of each season, needed and actual inventories should be appraised in relation to the prospects for demand, supply and international prices, and the results disseminated rapidly.

C. Early Warning Use of Inventory Information

1. Factors Determining Optimal Levels of Inventory

As a minimum, inventories should always be sufficient to ensure a smooth working of the pipeline from port or factory to the farm, to provide timely supplies, and to avoid erratic short-term fluctuations in prices. But this minimum level will vary according to the extent that supplies will be promptly available when demanded by importer or distributor.

Optimal inventories depend upon a mix of considerations, which will vary in importance one with another from time to time according to prospects for fertilizer demand and supply. These considerations are:

- Sufficient inventories for smooth pipeline operation;
- The ability and willingness of foreign producers and shippers to ensure prompt and assured supply, both of which vary according to general supply/demand balances in production and ocean transport;
- Carrying costs of inventories;
- The middleman's expectations of short-term price changes; and
- The more immediate prospects for domestic demand.

Optimal inventories can vary considerably according to circumstances. They should not be judged simply by some inflexible rule regarding the technical minimum for smooth pipeline operation, nor should carrying costs be considered in isolation from other economic costs or benefits. For example, the exceptionally large build-up of urea inventories recorded from November 1986 to June 1987 would appear as a wasteful glut unless account is taken of the exceptionally depressed world market prices over most of the period. Prices FOB West Europe in bags were down to around $65/ton in November-December and averaged some $75/ton in November-May, as against an average for the rest of 1987 of around $100/ton. There seems to have been much shrewd buying at a time when world markets were patently far below likely short-term changes. Apart from the substantial private profit, this has saved the Philippines a large amount of foreign exchange.

2. The Role of the Private Sector in Inventory Management

The economic management of inventories is not easy. With hindsight, it will often be seen that mistakes have been made. However, private businessmen are normally likely to be at least

as efficient in a fully liberalized situation as control through a public body, and probably more efficient, in maintaining inventories at or near economically optimal levels. Of course, they will need to be provided with exactly the same kinds of market intelligence as a public stock management organization would have, and much of which will need to be provided by FPA.

3. Crisis Management in Inventory Control

However, there are two types of situation which could pose special problems, namely where the risks of falling short of the minimum pipeline supplies to ensure a smooth flow of product must take absolute precedence over other considerations and where there will be need for very much closer public supervision of the month-by-month situation than is normally needed:

- The uncertain flow of credits and grants that finance a substantial part of imports could lead to significant disruption of supplies, requiring GOP appraisal of the adequacy of stocks for tiding over the disruption and of the need for any special action.

- Extremely tight international markets, as has been envisaged in chapter IV for some time in the early 1990s, would pose the same but somewhat longer-term problem.

In these circumstances a well-developed early warning system is needed.

Such an approach has been discussed in Agro-Chemical News in Brief, Special Issue of June 1987, with particular reference to Bangladesh, Indonesia, Pakistan, and Sri Lanka. In these cases the monthly demand-supply balances were studied over five years to test whether there were any clear monthly patterns in cumulative changes in supply relative to demand. If such patterns can be established they can be related to opening inventories and to projected monthly demand to identify the times when critical problems of availability might arise when supply is limited.

Philippine supply-demand balances have been examined for the five agricultural years beginning April 1982. This period has seen substantial changes in the factors affecting monthly supply-demand balances, particularly the severe financial stringency of 1984, the startup of PHILPHOS in November 1985, the general liberalization of marketing in 1986, and the strong price incentive to unusually large stocking of urea by importers towards the end of calendar 1987 and early 1988. In these circumstances, it has been difficult as yet to detect any clear seasonal patterns in supply-demand balances.

However, it is highly desirable to have the fullest possible historical record as one means of gaining perpsective on possible developments whenever the maintenance of an adequate supply is threatened by either an unexpected disturbance in the flow of foreign credits and finance or by tight international markets. Tables 6A.1-6A.5 and tables 6A.6- 6A.9 provide appropriate data for the last five years to April 1986/March 1987. This information should be updated regularly to provide a more complete record and to identify seasonal patterns. In this way, for example, if the fertilizer emergency of high international prices and tight supplies should materialize in the early 1990s, there would be records for nine or ten years to assist in anticipating likely changes in monthly supply-demand balances.

D. Short- and Medium-term Outlooks for International Prices and Supplies

1. General

The time periods here are (1) as little as one month and up to one year, and (2) five years.

2. World Demand/Supply Balances in Each of the Three Principal Nutrients

The annual reports of the FAO/UNIDO/World Bank give a five-year perspective on demand/supply for nitrogen, phosphates and potash. The information is usually available to governments well before official publication as a document of the FAO Fertilizer Commission. The most recent published and unpublished reports have been cited in annex 2, and are used already by FPA. Backup information on plant-by-plant and country-by-country capacities are prepared by W.F. Sheldrick, Fertilizer Advisor of the World Bank.

As indicated in annex 2, these sources need to be used bearing in mind that (1) no attempt is made to forecast closures of capacity unless they have been announced, even through the considerations of age profile of plants and pressures of market forces often mean that there will be substantial additional changes to those known at the time of the analysis, and that (2) the forecasts for the still important category of "other phosphates" fail to reflect the substantial future reductions of capacity which will occur if, as is virtually certain, adjustments continue in line with the strongly-established trends of the last 17 years. In particular, these considerations mean that the Working Group's forecasts made at a time of accute oversupply can seriously overestimate world capacities, especially in nitrogen and phosphates.

By contrast, the forecasts make no allowance for unannounced new plants which may come on stream towards the end of the five-

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Table 6A.1

Philippines: Monthly Supply-Demand Balances of Fertilizer - 1982-1983 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
N													
1. Production	2,418.00	1,602.00	2,086.00	--	--	966.00	2,209.00	977.00	1,232.00	2,365.00	1,419.00	4,020.00	19,294.00
2. Imports	13,097.00	22,702.00	24,218.00	12,155.00	47,254.00	17,421.00	24,975.00	14,722.00	17,436.00	11,091.00	7,394.00	1,848.00	214,313.00
3. Supplies (1&2)	15,515.00	24,304.00	26,304.00	12,155.00	47,254.00	18,387.00	27,184.00	15,699.00	18,668.00	13,456.00	8,813.00	5,868.00	233,607.00
4. Monthly Per cent	6.60	10.40	11.30	5.20	20.20	7.90	11.60	6.70	8.00	5.80	3.80	2 50	100.00
5. Cumulative Per cent	6.60	17.00	28.30	33.50	53.70	61.60	73.20	79.90	87.90	93.70	97.50	100.00	--
6. Sales	12,829.00	12,906.00	26,707.00	21,387.00	25,923.00	20,617.00	16,523.00	18,752.00	26,746.00	19,237.00	16,833.00	14,428.00	232,893.00
7. Monthly Per cent	5.50	5.50	11.50	9.20	11.10	8.90	7.10	8.00	11.50	8.30	7.20	6.20	100.00
8. Cumulative Per cent	5.50	11.00	22.50	31.70	42.80	51.70	58.80	66.80	78.30	86.60	93.80	100.00	--
9. Surplus (+)/Deficit(-) (5-8)	1.10	6.00	5.80	1.80	10.90	9.90	14.40	13.10	9.60	7.10	3.70	--	--
P205													
1. Production	2,568.00	1,602.00	2,086.00	--	101.00	1,199.00	2,389.00	1,095.00	1,337.00	2,400.00	1,440.00	4,080.00	20,297.00
2. Imports	--	616.00	392.00	5,552.00	4,948.00	4,752.00	7,290.00	2,486.00	2,422.00	1,305.00	870.00	218.00	30,851.00
3. Supplies (1&2)	2,568.00	2,218.00	2,478.00	5,552.00	5,049.00	5,951.00	9,679.00	3,581.00	3,759.00	3,705.00	2,310.00	4,298.00	51,148.00
4. Monthly Per cent	5.00	4.30	4.90	10.90	9.90	11.60	18.90	7.00	7.40	7.20	4.50	8.40	100.00
5. Cumulative Per cent	5.00	9.30	14.20	25.10	35.00	46.60	65.50	72.50	79.90	87.10	91.60	100.00	--
6. Sales	4,058.00	5,091.00	4,890.00	4,498.00	5,587.00	4,173.00	4,037.00	5,471.00	7,254.00	4,383.00	3,835.00	3,287.00	56,564.00
7. Monthly Per cent	7.20	9.00	8.60	8.00	9.90	7.40	7.10	9.70	12.80	7.70	6.80	5.80	100.00
8. Cumulative Per cent	7.20	16.20	24.80	32.80	42.70	50.10	57.20	66.90	79.70	87.40	94.20	100.00	--
9. Surplus (+)/Deficit (-) (5-8)	(2.20)	(6.90)	(10.60)	(7.70)	(7.70)	(3.50)	8.30	5.60	0.20	(0.30)	(2.60)	--	--

**All values are in tons of nutrient excepting the specified percentages

Table 6A.1 (continued)

Philippines: Monthly Supply-Demand Balances of Fertilizer - 1982-1983 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
							K20						
1. Production	2,197.00	1,602.00	2,086.00	--	--	289.00	1,873.00	977.00	1,199.00	1,672.00	1,003.00	2,843.00	15,741.00
2. Imports	--	616.00	392.00	5,552.00	4,948.00	4,752.00	7,290.00	2,486.00	2,422.00	2,889.00	1,926.00	482.00	33,755.00
3. Supplies (1&2)	2,197.00	2,218.00	2,478.00	5,552.00	4,948.00	5,041.00	9,163.00	3,463.00	3,621.00	4,561.00	2,929.00	3,325.00	49,496.00
4. Monthly Per cent	4.50	4.50	5.00	11.20	10.00	10.20	18.50	7.00	7.30	9.20	5.90	6.70	100.00
5. Cumulative Per cent	4.50	9.00	14.00	25.20	35.20	45.40	63.90	70.90	78.20	87.40	93.30	100.00	--
6. Sales	4,429.00	5,985.00	5,544.00	5,170.00	5,476.00	4,414.00	4,761.00	5,326.00	5,986.00	5,160.00	4,515.00	3,870.00	60,636.00
7. Monthly Per cent	7.30	9.90	9.10	8.50	9.00	7.30	7.90	8.80	9.90	8.50	7.40	6.40	100.00
8. Cumulative Per cent	7.30	17.20	26.30	34.80	43.80	51.10	59.00	67.80	77.70	86.20	93.60	100.00	--
9. Surplus (+)/Deficit (-) (5-8)	(2.80)	(8.20)	(12.30)	(9.60)	(8.60)	(5.70)	4.90	3.10	0.50	1.20	(0.30)	--	--
							N+P205+K20						
1. Production	7,182.00	4,806.00	6,258.00	--	101.00	2,454.00	6,470.00	3,048.00	3,768.00	6,437.00	3,862.00	10,944.00	55,330.00
2. Imports	19,778.00	37,986.00	28,427.00	22,484.00	53,497.00	23,591.00	40,467.00	18,662.00	35,046.00	15,285.00	10,190.00	2,548.00	307,961.00
3. Supplies (1+2)	26,960.00	42,792.00	34,685.00	22,484.00	53,598.00	26,045.00	46,937.00	21,710.00	38,814.00	21,722.00	14,052.00	13,492.00	363,291.00
4. Monthly Per cent	7.40	11.80	9.50	6.20	14.70	7.20	12.90	6.00	10.70	6.00	3.90	3.70	100.00
5. Cumulative Per cent	7.40	19.20	28.70	34.90	49.60	56.80	69.70	75.70	86.40	92.40	96.30	100.00	--
6. Sales	21,316.00	23,982.00	37,141.00	31,055.00	36,992.00	29,204.00	25,321.00	29,548.00	39,985.00	28,780.00	25,182.00	21,585.00	350,091.00
7. Monthly Per cent	6.10	6.90	10.60	8.90	10.60	8.30	7.20	8.40	11.40	8.20	7.20	6.20	100.00
8. Cumulative Per cent	6.10	13.00	23.60	32.50	43.10	51.40	58.60	67.00	78.40	86.60	93.80	100.00	--
9. Surplus (+)/Deficit (-) (5-8)	1.30	6.20	5.10	2.40	6.50	5.40	11.10	8.70	8.00	5.80	2.50	--	--

