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9. ABSTRACT

In order to study the prices and the pricing process of three main capital goods in agriculture, viz., fertilizers, tractors and tubewells, it was decided to conduct a preliminary field survey wherein farmers as well as firms and agencies involved in the import, production and distribution of the three capital goods were interviewed with the help of specially prepared questionnaire. The interviews were carried out in November and early in December, 1973 in Peshawar, Islamabad, Lyallpur, Lahore, Karachi, Hyderabad, and Quetta areas, thereby covering all major regions of Pakistan.

The three capital goods studied involve somewhat different production and pricing processes. Fertilizer is manufactured domestically as well as imported. The marketing margins and the retail prices are set by the Central Government. Tractors are at present imported but there are plans for domestic assembly. Trading margins and prices of tractors are also controlled by the Central Government. Tubewells are manufactured in Pakistan from imported raw materials and components. While the Central Government does not fix margins or retail prices, it does influence them through its regulation and distribution of raw material inputs. Thus, one could say that the results of the survey basically reflect administered pricing. However, it may be pointed out that the prices actually paid by the farmers are often in excess of those fixed by the Government.

The three capital inputs have been discussed in three separate chapters and received identical treatment consisting of a review of the structure of distribution, an examination of costs and prices, and finally, a review of problems and issues. Since prices are affected by the institutional structure, a certain amount of overlap is involved. Some of the policy discussions deal as much with structure as with price.

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No. 18

THE PRICING OF AGRICULTURAL CAPITAL INPUTS IN PAKISTAN

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1974

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The Institute was established by the Government of Pakistan as an autonomous organization to conduct basic research on the problems of economic development with special reference to Pakistan. It also provides professional training in economic analysis and research methodology.

FOREWORD

Agriculture, the most important sector of Pakistan's economy, has been receiving special attention during the past several years. Capital inputs are being increasingly used on the farm. Since the pace of the use of capital inputs, so essential for agricultural modernization, depends heavily upon the prices which the farmer has to pay, a study of the pricing mechanism of the capital inputs assumes considerable importance. This monograph of the Pakistan Institute of Development Economics (PIDE) has attempted to study in depth the prices of three major capital inputs, viz.. fertilizers, tractors and tubewells, at each level of the marketing system. In some cases, problem areas are explored and alternative approaches suggested.

It is hoped that some of the implications of the policies discussed in this monograph within the framework of broad policy areas will prove useful in designing programmes for agricultural development in Pakistan. The study may also help identify some of the problems and areas which should be given high priority in future agricultural research.

The study was carried out by a joint team of six agricultural economists drawn from the PIDE and the U. S. Department of Agriculture (USDA). Mr. Mohammad Afzal, Research Economist at the PIDE, was the leader of the team. The other PIDE economists engaged in this study were Mr. Rauf Azhar and Mr. Mohammad Ahsan. The USDA economists were Messrs. Dana G. Dalrymple, Lyle P. Schertz and James R. Sayre who were supported by the U. S. Agency for International Development (US AID).

The study was completed in December, 1973. Since then, it must be pointed out here, the prices of fertilizers and petroleum in international trade have gone up dramatically.

The views expressed in this monograph are solely of the authors and do not necessarily reflect the official thinking of either the PIDE or the USDA.

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Introduction

Capital inputs have become increasingly important in the expansion of agricultural production in developing countries. Economists normally classify capital goods as fixed or working capital. Fixed capital contributes to the production process but is not immediately used up in that process. Thus, the term is generally used with reference to hardware items such as tractors, trucks, and pump sets. Working capital includes such goods as fertilizers which are consumed in the production process.

While the importance of capital goods is widely recognized, and their effects extensively studied, not much is generally known as to how they are priced or what the price levels are at various points in the marketing process.

In order to study the prices and the pricing process of three main capital goods in agriculture, viz., fertilizers, tractors and tubewells, it was decided to conduct a preliminary field survey wherein farmers as well as firms and agencies involved in the import, production and distribution of the three capital goods were interviewed with the help of specially prepared questionnaire. The interviews were carried out in November and early in December, 1973 in Peshawar, Islamabad, Lyallpur, Lahore, Karachi, Hyderabad, and Quetta areas, thereby covering all major regions of Pakistan.

The limited number of principals interviewed were concerned with the import, production and wholesale distribution of the three capital goods. It is possible to contact nearly all the key groups involved, the only exception being that of tubewell manufacturers. The degree of coverage dropped very sharply at the retailer and farmer stage because of the vast numbers involved.

The three capital goods studied involve somewhat different production and pricing processes. Fertilizer is manufactured domestically as well as imported. The marketing margins and the retail prices are set by the Central Government. Tractors are at present imported but there are plans for domestic assembly. Trading margins and prices of tractors are also controlled by the Central Government. Tubewells are manu-

factured in Pakistan from imported raw materials and components. While the Central Government does not fix margins or retail prices, it does influence them through its regulation and distribution of raw material inputs. Thus, one could say that the results of the survey basically reflect administered pricing. However, it may be pointed out that the prices actually paid by the farmers are often in excess of those fixed by the Government.

The three capital inputs have been discussed in three separate chapters and received identical treatment consisting of a review of the structure of distribution, an examination of costs and prices, and, finally, a review of problems and issues. Since prices are affected by the institutional structure, a certain amount of overlap is involved. Some of the policy discussions deal as much with structure as with price. A closing chapter attempts to cast some of the major findings of the study in a more general policy framework.

Chapter I

PRICING AND DISTRIBUTION OF FERTILIZERS

This section briefly reviews the pricing and distribution of fertilizer in Pakistan as of November 1973. It attempts to provide an introduction to the subject and suggest important policy areas requiring further study.

Structure of the Fertilizer Industry

The structure of Pakistan's fertilizer industry is fairly complex, involving not only Central and Provincial Governments but also Pakistani and American firms. Fertilizer is both produced in the country and imported.

In discussing the structure of the fertilizer industry, we will trace its evolution, examine statistics of fertilizer supply and consumption, review the present distribution system, and briefly note the proposed fertilizer plant construction.

Evolution[1]

Fertilizers were first imported by Pakistan in 1952 and the first domestic production reached the market in 1957. Imports were made solely by the Central Government which then supplied the imported fertilizers to the Provincial Governments for distribution through Government outlets. Domestic production was carried out in plants owned by the Pakistan Industrial Development Corporation (PIDC) and was initially sold through commercial agents in *mandi* towns.

In 1963-64, the Central Government decided to turn the distribution of fertilizer over to the Agricultural Development Corporation (ADC), with "basic democrats" at the village level acting as sub-agents. The arrangement with the "basic democrats" having proved unsatisfactory, the distribution of the domestically produced fertilizers was later entrusted to the Rural Supply Co-operative Corporation (RSCC).

From 1963-64 to 1968, imports and distribution of imported fertilizers were the responsibility of the ADC while the production and distribution

[1]Based on [2, pp. 9-10].

of domestically produced fertilizers were the responsibility of the PIDC. Both the organizations sold fertilizers through their commission agents many of whom acted as agents to both the ADC and PIDC simultaneously.

From January 1968 onwards, the ADC appointed a number of principal agents to carry out distribution while it itself concentrated on newer fertilizers or geographic areas where private distributors were not operating. The RSCC continued to be active in handling a large portion of the fertilizers produced by the PIDC factories. ESSO began fertilizer production in December 1968 and established its own distribution system. Other principal agents were private Pakistani firms the largest among which were Dawood Corporation Ltd., Jaffer Brothers Ltd., and Pakistan National Oils Ltd. (PNO).

Each private firm had its own retail distributors, though some retail agents served more than one principal agent. The privately owned Dawood-Hercules (D.H.) Urea Plant began production in October 1971; distribution was initially handled by several private principal agents but subsequently was undertaken by the Dawood Corporation and the Government.

On January 8, 1972, the ADC was dissolved and replaced by the Agricultural Supply Organization (ASO), which was charged with the responsibility of purchasing all imported fertilizers. Provincial counterparts were established in 1973 (e.g., the Sind Agricultural Supply Corporation, or SASCO, and the Punjab Agricultural Supply Corporation, PASCO) which took over local distribution formerly handled by the ADC and the RSCC.

On August 28, 1973, the Punjab Government provincialized the distribution of fertilizers within the province. At that time the functions of the four private principal agents (Dawood, Esso, Jaffer, and PNO) and others were to be assumed by the Provincial Agricultural Supply Corporations (but the Directorate of Agriculture in Baluchistan). A month later, the Punjab Government modified the new policy and permitted half of the distribution of the Dawood-Hercules urea output to remain in private hands. The number of principal private agents, however, was reduced to two, viz., Dawood and Esso, the latter having confined its operation to the southern portion of the province. Fertilizer distribution

in Sind was not provincialized but was influenced in that Dawood, Jaffer, and PNO withdrew from Sind and Esso increased its distribution there. The distribution system in the North-West Frontier Province (NWFP) remained unchanged as of November 1973.

Fertilizer Supply and Consumption Statistics

Fertilizer statistics may be divided into two main groups; those concerning supply and those relating to consumption. Supply, in turn, is composed of domestic production and imports.

Domestic Production

Domestic fertilizer production is largely of the nitrogenous types and is based on domestic natural gas. Phosphatic fertilizer production is relatively limited and is currently based on imported raw materials.

The major forms of the fertilizers produced in Pakistan are:

Urea	(46% N)
Ammonium Sulphate	(21% N)
Ammonium Nitrate	(26% N)
Single Superphosphate	(18% P)

Production of nitrogenous forms began in 1958 while that of the phosphatic forms began in 1957. Output has expanded considerably over the years, as shown in Table 1.

Details of domestic production, as of November 1973, are given in Table 2. Production levels in some of the PIDC factories in earlier years were below these levels.[8]

It is understood that Dawood-Hercules could increase their output by 15% if they could get more natural gas. This would be about 50,000 metric tons a year, a significant expansion in terms of total production. No plants were under construction in November 1973. One was scheduled to begin construction in January 1974 while negotiations were at an advanced stage on several others. (This matter will be discussed later in this section.)

[8]For further details on the first five plants through 1968-69, see [2, pp. 152-163].

Table 1

Domestic Fertilizer Production in Pakistan (1957 *to* 1972-73)
(Metric Tons)

Year	Nutrient Weight	
	Nitrogenous	Phosphatic
1957	—	188
1958	4,300	200
1959	9,000	280
1960	9,560	710
1960-61	9,902	1,618
1961-62	13,906	1,442
1962-63	41,460	1,108
1963-64	45,269	1,205
1964-65	48,141	1,467
1965-66	47,132	1,438
1966-67	51,961	724
1967-68	50,204	2,894
1968-69	75,027	2,548
1969-70	128,657	4,069
1970-71	129,579	4,583
1971-72	215,070	4,948
1972-73	280,411	8,877

Source: Chemical Consultants, Lahore. (Compiled from Government statistics.)

Table 2

Domestic Fertilizer Production in Pakistan, 1973

Plant Owner	Location	Product	Estimated Production (Metric Tons)
PIDC	Daudkhel	Ammonium Sulphate	91,000
	Multan	Ammonium Nitrate	90,000
		Urea	45,000
	Lyallpur & Jaranawala	Single Superphosphate	54,000
Esso	Dharki	Urea	175,000
Dawood-Hercules	Chichoki Malian	Urea	340,000

Source: Interviews in Lahore and Karachi, November 1973.

Imports

Fertilizer imports began in 1952. As in the case of domestic production, emphasis has been placed on nitrogenous forms. Data of fertilizer imports during 1960-61 are summarized in Table 3. Imports of nitrogenous fertilizers reached their peak in 1969-70 while those of phosphatic types reached their highest point in 1972-73 although they are projected to go even higher in 1973-74.

Table 3

Imports of Fertilizers in Pakistan (1960-61 *to* 1972-73)

(Nutrient Weight in Metric Tons)

Year	Type of Fertilizer	
	Nitrogenous	Phosphatic
1960-61	20,699	2,556
1961-62	20,759	—
1962-63	31,143	—
1963-64	5,125	—
1964-65	3,204	—
1965-66	48,986	—
1966-67	106,397	16,391
1967-68	103,331	49,316
1968-69	117,518	31,979
1969-70	288,633	6,160
1970-71	107,156	37,897
1971-72	70,440	—
1972-73	120,597	70,152
(1973-74)	(211,040)*	(98,399)*

Source: Chemical Consultants, Lahore, and Dawood Corporation, Lahore (for 1972-73 and 1973-74).

*Projections.

Among the various types of fertilizers imported in Pakistan in recent years, urea (46% N) has been by far the most important while diammonium phosphate (DAP) (18% N and 46% P) has been second in importance. Other fertilizers have become relatively less important. Breakdown of imported fertilizers by major types, for the last few years, is given in Table 4. In 1972-73, in terms of product weight, urea accounted for 54%, DAP 38% and others 8% of the total.

Table 4

Imports of Fertilizers (by type) in Pakistan (1969-70 *to* 1972-73)
(Product Weight in Metric Tons)

Year	Type of Fertilizer			Total
	Urea	DAP	Other	
1969-70	607,571	10,000	30,070	647,641
1970-71	193,782	72,861	33,905	300,548
1971-72	153,130	—	—	153,130
1972-73	193,601	137,895	29,219[a]	366,715
(1973-74)	(409,000)	(190,920)	(112,000)[b]	(711,920)

Source: Chemical Consultants, Lahore.

Note: 1973-74 figures are projections.

[a]Nitrophos (23% N, 23%P)

[b]Nitrophos 46,000; Ammonium Sulphate (21%N) 50,000, Sulphate of Potash (50%K) 10,000.

Fertilizers are imported under a number of different administrative and financial terms—outright gifts, long-term credits (U.S. AID and other bilateral aid programmes), barter, and cash. Pakistan has received fertilizer gifts or cash-purchased foreign fertilizers in only small quantities. The Central Government usually makes cash purchases monthly from near by countries (such as Kuwait) only in emergency situations. Barter deals are made with East European countries.

Relative Roles of Domestic Production and Imports

The relative roles of domestic production and imports in terms of total supply have varied from year to year. Data for the year 1970-71, 1971-72 and 1972-73 are summarized in Table 5.

Domestic production of nitrogenous fertilizers is proportionately far more important than of phosphatic fertilizer. The relative importance of domestic nitrogen production grew with the commencement of production at the D.H. Urea plant, Sheikhupura, in the early 1970's. By the 1972-73 season, 70% of the nitrogenous fertilizer was produced domestically and 30% was imported.