**All values are in tons of nutrient excepting the specified percentages

Table 6A.2

Philippines: Monthly Supply-Demand Balances of Fertilizer - 1983-1984 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
					N								
1. Production	3,311.00	2,128.00	2,838.00	0.00	236.00	1,182.00	3,074.00	1,419.00	1,655.00	341.00	2,160.00	1,593.00	19,937.00
2. Imports	11,091.00	18,485.00	16,636.00	12,939.00	33,273.00	14,788.00	24,030.00	12,939.00	20,333.00	4,379.00	2,415.00	3,998.00	175,306.00
3. Supplies (1&2)	14,402.00	20,613.00	19,474.00	12,939.00	33,509.00	15,970.00	27,104.00	14,358.00	21,988.00	4,720.00	4,575.00	5,591.00	195,243.00
4. Monthly Per cent	7.40	10.50	10.00	6.60	17.20	8.20	13.90	7.30	11.30	2.40	2.30	2.90	100.00
5. Cumulative Per cent	7.40	17.90	27.90	34.50	51.70	59.90	73.80	81.10	92.40	94.80	97.10	100.00	--
6. Sales	14,428.00	16,833.00	26,451.00	21,642.00	26,451.00	19,237.00	16,833.00	19,237.00	28,856.00	13,011.00	13,336.00	9,384.00	225,699.00
7. Monthly Per cent	6.40	7.50	11.70	9.60	11.70	8.50	7.50	8.50	12.80	5.80	5.90	4.10	100.00
8. Cumulative Per cent	6.40	13.90	25.60	35.20	46.90	55.40	62.90	71.40	84.20	90.00	95.90	100.00	--
9. Surplus (+)/Deficit (-)(5-8)	1.10	4.00	2.30	(0.70)	4.80	4.50	10.90	8.20	8.20	4.80	1.20	0.00	--
						P205							
1. Production	3,360.00	2,160.00	2,880.00	0.00	240.00	1,200.00	3,120.00	1,440.00	1,680.00	379.00	2,206.00	1,935.00	20,600.00
2. Imports	1,305.00	2,176.00	1,958.00	1,523.00	3,916.00	1,740.00	2,828.00	1,523.00	2,393.00	2,677.00	630.00	0.00	22,669.00
3. Supplies (1&2)	4,665.00	4,336.00	4,838.00	1,523.00	4,156.00	2,940.00	5,948.00	2,963.00	4,073.00	3,056.00	2,836.00	1,935.00	43,269.00
4. Monthly Per cent	10.80	10.00	11.20	3.50	9.60	6.80	13.70	6.80	9.40	7.10	6.60	4.50	100.00
5. Cumulative Per cent	10.80	20.80	32.00	35.50	45.10	51.90	65.60	72.40	81.80	88.90	95.50	100.00	--
6. Sales	3,288.00	3,835.00	6,026.00	4,931.00	6,026.00	4,383.00	3,835.00	4,383.00	6,574.00	2,918.00	3,682.00	4,284.00	54,165.00
7. Monthly Per cent	6.10	7.10	11.10	9.10	11.10	8.10	7.10	8.10	12.10	5.40	6.80	7.90	100.00
8. Cumulative Per cent	6.10	13.20	24.30	33.40	44.50	52.60	59.70	67.80	79.90	85.30	92.10	100.00	--
9. Surplus (+)/Deficit (-)(5-8)	4.70	7.00	7.70	2.10	0.60	(0.70)	5.90	4.60	1.90	3.60	3.40	0.00	--

**All values are in tons of nutrient excepting the specified percentages.

Table 6A.2 (continued)

Philippines: Monthly Supply-Demand Balances of Fertilizer - 1983-1984 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
						K20							
1. Production	2,341.00	1,505.00	2,007.00	0.00	167.00	836.00	2,174.00	1,003.00	1,171.00	326.00	2,002.00	471.00	14,003.00
2. Imports	2,889.00	4,815.00	4,334.00	3,371.00	8,667.00	3,852.00	6,260.00	3,371.00	5,297.00	297.00	4,777.00	2,052.00	49,982.00
3. Supplies (1&2)	5,230.00	6,320.00	6,341.00	3,371.00	8,834.00	4,688.00	8,434.00	4,374.00	6,468.00	623.00	6,779.00	2,523.00	63,985.00
4. Monthly Per cent	8.20	9.90	9.90	5.30	13.80	7.30	13.20	6.80	10.10	0.90	10.60	4.00	100.00
5. Cumulative Per cent	8.20	18.10	28.00	33.30	47.10	54.40	67.60	74.40	84.50	85.40	96.00	100.00	--
6. Sales	3,870.00	4,515.00	7,095.00	5,805.00	7,095.00	5,160.00	4,515.00	5,160.00	7,740.00	3,183.00	3,563.00	3,076.00	60,777.00
7. Monthly Per cent	6.40	7.40	11.70	9.50	11.70	8.50	7.40	8.50	12.70	5.20	5.90	5.10	100.00
8. Cumulative Per cent	6.40	13.80	25.50	35.00	46.70	55.20	62.60	71.10	83.80	89.00	94.90	100.00	--
9. Surplus (+)/Deficit (-)(5-8)	1.80	4.30	2.50	(1.70)	0.40	(0.80)	5.00	3.30	0.70	(3.60)	1.10	0.00	--
						N+P2O5+K2O							
1. Production	9,012.00	5,794.00	7,725.00	0.00	644.00	3,219.00	8,369.00	3,862.00	4,506.00	1,046.00	6,368.00	3,999.00	54,544.00
2. Imports	15,283.00	25,476.00	22,928.00	17,833.00	45,856.00	20,380.00	33,118.00	17,833.00	28,023.00	7,353.00	7,822.00	6,051.00	247,956.00
3. Supplies (1&2)	24,295.00	31,270.00	30,653.00	17,833.00	46,500.00	23,599.00	41,487.00	21,695.00	32,529.00	8,399.00	14,190.00	10,050.00	302,500.00
4. Monthly Per cent	8.00	10.30	10.10	5.90	15.40	7.80	13.70	7.20	10.80	2.80	4.70	3.30	100.00
5. Cumulative Per cent	8.00	18.30	28.40	34.30	49.70	57.50	71.20	78.40	89.20	92.00	96.70	100.00	--
6. Sales	21,585.00	25,182.00	39,572.00	32,377.00	39,572.00	28,780.00	25,182.00	28,780.00	43,169.00	19,113.00	20,582.00	16,745.00	340,639.00
7. Monthly Per cent	6.30	7.40	11.60	9.50	11.60	8.40	7.40	8.80	12.70	5.60	5.90	4.80	100.00
8. Cumulative Per cent	6.30	13.70	25.30	34.80	46.40	54.80	62.20	71.00	83.70	89.30	95.20	100.00	--
9. Surplus (+)/Deficit (-)(5-8)	1.70	4.60	3.10	(0.50)	3.30	2.70	9.00	7.40	5.50	2.70	1.50	0.00	--

**All values are in tons of nutrient excepting the specified percentages.

Table 6A.3

Philippines: Monthly Supply-Demand Balances of Fertilizer-1984-1985 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
						---							
1. Production	2,116.00	965.00	1,499.00	1,128.00	1,186.00	1,323.00	550.00	0.00	2,796.00	3,055.00	3,671.00	3,157.00	21,446.00
2. Imports	4,042.00	20,144.00	7,127.00	43,679.00	19,214.00	13,506.00	15,031.00	22,294.00	25,064.00	8,091.00	23,332.00	5,020.00	207,354.00
3. Supplies (1+2)	6,158.00	21,109.00	8,626.00	44,807.00	20,400.00	14,829.00	15,581.00	22,294.00	27,860.00	11,956.00	27,003.00	8,177.00	228,800.00
4. Monthly per cent	2.70	9.20	3.80	19.60	8.90	6.50	6.80	9.70	12.20	5.20	11.80	3.60	-
5. Cumulative per cent	2.70	11.90	15.70	35.30	44.20	50.70	57.50	67.20	79.40	84.60	96.40	100.00	-
6. Sales	6,198.00	11,216.00	15,026.00	20,745.00	18,831.00	17,949.00	16,073.00	14,787.00	21,448.00	11,848.00	17,808.00	7,980.00	179,909.00
7. Monthly per cent	3.40	6.20	8.40	11.50	10.50	10.00	8.90	8.20	11.90	6.70	9.90	4.40	-
8. Cumulative per cent	3.40	9.60	18.00	29.50	40.00	50.00	58.90	67.10	79.00	85.70	95.60	100.00	-
9. Surplus (+)/Deficit (-) (5-8)	(0.70)	2.30	(2.30)	5.80	4.20	0.70	(1.40)	0.10	0.40	(1.10)	0.80	-	-
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						P205							
						---							
1. Production	2,625.00	968.00	1,846.00	1,372.00	1,186.00	1,172.00	502.00	62.00	0.00	921.00	2,211.00	3,744.00	16,609.00
2. Imports	2,432.00	6,383.00	4,834.00	3,847.00	7,438.00	6,059.00	1,720.00	6,355.00	8,185.00	2,436.00	3,896.00	1,221.00	54,806.00
3. Supplies (1+2)	5,057.00	7,351.00	6,680.00	5,219.00	8,624.00	7,231.00	2,222.00	6,417.00	8,185.00	3,357.00	6,107.00	4,965.00	71,415.00
4. Monthly per cent	7.10	10.30	9.40	7.30	12.10	10.10	3.10	9.00	11.50	4.70	8.50	6.90	-
5. Cumulative per cent	7.10	17.40	26.80	34.10	46.20	56.30	59.40	68.40	79.90	84.60	93.10	100.00	-
6. Sales	2,919.00	8,060.00	3,447.00	2,926.00	3,193.00	3,401.00	3,962.00	2,717.00	3,863.00	2,639.00	4,288.00	2,246.00	43,661.00
7. Monthly per cent	6.70	18.50	7.90	6.70	7.30	7.80	9.10	6.20	8.80	6.00	9.80	5.20	-
8. Cumulative per cent	6.70	25.20	33.10	39.80	47.10	54.90	64.00	70.20	79.00	85.00	94.80	100.00	-
9. Surplus (+)/Deficit (-) (5-3)	0.40	(7.80)	(6.30)	(5.70)	(0.90)	1.40	(4.60)	(1.80)	0.90	(0.40)	(1.70)	-	-
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**All values are in tons of nutrient excepting the specified percentages.

Table 6A.3 (continued)

Philippines:Monthly Supply-Demand Balances of Fertilizer-1984-1985 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
					----								
1. Production	520.00	954.00	115.00	156.00	1,186.00	1,084.00	440.00	0.00	0.00	0.00	0.00	0.00	4,455.00
2. Imports	3,234.00	839.00	1,789.00	20,394.00	1,692.00	1,104.00	840.00	1,998.00	4,654.00	742.00	1,400.00	1,325.00	40,011.00
3. Supplies (1+2)	37,540.00	1,793.00	1,904.00	20,550.00	2,878.00	2,188.00	1,280.00	1,998.00	4,654.00	742.00	1,400.00	1,325.00	44,466.00
4. Monthly per cent	8.40	4.00	4.30	46.20	6.50	4.90	2.90	4.50	10.50	1.70	3.10	3.00	-
5. Cumulative per cent	8.40	12.40	16.70	62.90	69.40	74.30	77.20	81.70	92.20	93.90	97.00	100.00	-
6. Sales	2,921.00	5,630.00	1,922.00	2,883.00	2,178.00	2,069.00	2,509.00	3,211.00	5,471.00	1,776.00	2,676.00	1,937.00	35,183.00
7. Monthly per cent	8.30	16.00	5.50	8.20	6.20	5.90	7.10	9.10	15.60	5.00	7.60	5.50	-
8. Cumulative per cent	8.30	24.30	29.80	38.00	44.20	50.10	57.20	66.30	81.90	86.90	94.50	100.00	-
9. Surplus (+)/Deficit (-) (5-8)	0.10	(11.90)	(13.10)	24.90	25.20	24.20	20.00	15.40	10.30	7.00	2.50	-	-
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						N + P205 + K20							
						----------							
1. Production	5,260.00	2,886.00	3,459.00	2,656.00	3,557.00	3,578.00	1,492.00	62.00	2,796.00	3,976.00	5,882.00	6,901.00	42,505.00
2. Imports	9,708.00	27,366.00	13,750.00	67,920.00	28,344.00	20,669.00	17,591.00	30,647.00	37,902.00	12,079.00	28,628.00	7,565.00	302,169.00
3. Supplies (1+2)	14,968.00	30,252.00	17,209.00	70,576.00	31,901.00	24,247.00	19,083.00	30,709.00	40,698.00	16,055.00	34,510.00	14,466.00	344,674.00
4. Monthly per cent	4.30	8.80	5.00	20.50	9.30	7.00	5.50	8.90	11.80	4.70	10.00	4.20	-
5. Cumulative per cent	4.30	13.10	18.10	38.60	47.90	54.90	60.40	69.30	81.10	85.80	95.80	100.00	-
6. Sales	12,038.00	24,906.00	20,395.00	26,553.00	24,202.00	23,419.00	22,544.00	20,714.00	30,783.00	16,264.00	24,772.00	12,162.00	258,752.00
7. Monthly per cent	4.70	9.60	7.90	10.30	9.30	9.00	8.70	8.00	11.90	6.30	9.60	4.70	-
8. Cumulative per cent	4.70	14.30	22.20	32.50	41.80	50.80	59.50	67.50	79.40	85.70	95.30	100.00	-
9. Surplus (+)/Deficit (-) (5-8)	(0.40)	(1.20)	(4.10)	6.10	6.10	4.10	0.90	1.80	1.70	0.10	0.50	-	-
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**All values are in tons of nutrient excepting the specified percentages.