Table 5

Percentage of Total Supply of Fertilizers Provided by Domestic Production and Imports in Pakistan (1970-71 *to* 1972-73)

Year	Fertilizer type	Domestic Production (%)	Import (%)
1970-71	Nitrogenous	54.6	45.4
	Phosphatic	11.2	88.8
	Potash	—	100.00
	Total[a]	47.0	53.0
1971-72	Nitrogenous	75.3	24.7
	Phosphatic	100.0	—
	Total[a]	75.7	24.3
1972-73	Nitrogenous	70.0	30.0
	Phosphatic	112.0	88.8
	Total[a]	60.3	39.7

Source: Calculated from Tables 1 and 3.

[a]Based on addition of fertilizer weights in metric tons.

The proportion of total fertilizer supply provided by domestic production may well have reached a temporary peak in 1972-73 or 1973-74 with full D.H. urea production. As domestic production stablizes over the next few years and as demand increases, imports may play an increasingly important role, depending on world prices.

Consumption

Supply is not the same as consumption because of storage carry-over. If consumption is measured by movement to retail outlets where storage is minimal, then the trend in use is as shown in Table 6. The trend is clearly one of steady increase in the consumption of nitrogenous fertilizers but of more sporadic growth in the case of phosphatic fertilizers.

Distribution of fertilizer sales has been seasonal, with peaks occurring twice a year, reflecting the two growing seasons. The peaks for nitrogenous fertilizers during the 1971-72 season were in July-August and January-February. The peaks for phosphatic fertilizers during the same

Table 6

Consumption of Fertilizers in Pakistan (1962-63 *to* 1972-73)

(Metric Tons)

Year	Fertilizers	
	Nitrogenous	Phosphatic
1962-63	41,160	210
1963-64	67,620	630
1964-65	84,147	1,029
1965-66	69,242	1,245
1966-67	107,779	3,911
1967-68	177,441	12,777
1968-69	203,521	38,642
1969-70	252,566	33,801
1970-71	271,500	30,462
1971-72	343,900	37,231
1972-73	386,385	48,730

Source: Chemical Consultants, Lahore (Compiled from Government Statistics).

season were in October-November and May, the former accounting for 24% of the season's total. Over the last few years, fertilizer distribution has become more even over the season.

The regional distribution pattern shows a strong concentration in the Punjab followed by Sind. The consumption in the NWFP and Baluchistan was relatively small. The province-wise breakdown of fertilizer distribution percentages during the 1971-72 season was as follows:

Province	Fertilizer Distribution as % of W. Pak. Total	
	Nitrogenous	Phosphatic
Punjab	65.8	68.1
Sind	25.5	21.7
NWFP	8.5	9.8
Baluchistan	0.2	0.4
Total:	100.0	100.0

The distribution pattern was determined by agricultural production, cropping patterns, and other factors.[3] The distribution pattern of fertilizers in 1973 like this: Punjab 67%, Sind 22.5%, NWFP 9% and Baluchistan 1.5%.

Present Distribution System

We have already traced the evolution of fertilizer production and distribution in Pakistan. Here, we will focus on some more detailed aspects of distribution, particularly at the retail level.

As far as domestic fertilizer production is concerned, half of the D.H. production goes to the public sector (PASCO) and half to the private sector, principally in the Punjab and the NWFP. ESSO production is entirely distributed through its agents, principally in Sind, though little is distributed in lower Sind. All the PIDC production goes to the public sector, principally to the PASCO (Punjab).

Under the distribution system in operation prior to September 1973, three main stages were involved: principal agents, agents at the *mandi* town level, and sub-agents. As noted earlier, there were six principal agents. A survey in early 1970 [2, p. 61] revealed a total of 1,697 agents distributed as follows:

Province	*Private*[a]	*Public*[b]	*Total*
Punjab	928	161	1,089
Sind	403	53	456
NWFP	101	36	137
Baluchistan	11	4	15
Total:	1,443	254	1,697

[a]Dawood, ESSO, Jaffer and PNO. [b]ADC and RSCC.

The number of sub-agents was not known, but it appears that their role was not very important [2, pp. 126 and 128][4]; it may have grown since

[3]We are not certain how much attention is given to actual farm demand as compared with the potential demand suggested by the above factors.

[4]While some principal agents reported many sub-agents, a village level survey revealed comparatively few of them, and often they were close by in the same town. They were, in reality, 'usually no more than the extension of *mandi* town agents', own activities but under different names." Further, they were "doing a large business by the use of improper means."

then. The number of agents probably continued to grow through 1973.

In September 1973, as noted, distribution was provincialized in the Punjab and Baluchistan. This process, in turn, had some repercussions in Sind.

The Punjab

Provincialization had by far the most profound effect in the Punjab. We noted above that in early 1970, there were 1,089 agents (928 private, 161 public) in operation; by early 1973 their total number was estimated to have grown to about 1,800. In addition, there were about 700 sub-agents.[5]

Following provincialization, the total number of agents was reduced to about 875. Private agents were reduced to approximately 275 while public outlets were increased to 600. At the private level, the four principal agents were reduced to two, namely, Dawood and ESSO. ESSO's operations were limited to the southern portion of the province. Dawood had 200 agents and ESSO 75. It is not known how many public outlets were operating just before provincialization, but if we assume an increase from 161 in 1970, it might not be incorrect to suggest that about 400 new outlets were added after provincialization.[6]

The number of sales points was cut atleast to half by provincialization —from perhaps 1800 (excluding sub-agents) to less than 900. If sub-agents are included, the number of operators was cut by about two-thirds (from 2,500). At first review, this may seem like retrogression in terms of getting fertilizer to the country-side. However, precise evaluation is not possible at this stage as a number of points cloud the issue.

The question of geographic distribution is perhaps the most intractable. Private agents, before provincialization, were generally located at the *mandi* town level and several agents were located in some towns. It has been suggested that a total of no more than 283 locations were involved

[5]Estimate provided by a private firm. The same total number (2,500) was mentioned by the PASCO.

[6]Some sales are made to co-operatives but we do not know the total volume, nor do we know their relative importance before provincialization. Hence they are excluded from this discussion.

but the derivation of this figure is not given and it is contested by some. According to the PASCO, they had 600 agents in different locations with seven or more in each tehsil.

It was not possible to go into this important matter further, but a number of questions come to mind. Were the 600 outlets actually in effective operation? How are they located? As the private distribution system covered major agricultural areas, has the system actually made fertilizer more readily available to farmers? Since farmers are accustomed to going to *mandi* towns to sell produce and to buy fertilizer as well as other inputs, does it make any difference? These and other questions need to be studied. However, there is no gainsaying the fact that a profound change was made over a very short period of time in the fertilizer distribution system in the Punjab. A more thorough evaluation is needed before firm conclusions can be drawn. This will be difficult because (i) the country was recovering from flood damage during the provincialization period, and (ii) the credit system was changed concurrently.

Sind

Although fertilizer distribution was not provincialized in Sind, it shows the same basic division between public and private firms. Public distribution is in the hands of the Sind Agricultural Supply Corporation (SASCO) which in turn makes use of many private dealers. Private distribution is by ESSO, which, in drawing back from much of the Punjab after provincialization, replaced three private firms.

SASCO basically deals with imported fertilizer while ESSO dealers handle the firm's domestic production of urea (86% of which is marketed in Sind). SASCO, as of November 15, 1973, had about 91 sales agents and 300 dealers. It planned to increase the number of the latter to 500. ESSO, as of November 1973, had about 175 agents.

SASCO plans to introduce a system of fertilizer cards to provide a more complete control over distribution. The fertilizer card, to be verified by a revenue officer, will indicate the type and nature of land holdings and cropping. This will help determine the fertilizer needs of individual farmers. Views differ on whether the system will be effective in promoting fertilizer consumption.

The North-West Frontier Province

Fertilizer distribution in the NWFP continues basically in the same pattern as it has followed for several years. It is a combination of government agencies and private firms.

The principal government group is the Agricultural Development Authority (ADA), formerly the Agricultural Supplies Organisation. It markets about 40% of the province's allocation of imported fertilizer and 50% of its domestic fertilizer allocation. Twenty percent of the imported total is actually allocated to the Integrated Rural Development Programme but is distributed by the ADA. The ADA has 20 of its own sale points, which handle most of its sales, and 80 commission agents. In addition, the Rural Supply Cooperative Corporation handles about 16.25% of the domestic fertilizer allocation.

The private sector markets 60% of the province's allocation of imported fertilizer and 33.75% of the domestic fertilizer allocation. The sector consists of three principal agents, viz., PNO, Dawood Corporation and Jaffer Brothers, in the case of imported fertilizer. In the case of domestic fertilizer, these three are accompanied by several other groups, e.g., Agricultural Enterprises, Agprise Farm Services Syndicate, and Karimi Enterprises.

Because of its relatively remote location from the sources of imported and domestic fertilizer supplies, the province experiences some difficulty in obtaining adequate and reasonably priced transportation.

Baluchistan

Although very little fertilizer is currently used in Baluchistan, i.e., about 1.5% of the national total of available supplies, the province holds considerable potential for increased use. The main limitations are (i) the widely scattered nature of agriculture which is found widely scattered in small pockets over a land area representing 42% of the country's total and (ii) the concurrent need for matching irrigation. As of the 1972-73 season, only five private dealers were reported in Baluchistan.[7] They limited their activities primarily to the Quetta region and moved only

[7]We noted earlier that 11 private dealers were reported in 1970.

5,500 metric tons of fertilizer. In order to broaden fertilizer distribution into the outlying regions, distribution was provincialized in the summer of 1973 and turned over to the Baluchistan Government's Department of Agriculture. The department had, by November, established 36 sales outlets and planned to raise the number to 54. It expected to distribute 21,000 tons of fertilizer during 1973-74—nearly a fourfold increase. Distribution is being tied in with a large fertilizer demonstration programme on wheat. Whether the department will be able to carry out distribution over wide areas for the marketing margin of Rs. 73 per ton allowed elsewhere is questionable; some increment may be needed.

Proposed Fertilizer Plant Construction

No fertilizer plants were under construction in Pakistan in November 1973. However, contracts were signed for the construction of an additional WPIDC facility at Multan. Several others were at an advanced stage of discussion or negotiation. These are outlined in Table 7.

It will probably take a minimum of three years before the first new plant comes into commission, and even longer before it reaches full production. Thus, it will be at the earliest 1976-77 (more likely, 1977-78) before increased domestic fertilizer production becomes available.

Pricing, Costs and Subsidies

The formal retail price for fertilizer in Pakistan is set by the Central Government. Different prices are set for each of the several forms of fertilizer and each price is the same throughout the country. The Central Government also sets the marketing margins, known as incidentals. It has less control, at least directly, over actual costs of domestic production or of imports; but costs of these are used in setting the marketing margin and the retail price. Since retail prices do not cover import costs, a subsidy is involved.

Retail Prices

The official retail price for fertilizer has increased sharply since September 1972. The increases have reflected (i) increased costs of imports (both raw materials and finished products) which in turn were

Table 7

Pakistan: Proposed Fertilizer Plant Projects (1973)

	Company	Fertilizer Type	Quantity of Nutrient		Financing	Status
			Nitrogen	Phosphorus		
			(Metric Tons)			
Public Sector						
1.	WPIDC, Multan to be called PAK-ARAB FERTILIZERS LTD.	Nitrophosphates	68,850	68,850	ADB/World Bank	Contracts signed.
		Amm-Nitrate	132,682	—		Construction probably to start Jan. 1974.
		Urea	33,396	—		
			234,928	68,850		
2.	WPIDC Upper Sind	Urea	237,000	—	Suppliers Credit	Contracts signed Feb. 1974.
3.	Pak. Fertilizers Ltd. Karachi (Formerly Jaffer Bros. Project)	MAP	10,000	50,000	PICIC (World Bank) financing	Orders placed for MAP plant but difficulties being encountered in buying Phosphoric Acid.
4.	Sarhad Dev. Authority, near Tarbela	Phosphoric acid	—	50,000 (to supply to Karachi Plant)		Govt. approval being finalised.
		TSP		40,000		
			—	90,000		
Private Sector						
5.	Dawood Corporation, Upper Sind.	Urea	261,724	—	Private (Pak. and U.S.) and public sector	Discussion with potential U.S. partners underway.
6.	Fauji Foundation Sadiqabad (Lower Punjab)	Urea	167,000	—	Discussion with IFC/USAID etc.	—
	Total		911,000	208,850		

Source: Chemical Consultants (Lahore) and Dawood Corporation (Lahore).
Note: MAP stands for Mono Ammonium Phosphate while TSP stands for Triple Super Phosphate.

sharply influenced by devaluations and (ii) a desire to set a more realistic price that would reduce the cost of subsidies and lessen the influence of the black market.

While prices for nearly all fertilizers have increased, the situation is the perhaps most simply and sharply illustrated by the case of urea prices of which moved as follows:

Period	*Price in Rupees per*	
	110-lb. *bag*	*Metric Ton*
August 1971 to September 25, 1972	28	560
Sept. 26, 1972 to March 30, 1973	35	700
March 31, 1973 to August 14, 1973	42	840
August 14, 1973 to Nov., 73	55	1,100

Thus the price of urea fertilizer increased by 96% within one year. During the same period, however, the support price for wheat was raised twice, amounting to a total increase of 18%. The support price has been well below the actual market prices and the prices of other farm crops have risen much higher.

As of November 1973, retail prices for the various types of fertilizers ranged as follows on a metric ton basis.

Fertilizer Type	*Retail Price*
	(Rupees)
Nitrogenous	
Urea	1,100
Ammonium sulphate	490
Ammonium sulphate nitrate	620
Compound	
Diammonium phosphate	1,140
Nitrophos	1,100
Phosphates and potash	
Single superphosphate	295
Triple superphosphate	680
Sulphate of potash	640

There is no difference in the retail prices of imported and domestically produced fertilizers of the same type. As might be expected, there are some variations from these formal prices.

Retailers are permitted to lower prices if they are willing to take a cut in their own returns. This is not common but may occur in a few areas where competition is severe or in off seasons. There may be some price discounting of the urea produced by the PIDC plants because the urea is in powder form whereas farmers prefer the granular form. Some farmers who were short on cash are known to have used a Government loan to buy fertilizer at the official prices and then to have sold it at a lower price to other farmers willing to pay cash. This provides the original farmer a source of operating capital.

Although prohibited, some fertilizer has been sold for more than the official prices. This is black market and is, of course, common where demand exceeds supply. Unconfirmed estimates suggest that, on an average, perhaps 25% of the fertilizer (30% in the *Kharif* and 20% in the *Rabi* seasons) was sold in this way during the last year or two in the Punjab. The premium paid was thought to be generally no more than Rs. 2 to Rs. 8 per bag of urea during the peak period of demand but usually was less. Higher premia have been reported for the other types of fertilizers in the NWFP. Since it is risky for the dealer to make such sales himself, an intermediary may often be used. In order to reduce the black market, the Government has, as noted, increased prices.