TABLE 6A.4

Philippines: Monthly Supply-Demand Balances of Fertilizer - 1985-1986 **

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
						N							
1. Production	5,630.00	5,508.00	8,720.00	7,035.00	11,854.00	7,231.00	9,330.00	12,341.00	11,389.00	10,443.00	9,543.00	9,107.00	108,131.00
2. Imports	4,203.00	11,461.00	22,911.00	31,925.00	27,985.00	24,595.00	2,290.00	5,676.00	9,992.00	3,681.00	24,803.00	24,152.00	193,674.00
3. Supplies, Gross (1+2)	9,833.00	16,969.00	31,631.00	38,960.00	39,839.00	31,826.00	11,620.00	18,017.00	21,381.00	14,124.00	34,346.00	33,259.00	301,805.00
4. Exports	-	-	-	-	-	-	-	-	-	3,420.00	13,625.00	12,008.00	29,053.00
5. Supplies Net (3-4)	9,833.00	16,969.00	31,631.00	38,960.00	39,839.00	31,826.00	11,620.00	18,017.00	21,381.00	10,704.00	20,721.00	21,251.00	272,752.00
6. Monthly per cent	3.60	6.20	11.60	14.30	14.60	11.70	4.30	6.60	7.80	3.90	7.60	7.80	100.00
7. Cumulative per cent	3.60	9.80	21.40	35.70	50.30	62.00	66.30	72.90	80.70	84.60	92.20	100.00	-
8. Sales	15,608.00	18,048.00	18,663.00	25,454.00	19,606.00	13,494.00	15,678.00	16,895.00	21,177.00	27,157.00	21,824.00	15,304.00	228,908.00
9. Monthly per cent	6.80	7.90	8.20	11.10	8.60	5.90	6.80	7.40	9.20	11.90	9.50	6.70	100.00
10. Cumulative per cent	6.80	14.70	22.90	34.00	42.60	48.50	55.30	62.70	71.90	83.80	93.30	100.00	-
11. Surplus (+)/Deficit (-) (7-10)	(3.20)	(4.90)	(1.50)	1.70	7.70	13.50	11.00	10.20	8.80	0.80	(1.10)	-	-
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						P205							
1. Production	7,535.00	3,938.00	7,260.00	4,678.00	15,092.00	4,939.00	11,176.00	24,885.00	23,275.00	18,025.00	24,389.00	21,597.00	166,789.00
2. Imports	2,469.00	2,400.00	5,920.00	2,890.00	6,639.00	3,380.00	410.00	879.00	866.00	1,770.00	700.00	2,826.00	31,149.00
3. Supplies, Gross (1+2)	10,004.00	6,338.00	13,180.00	7,568.00	21,731.00	8,319.00	11,586.00	25,764.00	24,141.00	19,795.00	25,089.00	24,423.00	197,938.00
4. Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8,740.00	34,818.00	28,353.00	71,911.00
5. Supplies Net (3-4)	10,004.00	6,338.00	13,180.00	7,568.00	21,731.00	8,319.00	11,586.00	25,764.00	24,141.00	11,055.00	(9,729.00)	(3,930.00)	126,027.00
6. Monthly per cent	7.90	5.00	10.50	6.00	17.20	6.60	9.20	20.40	19.20	8.80	(7.70)	(3.10)	100.00
7. Cumulative per cent	7.90	12.90	23.40	29.40	46.60	53.20	62.40	82.80	102.00	110.80	103.10	100.00	-
8. Sales	4,287.00	3,550.00	4,687.00	4,554.00	4,518.00	2,970.00	2,612.00	2,979.00	3,492.00	5,681.00	4,335.00	1,581.00	45,246.00
9. Monthly per cent	9.50	7.80	10.30	10.10	10.00	6.60	5.80	6.60	7.70	12.50	9.60	3.50	100.00
10. Cumulative per cent	9.50	17.30	27.60	37.70	47.70	54.30	60.10	66.70	74.40	86.90	96.50	100.00	-
11. Surplus (+)/Deficit (-) (7-10)	(1.60)	(4.40)	(4.20)	(8.30)	(1.10)	(1.10)	2.30	16.10	27.60	23.90	6.60	-	-

**All values are in tons of nutrient excepting the specified percentages.

TABLE 6A.4 (continued)

Philippines: Monthly Supply-Demand Balances of Fertilizer - 1985-1986 **

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
						K2O							
1. Production	0.00	179.00	13.00	0.00	500.00	842.00	2,235.00	1,743.00	0.00	0.00	0.00	1,077.00	6,589.00
2. Imports	2,446.00	1,387.00	5,497.00	1,837.00	3,004.00	3,322.00	622.00	1,204.00	2,877.00	700.00	700.00	8,096.00	31,692.00
3. Supplies, Gross (1+2)	2,446.00	1,566.00	5,510.00	1,837.00	3,504.00	4,164.00	2,857.00	2,947.00	2,877.00	700.00	700.00	9,173.00	38,281.00
4. Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,500.00	1,500.00
5. Supplies Net (3-4)	2,446.00	1,566.00	5,510.00	1,837.00	3,504.00	4,164.00	2,857.00	2,947.00	2,877.00	700.00	700.00	7,673.00	36,781.00
6. Monthly per cent	6.60	4.30	15.00	5.00	9.50	11.30	7.80	8.00	7.80	1.90	1.90	20.90	100.00
7. Cumulative per cent	6.60	10.90	25.90	30.90	40.40	51.70	59.50	67.50	75.30	77.20	79.10	100.00	-
8. Sales	3,550.00	3,633.00	3,917.00	3,555.00	3,721.00	2,286.00	2,020.00	2,529.00	3,460.00	4,310.00	2,961.00	4,087.00	40,029.00
9. Monthly per cent	8.90	9.10	9.80	8.90	9.30	5.70	5.00	6.30	8.60	10.80	7.40	10.20	100.00
10. Cumulative per cent	8.90	18.00	27.80	36.70	46.00	51.70	56.70	63.00	71.60	82.40	89.80	100.00	-
11. Surplus (+)/Deficit (-) (7-10)	(2.30)	(7.10)	(1.90)	(5.80)	(5.60)	0.00	2.80	4.50	3.70	(5.20)	(10.70)	0.00	-
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						N+P2O5+K2O							
1. Production	13,164.00	9,624.00	15,993.00	11,712.00	27,449.00	13,012.00	22,742.00	38,969.00	34,664.00	28,469.00	33,932.00	31,781.00	281,511.00
2. Imports	9,118.00	15,249.00	34,329.00	36,651.00	37,628.00	31,297.00	3,321.00	7,758.00	13,735.00	6,151.00	26,203.00	35,074.00	256,514.00
3. Supplies, Gross (1+2)	22,282.00	24,873.00	50,322.00	48,363.00	65,077.00	44,309.00	26,063.00	46,727.00	48,399.00	34,620.00	60,135.00	66,855.00	538,025.00
4. Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12,160.00	48,443.00	41,860.00	102,463.00
5. Supplies Net (3-4)	22,282.00	24,873.00	50,322.00	48,363.00	65,077.00	44,309.00	26,063.00	46,727.00	48,399.00	22,460.00	11,692.00	24,995.00	435,562.00
6. Monthly per cent	5.10	5.70	11.60	11.10	14.90	10.20	6.00	10.70	11.10	5.20	2.70	5.70	100.00
7. Cumulative per cent	5.10	10.80	22.40	33.50	48.40	58.60	64.60	75.30	86.40	91.60	94.30	100.00	-
8. Sales	23,445.00	25,232.00	27,267.00	33,562.00	27,846.00	18,750.00	20,310.00	22,403.00	28,129.00	37,148.00	29,120.00	20,972.00	314,184.00
9. Monthly per cent	7.40	8.00	8.70	10.70	8.90	6.00	6.50	7.10	8.90	11.80	9.30	6.70	100.00
10. Cumulative per cent	7.40	15.40	24.10	34.80	43.70	49.70	56.20	63.30	72.20	84.00	93.30	100.00	-
11. Surplus (+)/Deficit (-) (7-10)	(2.30)	(4.60)	(1.70)	(1.30)	4.70	8.90	8.40	12.00	14.20	7.60	1.00	-	-
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**All values are in tons of nutrient excepting the specified percentages.

Table 6A.5

Philippines: Monthly Supply-Demand Balances of Fertilizer 1986-87 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
						N							
1. Production	10,001.00	10,433.00	10,588.00	9,106.00	5,878.00	10,455.00	11,432.00	7,504.00	15,457.00	10,255.00	11,252.00	13,514.00	125,875.00
2. Imports	31,172.00	22,485.00	18,316.00	33,010.00	27,967.00	27,557.00	29,213.00	37,861.00	19,775.00	27,237.00	14,832.00	1,002.00	290,427.00
3. Supplies, Gross (1+2)	41,173.00	32,918.00	28,904.00	42,116.00	33,845.00	38,012.00	40,645.00	45,365.00	35,232.00	37,492.00	26,084.00	14,516.00	416,302.00
4. Exports	9,069.00	10,682.00	10,662.00	5,229.00	5,607.00	10,946.00	8,051.00	2,532.00	12,003.00	12,555.00	4,718.00	8,982.00	101,036.00
5. Supplies Net (3-4)	32,104.00	22,236.00	18,242.00	36,887.00	28,238.00	27,066.00	32,594.00	42,833.00	23,229.00	24,937.00	21,366.00	5,534.00	315,266.00
6. Monthly per cent	10.20	7.00	5.80	11.70	9.00	8.60	10.30	13.60	7.40	7.90	6.80	1.70	100.00
7. Cumulative per cent	10.20	17.20	23.00	34.70	43.70	52.30	62.60	76.20	83.60	91.50	98.30	100.00	0.00
8. Sales	17,389.00	24,241.00	27,256.00	33,096.00	29,395.00	25,865.00	19,565.00	28,214.00	24,500.00	26,723.00	31,254.00	29,399.00	316,897.00
9. Monthly per cent	5.50	7.60	8.60	10.40	9.30	8.20	6.20	8.90	7.70	8.40	9.90	9.30	100.00
10. Cumulative per cent	5.50	13.10	21.70	32.10	41.40	49.60	55.80	64.70	72.70	80.80	90.70	100.00	0.00
11. Surplus (+)/Deficit (-) (7-10)	4.70	4.10	1.30	2.60	2.30	2.70	6.80	11.50	11.20	10.70	7.60	0.00	0.00
						P205							
1. Production	22,293.00	22,389.00	26,076.00	22,932.00	8,922.00	15,610.00	26,829.00	13,107.00	34,044.00	19,369.00	22,680.00	28,851.00	263,102.00
2. Imports	2,453.00	614.00	850.00	850.00	0.00	0.00	203.00	0.00	0.00	0.00	0.00	0.00	4,970.00
3. Supplies, Gross (1+2)	24,746.00	23,003.00	26,926.00	23,782.00	8,922.00	15,610.00	27,032.00	13,107.00	34,044.00	19,369.00	22,680.00	28,851.00	268,072.00
4. Exports	20,727.00	27,298.00	22,521.00	13,363.00	14,329.00	18,409.00	20,575.00	6,471.00	30,674.00	32,085.00	9,338.00	22,954.00	238,744.00
5. Supplies Net (3-4)	4,019.00	(4,295.00)	4,405.00	10,419.00	(5,407.00)	(2,799.00)	6,457.00	6,636.00	3,370.00	(12,716.00)	13,342.00	5,897.00	29,328.00
6. Monthly per cent	13.70	(14.60)	15.00	35.50	(18.40)	(9.50)	22.00	22.60	11.50	(43.40)	45.50	20.10	100.00
7. Cumulative per cent	13.70	(0.90)	14.00	49.60	31.20	21.70	43.70	66.30	77.80	34.40	79.90	100.00	0.00
8. Sales	2,689.00	2,891.00	5,080.00	5,070.00	4,670.00	3,385.00	3,156.00	3,638.00	3,400.00	3,743.00	7,320.00	5,296.00	50,338.00
9. Monthly per cent	5.30	5.80	10.10	10.10	9.30	6.70	6.30	7.20	6.80	7.40	14.50	10.50	100.00
10. Cumulative per cent	5.30	11.10	21.20	31.30	40.60	47.30	53.60	60.80	67.60	75.00	89.50	100.00	0.00
11. Surplus (+)/Deficit (-) (7-10)	8.40	(12.00)	(7.10)	18.20	(9.40)	(25.60)	(9.90)	5.50	10.20	(40.60)	(9.60)	0.00	0.00