Wholesale Prices

The wholesale price is basically the ex-plant price for imported fertilizer. Wholesale prices may be tempered by subsidies and taxes although they do not all necessarily enter the system at this point.

Ex-plant prices have been established for each of the fertilizers produced in Pakistan. These prices include all costs and a profit of about 20% for the foreign-owned firms. The prices are established by the Government after consultation with the firms.

In the case of urea, the average ex-plant price was stated as Rs. 850/m.t. in August 1973. Prices of fertilizer from different plants, however,

seem to vary, ranging from Rs. 648 for Dawood-Hercules and Rs. 677 for ESSO to approximately Rs. 1,022 for the PIDC plants. The first two are low enough to be able to compete in the international market.

In addition to the ex-plant price, a development surcharge of Rs. 400 is added to the Dawood-Hercules cost and Rs. 324 is added to the ESSO cost. A final equalizer is a varying set of marketing margins which will be discussed in a following section.

The precise plant costs and profit levels are, of course, things in publicising which the private firms are not interested. However, one of the urea producers was kind enough to outline his major costs for us. They are approximately as follows:

Variable	(Rs./m.t.)	*Fixed*	(Rs./m.t.)
Raw materials	95	Depreciation	172
Bags and liners	100	Interest on loans	100
Chemical catalyst	21	Salaries, employee benefits, overheads	75
Other	30	Maintenance materials	12
Sub-total	245	*Sub-total*	359

The costs are, of course, subject to variation depending on purchase prices and the efficiency of output. The low variable costs are due to a relative abundance of the modestly-priced natural gas in Pakistan. The current price of the gas supplied to the plant is Rs. 2.56 per 1,000 cubic ft. which we understand, is near the lower end of the price range in the United States.

Another urea plant is somewhat older and considerably smaller. Its unit costs appear to be slightly higher, as might be expected. The PIDC plant has much higher raw material costs, evidently due to its use of ammonia produced by obsolete machinery. In the older plants, lower efficiency and higher maintenance costs may be partially offset by lower depreciation and interest charges.

It appears that current profit levels are at least adequate for the private firms. The ESSO plant declared a profit of 20% last year, and an interim profit of 37% this year. Neither (American) parent company is

considering expansion, but the Dawood Corporation, not to be confused with Dawood-Hercules, is in an advanced stage of negotiations.

Import Prices

Import prices per metric ton vary widely from year to year and, recently, even within years depending largely upon which countries the fertilizer imports are made from. In 1968-69, for example, urea imports from the United States were most costly ($ 118 to $ 126, CIF) followed by those from Canada ($117), Italy and France ($99.5 each), USSR and Bulgaria ($95 each), and Kuwait ($68.) Data compiled on arrivals during the fall of 1973 showed much the same pattern. CIF urea prices from other sources were: Holland $ 96.60, Kuwait $ 102 and Japan $ 87.24. Undoubtedly, a substantial part of the high import cost of fertilizer imports from the U.S.A. is due to higher transportation costs. These imports must come the longest distance and by the most expensive shipping. The U.S. regulations require that at least half of the fertilizers exported by that country must be shipped in U.S. carriers, which have rates two to three times higher than those of other countries. The annual FOB value of U.S. fertilizer shipments to Pakistan since 1966 has varied from a low of $ 1.9 million in 1970-71 to a high of $ 26.5 million in 1972-73.

Fluctuations in annual prices have recently become particularly sharp. In the US fiscal year 1970, the FOB sale price of urea in the United States was $ 81.47 per/m.t. No urea sales were made in the fiscal years 1971 and 1972. In the fiscal year 1973, the first sale to Pakistan was made at $ 93.00/m.t. (plus ocean freight); by June the price had increased to $ 115.57, and by November the bid price was $ 170; and even at that only one-quarter of the tender was met. The latter bid was not accepted, and a subsequent one in November elicited no bids.

For a number of reasons, the later increases have not become very evident in the thinking of many of those we interviewed. Average CIF prices quoted in discussions were usually below the June figure, cited above, plus transportation. Firstly, there is a lag between the offering of the bid and the signing on the one hand and actual delivery on the other. One study suggested that this lag averaged about nine months. Secondly, the fertilizers are priced in accordance with costs at the time of purchase, not

at current market prices. Thirdly, the Agricultural Supply Organisation handles all purchases so that relatively only a few individuals get close to the current world fertilizer situations.

In any case, it is evident that at present the cost of urea produced in modern plants in Pakistan is well below that of imports and probably below those occurring in more normal periods in the past. Low cost natural gas is a major factor. Because of this, Pakistan has the potential to become an exporter of urea in the future. It may not have quite the same advantage in phosphatic fertilizers, though domestic sources are known and plant construction is contemplated.

The relative cost differential of domestic fertilizer production, at least of urea, compared with the currently increasing cost of fertilizer imports will be substantial and of growing importance in the future.

Marketing Margin (Incidentals)

The marketing margin, commonly known as incidentals, covers all the services performed from point of production or import to the point of actual sale to the farmer. The overall size of this margin is controlled by the Government of Pakistan. Following annual investigations of actual costs, it also establishes the margin to be paid for individual components of the margin for each of the types of fertilizers sold. The components for domestically produced as well as imported urea and DAP are outlined in Table 8 in which components are sorted into three categories: (1) administrative costs, including retail margin; (2) transportation, handling and storage costs; and (3) port charges.

It may be seen that the margin for domestically produced urea (Rs. 101/m.t.) was the same in September 1973 as during the 1969-70 season. In fact, the commission paid to the retail agent for both domestically produced and imported fertilizer has remained the same (Rs. 22) for both the periods. The same is true of sales promotion charges (Re. 1.0), unforeseen charges (Rs. 5.5) handling charges (Rs. 12.5 at railhead and Rs. 20.0 to non-*mandi* towns) and storage charges (Rs. 5.0). Those showing slight increases include organisation and administration charges (Rs. 6.0 to Rs. 7.0 respectively), wharfage and wharf rent (Rs. 2.0 to Rs. 2.5) and purchase and inspection costs (Rs. 4.0 to Rs. 5.8). More

substantial increases in the imported category were reported—their extent varying by type of fertilizer—for bank commissions (Rs. 6.0 to Rs. 8.3; Rs. 6.0 to Rs. 13.5), interest charges (Rs. 15.0 to Rs. 61.7; Rs. 15.0 to Rs. 75.3), railway charges on imported fertilizer (Rs. 32.2 to Rs. 54.9), and in stevedoring (Rs. 9.7 to Rs. 14.3; Rs. 9.7 to 19.1). It is not clear why interest charges have gone up so much. The reason why railway charges went up for imported and not for domestic fertilizer is also not known. The result, in any case, has been a substantial increase in the margin for imported urea (+56%) and DAP (+75%). Thus, the current margin or incidental charges for imported fertilizers is well over twice that of domestically produced fertilizers.

Since these are generalized charges, there is naturally some variation from them in specific instances. This seems to be particularly true of domestically produced urea. Despite an overall margin of Rs. 101 we did not find any firms actually achieving that margin. The closest was ESSO with a margin of Rs. 99. In the case of urea produced by the PIDC, a margin of Rs. 78 was allowed, and in the case of urea produced by Dawood-Hercules, it was Rs. 52. Much, if not all, of the variation is due to transportation cost differentials; the market area for ESSO fertilizers involves longer distance than those of the other two firms which have their plants in the Punjab. The PIDC makes greater use of rail freight than the Dawood-Hercules which is able to distribute 80% of its production within a 200-mile radius by truck. Due to these and other factors, there can be considerable variations in marketing margins even within a province. The PASCO, for example, handles urea produced by both the PIDC and the D-H in the Punjab; the marketing margin on the two differs by Rs. 26. One might suspect that such a wide differential could lead to (i) some difficulties for the PASCO which markets both types of fertilizer, or (ii) some inequities between the PASCO and the private firm.[8]

Out of the margins for imported fertilizers, the Punjab and Sind Agricultural Supply Organisations are allowed Rs. 72 (71.5) to meet their operation costs.

[8]In partial defence of this variation, it might be argued that PASCO's costs are higher because it is setting up largely new distribution units which will handle only fertilizer and seed. Dawood units, on the other hand, can sell not only D-H urea among fertilizers but can handle also a range of other agricultural items. We were not in a position to pursue such questions.

Table 8

Composition of Generalized Marketing or Incidental Costs (Administrative, Transportation and Port Charges[1]) for Urea and DAP Fertilizers, 1969-70 and late 1973

Head of Cost	Urea				DAP	
	Domestic		Imported		Imported	
	1969-70	Sept. 1973	1969-70	Sept. 1973	1969-70	Sept. 1973
	(*Rupees per Metric Ton*)					
Administrative Costs						
Bank commission on letter of credit	1.2	1.2	6.0	8.3	6.0	13.5
Organisation and administration	6.0	6.0	6.0	7.0	6.0	7.0
Interest charges	12.5	12.5	15.0[1]	61.7[2]	15.0	75.3[3]
Sales promotion	1.0	1.0	1.0	1.0	1.0	1.0
Commission to retail agent	22.0	22.0	22.0	22.0	22.0	22.0
Unforeseen	5.0	5.0	5.0	5.0	5.0	5.0
Sub-total	47.7	47.7	55.0	105.5	55.0	124.3
Transportation, Handling and Storage						
Railway charges	15.5	15.5	32.2	54.9	32.2	54.9
Handling at railhead and up to sale point	12.5	12.5	12.5	12.5	12.5	12.5
Handling to non-*mandi* towns	20.0	20.0	20.0	20.0	20.0	20.0
Storage charges	5.0	5.0	5.0	5.0	5.0	5.0
Sub-total	53.0	53.0	69.2	92.4	69.7	92.4
Port Charges						
Wharfage/wharf rent	—	—	2.0	2.5	2.0	2.5
Purchasing and inspection	—	—	4.0	5.8	4.0	5.8
Stevedoring, clearing, and forwarding	—	—	3.7	5.0	3.7	10.8[4]
Sub-total	—	—	9.7	14.3	9.7	19.1
GRAND TOTAL	100.7	100.7	133.9	212.3	134.9	235.9
Rounded	101.0	101.0	134.0	212.0	135.0	236.0

Source: For 1969-70, [2, p. 49].
For Sept. 1973, Table provided by Agricultural Supply Organisation, Karachi. "Effective from 16th August, 1973."

[1]Normally these three categories would be grouped under marketing, but for expository purposes it has been decided to separate them.
[2]Interest charges on funds arranged by the ADC for purchases and handling of fertilizer at an average rate of 8% per annum for four months' turnover of domestic production and 6 months' turnover on imported fertilizer.
[3]Interest charges on funds arranged by the FDAS for purchase and handling of fertilizer at an average rate of 10% per annum for four months' turnover of imported fertilizer.
[4]Includes bagging cost on board ship at dockside, Rs. 4.41/m.t. bag provided with bulk shipment.

Despite these variations, all firms felt that the margin was tight for it fails to provide room for either financing or for adjusting quickly to major changes in costs. Major increases in rail freight for domestically produced fertilizer (+54%) and for gasoline, for instance, were announced during the period of our study. The firms will have to go to the Government for a change in margin allowance. It is not clear how this would then affect the rest of the price structure.

Surcharge and Subsidies

The present pricing structure is a combination of surcharges and subsidies. As Table 9 shows, substantial surcharges are imposed on the urea production of the two private plants. At the same time, substantial subsidies are needed to reduce the price of imported fertilizer. Supposedly, the surcharges are used to offset the susbsidies. Where this is not the case, it is the policy of the Central and Provincial Governments to share the costs of the subsidies equally between themselves.

It is possible that the surcharge/subsidy plan was near to breaking even in mid-1973. If so, this was a unique situation since it has not been the case in the past, nor is it likely to be in the future. During the 11-year period between 1955-56 and 1965-66, the average fertilizer subsidy ranged between 25% and 66% of the fertilizer cost and averaged 48% [2, p. 12]. The net cost of the subsidy during the 1969-70 season was reportedly Rs. 13.80 crore and represented about 22% of total fertilizer cost. The proportionate cost was, interestingly, higher on domestic (28.5%) than on imported (18.9%) fertilizer [2, p. 48]. Higher prices on recent international purchases suggest that the subsidy will need to be increased in the next few months. In the coming few years, as domestic urea production remains at roughly the same levels and import costs remain at their current high levels, the cost of subsidy (assuming that the current retail price levels are retained) could become very substantial.

Summary Comparison

The preceding discussion and statistics are summarized for urea and DAP in Table 9. Current 1973 data as well as comparative data for 1969-70 are included. Total cost figures have increased sharply between the two periods, but, in the case of ESSO, much of this was due to the

Table 9

Summary of Estimated Cost, Price and Subsidy Breakdown for Urea and DAP Fertilizer, Pakistan, Fall 1973

	Urea				DAP
	Domestic Production			Imported	Imported
	D.H.	ESSO	PIDC	PASCO	PASCO
	(*Rupees per Metric Ton*)				
Late 1973					
Cost of product	648	677	1,022	1,186[b]	1,462[c]
Marketing Margin (incidentals)	52	99	78	212[d]	236[d]
Development surcharge[a]	400	324[b]	—	—	—
Total cost	1,100	1,100	1,100	1,398	1,698
Farm price	1,100	1,100	1,100	1,100	1,140
Subsidy ("profit") Proportion of cost	(400)	(324)	—	298	558
1969-70					
Cost of production	—	457	713	500	540
Marketing margin (incidentals)	—	101	101	135	135
Total cost		558	814	635	675
Farm price	—	520	573	520	500
Subsidy	—	38	241	115	175
Proportion of cost	—	6.8%	29.6%	18.1%	25.9%

Source: For 1973, (i) the tables which are given later in this study, (ii) interviews in Lahore and Karachi, and (iii) data from the US AID.
For 1969-70, (2, pp. 48-49).

Notes : [a]Levied by the Government and appears below in the table in parentheses as a "profit."

[b]As reported by the Government in August and presumably an average of shipments from several countries. If only shipments from the U.S. were included, the figure would be higher. For example, an AID contract was signed on June 22 for 30,000 tons of urea in bags at an FOB price of $115.57/m.t. A subsequent agreement early in November was for $ 170.00/m.t. The ocean shipping cost from the U.S. which is higher than for other nations, was about $64.50/m.t. This would bring the relative CIF costs up to about $180 and $234/m.t. respectively.