**All values are in tons of nutrient excepting the specified percentages

Table 6A.5 (continued)

Philippines: Monthly Supply-Demand Balances of Fertilizer 1986-87 **

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
						K2O							
						---							
1. Production	1,436.00	2,747.00	497.00	230.00	3,792.00	6,062.00	1,178.00	1,665.00	600.00	1,876.00	2,423.00	1,998.00	24,504.00
2. Imports	12,783.00	104.00	350.00	2,430.00	13,320.00	1,799.00	1,326.00	0.00	208.00	3,507.00	8,400.00	0.00	44,227.00
3. Supplies, Gross (1+2)	14,219.00	2,851.00	847.00	2,660.00	17,112.00	7,861.00	2,504.00	1,665.00	808.00	5,383.00	10,823.00	1,998.00	68,731.00
4. Exports	1,575.00	0.00	3,038.00	0.00	14,329.00	4,586.00	0.00	0.00	0.00	0.00	1,748.00	0.00	25,276.00
5. Supplies Net (3-4)	12,644.00	2,851.00	(2,191.00)	2,660.00	2,783.00	3,275.00	2,504.00	1,665.00	808.00	5,383.00	9,075.00	1,998.00	43,455.00
6. Monthly per cent	29.10	6.60	(5.00)	6.10	6.40	7.50	5.80	3.80	1.80	12.40	20.90	4.60	100.00
7. Cumulative per cent	29.10	35.70	30.70	36.80	43.20	50.70	56.50	60.30	62.10	74.50	95.40	100.00	0.00
8. Sales	2,932.00	4,429.00	5,273.00	4,547.00	2,777.00	2,989.00	5,223.00	3,248.00	3,300.00	2,428.00	7,564.00	3,409.00	48,119.00
9. Monthly per cent	6.10	9.20	11.00	9.40	5.80	6.20	10.80	6.80	6.90	5.00	15.70	7.10	100.00
10. Cumulative per cent	6.10	15.30	26.30	35.70	41.50	47.70	58.50	65.30	72.20	77.20	92.90	100.00	0.00
11. Surplus (+)/Deficit (-) (7-10)	23.00	20.40	4.40	1.10	1.70	3.00	(2.00)	(5.00)	(10.10)	(2.70)	2.50	0.00	0.00
						N+P2O5+K2O							
						---							
1. Production	33,730.00	35,569.00	37,160.00	32,269.00	18,591.00	32,127.00	39,439.00	22,276.00	50,101.00	31,501.00	36,354.00	44,363.00	413,480.00
2. Imports	46,409.00	23,202.00	19,516.00	36,290.00	41,287.00	29,356.00	30,741.00	37,861.00	19,983.00	30,745.00	23,232.00	1,002.00	339,624.00
3. Supplies, Gross (1+2)	80,139.00	58,771.00	56,676.00	68,559.00	59,878.00	61,483.00	70,180.00	60,137.00	70,084.00	62,246.00	59,586.00	45,365.00	753,104.00
4. Exports	31,371.00	37,980.00	36,220.00	18,592.00	34,265.00	33,941.00	28,626.00	9,004.00	42,676.00	44,640.00	15,803.00	31,936.00	365,054.00
5. Supplies Net (3-4)	48,768.00	20,791.00	20,456.00	49,967.00	25,613.00	27,542.00	41,554.00	51,133.00	27,408.00	17,606.00	43,783.00	13,429.00	388,050.00
6. Monthly per cent	12.60	5.30	5.30	12.90	6.60	7.10	10.70	13.20	7.10	4.50	11.30	3.40	100.00
7. Cumulative per cent	12.60	17.90	23.20	36.10	42.70	49.80	60.50	73.70	80.80	85.30	96.60	100.00	-
8. Sales	23,010.00	31,561.00	37,609.00	42,713.00	36,842.00	32,239.00	27,944.00	35,100.00	31,200.00	32,893.00	46,138.00	38,105.00	415,354.00
9. Monthly per cent	5.50	7.60	9.10	10.30	8.90	7.80	6.70	8.40	7.50	7.90	11.10	9.20	100.00
10. Cumulative per cent	5.50	13.10	22.20	32.50	41.40	49.20	55.90	64.30	71.80	79.70	90.80	100.00	-
11. Surplus (+)/Deficit (-) (7-10)	7.10	4.80	1.00	3.60	1.30	0.60	4.60	9.40	9.00	5.60	5.80	0.00	-

**All values are in tons of nutrient excepting the specified percentages

Table 6A.6

Philippines: Summarized Cumulative Supply-Demand Balances *
For Five Years Ending 1986-87 - N

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
1982-83												
1. Supply %	6.6	17.0	28.3	33.5	53.7	61.6	73.2	79.9	87.9	93.7	97.5	100.0
2. Demand %	5.5	11.0	22.5	31.7	42.8	51.7	58.8	66.8	78.3	86.6	93.8	100.0
3. Balance %	1.1	6.0	5.8	1.8	10.9	9.9	14.4	13.1	9.6	7.1	3.7	-
1983-84												
1. Supply %	7.4	17.9	27.9	34.5	51.7	59.9	73.8	81.1	92.4	94.8	97.1	100.0
2. Demand %	6.4	13.9	25.6	35.2	46.9	55.4	62.9	71.4	84.2	90.0	95.9	100.0
3. Balance %	1.1	4.0	2.3	(0.7)	4.8	4.5	10.9	9.7	8.2	4.8	1.2	-
1984-85												
1. Supply %	2.7	11.9	15.7	35.3	44.2	50.7	57.5	67.2	79.4	84.6	96.4	100.0
2. Demand %	3.4	9.6	18.0	29.5	40.0	50.0	58.9	67.1	79.0	85.7	95.6	100.0
3. Balance %	(0.7)	2.3	(2.3)	5.8	4.2	0.7	(1.4)	0.1	0.4	(1.1)	0.8	-
1985-86												
1. Supply %	3.6	9.8	21.4	35.7	50.3	62.0	66.3	72.9	80.7	84.6	92.2	100.0
2. Demand %	6.8	14.7	22.9	34.0	42.6	48.5	55.3	62.7	71.9	83.8	93.3	100.0
3. Balance %	(3.2)	(4.9)	(1.5)	1.7	7.7	13.5	11.0	10.2	8.8	0.8	(1.1)	-
1986-87												
1. Supply %	10.2	17.2	23.0	34.7	43.7	52.3	62.6	76.2	83.6	91.5	98.3	100.0
2. Demand %	5.5	13.1	21.7	32.1	41.4	49.6	55.8	64.7	72.4	80.8	90.7	100.0
3. Balance %	4.7	4.1	1.3	2.6	2.3	2.7	6.8	11.5	11.2	10.7	7.6	-

* = (1) - (2)

30V

Table 6A.7

Philippines: Summarized Cumulative Supply-Demand Balances*
For Five Years Ending 1986-87 - P205

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
1982-83												
1. Supply %	5.0	9.3	14.2	25.1	35.0	46.6	65.5	72.5	79.9	87.1	91.6	100.0
2. Demand %	7.2	16.2	24.8	32.8	42.7	50.1	57.2	66.9	79.7	87.4	94.2	100.0
3. Balance %	(2.2)	(6.9)	(10.6)	(7.7)	(7.7)	(3.5)	8.3	5.6	0.2	(0.3)	(2.6)	-
1983-84												
1. Supply %	10.8	20.8	32.0	35.5	45.1	51.9	65.6	72.4	81.8	88.9	95.5	100.0
2. Demand %	6.1	13.2	24.3	33.4	44.5	52.6	59.7	67.8	79.9	85.3	92.1	100.0
3. Balance %	4.7	7.6	7.7	2.1	0.6	(0.7)	5.9	4.6	1.9	3.6	3.4	-
1984-85												
1. Supply %	7.1	17.4	26.8	34.1	46.2	56.3	59.4	68.4	79.9	84.6	93.1	100.0
2. Demand %	6.7	25.2	33.1	39.8	47.1	54.9	64.0	70.2	79.0	85.0	94.8	100.0
3. Balance %	0.4	(7.8)	(6.3)	(5.7)	(0.9)	1.4	(4.6)	(1.8)	0.9	(0.4)	(1.7)	-
1985-86												
1. Supply %	7.9	12.9	23.4	29.4	46.6	53.2	62.4	82.8	102.0	110.8	103.1	100.0
2. Demand %	9.5	17.3	27.6	37.7	47.7	54.3	60.1	66.7	74.4	86.9	96.5	100.0
3. Balance %	(1.6)	(4.4)	(4.2)	(8.3)	(1.1)	(1.1)	2.3	16.1	27.6	23.9	6.6	-
1986-87												
1. Supply %	13.7	(0.9)	14.1	49.6	31.2	21.7	43.7	66.3	77.8	34.4	79.9	100.0
2. Demand %	5.3	11.1	21.2	31.3	40.6	47.3	53.6	60.8	67.6	75.0	89.5	100.0
3. Balance %	8.4	(12.0)	(7.1)	18.3	(9.4)	(25.6)	(9.9)	5.5	10.2	(40.6)	(9.6)	-

* = (1) - (2)

Table 6A.8

Philippines: Summarized Cumulative Supply-Demand Balances*
For Five Years Ending 1986-87 - K20

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
						1982-83						
1. Supply %	4.5	9.0	14.0	25.2	35.2	45.4	63.9	70.9	78.2	87.4	93.3	100.0
2. Demand %	7.3	17.2	26.3	34.8	43.8	51.1	59.0	67.8	77.7	86.2	93.6	100.0
3. Balance %	(2.8)	(8.2)	(12.3)	(9.6)	(8.6)	(5.7)	4.9	3.1	0.5	1.2	(0.3)	-
						1983-84						
1. Supply %	8.2	18.1	28.0	33.3	47.1	54.4	67.7	74.4	84.5	85.4	96.0	100.0
2. Demand %	6.4	13.8	25.5	35.0	46.7	55.2	62.6	71.1	83.8	89.0	94.9	100.0
3. Balance %	1.8	4.3	2 5	(1.7)	0.4	(0.8)	5.0	3.3	0.7	(3.6)	1.1	-
						1984-85						
1. Supply %	8.4	12.4	16.7	62.9	69.4	74.3	77.2	81.7	92.2	93.9	97.0	100.0
2. Demand %	8.3	24.3	29.8	38.0	44.2	50.1	57.2	66.3	81.9	86.9	94.5	100.0
3. Balance %	0.1	(11.9)	(13.1)	24.9	25.2	24.2	20.0	15.4	10.3	7.0	2.5	-
						1985-86						
1. Supply %	6.6	10.9	25.9	30.9	40.4	51.7	59.5	67.5	75.3	77.2	79.1	100.0
2. Demand %	8.9	18.0	27.8	36.7	46.0	51.7	56.7	63.0	71.6	82.4	89.8	100.0
3. Balance %	(2.3)	(7.1)	(1.9)	(5.8)	(5.6)	-	2.8	4.5	3.7	(5.2)	(10.7)	-
						1986-87						
1. Supply %	29.1	35.7	30.7	36.8	43.2	50.7	56.5	60.3	62.1	74.5	95.4	100.0
2. Demand %	6.1	15.3	26.3	35.7	41.5	47.7	58.5	65.3	72.2	77.2	92.9	100.0
3. Balance %	23.1	20.4	4.4	1.1	1.7	3.0	(2.0)	(5.0)	(10.1)	(2.7)	2.5	-