[c]As reported by the Government in August and presumably an average of shipments from several countries. If only shipments from the U.S were included, the figure would be higher. For example, agreements for 197,500 tons of DAP in bulk, with empty bags, signed in fiscal 1972 averaged $109.90/m.t. A contract for 5,000 tons was signed on September 28 at a price of $138.85/m.t. The shipping cost in both was $54.04/m.t. for a ship arriving in November. This would bring the total CIF costs up to roughly $164 and $193. The bagging cost in port is about Rs. 4.4/m.t. and is included in the port charges in these calculations.

[d]Transport charges to some parts of the country could raise this figure.

imposition of the development surcharge. The farm price of fertilizers has almost doubled. The increase in price has led to a removal, for the moment at least, of the subsidy on domestic production. The PIDC seems to be breaking even. Because of increases of over 100% in the CIF cost of imports and substantial expansion in the incidentals category, the subsidy on imports has increased rather than decreased. It is likely to increase further in the future since the cost of imported urea is almost twice the cost of domestic fertilizer, excluding the development surcharge.

Problem Areas

It may be useful to divide our discussion of problem areas into two main components: (a) those likely to affect the country as a whole; and (b) those found in various provinces. Our evaluations are necessarily tentative and, in some cases, subjective. National problems, in turn, can be divided into three major sub-sectors: over-all supply, wholesale distribution and retail marketing.

Over-all Supply

Pakistan's present supply of fertilizers is generally thought to be inadequate. The situation is likely to get worse over the next three or four years. The demand for fertilizers is expected to continue to grow while domestic production is expected to increase only marginally. Increased imports will, therefore, be needed.[9] Current imports are heavily subsidized. Subsequent purchases will be made at higher prices which means that the CIF price will soon be even higher and in the near future there may be problems in obtaining bids at any price. An AID tender in late November 1973 elicited no bids. Whether this will be covered by even higher subsidies or prices is not yet clear. If world fertilizer prices continue to rise, Pakistan will indeed be in a difficult situation with regard to imports.

A large portion of the fertilizers imported in the past has come from the United States. The CIF prices of these shipments have been 25%

[9]This point has been made in several projections. One of the most recent, concerning nitrogen and containing some rather optimistic projections on new plant construction, shows a considerable excess of demand over supply through 1976-77. Unless demand growth slips off, or plant construction moves faster than anticipated, it might be a year or two later. Some revised projections would be most desirable.

higher, or more, than of those from other countries. This is due in large part to the great distances the fertilizer must be shipped and the high cost of shipping. Pakistan does get fertilizer from a wide range of other countries and one wonders why it does not get more from them. The answer may lie in the ready availability of supplies and softness of terms. Still, there is a point where high price outweighs softness of terms.

In the face of these problems and in view of the availability of ample supplies of relatively low cost natural gas domestically, it appears logical that all possible attention should be given to expanding the output of nitrogenous fertilizers as fast as possible. Since phosphatic rock is available in the NWFP, the phosphatic variety, too, could well be produced. Discussions and negotiations concerning specific plants, and phosphate mining in particular, should be sharply expedited.[18] How many plants should be built beyond the replacement of imports, however, is a different matter and is beyond the scope of this study.

Wholesale Distribution

An increase in the supply of fertilizers is useless if it does not reach the farmer. The current seasonality of demand can create severe pressures on transportation facilities. If distribution could be made on a more even basis, more rational use could be made of existing transport capacity. But this would simultaneously require imported storage facilities.

While some of the best agricultural areas may be relatively well off in terms of distribution points, many interior areas evidently are not. There seems to be a general agreement that more distribution points are needed everywhere, particularly in the interior. The poorest farmers do not have a tractor to haul their fertilizers. Indeed, in extreme cases, they may have to carry the 110-lb. sack on their back for many miles. Naturally, fairly ready access to a distribution point would facilitate and encourage fertilizer use.

The current marketing margins (or incidentals) make no direct provision for technical services to retailers or farmers. Some firms felt

[18]This matter is discussed in some detail in [3].

that the farmers needed more technical help. It was not possible to judge whether the technical information currently available was inadequate, or in case it was so, who should provide it. The matter needs further study.

Retail Distribution

It has been noted that the price of urea to the farmer has gone up thrice in a year and, in the process, about doubled. Prices of other fertilizers have also gone up. This increase was softened by concurrent increases in the support prices for wheat and in general price levels for agricultural products. The cost/price situation may not be as severe as it seems. It would be desirable, however, that a study be made of the net effect of these adjustments on the income level of various sizes and types of farms.

A somewhat different matter concerns the selection of fertilizers available. In some cases, the desired types of fertilizers were either not available in time, or not available without a tie-in purchase of some less desired fertilizer, or even not available at all. Some farmers in the Lyallpur area, for instance, found superphosphate very short in supply before the *rabi* season. Others said they were required to buy three bags of urea in order to get one bag of DAP.

Provincial Problems

Each of the provinces in Pakistan faces somewhat different problems in pricing and distribution of fertilizer. Here, we will primarily focus on the Punjab and Sind which, together, use over 90% of the total fertilizer consumed in the country. The problems appear to be particularly great in the Punjab. Some brief additional comment will also be included on the NWFP.

The Punjab

As we noted earlier, the distribution of fertilizer in the Punjab was provincialized during September 1973. In a handout distributed during a press conference on August 28, 1973, announcing provincialization it was stated that the "Private sector failed to help the farmers due to: (1) black marketing, (2) smuggling, (3) hoarding, and (4) inequitable distribution."

The statement went on to say:

> "It happened because fertilizer was being sold in big cities/towns only and consumers could not keep a watch on its distribution. At the same time Private Sector insisted on maximum profiteering from this trade. Governor gave repeated warnings to the Private Sector, to improve their performance and assist the Government in helping the farming community, but there was no favourable response."

How much support does there appear to have been to these charges? The Government presented no further information in its press release and did not cite any particular inquiries or investigations.[11] We found no proof, but gathered from various discussions that some black marketing, smuggling, and hoarding had indeed been carried out but this, however, was more a function of a shortage of supply than of the type of distribution system, except possibly in the case of hoarding. The black market and smuggling problems should have been reduced by the most recent fertilizer price increase which was announced several weeks before provincialization.

The question of inequitable distribution is one that has been already touched on above and is difficult to document. The detailed study done for AID in 1970 did not suggest any special deficiencies at the sales agent level in the Punjab, though problems were noted in the NWFP which province was principally served by public agencies. The private distributors were thickly spread throughout the Punjab plain. A dot map kept by Dawood, for instance, shows very few agriculturally important areas which were very far from a sales point. Of course, some of the less important areas, or those in the rainfed zone which make less use of fertilizer, were less well served. This latter point may have led to a certain inequity in a social, if not economic, sense.

A further problem was that the principal agents, who received four month's credit from the fertilizer suppliers, were criticised for not passing on the credit to their agent and, in turn, to farmers. The four month's credit, however, was cut back to one month early in the year. Most of the agents were not in a financial position to offer credit on their own.

[11]One possible relevant report may be [12]. We did not see the Survey Report but understand from reference to it that it noted the credit problems which the small farmers faced in buying fertilizer. See [9, p. 75].

There are serious problems involved in sharply changing the system in a very short period of time. In the case of fertilizer distribution, private and public firms faced difficulty in readjustments.

The Punjab Agricultural Supply Corporation had a difficult task to perform. It had opened up some 400 new agencies in a very short period and had to organise the physical distribution of the fertilizers to these outlets as well as to make a multitude of other arrangements. It is not known yet how well these things were done, but it is a miracle that they were accomplished at all. But more fundamental problems still remain. The PASCO outlets are required to make financial go of things when handling only one rather seasonal commodity, while the Dawood dealers usually handle a number of other items. They are expected to pay their own way when using salaried Government employees. Outlets are not scheduled to be open in the evening. Besides, many of them are new and farmers may not know about them or how to find them.

It would seem that the shift is likely to make fertilizer distribution more difficult in both public and private sectors, at least for a while, and may affect the *rabi* crop. Statistics seem to bear this out (Table 10).

Table 10

Stocks and Sales of Nitrogen Fertilizers in the Punjab: July to December, 1973
(Metric Tons)

Period (1973)	Nitrogen Fertilizer Sales[a]			Closing Stocks (1973)
	Projected (1973)	Actual (1973)	Actual 1972-73 (1973)	
July	24,200	19,527	17,746	16,528
August	36,600	16,682	16,428	17,272
September	23,600	9,085	23,620	23,832
October	35,400	3,787	18,982	47,833
November	59,000		17,760	
December	47,200		23,324	

Source: Official statistics, "Monthly Sales and Stock Report of Fertilizer for the Month of October 1973" (PASCO), November 17, 1973.

[a]Measured as movement into retailers' hands.

There was clearly a sharp drop in sales through October and a corresponding increase in closing stocks.

It is too early to say whether anything has been gained from provincialization, and it would take detailed farm level study to be sure. But it appears that a corollary programme—the increased availability of Government credit—is working out. Each of the provincialized sales units has an ADB representative present and credit is available. This could have been done with the previous system but would have been more difficult because of the greater numbers of outlets.

On balance, the wisdom of the decision for widespread provincialization in the Punjab is uncertain. The timing of the decision, namely, the middle of the *rabi* season, was unfortunate.

Sind

The problems experienced in Sind are relatively mild and of a different nature as compared to those in the Punjab. The Sind Agricultural Supply Corporation (SASCO) mentioned difficulties centering around lack of essential supplies such as transport, diesel fuel, and godown facilities.

The introduction of the fertilizer card system with a view to providing equal benefit to each farmer proportionate to his land holdings and cropwise per acre requirement and anticipated supply position of fertilizer was appreciated by SASCO. However, the probability of malpractices in the implementation of the anticipated fertilizer card system could not be ruled out. This may create problems for the farmers with respect to inadequate availability of fertilizers, encouragement of black marketing, corruption, and hindered promotional services.

Fertilizers Pakistan Ltd. faced some difficulties regarding the adjustment of their sales points following provincialization in the Punjab. About 86% of the total production now has to be distributed in Sind while, previously, only 60% of their total production went to Sind and the remaining 40% was distributed in the Punjab. Some transportation difficulties are experienced in serving their territory; and an imminent 54% increase in the freight rate was a special cause for concern. The increase in the freight rate is likely to increase further due to increase in oil prices as announced by the Government of Pakistan on November 22, 1973.

North-West Frontier Province

One of the major problems in the NWFP seems to be black-marketing of certain types of fertilizer. This arises, according to our interviews, from the following three basic reasons.

The demand for non-urea types of fertilizers, especially SSP, is much greater than that for urea. Thus, some of these types are sold at higher than official prices and may even be "imported" at extra cost from the Punjab. Recent black-market prices have run three to five rupees above the official price of ammonium sulphate and ammonium nitrate (Rs. 25) and six to seven rupees above the official price of single superphosphate (Rs. 15). Urea was, in turn, "exported" to the Punjab this year.

There is some smuggling to Afghanistan when there is an abundance of urea. This was not a problem this year.

There are uncertainties in transportation. Railroad wagons are not always available, and truck transport is expensive.

Chapter II

THE PRICING OF TRACTORS

Introduction

In November 1973, there were approximately 25,000 tractors in Pakistan. Most of these were in the range of 45 to 55 H.P. and the most popular among these were Massey-Ferguson, a British make, and Byelarus, a Russian product.

The increasing use of tractors in Pakistan has been criticised as a labour-displacing factor in an economy with surplus labour. However, there is a definite economic advantage in their use. Tractor power improves the quality and speed of agricultural operations. In addition, the use of tractors frees land formerly used to raise feed for the bullocks. The labour displacement problem, such as it is, needs more investigation by comprehensive field surveys before any definite conclusions can be drawn.

Though there are plans for manufacturing tractors within Pakistan by the Pakistan Tractors Corporation, tractors so far have been imported under tied loans and barter. The tied imports are financed by the International Development Association (IDA), an affiliate of the International Bank for Reconstruction and Development (IBRD/World Bank). According to the requirements of the IDA 'tractor loans' to the Government of Pakistan, tractor procurement is 'tied' to member countries of the World Bank/IDA. Imports of 'barter' tractors are tied to the countries with which Pakistan has negotiated such barter agreement, e.g., Russia, Yugoslavia and Poland. The United Kingdom, the United States, and Yugoslavia are the World Bank members from whom Pakistan has been importing tractors financed by the IDA. Total tractor imports by the type of programme and year are shown in Tables 11 and 12.

Structure of the Industry

The demand for tractors at the fixed selling price exceeds the existing supply in Pakistan. In the imports and distribution of tractors within

Table 11

Number of Tractors Imported in Pakistan, 1965-66 to 1972-73

Make of the Tractor	IDA Loan Imports ADBP Financed	Other Imports		Total
		ADBP Financed	Cash Payment	
M.F.	6,054	—	324	6,378
Ford	3,485	—	557	4,042
I.H.	2,175	—	187	2,362
Byelarus	—	1,994	6,865	8,859
J. Deere	749	103	N.A.	852
Deutz	237	783	170	1,190
Zudrugar	98	—	—	98
IMT	137	102	462	701
Fiat	—	568	1,912	2,480
Zetor	—	154	384	538
Holder	—	15	N.A.	15
Total	12,935	3,719	10,861	27,515

Source: Data, except those for Ford which were obtained from the distributor, are derived from the ADBP data.

Table 12

ADBP Financed Imports of Tractors in Pakistan, 1965 to 1972-73

Period	Tractor Imported Financed by		Total No. of Tractors
	IDA	Non-IDA	
1965-66	925	1	926
1966-67	2,471	30	2,501
1967-68	1,500	532	2,032
1968-69	1,590	551	2,141
1969-70	1,934	543	2,477
1970-71	2,441	455	2,896
1971-72	1,521	385	1,906
1972-73	1,375	304	1,679
Total	13,757	2,801	16,558

Source: ADBP

the country, a central role has been played by the Agricultural Development Bank of Pakistan (ADBP).

Role of the ADBP

An agreement between the IDA and the Government of Pakistan stipulated that each person importing a tractor financed by the IDA loan must apply to the ADBP. The minimum requirements include ownership of at least 25 acres of farm land and plans to use the tractor on at least 75 acres. Approved applications are added to a waiting list for the type of the IDA-financed tractor desired.

When the IDA funds are available, the ADBP fixes the number of tractors of each brand to be imported. The licenses eventually issued for the different types of tractors are according to the preferences indicated by the approved applicants. Ford, Massey-Ferguson, International Harvestor, Fiat, and IMT have been imported under the IDA credit. Since Yugoslavia, an IDA member, also has a barter agreement with Pakistan, IMT, a Yugoslav product, is the only tractor imported under both the IDA and barter arrangements.