* = (1)-(2)

Table 6A.9

Philippines: Summarized Cumulative Supply-Demand Balance*
For Five Years Ending 1986-87 - N + P205 + K20

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
						1982-83						
1. Supply %	7.4	19.2	28.7	34.9	49.6	56.8	69.7	75.7	86.4	92.4	96.3	100.0
2. Demand %	6.1	13.0	23.6	32.5	43.1	51.4	58.6	67.0	78.4	86.6	93.8	100.0
3. Balance %	1.3	6.2	5.1	2.4	6.5	5.4	11.1	8.7	8.0	5.8	2.5	-
						1983-84						
1. Supply %	8.0	18.3	28.4	34.3	49.7	57.5	71.2	78.4	89.2	92.0	96.7	100.0
2. Demand %	6.3	13.7	25.3	34.8	46.4	54.8	62.2	71.1	83.7	89.3	95.2	100.0
3. Balance %	1.7	4.6	3.1	(0.5)	3.3	2.7	9.0	7.4	5.5	2.7	1.5	-
						1984-85						
1. Supply %	4.3	13.1	18.1	38.6	47.9	54.9	60.4	69.3	81.1	85.8	95.8	100.0
2. Demand %	4.7	14.3	22.2	32.5	41.8	50.8	59.5	67.5	79.4	85.7	95.3	100.0
3. Balance %	(0.4)	(1.2)	(4.1)	6.1	6.1	4.1	0.9	1.8	1.7	0.1	0.5	-
						1985-86						
1. Supply %	5.1	10.8	22.4	33.5	48.4	58.6	64.6	75.3	86.4	91.6	94.3	100.0
2. Demand %	7.4	15.4	24.1	34.8	43.7	49.7	56.2	63.3	72.2	84.0	93.3	100.0
3. Balance %	(2.3)	(4.6)	(1.7)	(1.3)	4.7	8.9	8.4	12.0	14.2	7.6	1.0	-
						1986-87						
1. Supply %	12.6	17.9	23.2	36.1	42.7	49.8	60.5	73.7	80.8	85.3	96.6	100.0
2. Demand %	5.5	13.1	22.2	32.5	41.4	49.2	55.9	64.3	71.8	79.7	90.8	100.0
3. Balance %	7.1	4.8	1.0	3.6	1.3	0.6	4.6	9.4	9.0	5.6	5.8	-

* = (1)-(2)

year period as the industry adjusts to the prospects of cyclically tight markets. Longer-term tightness of supply might be misjudged.

The International Fertilizer Association provides medium-term forecasts, particularly for phosphate rock and sulphur, for its annual general conference and for some of its regional meetings. IFA and IFDC both provide occasions for discussion of the Working Group forecasts, as well as other assessments from time to time. IFA published a comprehensive range of annual reports, such as a review of phosphoric acid capacities, which are an important aid in building and maintaining a planning data base on demand and supply.

3. United States Phosphate Sector

The United States' phosphate sectors (rock, intermediate and finished products) are weather bells to changing supply and demand in world markets. Demand/supply balances can be calculated from published statistics to become available much more quickly than those of the Working Group's North America subgroup, as well as being more comprehensive. Monthly inventory data is available and is often a critical ingredient in understanding the very short-term changes in world market prices. The principal published sources of information are the USDA, the U.S. Department of Commerce, the Bureau of Mines of the U.S. Department of the Interior, and the industry's principal representation organization, the Fertilizer Institute. Other sources include Phosrock, Phoschem and the fertilizer unit at TVA.

A data base for demand/supply, inventories and prices in the U.S. phosphate sectors, updated monthly, would be of considerable value to the Philippines, both as an exporter of compounds and importer of phosphate rock, although cooperation with similarly interested developing countries in East Asia would be desirable to share costs. U.S. expertise is readily available for setting up the necessary statistical series and source contacts.

4. Sulphur

There is hardly any need to pursue short- and medium-term outlooks for this commodity, given the Philippines' marginal dependence on world markets. Apart from the specialist journals, which will be well-known, the most useful sources for general background information are probably the U.S. Bureau of Mines and the Canadian Sulphur Institute.

5. Market Intelligence

The work of FADINAP, in bringing together short-term information on prices, freight rates and similar matters of

special interest to the Asian fertilizer industry, and the monthly and bi-monthly newsletters of several private consulting and reporting organizations are sufficient for a general supervisory body such as FPA, but cannot be expected to be sufficiently prompt or comprehensive for commercial purposes. The telex and fax reporting services provided by several consulting organizations are geared to this last need.

E. Longer-Term Outlook for Prices and Demand/Supply

1. The Methods of Annex 2

Annex 2 provides a number of pointers to international issues which need to be kept under close review by FPA, as far as resources permit.

a. Projections of World Demand

Annex 2 indicates the considerable difficulties found in making forecasts of demand. "Scientific Approaches" do not have a good record in recent years, partly due to mistakes in assessing the general macroeconomic background and partly due to the difficulty of measuring fertilizer/output response relationships. By the same token, the "Delphi Method" of the Working Group is highly likely to be over-influenced by the recent past and immediate outlook, and thereby unduly pessimistic.

b. Forecasts of Trends in International Prices

Annex 2 has developed its long-term price projections by two approaches: (1) trend analysis of inflation-adjusted prices, and (2) cost of production and required rate of return budgeting with optimal technologies and size of plants. (The latter is also used in chapter V and annex 4 on PHILPHOS.) As the annex reveals, there is often need to reconcile significant differences in results from the two methods. Trend analysis is usually preferable, although the budgeting studies are critically important supports.

Whichever method is used, there has been the problem of handling the changes in the international value of the U.S. dollar which, particularly since 1980 has been an unrepresentative unit of measurement of the variations in international fertilizer price confronted by most economies. Even so, the dollar remains the most convenient unit of account.

In the analysis of inflation-adjusted trends, there are three basic rules:

- Select a long enough period to avoid important cyclical distortions. In the case of nitrogen, phosphate and

potash, it is best to go back to the early 1960s. (In any case reliable price data for these three sets of products usually are not available for earlier years.) Sulphur prices need to be considered over a much longer period to avoid cyclical distortions.

- o Allow for the sharp appreciation and then depreciation of the dollar exchange rate in the 1980s. In late 1987 the dollar was more or less in line with its 1970s trend.

- o Adjust for the effect of any critical shifts in the trends of costs of production on the long-run price. The discussion of the effects of energy costs and technological changes on urea prices in annex 2 illustrate this point.

The one important set of cost of production studies in recent years are, of course, those which W.F. Sheldrick has published regularly over the last eight years, mostly for the Working Group but also in several World Bank reports and at IFA and other conferences.

c. Sulphur

The analysis of the long-term outlook for sulphur is a particularly complex component in any appraisal of the future of fertilizer manufacture in the Philippines (i.e. PHILPHOS). As Annex 2 has indicated, published analysis is extremely limited. Should any detailed appraisal be required, it would be advisable to turn to one of the specialist consulting firms, possibly participating in the periodic multi-client studies, which in the recent past have been provided by one or other of two combinations of U.S. and U.K. firms.

ANNEX 7

FERTILIZER USE

A. Regional Demand For Fertilizer

From July 1986 to June 1987, the Philippines consumed about 295,900 tons of N, 51,000 tons of P_2O_5, and 46,800 tons of K_2O. The distribution of consumption by region based on warehouse withdrawals is shown in graph 7A-1. Comparing apparent regional demands in 1986-87 with 1983 figures shows a great deal of disparity in patterns. For instance, in 1986-87 the bulk of the fertilizer materials, particularly N, was consumed in Region IV.

Actually, this indicates limitation of available data and the pitfall of basing regional consumption on the basis of warehouse withdrawals. This data provides no means of accounting for withdrawals in one region to serve the needs of other regions, as for instance the off-takes in Metro Manila that may be used to serve the needs of provinces in Regions I to V. This data limitation constrains a detailed analysis of factors affecting regional demand.

The potential demand for fertilizer by the various regions is expected to be influenced by the amount of arable land, population, crops grown and areas devoted to each crop, cropping intensity, area under irrigation, market infrastructures, and soil fertility status. Regional sets of data are available for some of these parameters but there exist no empirical data on the relationship of these factors to fertilizer demand. Accordingly, it is difficult to make quantitative predictions on a regional basis.

Based on limited experimental results compiled by the Philippine Council for Agriculture and Resources Research and Development (PCARRD), the percentage distribution of nutrient responses (obtained from experimental studies involving varying rates of NPK applications) were plotted by region (graph 7A-2). A high percentage distribution for a particular level of nutrient indicates a greater probability of getting optimum yield responses from fertilizer application at that particular nutrient level. For instance in the case of N, not a single experiment conducted for all regions showed comparable yields at zero N application with that of fertilized areas. In fact for all regions, optimum yield responses for N occurred at around 60 - 80 kg N/ha application. There were only a very limited number of experiments in a few regions showing optimum N responses at 135 kg N/ha. For P, optimum responses were obtained between 30 to 40 kg P_2O_5/ha. In contrast, most soils in all regions did not respond to K fertilization. This information if further refined can be a useful basis for directing fertilizer supplies

Table 7A-1

Total Annual Fertilizer Nutrient Consumption and Average Nutrient Application Rates for the Cropped Area of each Region, 1983

Region	No.	Total Nutrient ('000 ton)			Crop Area Harvested ('000 Ha)	Ave. Fert. Rate (Kg/Ha)		
		N	P205	K20		N	P205	K20
Ilocos	(I)	11.0	3.1	2.0	566.2	19.4	5.5	3.5
Cagayan Valley	(II)	10.5	3.3	2.0	764.0	13.7	4.3	2.6
Central Luzon	(III)	57.1	11.0	6.5	615.9	92.7	17.9	10.6
Southern Tagalog	(IV)	23.5	2.3	1.9	1,408.0	16.7	1.6	1.3
Bicol	(V)	5.3	1.3	0.9	1,021.8	5.2	1.3	0.9
Western Visayas	(VI)	72.0	19.3	25.6	1,067.9	67.4	18.1	24.0
Central Visayas/ Eastern Visayas	(VII,VIII)	14.2	5.1	5.2	1,871.5	7.6	2.7	2.8
Western Mindanao/ Southern Mindanao	(IX, XII)	34.2	3.6	14.8	2,168.6	15.8	1.7	6.8
Northern Mindanao	(X)	11.3	5.0	4.3	997.8	11.3	5.0	4.3
Central Mindanao	(XI)	4.8	0.8	1.3	1,723.2	2.8	0.5	0.8
		---	---	---	---	---	---	---
		243.9	54.8	64.5	12,204.9	20.0	4.5	5.3

NOTES: 1. The total fertilizer nutrient was base estimated consumption of fertilizer by region, 1983.
2. The crop area harvested (for all crops) was based from the estimates of Bureau of Agricultural Statistics, 1983

Table 7A-2

Total Annual Fertilizer Nutrient Consumption and Average Nutrient Application Rates for the Cropped Area of each Region, 1986-87

Region	No.	Total Nutrient ('000 ton)			Crop Area Harvested ('000 Ha)	Ave. Fert. Rate (Kg/Ha)		
		N	P205	K20		N	P205	K20
Ilocos	(I)	8.9	0.6	0.4	566.2	15.7	1.0	0.7
Cagayan Valley	(II)	1.4	0.1	0.0	764.0	1.8	0.1	0.0
Central Luzon	(III)	6.5	0.2	0.4	615.9	10.5	0.3	0.7
Southern Tagalog	(IV)	174.0	36.7	23.2	1,408.0	123.6	26.1	16.5
Bicol	(V)	0.0	0.0	0.5	1,021.8	0.0	0.0	0.5
Western Visayas	(VI)	43.1	9.5	10.7	1,067.9	40.3	8.9	10.0
Central Visayas/ Eastern Visayas	(VII,VIII)	9.0	1.0	0.8	1,871.5	4.8	0.5	0.4
Western Mindanao/ Southern Mindanao	(IX, XII)	30.2	2.2	2.8	2,168.6	13.9	1.0	1.3
Northern Mindanao	(X)	0.4	0.0	0.0	997.8	0.4	0.0	0.0
Central Mindanao	(XI)	22.6	0.9	8.0	1,723.2	13.1	0.5	4.6
		---	---	---	---	---	---	---
		296.0	51.0	46.9	12,204.9	24.2	4.2	3.8

(particularly for P and K, in case of a shortage of these nutrients).