Pakistani imports agents of the tractor companies are then notified and asked to negotiate a price with their foreign suppliers. These prices and the costs that the importer anticipates to incur in distributing the tractors within Pakistan must be approved by the ADBP. In turn, the ADBP recommends a C&F price (Karachi) for approval to the Ministry of Industries' Controller-General of prices.

Agents for three major suppliers of tractors to Pakistan have claimed that these negotiated prices were significantly below the prices obtaining in the country of manufacture. These "discounts" have reportedly been as high as 30% but more recently they have been about 20% to 25%.

With the approval of the Ministry of Industries, the IDA makes payment both to the exporter for the approved FOB price and for the ocean freight. The Ministry of Industries' Supply and Price Wing also determines the price at which the tractors will be sold to farmers on the basis of the approved C&F price, the official rate of exchange, and the internal costs documented by importers and approved by the ADBP.

The ADBP supplies a list of approved applications to importers for the delivery of tractors. Farmers must obtain loans from the ADBP regardless of their financial condition. The typical terms are 20% cash and 8% interest with ten annual equal payments of principal and interest. The loans are secured by "immovable property" such as land for at least one-half of the loan with, the remainder under such security as bank guarantees and fixed deposits including those with the ADBP. The loan may not be repaid in full before the expiry of two years. Some farmers with sufficient cash deposits earn an interest of 6.5 percent per annum against an interest of 8% on the tractor loan.

Prior to December 1973, the ADBP had received several loans from Government and the State Bank of Pakistan. The ADBP borrows at six percent, and lends at eight percent per annum. However, since the bank rate was raised from six to eight percent, interest payable by the ADBP might rise from six to eight percent. The interest rate payable by the borrower might also be raised by two points.

Home Delivery System

Although the Home Delivery System has been in operation for a number of years, only a limited number of tractors were imported under it. The scheme permits a Pakistani living abroad to send a tractor to a friend in Pakistan, provided the former's earnings are proved not to have originated from salary or other remittances from Pakistan. However, the rules in this regard are rather vague and the scheme has been of little use.

Barter

When the Government negotiates barter agreements with foreign Governments, such as the Government of Yugoslavia, import agents, say of tractors, indicate to the Government their desire to utilize the prospective barter, specifying the number of tractors required. All such requests are processed by the Ministry of Agriculture and are passed on to the Ministry of Commerce which conducts the barter negotiations. Once the barter agreement is reached, Pakistani agents negotiate contracts directly with supplier firms in the barter country. The contracts specify the number of machines, the delivery schedule, and rupee prices. The ADBP must

then approve these prices. The interviews indicated that the negotiated barter prices were lower than those obtaining in the exporting country.

The barter price is the basis for determining the sale price to the farmer. Port charges, transportation costs, and duties for barter tractors are similar to those for the IDA- financed tractors. The National Bank of Pakistan makes a book adjustment for payment to the tractor exporters for which reimbursement is made by the importer to the bank in Pakistan.

Prior to September 3, 1973, there was no restriction on the distribution of barter tractors. Sales on payment could be made to farmers and others. Because of devastating floods in Summer 1973, tractors were, however, declared an essential commodity on September 3, and all tractors to be delivered to farmers were taken over by the Government. These are now being made available to public organisations involved in flood affected areas for reconstruction purposes and for hire by farmers for agricultural activities. Before the floods, imports of IMT tractors (from Yugoslavia) were sufficient to meet the demand at the given price.

The Pakistan Tractors Corporation[18]

The Pakistan Tractors Corporation (PTC), a semi-Government body, was formed on October 17, 1973. It aims at making Pakistan self-sufficient in 40-50 H.P. tractors, in the long run. The production of standardised tractors will be a gradual process, beginning with assembling of tractors from components and parts imported in completely knocked down condition.

In October 1973, the PTC invited tenders to develop tractors, implements, and tractor parts production, distribution, and service facilities in Pakistan. There were two main contenders—Fiat of Italy and Massey-Ferguson Tractor Company of the United Kingdom. An agreement was concluded with Massey-Ferguson and its subsidiary, Perkins Engine Company,[19] in January 1973 which became effective in October 1973.

The contracts, valid for 10 years, provide for technical assistance for the manufacture of the 47 H.P. Model 135 tractors in Pakistan. The

[18]Based on information furnished by the PTC.

[19]Perkins manufactures engines for Massey-Ferguson tractors.

agreement encompasses production and quality control of the components and parts manufactured in Pakistan and provides for supply of those components and parts to the PTC which are not manufactured in Pakistan.

The Millat Tractor Corporation of Pakistan, a private sector firm the management of which has been taken over by Government, had contracts with M-F and its subsidiary, Perkins. These provided for technical assistance and supply of tractors and, in some cases, components to Millat. The technical assistance contract expired in 1971 and the service contract was allowed to lapse.

An appraisal has been made by the Pakistan Tractors Corporation and Massey-Ferguson of parts that can be manufactured in Pakistan for the "Massey-Ferguson 135." Though some parts will be made by the PTC itself, it has not yet been decided as to which parts are to be imported. The supervision of the quality of the parts made in Pakistan is the responsibility of Massey-Ferguson.

The PTC is responsible for the contract and delivery of the parts from Pakistani suppliers and for imports. At present all components will be imported in the completely knocked down condition and the assembly facilities of the Millat Factories in Lahore will be utilised. As Pakistan-made parts become available, these will gradually replace the imported components.

The mix of different brands and sizes of tractors including components parts (partial or complete) of Massey-Ferguson tractors is determined by a Committee including representatives of the Ministries of Production, Commerce and Finance, and the Agricultural Development Bank. The PTC itself is not a member but assists in the work of the Committee.

Many factors influence the determination of the mix of imports. For example, with the conclusion of the agreement with Massey-Ferguson in 1973, foreign exchange was allocated to the PTC for the purchase of the M-F machines. Previously, the imports of M-F 135 as well as other tractors had been limited to IDA credits, barter, home delivery system, and bilateral agreements with countries such as Germany. The mix of imports was influenced by the availability of barter credit, the availability of IDA credit, the price offers by alternative suppliers, and the ready

availability of tractors. The influence of these factors was brought out in September-October, 1973. The devastating flood accentuated the demand for tractors in the horse power range of the M-F 135. However, Massey-Ferguson was not in a position to supply the requisite number of tractors at short notice. Therefore, negotiations were carried out not only with Massey-Ferguson but also with Fiat, Ford, IMT, and Byelarus for the delivery of tractors.

The PTC's plans for manufacturing implements (e.g., cultivators, mouldboard ploughs, and disc harrows) are still in the formative stage. While the arrangement with Massey-Ferguson provides for assistance in this area, the PTC is not obliged to go ahead with implement production.

Prices and Costs

Tractors

There are wide variations in the C&F prices of tractors due to differences in freight rates, horse power, and the makes of the tractors. The FOB prices for the same type and make of tractors may vary over consignments.

In Table 13, we have shown the detailed cost build-up of various tractors by taking into account the FOB price, freight costs, port charges, customs duties, and preparation and other charges.

Spare Parts

Until recently, imports of spare parts were permitted only to tractors importers. They were required, however, to import spare parts equal to $16\frac{2}{3}\%$ or $\frac{1}{6}\%$ of the combined value of tractors, spare parts, and implements imported. The number and type of spare parts are required to reflect the expected depreciation and wear of the tractors. Spare parts can be freely imported now, but the $16\frac{2}{3}\%$ rule has been retained for the principals dealing with tractor imports. The result has been the import of fast moving parts by both the non-tractor importers and the principals.

The mark-up allowed on spare parts is 30% and the commission of the dealer is 10%. The import duty levied on spare parts by the Government is 50%. Previously, the duty was 10% but had to be raised to the

Table 13

Tractor Cost Build-up, Pakistan, 1973

Cost Item	Tractor Makes and Specifications							
	IH 444[1] (45 h.p.) (UK)	IH[2] (72 h.p.) (W. Germ.)	Ford 3000[3] (46 h.p.) (UK)	MF 35[4] (45 h.p.) (UK)	Zetor 4712[5] (45 h.p.) (Czech.)	Zetor 5711[6] (60 h.p.) (Czech.)	Imt 533[7] (41 h.p.) (Yug.)	Byelarus Mt[8] (55 h.p.) (USSR)
FOB Cost	£ 921.54	Dm. 14,189	£ 1,197.5	NA	NA	NA	NA	NA
Ocean Freight	£ 67.38	Dm. 980	£ 104	NA	NA	NA	NA	NA
C & F Cost	£ 988.92	Dm 15,169	£ 1,301.5	NA	$ 3,008	$ 3,342	NA	NA
Rupees equivalent	Rs. 28,674	Rs. 65,959	Rs. 34,477	Rs. 39,750	Rs. 29,780	Rs. 33,086	Rs. 22,730	Rs. 23,772
Importing Cost[a] (5% of C&F)	Rs. 1,435	3,300	1,725	1,988	1,489[f]	1,654[f]	1,137	1,188
Customs duty	Rs. 0-[b]	6,662	3,621	4,173	3,183[fg]	3,544[fg]	2,284	2,424
Landed Cost	Rs. 30,494	• 76,745	40,253	45,911	34,452	38,284	26,151	27,384
Octroi (Municipal Taxes)	Rs. 64	767	450	NA	344	386	NA	242
Preparation Cost	Rs. 400	400[d]	650	750	400	400	450	400
Agent and Dealer's Mark-up	Rs. 2,367[e]	7,674[e]	3,101	4,591[e]	3,445	3,828	2,615	2,738
Ex-Karachi Price	Rs. 32,940	Rs. 84,762	Rs. 44,024	Rs. 51,252[h]	Rs. 38,641	Rs. 42,898	Rs. 29,216[h] (Ex-Lahore)	Rs. 30,764

Source: Interviews in Lahore and Karachi, November, 1973.

Terms of Sale

1. IDA-financed, delivered July, 1972.
2. Imported under German credit. Delivered Karachi Nov. 17, 1973. Imported in semi-knocked down condition.
3. Delivered April 1973 in semi-knocked down condition.
4. Ordered August, 1973. Selling price has not yet been finalized by the Controller-General of Prices.
5. Ordered and to be delivered in first half of 1974 under barter. Selling price has not yet been finalized by the Controller-General of Prices.
6. Ordered and to be delivered first half of 1974 under barter. Selling price has not yet been finalized by Controller-General of Prices.
7. Shipment delivered to Pakistan on barter and IDA financing in Spring 1973.
8. Shipment expected to be delivered in early 1974. C&F price is firm. Other costs and selling price ex-Karachi are proposed but not yet approved by the Controller-General of Prices.

Footnotes

[a]Composed as follows: part handling 1/2%, insurance charges 1%, license fee 1/4%, banking and financing costs 3%, other 1/4%. Some of the actual figures reported for these categories differed from these reported in the table; usually they were higher.

[b]Imported before the duty was levied.

[c]Residual

[d]Firm has applied to the Government of Pakistan for increase to Rs. 7.50.

[e]10% of the landed cost.

[f]Anticipated allowances that will be approved by the Controller-General of Prices.

[g]10% of 105% of C&F.

[h]Plus Octroi Tax.

load of the duty imposed on equivalent automobile spare parts. The rate of duty on non-interchangeable parts, however, remains unchanged. Some of the tractor importers feel that this combination of procedures is placing an undue burden on them. They suggested that either the percentage rule applicable to them be relaxed or that licenses for parts be given only to the tractor importers.

Tariff classifications have caused market disruptions. Because car and bus parts were assessed at 50% to 60% tariff and tractors parts were assessed at 5% to 10%, imports of car and bus parts were declared as tractor parts. This led the Government to declare that for purposes of tariffs on parts, a tractor would be considered an automotive vehicle and that tractor parts (specifically tractor parts under Pakistan Tariff Classifications 84.63, 84.64 and 85.08) will be subject to duty applicable to parts of automotive vehicles, i.e., at 50%.

Implements

At one time, 10% of the combined import value of barter tractors, implements, and parts were required to be implements. This rule is no longer applicable to barter imports. The IDA loan proceeds are still utilized in the ratio of $\frac{3}{8}$ for tractors, $\frac{1}{8}$ for implements, and $\frac{1}{8}$ for parts.

The ADBP has required that a cultivator be sold with each tractor. Equipment prices are fixed. However, prices of cultivators in the free-market were reported to be almost double the fixed price during the last part of 1973.

Implements are imported with the approval of the ADBP. The Ministry of Commerce issues the import licences, which are freely given to those on approval lists. Suppliers of implements give discounts (relative to prices in the exporting country) which are somewhat lower than the discounts for tractors. The duty on imported implements is 10% to 20% and the dealer's commission is 7.5%.

Some principals felt that prices of implements had gone up considerably due to protection given by the Government to local manufacturers and had an adverse effect on their quality.

The following price quotations given by an agent illustrate the sharp price advantage for purchasing Pakistani-made implements.

Table 14

Price of Ford Tractors Implements, Domestic Manufacture vs. Imported Implements Price

(Rupees)

Implement	Domestically Manufactured	Imported
Trolley	4,000—5,000	10,000
Cultivator	—	2,642
Rear Blade	700—1,000	4,000—6,000
Power transmission pulley[1]		300

[1]Except one or two lots imported in 1971-72 where the pulley was already fitted to the tractor and was not an allied implement.

Problem Areas

With the introduction of a liberal import policy with respect to spare parts, the slow moving spares (transmissions, gear boxes, etc.) have almost disappeared from the market and are being sold at exorbitant prices. On the other hand, the market is flooded with fast-moving spare parts which are easy and quick to sell.

The principals interviewed by us felt that they were being discriminated against by the Government in that they were under the restriction of importing spares worth only 16.66 percent of their licence, while other importers were free to import as many spare parts as they wished. Some importers thought that tractor prices could be reduced by 10 percent if they were allowed to import tractors in "a completely knocked down" (CKD) condition, and that some parts could be imported from sources cheaper than the original makers. For example, import prices of tyres of Yugoslav tractors were reported to be 17.5 percent higher than of comparable tyres obtained from elsewhere.

The existing aggregate demand for tractors was estimated at about 12,000 to 15,000 per annum at current prices. With the removal of the 10% duty, the demand was estimated at 20,000 and could increase still

further if the tractor prices were reduced according to the suggestions of the importers.

Some farmers were not satisfied with the existing system of distribution of tractors through the ADBP, which was reported to be unnecessarily expensive and lengthy.

Farmers feel that tractors add to their farms' productivity. Almost all the farmers interviewed observed that they were saving on labour and bullocks. In addition, they were utilizing land for remunerative crops which they had previously used for providing fodder to the bullocks. They were also able to increase cropping intensity by 33% by using tractors.

Another set of problems is related to the large quantity of tractors demanded at official selling prices. Estimates by the individuals interviewed about the excess demand for tractors suggest that the sale prices for IDA tractors are below their equilibrium price given current levels of production, imports, and prices of other tractors. For example, one dealer estimated that he could sell 1,000 tractors per month if they were available. He sold less than 50 in 1972. Thus, there is a scarcity gain to an individual who is fortunate to be approved for an ADBP loan and for his name to be high on the list. This leads to corruption and black marketing.

Alternative Approaches

Tractor Imports

Economic conditions in the non-farm sectors of agricultural regions of Pakistan make it very profitable to use tractors for haulage. Attempts are being made to insulate the resulting demand and various rules and procedures are being designed to prevent tractors from being used in this manner. Alternative sources of power for road hauling should be seriously examined. More efficient vehicles are likely to be available and this would presumably mitigate the withdrawal of tractors from farming.

Chapter III

THE PRICING OF TUBEWELL INSTALLATION

Introduction

Agricultural breakthrough in Pakistan during the late 1960's was the result of a number of consistent favourable factors not the least important among which was the development of the country's water resources, especially through tubewells. Among other factors which helped increase cropping intensity in the country were cultivation of high yielding cereals and increased use of fertilizers.

The average yields of various crops, however, are still estimated to be much lower than in some other countries with comparable geographic, climatic, agronomic, and other conditions.

A major agricultural problem in Pakistan has been the scarcity of water. For example, one cusec (cubic foot per second) of water is generally supplied to a maximum of 70 acres in the United States while in Pakistan the same quantity of water is used to irrigate land three times that much or even more. Increased water supply is likely to boost production per acre, especially on those lands which have inadequate water supply at present.

Tubewell equipment was included in the scope of this study for several reasons. To begin with, tubewells play an important role in Pakistan's crop production. Then, tubewell equipment is largely made in Pakistan although with imported components. Moreover, the selling prices are not controlled by Government. Therefore, a study of tubewell equipment is particularly interesting as it is different from the study of tractors and fertilizers.

Structure of the Industry

Pakistan has the largest single canal irrigation system in the world, covering about 33 million acres. The Tarbela Dam which is nearing completion will increase water availability by nearly 10%. Despite this

vast canal system, Pakistan has witnessed a substantial increase in the number of private tubewells in operation during the last 15 years, i.e., from 1,780 in 1954 to 79,233 in 1969. The rate of expansion was greatest in 1966 and 1967 (Table 15).[16]

This increase in the number of tubewells was, principally, because of certain limitations of the canal system, e.g., its dependence on river flows which vary not only from year to year but also from season to season: its

Table 15

Number of Private Tubewells Installed Annually in Pakistan[1]

Year	Number of Private Tubewells Installed	
	Annual	Cumulative
1954	1,780	—
1954-60	6,145	7,925
1961	3,827	11,752
1962	5,253	17,005
1963	5,867	22,872
1964	8,304	31,176
1965	9,031	41,207
1966	11,120	52,327
1967	9,986	73,149
1969	7,005	80,233[2]

Source: [13, p. 34].

[1]The life of the tubewell equipment, particularly of the strainer, is finite and, therefore, some of the installations in later years may have represented replacements. For further discussion, see [1, pp. 81-90].

[2]This figure is 1,000 higher than that used in the text and is probably due to an as-yet-undetermined error in arithmetic.

[16]Some more recent unpublished data compiled from Provincial Statistics for public and private tubewells show that there were 85,729 tubewells in 1969-70 and 94,638 tubewells in 1970-71. The number of private tubewells in the Punjab reportedly grew from 75,123 in 1969-79 through 81,814 in 1970-71 to 90,844 in 1971-72. (Provided by A.R. Khan, Research Investigator, Planning Unit, Ministry of Food and Agriculture, Islamabad, December 6, 1973).

tendency to lead to water-logging and salinity; high evaporation losses; and the difficulty of regulation at the extremities. In addition, there are important areas still not amenable to canal irrigation, particularly outside the Indus Basin. Further, the tubewells are amenable to private ownership and do not have to await Government action. For these reasons, tubewells have been widely used to supplement canal water in many regions of Pakistan.

In this section, a statistical review is made of the use of tubewells at the farm level which is followed by a brief introduction to tubewell manufacture. Finally, the role of the Agricultural Development Bank is examined.

Characteristics of Tubewells in Use in Pakistan[15]

Although much has been written about tubewells in Pakistan, relatively little comprehensive engineering information exists. We will initially focus on the major findings of a comprehensive survey conducted in 1969.

As of 1969, the study suggested that there were 79,233 private tubewells and 8,519 public tubewells.[16] Over two-thirds (68.27%) of the private tubewells in 1969 were found in two districts, viz., Multan and Lahore, both in the Punjab. Public tubewells were also concentrated in these two areas, but the total proportion (59.3%) was not quite as high (Table 16). Altogether, about 80% of the tubewells were in the Punjab.

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[15]As indicated in footnote 14, unpublished statistics suggest that the total number of public and private tubewells was 85,729 in 1969-70 and 94,638 in 1970-71. Of the 89,539 tubewells in the Punjab in 1970-71, 81,814 were private and 7,725 public; the comparable figures in 1971-72 were 98,409, 90,844 and 7,565 repectively. [Source: Khan. See footnote 14.]

[16]It has so far been difficult to obtain comprehensive, recent data on tubewell numbers. Aside from the source cited here, the only annual data found were for 1964 to 1968 and were reported in *Development Statistics of West Pakistan*. The most recent issue found in the PIDE Library was issued in April, 1971 and in turn the private tubewell data were taken from *PIDE Report* 71 and the *Farm Mechanisation Survey* of 1968. The public data were from the WAPDA. Perhaps other more complete and current statistics are available but we had not located them as of this writing.

Table 16

Division Location of Private and Public Tubewells in Pakistan, 1969

Division	Private Tubewells		Government Tubewells		Total Tubewells (Number)
	Number	as% of Total Private Tubewells	Number	as% of Total Govt. Tubewells	
Multan	28,167	(35.6)	1,843	(21.4)	30,010
Lahore	25,617	(32.6)	3,202	(37.9)	28,819
Sargodha	11,526	(14.6)	1,610	(19.2)	13,136
Bahawalpur	4,526	(4.8)	174	(2.2)	4,700
Rawalpindi	2,503	(3.3)	875	(10.4)	3,378
Peshawar	2,082	(2.6)	73	(0.3)	2,155
Khairpur	1,333	(1.8)	540	(6.4)	1,873
Other	3,479	(4.3)	203	(2.4)	3,682
Total	79,233	(100.0)	8,519	(100)	87,752

Source: [13, p. 40].

The total capacity of the tubewells by sector was estimated by one study to be:

Sector	Capacity Measure of Tubewells	
	Cusec[1]	MAF[2]
Private	82,000 (75%)	14 (74%)
Government	27,000 (25%)	5 (26%)
	109,000 (100%)	19 (100%)

[1]Cubic feet per second.
[2]Million acre feet.

The MAF total of 19 is about 20% of the total of 94 MAF estimated to be supplied by canals in Pakistan.[17]

[17]Quite different MAF figures are provided by F. Kalnert *et al.* [7]. Development tubewell figure is placed at 11.3, the public figure at 10.2, and the canal figure at 55.5. The reasons for these differences are not immediately known.

Private tubewells are used either to provide water where canal water is not available or to supplement canal water. Public tubewells are used mostly to reduce waterlogging and salinity. In 1969, about 58% of the tubewells were not on canal irrigated land while 42% were.* In the latter case, nearly 61% of the tubewells were used to supplement perennial canals and 39% to supplement seasonal canals. Since river and canal seepages help recharge underground water, a study of 1,807 tubewells in the Punjab in 1966-67 [10, p. 15] significantly revealed that only 18% of these were located more than 5 miles from rivers or canals.[18]

The major technical characteristics of the tubewells in 1969 which have relevance to this study were as follows. About 72% of the tubewells were in the 0.51 to 1.50 cusec range and the average capacity was 1.04 cusecs. Similarly, nearly 47% of the engines were in the 16 to 20 h.p. range and nearly 82% were in the 11 to 25 h.p. range (only 16% under 11 h.p. and 2% over 25 h.p.). In the private sector, 61% of the engines were diesel, 39% electric while in the public sector all were electric. Nearly 60% of the bore pipe was 6 inches in diameter, and another 17% was 5 inches in diameter. The strainer in 84% of the cases was made of coir (to be described later); some 9% of the tubewells were open wells which used no strainer; and 6% used a brass strainer. The strainer was generally as long as or longer than the bore pipe. The depth of the well itself was from 100 to 200 ft. in 55% of the cases and less than 100 ft. in 40% of the cases. Only 5% of the wells were deeper than 200 ft.[19]

The ~~most~~ common size of the area irrigated per tubewell in 1969 was in the 26 to 50 acre range (30%) followed by those of 11 to 25 acres (20%), 51 to 75 acres (18%), 76 to 100 acres (11%), and over 100 acres (15%). In only 6% of the cases was the area less than 10 acres. The overall average was 64.5 acres.

Several other observations may help round out the statistical picture presented in the previous paragraphs. The tubewells are, as might be suspected, generally relatively large and permanent installations. The pumps themselves are normally of centrifugal type and in many regions

[18] In the Punjab as of June 30, 1972, about 70% of the private tubewells and 4% of the public tubewells were diesel powered. The remainder were electric [11, pp. 34-35].

[19] For similar information for the Punjab in 1966-67, see [11].

are placed at the bottom of excavated pits.[80] They are normally covered in fairly permanent structures and make use of a well-developed water distribution system.

Diesel engines were widely used in the early years because of the relatively scarce and unreliable supply of electricity. But as electrical power has become more widely available and dependable, electric motors have become more widely used. They are cheaper for the operator to buy and also to maintain. The diesels are almost always low-speed water-cooled units, though one firm has introduced a high-speed, air-cooled 7.5 h.p. unit and is now manufacturing about 2,000 a year.

The well itself normally consists of a pipe driven into the ground. When, in drilling, the water-bearing strata are reached, the pipe is withdrawn and a perforated section of pipe known as the strainer is attached and the unit is re-sunk into the ground. The pipe may be of two main types: galvanized (G.I) and mild steel (M/S) while the strainer used in 1969 was usually of the coir type.[81] It is begining to be replaced by units made of polyvinyl chloride (PVC).

Essentially all the components of the tubewell unit are manufactured or fabricated in Pakistan. But since Pakistan does not produce metal, all the basic iron, steel, copper, brass, etc., have to be imported. This has an important bearing on costs. Some of the main elements of the tubewell industry are described in the following section.

Tubewell Manufacture

Tubewell manufacturing industry basically consists of a large number of relatively small firms. Only a couple of firms produce the full range of components used in tubewells while many firms specialise in the manufacture of particular types of equipments such as pumps, pipes, and even specific types of parts such as blocks for diesel engines. While there

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[80]Centrifugal pumps do not have a great suction capacity. The pit is used to place the pump as close to the water level as possible. The depth of the pits goes down to 26 feet in Multan and Sahiwal districts.

[81]This unit is constructed by manual labour using iron, strips, rivets, and hammer to form a pipe-shaped cage which is wrapped with coir (coconut fibre) cord.

are many manufacturers of diesel engines, there are relatively few producers of electric engines, possibly because of patents. The specialization of seven of the major tubewell firms is as indicated in Table 17.

Table 17

Tubewell Equipment Manufactured by Selection Firms

Firm	Manufactured Items				Resale Items		
	Diesel Engines	Electric Motors	Pumps	Filter Strainer	Blind Pipe	Delivery Pipe	Boring Machinery
Peco	X	X	X	X	X	X	X
Matchless	X	—	—	—	—	—	—
Nazir Abid	X	X	X	X	X	X	—
Hussain	X	—	X	—	—	—	—
Nawab	X	—	X	X	X	X	—
Ittefaq	X	—	—	—	—	—	—
Kissan	X	—	X	X	X	X	X

Generally, it is relatively easy for tubewell firms to go into production. Capital requirements are evidently not large, needed skills are not excessive, and technology is such that costs do not drop sharply as production is increased. Thus, tubewell firms go out of production as easily as they go into it. Most production is concentrated in the Lahore area.[22]

Thus the situation at the retail end is one of competition among a wide variety of producers. Prices are not regulated by the government. The buyer is able to bargain among a number of different producers for the various components.

The government has not provided any special encouragement to the tubewell manufacturing industry over the years and the industry has not received any subsidy.[23] Loans have, however, been made to farmers to encourage their use of pumpsets. Some of the basic financing for this programme is described below.

[22]The situation in November, 1973 was little different from that of 1969 and 1970 described in greater detail in [8].

[23]By comparison, Gotsch [6, p. 15] notes that India, which produces its own iron and steel, has made some attempt to make supplies available to small scale industry at favourable rates.

Role of the Agricultural Development Bank

The Agricultural Development Bank has been providing credit for tubewells since as early as 1965. The foreign exchange costs of tubewell equipment have, in turn, been met by two more general IDA loans administered by the World Bank. These were calculated at 50% of the total cost.

The first IDA loan (No. 76) covered the 4-year period from July 1965 to June 1969. It totalled $10 million or Rs. 47.6 million. Thus the total ADBP tubewell programme involved a $20 million effort. Borrowers had to own or rent 25 acres of land or more. The interest rate to the farmer was 6% over a year. The IDA tubewell loan was originally scheduled to run for three years, but because of a slower than anticipated rate of installation it was extended to four years.

The second IDA loan (No. 157) extends from July 1969 to June 1974. It was originally for $ 9.95 million but was reduced, because of slower than anticipated rates of installation, to $5.95 million in March 1971, and again, to $5.50 million in December 1972. Similarly, the loan was originally expected to expire in June 1972, but was extended to June 1974. The original loan was expected to finance 8,000 tubewells. Minimum requirement for borrowers was operation of at least 12.5 acres of land with a minimum 50% ownership.[24] The borrower further had to make a 20% deposit which was to be refunded when the loan was repaid. The interest rate was 8%.

The number of tubewells financed annually under the ADBP/IDA programme is outlined in Table 4. From an examination of both Table 4 and 1 it is apparent that a large proportion (perhaps half in the mid- to

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[24]Various sizes of pumps were allowed for various minimum development area. They were reportedly as follows:

Size of pump (*cusecs*)	*Land area* (*acres*)
1/4	12.5 to 25
1/2	25 to 50
1	50 to 100
1-1/2	75 to 150
2	100 to 200

One study suggested that these pump size were too small for the land areas indicated and that the 1 cusec pump might more appropriately be used for a land of 25 to 50 acres. See [13, p. 58].

late 1960's) of the tubewells was financed by the Bank with the help of the IDA.