B. Fertilizer Consumption by Crops

Rice and sugarcane account for 78.4% of the total fertilizer demand based on the latest survey of fertilizer consumption by crop. Corn accounts for only 6.4% of the total fertilizer consumed during the year. Despite the sizable drop in sugarcane acreage lately, rice and sugarcane still consume the bulk of fertilizers in the country.

The average nutrient application rate for cropped lands in the Philippines was 20 kg N, 4.5 kg P_2O_5 and 5.3 kg K_2O per hectare in 1983 (table 7A-1). In 1986-87, the average nitrogen application increased slightly to 24.2 kg N/ha, phosphorus rate was maintained while potassium slightly decreased (table 7A-2). These nutrient application rates are notably very low compared with the optimum fertilizer application rates of some major crops in the country. For example, the range of optimum fertilization rates, estimated from yield responses to fertilizers of some major crops, is as follows:

Table 7A-3

Optimum Fertilization Rates of Some Major Crops

Crops	Optimum Fertilizer Application Rates, Kg/Ha		
	N	P_2O_5	K_2O
Rice	60 - 90	30 - 40	0 - 30
Corn	60 - 90	30 - 60	0 - 60
Sugarcane*	100 - 150		
Coconut	150		125

* The average recommendation formula by the Philippine Sugar Commission (PHILSUCOM) is 200 - 100 - 300 NPK.

Source: Bureau of Soils

Based on the nutrient removal by crops (table 7A-4), these nutrient application rates are expected to lead to nutrient depletion and imbalance under prolonged and intensified agriculture.

In addition, on the basis of farmers' actual fertilization practices (table 7A-5), it appears that for farmers who use fertilizers, their application rates are much higher than the national average application rate. This implies that a significant number of farmed areas are not being fertilized at all.

Table 7A-4

Nutrient Removal by Crops

Crop	Yield Level (Kg/ha)	Nutrient Removal Kg/Ha		
		N	P_2O_5	K_2O
Rice	4,000 (grain)	90	35	110
Corn	4,500 (grain)	110	45	155
Sugarcane	90,000 (cane)	120	75	250
Coconut	100 (trees)	53	50	93

The above data indicates the potential of a promotional campaign aimed at increased use and level of usage of fertilizer on a national scale.

Table 7A-5

Actual Farmers' Fertilization Practices (Bureau of Soils, 1983)

Crop	Actual Farmers' Fertilization Practices, Kg/Ha		
	N	P_2O_5	K_2O
Rice			
Irrig. Dry Season	90 - 130	0 - 60	0 - 80
Irrig. Wet Season	30 - 70	0 - 30	0 - 20
Rainfed Lowland	30 - 70	0 - 30	0 - 20
Rainfed Upland	55 - 65	0	0
Corn			
HYV	50 - 150	20 - 80	0 - 40
Ord. Variety	25 - 35	25 - 40	0 - 35
Sugarcane	90 - 160	0 - 50	0 - 35
Coconut (100 tree/ha)	0 - 70	30	30
Vegetables	20 - 130	0 - 40	0 - 120

C. Fertilizer Consumption by Grade

In the early 1970's, urea accounted for 45 to 55% of total N with ammonium sulfate supplying 20 to 30% of the total N demand. The share of urea increased to 70% in 1983; for the period July 1986 to June 1987 urea supplied 80% of the N requirement. The share of ammonium sulfate has stabilized to around 10 to 11% of

the total N consumed. Ammonium sulfate is expected to maintain its current demand considering the need for S in some 1.3 million ha of sulfur-deficient areas (tables 7A-6 and 7A-7).

In the case of phosphorus, NP grades accounted for almost all of the P requirements. For potash, MOP supplied 56% of the consumption in 1986.

D. Fertilizer Output/Input Ratios

There is a clear need to generate ouput/input (O/I) values for crops to fertilizers on a regional basis. The effort of UNICO (1986) in this respect is of considerable interest. Unfortunately, the UNICO analysis does not appear to have recognized the complications involved and its results are misleading.

The generation of O/I values requires the use of specific fertilizer functions for characterizing the region. In the UNICO report, however, the response function used in calculating the O/I values for the various crops was an average response function for each crop for the whole country. This is very difficult to accept since in a quadratic equation the parametric coefficients (in this case a, b, and c) in the equation determine the position and shape of the yield response curve. The coefficients b and c which determine the shape of the curve influence the first derivative of the response function, an important determinant of the O/I ratio and the optimum economic fertilization rate. The coefficients, as can be observed from the several data sets presented in the report, vary considerably in time (e.g., the effect of season), in space (e.g., the effect of soil variation), variety and management, among others. In addition, as the equation is non-linear, it is very difficult to justify an average response curve for a very large and highly heterogeneous area. Instead, stratifying the country or even the region into units of homologous environmental conditions is suggested for generating a more functional yield response function for each region.

The UNICO report also made use of regional coefficients and the interpretation of these values should also be treated with caution. The value of the regional coefficient was taken from the average of realization rates (realization rates = the ratio of the farmer's yield with respect to expected yield at a particular level of fertilizer application). It is supposed to reflect the management skills of farmers in relation to the management requirements of the technology, in this case fertilizer technology innovation. However, the use of one point (at the farmers' application level) of the response curve in generating the realization rate (which was used eventually to solve for regional coefficients) assumed that the response curve

Table 7A-6

Estimated Area Deficient in Sulfur
('000 Ha)

Soil Series	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Bantog Clay	23.7	9.6	49.8	2.3	5.4	20.5	1.8	0.2	6.1	10.3	6.8	-	136.4
San Manuel silt loam	82.5	50.1	18.7	53.2	10.0	-	-	45.9	24.1	4.6	0.0	7.4	296.5
San Manuel clay loam	28.7	1.5	0.0	45.7	20.5	15.4	-	6.7	35.6	22.2	0.0	-	176.3
San Manuel sandy loam	28.9	55.7	29.0	-	0.0	-	-	6.4	20.1	0.1	1.1	-	141.2
San Fernando clay	12.9	6.5	8.9	-	0.0	-	-	-	-	-	-	-	28.2
Quinqua clay loam	-	56.6	0.0	56.3	0.0	-	-	15.8	5.0	-	-	-	133.7
Quinqua silt loam	-	17.2	122.5	16.9	0.6	-	-	-	-	6.0	-	-	163.2
Umingan sandy loam	12.8	9.0	15.4	24.7	0.0	13.3	-	2.7	-	-	-	-	77.9
Mandawe clay loam	-	-	-	-	1.4	-	42.1	8.9	-	-	-	-	52.4
St. Rita clay loam	0.0	27.1	-	-	0.0	17.6	-	-	-	-	-	-	44.6
Bigaa clay	2.8	29.1	26.5	3.6	0.0	-	-	22.7	-	-	-	-	84.8
Ragas sandy clay loam	0.0	50.0	-	-	0.0	-	-	-	-	-	-	-	50.0
Total (A)	192.4	312.3	270.7	202.7	37.8	66.8	43.9	109.3	90.8	43.1	7.8	7.4	1,385.2
Total Area of Suitable Class for Cultivation (B)	398.4	916.2	734.5	1,547.0	392.6	455.0	245.1	1,065.6	660.7	719.4	564.4	825.7	8,524.7
A/B (%)	48.3	34.1	36.9	13.1	9.6	14.7	17.9	10.3	13.7	6.0	1.4	0.9	16.2

Source: Unico Report, 1983

Table 7A-7
Sulfur-deficit Areas in the Philippines

Soil Type	Province	Region
Bantog Clay	Ilocos Sur	Ilocos
San Manuel silt loam	Cagayan Ilocos Norte La Union Camarines Sur	Cagayan Valley Ilocos Ilocos Bicol
Quinqua silt loam	Zambales Cagayan	Central Luzon Cagayan Valley
Sanfernance clay	Cagayan Ilocos Norte	Cagayan Valley Ilocos
Prensa sandy loam	Nueva Ecija	Central Luzon
San Manuel clay loam	Ilocos Norte	Ilocos
Quinqua clay loam	Mindoro Occidental	Southern Tagalog
San Manuel sandy loam	Mindoro Occidental	Southern Tagalog
Umingan sandy loam	Mindoro Occidental	Southern Tagalog

Source: The Philippines Recommends for Fertilizer Management [PCARRD, 1982]

for the farmers' level of management is parallel to the response curve obtained at experimental fields, which is not necessarily valid.

There are many fertilizer response functions available (table 7A-8). Since these are generated under very specific circumstances, and considering the neutral, well-defined boundaries represented by each set of response functions, these data sets are difficult to decompose to characterize the regional variations in fertilizer use, except for demonstrating the value of fertilizer in increasing yields and in estimating the potential impact of fertilizer on production.

The O/I ratio is an important indicator in predicting farmers' use of fertilizers, but there is a dearth of data particularly on the spatial limits of application of available response functions to enable the generation of values which could be of use. This constitutes an area that needs attention from the research support services of the government.

E. Farm Constraints to Fertilizer Use

The various factors affecting farm use of fertilizer in the Philippines, particularly in rice, is reviewed in detail in annex 3. Some of the important results of the analysis follow.

a. In irrigated and more favorable shallow rainfed areas, the contribution of risk is very small in explaining the sub-optimal use of fertilizer.

b. The effective price of fertilizer is an important determinant in the farmer's decision to use fertilizer, especially in the short run. Non-price factors as a group are more important. In areas where the price of fertilizer relative to production is high, the yield gap attributable to fertilizer is also high. The quantitative relationship between the ratio of urea and rice prices to yield gap is shown in graph 7A-3.

c. Distance of the farm to fertilizer sources strongly influences fertilizer adoption and the level of fertilizer usage. This factor deserves critical examination as it implies several possible limitations: fertilizer availability, access to extension services, the marketing of excess produce, and the setting of an effective price of fertilizer.

It is significant to point out that there is a dearth of studies on farm-level constraints regarding the influence of national policies on pricing of agricultural products and the public provision of rural infrastructure and support services such as irrigation, research and extension, post-harvest facilities, and credit. Support services are vital complementary inputs to fertilizer and are expected to play a more significant

Table 7A-8

Crop Responses to Applied Fertilizer Nutrients
(Kg Foodgrain Per Kg Fertilizer Nutrient)

CROPS & SOURCE OF DATA	NUTRIENTS N	P	K	NPK Combined Effect
1. Paddy (rough rice)				
a) Field experimental data 1/				
IRRI (a)				
irrigated (MV)	15.0	-	-	
rainfed (MV)	14.0	-	-	
IRRI (b)				
irrigated (MV)	14.0	-	-	
rainfed (MV)	13.0	-	-	
b) Farm survey data 2/				
irrigated (MV)	16.0	-	-	
rainfed (MV)	14.1	-	-	
2. Corn				
UPLB-PCARRD 3/	18.0	12.0	3.0	
UNDP/FAO 4/	14.0	7.0	4.0	
3. Fruits 5/				8.0
4. Vegetables & Others 5/				12.0

Estimated values of response ratios of IRRI's (a) and (b) are based on the following response functions:

	(a)	(b)
irrigated	$Y=2000+19.0\ N - 0.090\ N^2$ (45)	$=2100-18.0\ N - 0.09\ N^2$ (45)
rainfed	$Y=1200+16.0\ N - 0.110\ N^2$ (20)	$=1400+15.0\ N - 0.11\ N^2$ (20)

Figures in parentheses indicate nutrient rates at which the response was estimated.

MV = Modern varieties
1/ (a) R.W. Herdt & C. Capule (1983)
(b) C.C. David & R. Barker (1978)
2/ E. Price (1983)
3/ UPLB-PCARRD Proj. No. 820
4/ UNDP/FAO Fertilizer Demonstration and Pilot Credit Scheme (1972-77)
5/ Proxy crops are banana for fruits, and potato for vegetables.

role in the long-term growth and enhancement of fertilizer usage. Unfortunately, GOP investments in these complementary support services have been declining.