Table 18

Number of Tubewells Financed by the Agricultural Development Bank of Pakistan, 1965-66 to 1971-72.

Financial Source	Period	No. of Tubewells Financed	
		During the year	Cumulatively
First IDA Credit	1965-66	5,040	5,040
	1966-67	5,767	10,807
	1967-68	5,567	16,374
	1968-69	3,531	19,905
	Sub-total	19,905	
Second IDA Credit	1969-70	2,028	21,933
	1970-71	2,317	24,250
	1971-72	2,355	—
	1972-73		
	1973-74		
	Current sub-total	6,700[a]	
	Current total	26,605	

[a]The original goal for the first 3-year period was 8,000 units.

About 90% of the units were reported to be diesel powered while 10% were run on electricity. A number of reasons have been suggested for the slowdown, ranging from ADBP operating procedures to difficulty in getting electrical connections.[25]

Costs and Prices

In this section (a) costs of tubewells at the farm level, and (b) the influence of import programme on costs are reviewed.

Tubewell costs are principally composed of initial capital costs and annual operating costs. Our brief survey period did not give us the time to make anything like the detailed analysis carried out in the late 1960's by Edwin Clark and Mohammad Ghaffar [4]. Instead some more recent

[25]For details of some of these see [13, pp. 56 and 58].

statistics have been obtained on certain points. Comparative references to another study conducted in 1969 have been included. In addition, some remarks on current subsidy programmes have been appended.

Capital Costs

Capital costs cover current cost ranges for individual components and some current package costs from dealers. For current component costs the main purchased components are engines, pumps, pipes, and filters.

Engines are the most expensive item. In mid-November 1973, the following general prices of engines were quoted ex-Lahore:

Type	*Rs.*
Diesel (16 h.p.)	7,100 to 9,500*
Electric (15 h.p.)	2,000 to 3,000

*A typical quote was Rs. 475 per h.p.

The price range represented variations in quality. The best engines used, for instance, imported fuel injection units, and were of international quality. Others were less sophisticated and were hand-made by local artisans.

Pumps ranged in price from Rs. 700 to Rs. 1,300 and showed a similar variation in sophistication.

Tubewell pipes are either galvanized (G.I.) or made of mild steel (M.S.). Per foot prices of imported M.S. pipes in November 1973 were Rs. 24 for 5-inch bore and Rs. 28 for 6-inch bore (including one socket and ring at every 20 feet). G.I. pipe was not available and further imports are banned. Current prices on domestically manufactured pipes are:

Bore	*M.S.*	*G.I.*
	(Rupees)	
5-inch	28.01	29.75
6-inch	30.75	32.50

The local pipe is not only of higher price but also of lower quality (0.188-inch vs. 0.212-inch thickness) and the price does not include sockets.

Prices of strainers or filters vary with the material used in their manufacture. Brass strainers are very expensive and in 1969, as noted earlier, were used on only about 6% of the private tubewells. The coir strainer are more common. Prices for coir filters range from Rs. 6 to Rs. 9/foot. As noted earlier, filters made of PVC are growing in importance.

To the cost of the individual components must be added the cost of drilling the well, incidental labour costs, and the costs of building the tubewell house.

Current Total Costs

Current commercial quotations for 15 h.p. and 16 h.p. diesel and electric-powered units, less the cost of the tubewell house, are summarized in Table 19. The total cost (excluding labour, as may be seen, varied

Table 19

Estimates of Tubewell Costs, Two Dealers, Lahore Area, November 1973

(Rupees)

	Firm A		Firm B
	Diesel	Electric	Diesel
Diesel engine (16 h.p.)	7,100	—	7,600
Electric engine (15 h.p.)	—	2,300	—
Switch starter	—	1,000	—
Pump	875	875	700
Pipe (6 inch : 40 ft.)	1,560	1,560	1,520
Filter (100 ft.)			
Brass	6,000	6,000	NA
Coir	900	900	900
Miscellaneous[1]	1,715[2]	1,365[3]	1,386[2]
Sub-total			
Brass filter	17,250	13,100	—
Coir filter	12,150	8,000	12,106
Drilling (8 inch; 140 ft.)	560	560	450
Labour	NA	NA	300
Total Brass filter	17,810[4]	13,660[4]	—
Coir filter	12,710	8,560[4]	12,856

[1]General miscellaneous expenses include: ball plug, sockets, reflex valve, bends, flanges, nuts and bolts, and lowering charges.
[2]Includes general miscellaneous expenses plus pulley, flat belt, silencer pipe cooling system.
[3]Includes general miscellaneous expenses plus electrical materials, wire, conduit pipe and flexible pipe.
[4]Excluding labour costs.

from Rs. 8,560 to Rs. 17,180 depending on the types of engine and filter used). In the case of one firm, the diesel unit cost 48.5% more than the electric unit when a coir filter was used but 30% more when a brass filter was used. The diesel engine and pump represented about 63% of total costs (coir filter) in the case of one firm and 66% in the case of the other (both excluding labour). As against it, the electric motor and pump accounted for 49% of the total cost.

During our survey we were able to secure estimates of prices actually paid for somewhat smaller diesel-powered units by several farmers. These estimates are summarized in Table 20. The total costs were less, but the ratio of the engine/pump costs to the total costs was not much different: 56% and 60% respectively. An interesting and useful addition was the estimate of Rs. 1,500 for the cost of pumphouse.

Table 20

Estimated Tubewells Costs of Two Farmers, Lahore Area, November 1973

(Rupees)

Equipment	Farmer A	Farmer B[1]
Pipe	1,600 (5 inch)	668 (4 inch)
Engine (electric)	1,800 (10 h.p.)	1,300 (7.5 h.p.)
Switch starter	1,000	500
Pump	1,162 (5 x 4 inch)	600 (4 x 3 inch)
Coir filter	480 (5 inch)	450 (4 inch)
Miscellaneous	355	281
Sub-total	6,397	3,799
Drilling	200[2]	225
Labour	500	N.A.
Total (coir filter)	7,097	4,024[3]
Tubewell house	N.A.	1,500
Total (coir filter)	N.A.	5,524[3]

[1]Installed 1-1/2 years ago.
[2]By Agricultural Engineering Department, Sheikhupura.
[3]Excluding labour cost.

Results of an extensive survey conducted in 1969 are summarized in Table 21. They show that the diesel-powered pumpset cost 33% more than the electric-powered pumpset (our differential was 48.5% for a coir

Table 21

Average Installation Costs in Rupees for a One Cusec Capacity Private Tubewell, Five Districts, Pakistan, 1969[1]

Item	Diesel	Electric
	(17 h.p.)	(19 h.p.)
Engine, Pump, and Control	5,874	3,619
Other[2]	3,229	3,229
Total	9,103	6,848

Source: [13, p. 94]

[1]The five districts were Sialkot, Gujrat, Gujranwala, Sahiwal and Multan.

[2]Pipes, strainer, drilling, and miscellaneous.

filter). In turn, the diesel unit and pump were 64.5% of total costs while the comparable proportion for an electric engine and pump was 53% (both very close to our differentials).

Operating Costs

It was not possible to get much information on tubewell operating costs. This would have involved considerably more farm interviews, of a more detailed nature than was possible. However, some estimates of fuel and electric power consumption were obtained. These, together with a summary of average annual costs in 1969, provide some insights into the operational costs of tubewells.

The 1969 costs, which were broken down into three main categories, are summarized in Table 22. Total operating costs for the diesel tubewlls were about 90% higher than those for electric tubewells. Operating costs accounted for 72 percent of the total annual diesel tubewell costs and 66 percent of total annual electric tubewell costs. Replacement and repair were 16 percent for the diesel operation and 17 percent for the electric tubewell. In each case, the major single cost was for fuel (49%) or electricity (66%)—and the diesel fuel cost 40 percent more than electricity.

The current fuel and electricity charges are calculated as follow: Fora 16 h.p. diesel, it is estimated that the fuel cost per hour of operation was Rs. 2.01[26] before November 22 and Rs. 2.49[27] thereafter showing an increase of 24 percent. The cost of electricity for a 15 h.p.

Table 22

Average Annual Costs of a One-Cusec Capacity Private Tubewell, Five Districts, Pakistan, 1962[1]

(Rupees)

Cost Category	Diesel Tubewell	Electric Tubewell
1. *Operating Cost*		
Fuel	2,000	1,430
Electricity	—	—
Lubrication	49	—
Operator's pay[2]	461	—
Sub-total	2,510	1,430
2. *Annual Replacement and Repair*		
Tubewell Reboring	200	200
Repair of engine	400	100
Repair of pump	25	25
Miscellaneous	50	50
Sub-total	675	375
3. *Amortization of Capital Cost*[3]	480	359
Total annual cost	4,107	2,164
Cost per acre-foot of irrigation water	21	11

Source: [13, pp. 99-101]

[1]The five districts were Sialkot, Gujrat, Gujranwala, Sahiwal, and Multan. Costs were normalized on the basis of 2,130 hours of operation. A coir filter was used.

[2]Part-time.

[3]Assuming a life of 12 years for the coir strainer and 20 years of engines and 8% interest.

[26]The price of diesel fuel has been assumed to be Rs. 3.03 per gallon and of lubricant oil Rs. 10 per gallon.

[27]Price of diesel fuel has been assumed here as Rs. 3.98 per gallon and of lubricant oil Rs. 10 per gallon. The ruling prices on January 31, 1974 were Rs. 4.75 per gallon for diesel fuel and Rs. 12 per gallon for lubricant oil.

motor remained unchanged at Rs. 0.96 per hour (to which must be added a Government Tax of Rs. 75 per month). If we assume 200 hours of operation per month, the total post-November 22 costs, including the cost of electricity and tax, would be Rs. 498 for fuel and Rs. 267 for electricity. This means that fuel is currently 86.5 percent more expensive than electricity.

Subsidies

Subsidies are being provided in two separate instances. One is under the Peoples' Works Programme. The other is in the province of Baluchistan.

The Peoples' Works Programme

Farmers are being provided subsidies of Rs. 4,000, Rs. 6,000 and Rs. 8,000 under the Peoples' Works Programme for installation of tubewells under specific conditions. These conditions are:

1. land must be uninhabited.
2. land must be waterlogged or saline.
3. there should be no Government tubewells in the area, and
4. electricity is unavailable.

The minimum holding for a subsidized tubewell is 50 acres. Larger holdings qualify for a larger subsidy. More than 100 acres must be involved to qualify for the subsidy of Rs. 8,000. If one person does not have the required amount of land, more than one party can jointly get a subsidy by fulfilling the minimum land holding requirement together. Substantial numbers of tubewell diesel engines were sold in recent months to customers receiving subsidies. One company indicated that about 90 percent of its sales were now being made to customers receiving subsidies. In the calender year 1973, about 4,500 tubewells were sanctioned under this programme in the Punjab province.

The ADBP also provides loans for the installation of and equipment for both diesel and electric-powered tubewells.

Baluchistan

The Government of Baluchistan places funds (Rs. 3,600,000 in 1972-73) every year at the disposal of the Department of Agriculture to

purchase engines with pumps and accessories and distribute them among the farmers at a 66.6% subsidy. The director of farm machinery and equipment screens and recommends the applications of farmers for the award of tubewell machinery to a high level committee which, after scrutinizing the applications, provides to the Agriculture Department the list of farmers for the award of the said machinery.

After receiving the machinery, the farmer applies to the Irrigation Department of the Government of Baluchistan for installation. The Irrigation Department, again, is supposed to install tubewells for the farmer at one-third of the cost of installation. Some of the farmers who are not able to get tubewell machinery from the Agriculture Department buy tubewells from the market and apply to the Irrigation Department for installation.

Influence of Import Programmes

The prices of tubewell equipment are heavily dependent on the prices of imported components and imported raw materials, specifically metals of various types.

Components

The proportion of imported components—items which are fabricated outside the country and then used in the assembly process—varies by manufacture and by types of equipment. The most sophisticated manufacturer indicated that imported components represented the following proportions of total costs:

Item	*Cost as Percent of Total Cost*
Diesel engines	30
Electric motors	20
Pumps	8

The specific components imported are: diesel engines, with pistons and fuel injectors; electric motor with bearings and insulation wire; and pumps with bearings. Other manufacturers may use a smaller proportion of imported components.

Raw Materials

The major category of imported costs relates to raw materials. Pakistan produces no metals of its own so that all the metals used in tubewell must be imported. Pig iron is the major metal imported for tubewell engines and pumps, followed by brass. Pig iron was reported by two manufacturers to have accounted for about 40% of the retail price of the diesel engine. In the case of pipes, the main imported ingredients are steel strips and zinc ingots. Brass strainers are made entirely of imported brass. We shall examine the import system for pig iron and pipes in some detail.

Pig Iron

An overwhelming proportion of the imports of pig iron is made by the Trading Corporation of Pakistan (TCP). The TCP deals with two types of buyers of pig iron—industrial users and commercial importers who were importing pig iron before the inception of the TCP.

The TCP's normal procedure for pig iron imports is to invite demands from both industrial and commercial importers. Purchases of pig iron by the TCP are restricted by the allocation of foreign exchange by the Government for the import of pig iron. With this constraint, imports can be made from any country, but pig iron is usually imported from China, the USSR, and Korea. Foreign exchange is allocated on a calendar year basis.

The TCP floats a tender throughout the world. In response, they receive quotations from various countries on a barter as well as a non-barter basis. Bids are received C&F Karachi. Bids from barter countries also specify a country-currency equivalent of the dollar bid. Usually, quotations from countries having barter agreements with Pakistan are the lowest, though the TCP prefers to import under the barter arrangements even if the price is higher.

Commercial importers are not allowed to import except under the U.S. AID Programme which is available to the general public, including the private importers. Even in that case, they cannot import from a TCP source, and for the last two years no imports have been made under this heading.

The prevailing TCP selling price for pig iron is Rs. 1,150/m.t. Before devaluation, it was Rs. 750/m.t. The selling price is the highest landed price plus "costs" of the supplies available in the TCP inventory instead of current market conditions. The Rs. 1,150/m.t. price represents C&F costs plus about 10% to cover port charges, insurance, wastage, and financial costs involved.