F. Impact of Environment on Fertilizer Use Efficiency

The yield response to fertilizer is affected by the climatic conditions under which the crop grows. Yield gap analysis indicates that environment may explain 70% of the gap between farmers' and researchers' yields. What this shows is that farmers have less control over environmental variables affecting yield than researchers.

Of the climatic variables, water constitutes the single most important factor affecting yield. Without irrigation, farm activities are basically dictated by rainfall. To a large degree, the farmer's ability to effect timely performance of agricultural operations determines the yield level that he gets.

Under similar water availability, the response to fertilizer is higher during periods with high solar radiation. With lower radiation levels, maximum yields are obtained with smaller fertilizer applications.

In general, with the same fertilizer rate, the dry season yields are higher than the wet season; and moisture stresses drastically reduce response to fertilizer (graph 7A-4).

G. Impact on Variety

In rice, the modification of plant type from tall to dwarf stature, the shortening of growth duration from more than 150 days to less than 125 days, and the development of associated cultural packages to grow these varieties, has resulted in a very dramatic rise in yield potential. Contrary to popular belief, modern rice varieties are more fertilizer-responsive and more efficient users of fertilizer. Furthermore, their response to fertilizer is generally less variable compared to traditional varieties. This is indicated by the lower variability of the response coefficients shown below:

Table 7A-9

CV of Response Coefficients as Affected by Variety and Season

SEASON/VARIETY	CV OF RESPONSE COEFFICIENTS		
	a	b	c
Wet season			
Modern Variety	0.29	0.45	0.50
Traditional Variety	0.41	4.82	43.80
Dry Season			
Modern Variety	0.23	2.03	1.15
Traditional Variety	0.29	2.89	0.89

Source: Barker et al. (1982)

The lower coefficient of variation of the response coefficients of the modern variety indicates the stability of the fertilizer yield response.

Extensive analyses of response functions consistently show that modern varieties have higher yields, higher yield increases (/_\Ym), higher maximum yield fertilizer level (Fm), and higher average productivity of fertilizer as shown below:

Table 7A-10

Comparative Fertilizer Response Functions of Modern and Traditional Rice Varieties

Variety	No. of Trials	Coefficient of Response Functions			/_\Ym	Fm	/_\Ym/Fm
		a	b	c			
Wet Season							
Modern	31	3337	31.1	-0.178	1347	87	15.5
Traditional	30	2873	-2.5	-0.001	0	0	0
Dry Season							
Modern	29	4053	46.1	-0.130	4086	177	23.0
Traditional	29	4018	5.9	-0.090	96	33	5.9

Source: C.C. David and R. Barker (1978)

The above data indicate that coupling fertilizer use with modern varieties in effect minimizes risks because of better yield stability and improved fertilizer response.

H. Fertilizer Use Recommendation Methodologies and Practices

1. Existing Fertilizer Use Recommendations

Basically, the Philippines employs soil analysis techniques as the basis for assessing the fertilizer needs of crops (table 7A-11). Recently, the Philippine Coconut Authority started to rely on leaf analysis to assess nutrient needs of coconut by adapting the methodology of IRHO (table 7A-12). Tests are still underway to refine the methodology by field fertilizer trials. A nationwide survey has been undertaken of the coconut producing regions, and areas deficient in the major nutrients have been pinpointed (table 7A-13). Also recently, a quick method of soil testing was developed by the UP College of Agriculture to provide rapid assessment of nutrient needs in the field. Efforts are being exerted to popularize the use of this methodology by the extension service and farmers themselves.

The Bureau of Soils has regional soils laboratories to serve the soil-testing needs of the various regions. The commodity agencies (particularly the Philippine Sugar Authority) also have sugar mill district laboratories, in addition to the main laboratories in La Granja and Luzon Experiment Stations. Agricultural universities like the University of the Philippines at Los Baños, Central Luzon State University, and private entities such as Canlubang Sugar Estate, First Farmers Milling, Victorias Milling Co., also have soil analysis laboratories.

2. Limitations of Existing Methodology for Fertilizer Recommendation

While the existing soil testing laboratories are generally up to standard, in terms of equipment and analytical procedures, there are basic limitations in fertilizer recommendation procedures.

The current practice is the use of soil test calibration curves derived from correlation of soil nutrient analyses and fertilizer field experiments. Fertilizer recommendations are then based on soil test values which are matched with the soil test calibration curve. At present, the Bureau of Soils is still using generalized calibration curves for the whole country. There is a dire need to come up with soil test calibrations and field correlations for each homologous agro-environment (e.g. similar soil series and climate) in order that soil test values be more reliable and acceptable as a guide for recommending fertilizer. The soil analysis technique as a methodology has an inherent constraint. To date, no one has been able to simulate the nutrient-extracting capability of the plant root system under natural conditions. Until this is done, the soil analysis technique merely indicates the "ball park" figures of the nutrient status of soils.

Table 7A-11

Methods of Soil Chemical Analysis (Bureau of Soils)

SOIL PROPERTY	METHODS
pH	1:1 (soil:H_2O), pH meter
Organic matter	Chromic acid digestion (Walkley and Black)
Phosphorus (available)	Olsen, 0.5 M $NaHCO_3$ extraction
Potassium	Flame photometer. hot H_2SO_4 extraction
Potassium (exchangeable)	Flame phototometer, NH_4AC extraction
Magnesium (exchangeable)	Atomic absorption spectrophotometer, DPTA extraction
Chloride (soluble)	$AgNO_3$ titration, hot water extraction
Sulfur (soluble sulfate)	Colorimeter, NH_4AC extraction

Table 7A-12

Methods of Leaf Analysis (Philippine Coconut Authority)

LEAF NUTRIENT	METHODS
Nitrogen (%)	Kjeldahl/Colorimetric
Phosphorus (%)	Dry ashing/Colorimetric
Potassium (%)	Dry ashing/Flame photometer
Calcium (%)	Dry ashing/Atomic absorption (spectrophotometer)
Magnesium (%)	Dry ashing/Atomic absorption (spectrophotometer)
Sodium (%)	Dry ashing/Flame photometer
Chlorine (%)	$AgNO_3$ titration/Potentiometer
Sulfur (%)	$BaSO_4$ precipitation/Colorimetric

Table 7A-13

Provinces under the Ten Nutritional Deficiency Classes
(PCA Leaf Survey)

DEFICIENCY CLASS	NUMBER OF PROVINCES	PROVINCES*
(1) N-deficient	6	Ilocos Norte, Ilocos Sur, Mindoro Oriental, Aklan, Camiguin, Capiz
(2) N + K-deficient	7	Cagayan, Mindoro Occidental, Camarines Norte, Cebu, Negros Occidental, Siguijor, Zamboanga del Norte
(3) N + Cl-deficient	5	La Union, Cavite, Batangas, Laguna, Zamboanga del Sur
(4) N + S-deficient	0	Sorsogon, Negros Oriental, Antique, Leyte (Norte), Southern Leyte, Northern Samar, Western Samar, Surigao del Norte, Surigao del Sur
(5) N + K + S-deficient	10	Pangasinan, Bataan, Zambales, Quezon, Marinduque, Camarines Sur, Albay, Masbate, Catanduanes, Bohol
(6) N + Cl + S-deficient	11	Nueva Viscaya, Isabela, Zamboanga City, Basilan, Agusan del Sur, Misamis Oriental, Lanao del Norte, Bukidnon, Davao City, Davao del Sur, Davao del Norte
(7) N + S + P-deficient	1	Palawan
(8) N + K + Cl + S-deficient	3	Agusan Norte, Misamis Occidental, Davao Oriental
(9) N + Cl + S + Mg-deficient	4	South Cotabato, North Cotabato, Sultan Kudarat, Maguindanao
(10) N + K + S + P-deficient	2	Eastern Samar, Iloilo

* Romblon, Lanao del Sur, Sulu and Tawi-Tawi provinces may be considered under N + K + Cl + S-deficient class, hence $(NH_4)_2SO_4$ is highly suggested.

The best indicator is still field fertilizer experiments. Owing, however, to the massive expenditures necessary to conduct agronomic field tests to reflect the numerous environmental variations encountered in nature, generalized fertilizer recommendations have been developed by averaging results of fertilizer trials conducted on wide areas grossly classified as agro-environmentally homogeneous. It is high time that GOP policy on this matter be revised. The use of an averaged and generalized basis for fertilizer recommendation implies that Philippine soils are of similar nutrient supplying-characteristics, which they are not.

Continued reliance on average values and failure to adopt values which reflect agro-ecological variations and changing economic conditions have resulted in an erosion of farmers' confidence in soil laboratories. This is an understandable result of some unhappy experiences, as may be expected, for instance, when in rice, the soil N content of Philippine soils ranges from 0.66 to 0.35 % total N, yet the government's credit and extension program prescribes uniform nitrogen application: 60 kg/ha in the wet season, 80 kg/ha in the dry season, for all soils deficient in nitrogen.

Another basic limitation of fertilization recommendations in the Philippines is the use of the maximum yield nutrient value as the basis for determining the amount of fertilizer nutrient to be added. This implies that no consideration is given to the economics of fertilizer use in coming up with a recommendation to the farmer. While this situation is now being rectified through the conduct of on-farm fertilizer trials, there exists no systematic effort to maximize the results of this undertaking by developing ways of extrapolating the site-specific results to other areas, and in using the information generated in upgrading the current system of fertilizer recommendation.

Another source of inefficiency in the current system is the prescription for blanket application of P and K. In sugar, for instance, there have been very few cases demonstrating responses to P and K applications, but the fertilizer recommendation formula provides for P and K application rates based on figures derived from P and K uptakes of the plant. It should be pointed out that only 14.6 % of the A & D lands (table 7A-14) have been classified as P-deficient soils, and fertilizer studies conducted on these soils even show erratic P responses. In the case of K, most Philippine soils are volcanic in origin and are still young. K is not expected to be limiting except for some crops which utilize K in excessive quantities such as sugarcane and coconut. There is, therefore, a need to review the soil test values being used for P and K. Except for intensively cultivated areas such

Table 7A-14

Soil Type and Use as Deficient in Phosphate

Soil Type	Province	Class	Area (Ha)
Bani clay	Pangasinan	M	45,295
Bolinao clay loam	Pangasinan	M	25,144
Amaninos clay loam	Pangasinan	M	63,400
San Maruel clay loam	Ilocos Sur	A	27,056
Quinqua silt loam	Zambales	A	7,767
Banic clay	Zambales	M	24,219
Bancal clay	Zambales	Be	59,442
Tolan silt loam	Cagayan	Bw	5,664
Bago sandy clay loam	Nueva Viscaya	Bw	5,282
Maligana clay loam	Nueva Viscaya	Bw	6,835
Cauayan clay	Isabela	De	21,274
Bago clay	Isabela	Bw	14,543
Sibul clay	Bulacan	M	25,440
Antipolo clay loam	Bataan	M	72,630
La Paz silt loam	Bataan	Bs	5,970
Luisiana clay loam	Laguna	M	27,152
Antipolo clay loam	Zamboanga del Sur	De	95,625
Castilla clay loam	Zamboanga del Norte	M	95,313
Adtuyon clay loam	Misamis Occidental	Ce	29,631
Guimbalaon clay loam	Misamis Occidental	M	25,519
Camiguin clay	Misamis Occidental	M	57,862
Adtuyon clay	Bukidnon	De	205,124
Kidapawan clay loam	Bukidnon	M	139,189
Macolod clay	Bukidnon	M	52,921
Maapag clay	Bukidnon	Bw	4,576
TOTAL			1,142,873
% Alienable Lands			14.59%

Note: Class A, Be, Bw, Bs: suitable for cultivation
Class De : suitable for pasture
Class M : suitable for forest

Source: The Philippines Recommendation for Fertilizer Management, PCARRD, 1983. Area of Land Capability Classes and Sub-classes of the Philippines, BOS, 1977.

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as irrigated rice and sugarcane, at the level of fertilization being practiced, the profitability of adding P and K appears doubtful in most Philippine soils.

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ANNEX 8

ORGANIC FERTILIZER

A. Status and Potential

There are several organic materials that can be tapped as organic fertilizer for crop production in the Philippines. The estimated volume of some important crop residues, farm manures, industrial wastes and organic deposits (table 8A.1) in the Philippines is some 97 million metric tons/year with an estimated potential nutrient contribution of 250,475 tons of N, 56,660 tons P and 352,624 tons of K (table 8A.2). These values represent about the same magnitude of fertilizer consumption in 1986.

In the Philippines, research on the use of agricultural residues as fertilizers and soil conditioners is fragmented and has not been conducted on a sustained basis. Except for the massive promotion program undertaken for Azolla in the early part of the decade, no programs exist to promote widespread use of organic materials.

B. Utilization of Organic Fertilizer

Many research efforts have been undertaken locally, and the important research results, including the use of organic materials in the country, are summarized below.

1. Crop Residues

In the Philippines, crop residues are generally burned because of the difficulty of incorporating these materials into the soil during land preparation, since most farms essentially utilize animal power to prepare the land. This procedure of land preparation prevents effective land preparation if bulky residues are present. Burning of residues destroys most of the nitrogen and sulfur and some of the K and makes it less available.

Rice straws when incorporated into the soil have brought about increases of 0.74 % organic matter, 0.03 % N, 2.3 ppm P and 0.32 me K/100 g soil. Yield increases of 10 to 18 % after 5 years of yearly straw incorporation have been observed (IRRI Annual Report 1974). Twenty-two-year grain yield data from long-term fertility trials of IRRI have also shown that substituting inorganic fertilizer N with rice straw compost by about 17% in the dry season and 40% in the wet season produces yields comparable to those entirely supplied with inorganic sources (IRRI, 1986). Rice straw is used as mulch by vegetable growers, but the amount used is insignificant compared to the biomass produced yearly.

Table 8A.1.

Estimated Volume of Organic Materials per Year and Volume of Organic Deposits in the Philippines

ORGANIC MATERIAL	AMOUNT (1000MT/Yr)	SOURCE OF INFORMATION
Crop Residue		
Rice straw	14,400	Thesis compilation
Corn stover	9,240	Thesis compilation
Sorghum stover	12	Thesis compilation
Peanut hay	150	Thesis compilation
Leucaena herbage	2,250	PROFEM projection
Farm Animal Manures		
Poultry	580	PCARR, 1980
Hog	3,879	PCARR, 1980
Industrial Wastes		
Bagasse	6,202	Cosico, 1977
Mudpress	505	A.M.Briones and A.A. Briones, 1976
Organic Deposits		
Guano	440	Bureau of Mines, 1977
Peat	59,136	A.M.Briones and A.A. Briones, 1976

Source: B.B. Mabbayad (1981)

Table 8A.2.

Estimated Total Nutrient Contribution per Year from Bulk Agricultural Residues

AGRICULTURAL RESIDUE	AMOUNT OF NUTRIENTS (TONS)		
	N	P	K
Rice straw	72,000	14,400	187,200
Corn stover	64,680	27,720	110,880
Sorghum stover	96	24	180
Peanut hay	3,466	301	3,014
Leucaena herbage	90,000	4,275	31,500
Poultry manure	847	2,958	2,958
Hog manure	19,395	6,982	16,292

Source: B.B. Mabbayad (1981)

Mudpress, a by-product of sugar manufacture, is extensively used by sugarcane growers and applied at the rate of 30 to 40 tons/ha. Sugarcane trashes, however, are burned as a precautionary measure to prevent disease infestation, particularly smut.

2. Farm Animal Manure

Farm animal manures are used to a limited extent in the Philippines. The large users (using mostly chicken manure) are the vegetable growers of Benguet province and fishpond owners. There exists one large agro-industrial plant (Maya Farms) which converts hog manure into biogas and sludge for use as feed and fertilizers. In fact, the plant is completely dependent on the energy generated by the biogas plant. Nationally, during the energy crunch in the late seventies, active promotional effort was undertaken to promote biogas generation. The effort did not prosper, with the lack of effective organization by farmers and social acceptance, among other things, constraining the spread of the technology.

3. Green Manure

Green manuring is not practiced in the Philippines because of the high cost of land preparation plus the competition posed by the green manure crop on the major crop. Research interest now centers on the potential use of legume trees such as Leucaena leucocephala (more popularly known as Giant Ipil-ipil) and species of forage legumes as green manure crops. Corn plants fertilized with herbage from intercropped Leucaena have produced as much grain as a pure stand of corn fertilized with inorganic materials (table 8A.3). This experiment indicates the feasibility of intercropping legume trees to provide for fertilizer needs of food crops. The nutrients provided can fully replace inorganic fertilizers without significant effect on yields. Another legume crop which has been identified to to be of good potential as a source of nutrient is the perennial style. It has been reported to contain from 200 to 300 kg N in its herbage (Alferez, 1978).

Table 8A.3.

Grain Yield of Corn as Influenced by Herbage Fertilization from Intercropped Leucaena, 1979-80 Cropping Season

TREATMENTS	CROPPING SEASON 1979 Wet	1980 Dry
Single hedgerows - full herbage utilization	3.02 ab	3.13 a
Single hedgerows - 2/3 herbage utilization	2.62 bc	2.73 bc
Triple hedgerows - full herbage utilization	2.47 c	2.98 ab
Triple hedgerows - 2/3 herbage utilization	2.35 c	2.93 b
Pure stand of corn fertilized with 60-30-30 (inorganic)	3.12 a	3.39 a
Pure stand of corn without fertilizer	2.18 c	2.53 c

In a column, means followed by a common letter are not significantly different at 5% level (DMRT).

More studies are still needed particularly on crop establishment, competition for space with the intended crops, and long-term sustainability of the practice before widespread use can be attempted.

C. Biological N Fixation

Microorganisms have been known to fix atmospheric N and make it available to plants. Inoculation of legume seeds with *Rhizobium* has long been developed in the country. Recent interests are focused on other organisms (both symbiotic and non-symbiotic) which have the potential to fix N.

1. Azolla

The azolla-anabaena symbiosis received considerable attention in the early eighties owing to some favorable results obtained in introducing this technology into the country. The symbiosis has been shown to produce one ton of green manure per hectare per day. This material contains 3 kg of fixed N which is equivalent to 7 kg urea. Large-scale trials in the Philippines (59 demonstration trials in 1983), showed without doubt the feasibility of azolla substituting for N requirements of rice. Mindanao, particularly South Cotabato, has been shown to be the best area for azolla. Its successful use, however, requires special management, and the technology is site-specific. This was confirmed further when in 1984 the GOP embarked on a national program to promote the use of azolla. In areas where rainfall is not stable, with sunlight intensity and temperature giving extreme values, azolla failed to multiply as expected. Pest infestation added to the problem.

2. Other Organisms

A number of organisms have been identified as N fixers in the country. It has been found that some 20 varieties of about 200 blue green algae species are N fixers. The BIOTECH Institute of the University of the Philippines at Los Baños (the only national institute actively engaged in biological N fixation), has isolated *Rhizobium japonicum* from several leguminous plants. N fixation of legumes has been found to increase by 130% when *Rhizobia* was applied in soybean seed furrows. In addition to BIOTECH research on *Rhizobia*, mycorrhizal associations are also being examined. To date BIOTECH is at the stage of commercializing a mycorrhizal association which has been proven to work effectively in an agro-forestry establishment.

D. Combination of Organic and Inorganic Fertilizers

Research on organic fertilizer shows a complementary effect of combining organic and inorganic nutrient sources. This effect

can be explained by the beneficial effects of organic materials in enhancing the physical properties of the soil by promoting soil aggregation resulting in improved soil structure, aeration and water infiltration. Soil chemical properties are also enhanced via the chelating effect on essential metal nutrients and improved nutrient balance. These beneficial effects indirectly promote a more efficient utilization of applied inorganic nutrients.

E. Constraints to the Utilization of Organic Materials

Despite conclusive evidence showing the merits of organic fertilizer sources, their use in crop production is still very limited. Following are some of the major constraints to their utilization.

1. Costs

On a per nutrient basis, organic fertilizer sources are more expensive than inorganic fertilizer at current prices. A commercial fertilizer material costs 13.5 times more per kg N compared to urea. (P_2O_5 and K_2O content costed using MOP and DAP materials.) Economic analysis on the use of azolla as a source of N showed that it is not cost-effective when compared with the cost of urea (Rosegrant et al., 1985). Furthermore, composting of organic residues is a labor-intensive process because it involves collection of bulky materials.

One of the reasons for the apparent poor cost-competitiveness of organic materials vis-a-vis inorganic fertilizer is the lack of data to quantitatively estimate the value of the indirect benefits of organic fertilizers such as the improvement of the physico-chemical properties of the soil.

2. Social and Public Health Problems

Some materials for organic fertilizers such as sludge, sewage and components from solid and municipal wastes, are particularly hazardous to health if appropriate treatment is not employed. Furthermore, social barriers exist in the use of manures. There exists a natural aversion to handling waste materials. The strength of this social constraint has been demonstrated by the failure of the GOP to popularize biogas technology for fertilizer and energy purposes. Housewives refuse to cook their food using the methane gas generated, and more so, to participate in the operation of the biogas system.

3. Absence of Appropriate Farm Technologies to Incorporate Crop Residues

The main reason for burning crop residues as in sugarcane farming is the lack of the necessary equipment to

properly prepare the land and at the same time incorporate the crop residues. Trash choppers or deep-tillage equipment (as in the pineapple industry) would promote crop residue incorporation into the soil. These machines, however, are beyond the reach of most farmers. Additionally, crop establishment procedures such as minimum tillage including effective and cheap control of pests like rats and root grubs which proliferate when organic materials are used, would promote the use of organic residues.

4. Competition with Other Uses

Organic residues are utilized as fuel as in the case of sugarcane bagasse or as feed in the case of rice straw. Recycling systems taking cognizance of these competing uses would promote the practice.

F. Recommended Measures to Promote the Use of Organic Fertilizer

Organic fertilizers present strategic opportunities for the GOP to cushion the adverse impact of increased fertilizer prices on farm productivity and incomes. Their use should be considered as a supplement rather than as an alternative to inorganic fertilizers. Furthermore,the viable use of these materials appears to be site-specific depending on the source of materials, labor availability, crops grown, climate, fertilizer costs, etc. Accordingly, attempts to promote the use of these materials should concentrate on identifying specific farm circumstances that favor the adoption of the technology.

That being so, a farming systems research and extension focus would be very meaningful in promoting the use of organic materials since the approach employs a total systems analysis and a holistic view of farm situations. It is of significance that now the DA organization is already oriented along the farming systems approach. Accordingly, it is expected that specific opportunity areas in the various regions of the country can be identified within which to anchor promotional programs for organic fertilizer. At present, considering the disparities in the costs of organic fertilizer if commercialized compared to inorganic sources, promotional efforts should be concentrated on farm level recycling of organic residues including green manuring.

The following are suggested general measures for the GOP to pursue:

1. Research and Development Reorientation Towards Cropping Pattern-Based Technology Options

If technology development is based on cropping pattern as opposed to commodity focus, technologies such as green

manuring, crop rotation and fallowing assume greater significance. Note that these technologies have a direct relevance to crop sequencing and timing which are normally overlooked in a single-commodity focus.

The need for short turn-around time in cropping systems is crucial. Furthermore, in a cropping sequence, incorporation of residues has implications on the fertilizer management of the succeeding crop. Unless these are properly addressed, organic manuring will be constrained.

2. Conduct of Long-Term Demonstration Trials to Assess the Economic Significance of Technologies Such as Green Manuring, Crop Rotation, Composting, and Crop Residue Incorporation

There exists a paucity of data for extension workers to use in demonstration trials to show the technical and economic viability of organic materials as fertilizer alternatives.

The conduct of such trials, apart from dramatizing the value of organic manuring, are also expected to provide the necessary data on long-term effects of organic materials on farm operations.

3. Continued Support to Research on Biological N Fixation

This area of work presents promising opportunities for low-cost technology in providing for N fertilizers. To date, some potential organisms have already been identified. Support should be given to continue testing these organisms, including the packaging of technologies that will be developed for farmer use.

4. Provision of Government Incentives in the Utilization of Indigenous Organic Fertilizer Resources

Substantial peat and guano reserves including lime deposits exist in the country. The GOP should provide appropriate incentives for the private sector to explore and develop these reserves such as the granting of pioneering status to investments in this area.