Imports from sources other than barter countries are assessed at 10% import duty as well. The current open market price in Karachi is about Rs. 1,700/m.t. which reflects the relatively short supply in private hands, the low TCP stocks, and anticipated imports and demand. The open market price is especially sensitive to availability of TCP supplies. In mid-November 1973, the TCP held a stock of 6,000 m.t. which was likely to be soon exhausted. These stock are being released at a price of Rs. 1,150/m.t. The next shipment of 10,000 m.t. was expected to reach Pakistan by January, 1974.

Several factors have undoubtedly affected the balance between supply and demand in the Pakistan pig iron market and, in turn, the large increase in price. Private stocks imported previous to the devaluation were large and, in turn, availability restrained price increases. As these stocks became more depleted, dependence on the TCP increased.

Further, with increases in international prices, it has become evident that the TCP price for pig iron imports in the near future will be higher than the current Rs. 1,150/m.t. TCP selling price. This has possibly increased the quantity demanded for storage at the Rs. 1,150/m.t. price.

The TCP's normal procedure is to invite industrial users and commercial importers every six months to estimate the quantity of pig iron they would need for the forthcoming six-month period. If the demand is more than what can possibly be met within the allocated foreign exchange, the imports are distributed proportionately over the estimated demand. Because of the world market conditions for pig iron, the latest estimates were requested in terms of value instead of quantity. Industrial consumers do not make a deposit at the time of submitting their estimates. Commercial dealers, however, must deposit 10%.

Until recently, the TCP has been meeting nearly the entire demand. Last year (1972), a large quantity remained in the TCP storage, for cheaper

pi g iron which had been imported at lower prices before devaluation was still available in the market. This was made available at Rs. 750/m.t. The TCP imports were made after the devaluation and had a much higher rupee cost; hence the higher prices.

The September 1973 estimate of demand is so high that it cannot be met fully, due to the foreign exchange limitations.

Perhaps the buyers have given exaggerated figures out of fear of shortage in the market. In the past, the TCP has been allocating pig iron on a 50:50 basis between the industrial and commercial purchasers. At present, orders are about 2/3 in favour of industrial users. The justification advanced for the fixation of the 1/3 share to commercial importers is that it safeguards the interests of small manufacturers and users of pig iron. These firms usually buy small amounts of pig iron at a time and the commercial purchasers service their needs.

One suggestion for reducing black marketing of pig iron is that the TCP should supply its industrial buyers regularly on a monthly basis. But, as the TCP is dealing with too many commodities, it cannot finance imports for more than the usual grace period of 21 days after delivery. It also includes storage costs and other incidentals such as interest, damage, and wastage. Commercial purchasers are perhaps charging for the same with a tendency to profiteering due to the blocked supply on the part of the TCP. This tendency can, to some extent, be checked by an increased number of shipments which will serve to shorten the time lag between any two shipment periods.

Pipes

Pipes have been imported as well as manufactured domestically. The main imports in the past have been galvanized (G.I.) and mild steel (M.S.) pipes. Further import of both, however, was banned in 1973 —of the G.I. pipes in January and of the M.S. pipes in June. A few shipments are being received which had been ordered for before the policy change.

Huge quantities of imported pipes are, however, still available in the market. One importer indicated that he could supply the entire demand for 5-inch and 6-inch diameter pipe (M.S.) for the next 6 months.

The popular sources of imports were Japan, Korea, and Italy. The pipe is of heavy quality, with a thickness of 0.212 inches, and has a capacity of 900 lbs. per square inch.

There are very few domestic manufacturers of M.S. and G.I. pipes. The biggest manufacturers are Karachi Pipe Mills Ltd. (formerly, Hyesons Steel Mills), Peco (formerly Beco), and Model Steel Mills. Peco has recently started production. The two last named firms are producing essentially smaller pipes (up to 3-1/2 inches) that are rarely used in tubewells. The only firm producing pipes of a larger diameter is the Karachi Pipe Mills (KPM), which is manufacturing pipes up to 6 inches in diameter.

The main components are steel strips, zinc ingots, and chemicals. According to weight, the steel strips comprise 90% and the zinc ingots 10% of the pipe. Chemicals are used only for processing and they comprise 5% of the total costs.

All the raw materials used are imported. The TCP has been responsible for these imports since January, 1972, having replaced commercial importers. Popular sources of imports are the USA, Italy and Poland, mainly against barter agreements but by cash as well. There is a 20% import duty imposed on cash purchases. Recently, the TCP supplied steel strips imported from Japan against cash payment (Table 23).

Prices are determined by the TCP. If imports were made from our different countries, at different prices, the TCP charged the highest price of the four.

Table 23

Steel Strips and Zinc Ingots, Recent Shipments and Price

Commodity	Recent Shipment Supplied to KPM	Price Before Devaluation	Expected Price on Next Shipment
	(m.t.)	(Rs./m.t.)	(Rs./m.t.)
Steel strips	2,255[a]	2,622	3,500—4,000
Zinc ingots	—	7,500	10,000

Source: KPM.

[a]Imported from Japan against cash payment with a duty of 20% and supplied to KPM at an approximate price of Rs. 3,500/m.t. in November 1973.

KPM's own prices for 4-inch, 5-inch and 6-inch pipes are as given below:

	G.I. (Rs. per foot.)	*M.S.* (Rs. per foot.)
4-inch	25.25	23.77
5-inch	29.75	28.01
6-inch	32.50	30.75

These prices are for medium quality pipes having a thickness of 0.188 inches and a pressure capacity of 600 lbs. per square inch. The prices of sockets are not included.

The KPM has dealers throughout the country. They are given a commission of $2\frac{1}{2}\%$ up to Rs. 30,000 per calendar month. A bonus of $1\frac{1}{2}\%$ is given on sales exceeding the above-mentioned target.

Since imported G.I. pipes are not available in the market, a comparision can only be made with prices of M.S. black pipes. Imported pipes are cheaper than the locally manufactured pipes (Table 24).

Table 24

Comparison of Costs of Imported and Locally Manufactured M.S. Black Pipe in Rs./ft.

Size	Local Pipe	Imported Pipe (Nov. 1973)	Price before TCP Take-over (Nov. 1972)
5-Inch	Rs. 28.01	Rs. 24	Rs. 18
6-Inch	Rs. 30.75	Rs. 28	Rs. 24

The market price of one socket for a 6-inch diameter pipe is Rs. 30. As sockets are included in the price of the 20-foot piece in the imported product, about Rs. 1.50/ft. is the additional cost of the socket for locally manufactured pipes. If these are included in the above price, the price of the KPM 6-inch pipe is Rs. 32.25 per foot as compared to Rs. 28 per foot for imported pipe of a superior quality.

The higher prices of locally manufactured pipes seem to be due to higher raw material prices charged by the TCP and lack of competition in the industry.

Problems and Issues

Tubewells have made a major contribution to the growth of agricultural output in Pakistan. They have grown in number without major problems. The industry may, however, require more Government support now than before.

Escalation in Cost of Pig Iron

As noted earlier, virtually all the metal used in the manufacture of tubewell is imported. Prices of imported metals have recently risen very sharply.

This problem is illustrated by a review of the pig iron situation. The price of pig iron, the most important components, has recently increased from Rs. 40 and Rs. 42 to Rs. 73 and Rs. 75 per maund. It is a common phenomenon that whenever there is a delay on the part of the TCP in the supply of pig iron, the price increases to approximately twice the original price. Black marketing and profiteering are said to be very common. Of course, hoarders charge storage cost, an interest rate, and other incidentals. Even then, the open market (black market) price is substantially higher.

The TCP does not supply on a monthly basis because it does not have enough storage capacity. But the TCP can cover the cost of storage, interest, and other charges in its own fixed price of Rs. 1,150/m.t. That can, to some extent, reduce the prices of diesel engines. Manufacturers will be spared many difficulties if they could get a steady flow from the TCP.

Furnace Oil

The other important difficulty is the non-availability of furnace oil, used in small furnaces to make essential parts, without which a diesel engine cannot be completed. The price, a year ago (Nov. 1972), was Rs. 46 per drum but the black market price approaches Rs. 120 per drum. On top of that, it is often not available. This has caused enormous difficulties for small furnace owners who formerly manufactured smaller parts for the major manufacturers on contract. If furnace oil is not available in the market for another 6 to 10 months, it will certainly cause major

problems for the large producers of diesel engines as well. These problems deserve serious attention of the Government.

Possible Need for Smaller Units[28]

Most of the tubewells used in Pakistan are relatively large fixed units using 15 to 20 h.p. engines. Several studies have suggested that these were larger than necessary. Costs could presumably be reduced by using smaller units [13, p. 95; and 4, pp. 61-62].[29]

The minimum size range may be smaller than hitherto thought. In the Indian Punjab, smaller and more mobile 5. h.p. units are standard. This is particularly relevant because land-holdings are generally smaller in the Pakistani than in the Indian Punjab.[30] Some 64% of Pakistan's land holdings are under 25 acres.

Gotsch considered limitations of supply to be a factor in the use of smaller units,[31] but this does not take note of demand. Perhaps part of the answer has been the emphasis which the Agricultural Development Bank places on relatively large units in making its loans: a minimum of 12.5 acres and 50% ownership from 1969-70 to the present date. In addition, there were other procedural requirements that would be more easily met by the large rather than the small farmers. Since there is a limited number of large and medium size farms in Pakistan, it would not be surprising if loans to these groups eventually slowed down.

The important question, therefore, concerns the potential smaller tubewells of 5 h.p. Both the supply and demand factors need to be considered. The potential for increasing the manufacture of 7.5-h.p. engines (or the 5-h.p. air-cooled diesel engine used in India) should be

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[28]This section was suggested by a reading of Gotsch [6].

[29]One reason for oversize electric motors is uneven voltage; larger than needed units can survive these variations without burning out. Clark and Ghaffar [4] also suggest that costs could be reduced by shutting off private electric tubewells during periods of peak system load, a practice known as load shedding.

[30]This point has been documented by Jerry B. Eckert, Agricultural Economist, Water Management Research Project, Office of International Programs, Colorado State University. Currently stationed at Islamabad.

[31]The smaller units are more difficult to produce than the large slow-speed units now turned out in Pakistan. Some of the Pakistani firms may not be up to the test. But as noted earlier one firm is now manufacturing about 2,000 units of 7.5. h.p. a year and it is estimated the other firms produce another 200 or so.

considered. Designs would have to be prepared for local use and their feasibility for local artisan manufacture tested. The ADBP will have to make smaller loans on a more liberal basis. This may not be easy because of the higher relative cost of administering such loans.

Kaneda and Child stated in 1971 that "tubewell equipment... is within the reach of all but the most humble farmers." they went on to cite a PIDE study which indicated that 37% of all tubewells were owned by farmers with 25 acres or less [8, p. 38]. We would suggest that it is possible to do even better in terms of reaching the smaller farmer. Smaller tubewell units would seem to offer one of the most efficient ways of aiding the smaller farmer and at the same time of expanding agricultural output. The potential of small tubewells is well worth further investigation.

Need for Evaluation of both Private and Social Costs

Perhaps the main weakness of the foregoing sections is that only private cost has been considered. A more difficult question concerns social costs.

In the case of tubewells, this concept is particularly appropriate in evaluating operating costs of diesel and electric engines. This is because diesel fuel costs are not subsidized. In fact, diesel fuel is taxed. On the other hand, electric rates are, we gather, subsidized. In a PIDE study published in 1969, Clark and Ghaffar concluded that while the *private costs* of delivering an acre-foot of water by diesel tubewell is twice that of an electric tubewell, the *social cost* ratio of the two, after making appropriate adjustments for shadow prices, was reversed. Diesel costs were up to 2/3 less than those of electricity [4, pp. 60-61].

Thus the private cost was lower in the case of electricity but the social cost was lower in the case of diesel. A similar conclusion was reached in a subsequent and quite separate study done in England [5, pp. 150-151]. Whether this balance would still obtain with increasing fuel shortages and other price changes is not clear. The subject commands sufficient importance for policy purposes to be worthy of further study.

Special Problems in Baluchistan

Some farmers in the Quetta area pointed out that repair and service facilities with regard to tubewells were inadequate so that many tubewells lay out of order there. The big manufacturers of tubewells have Government contracts for the supply of tubewell machinery and do not bother about the availability of spare parts to the consumers.

One hydrologist observed that about 2,000 applications for the installation of tubewells were pending in the Department of Irrigation and there was a further demand of 2,000 tubewells per annum for at least another 10 years. On the other hand, both the WAPDA and the Irrigation Department hardly installed 80 tubewells a year with the present number of 28 rigs.

Chapter IV

POLICY IMPLICATIONS

Having identified the problems and issues related to prices, we propose in this chapter to discuss implications of alternative Government policies.

Pricing Policy

Prices, determined by the interaction of supply and demand in a free market economy, have a strong influence on the manufacture, distribution, and use of goods. Prices in Pakistan, however, have been distorted in various ways due to Government policies of input subsidies (water and fertilizers), price supports (wheat and rice) and protection (tubewell industry).

In the case of fertilizers and tractors, for example, prices are fixed by the Central Government, while in the case of tubewell machinery and parts, subsidy is being provided by the Government in certain areas. The official price for fertilizers has increased sharply since September 1972, and has doubled in little over a year, with chances of rising further in the future. The problem is basically that of static domestic production for at least the next three years versus the continuously rising demand. This will necessitate increased imports. The prices of fertilizers in the international market have increased sharply. The Government, as a result of these higher import costs, will be forced either to raise selling price or increase subsidies or even enhance the support price of agricultural products which will then compensate the farmer for the higher price of fertilizers.

Another set of problems is related to the large numbers of tractors demanded at official selling prices. Estimates by individuals interviewed as to the excess demand for tractors suggest that given current levels of production, imports and prices of other tractors, the sale price for the IDA tractors are below their equilibrium price. However, the establishment of the Pakistan Tractors Corporation for manufacturing tractors

with the help of Millat Tractors Corporation may restrain prices to farmers and reduce dependence on foreign supply.

Long-term Policy

A long-term policy is needed to provide a cohesive set of signals to the producers, importers, traders, and marketers. This would enable all the sections concerned to base their plans on Government strategy and priorities. Few, if any, long-term policies seemed to be evident at the time of our survey. The next Five-Year Plan may well provide more policy guidance.

A well-developed long-term policy about fertilizer should save the country a considerable amount of foreign exchange—which has been and will be spent on imports. Pakistan has the basic raw materials (mainly natural gas and phosphate rock) for expanding fertilizer output. However, no new plants are expected to start production until 1976. Contracts have been signed for the construction of one new plant and several others are at an advanced stage of negotiation. Because of increasingly high costs of imported fertilizers, the Government of Pakistan will be well advised to facilitate and accelerate the construction and operation of these plants.

With regard to tractors and tubewells, tied imports are financed by loans by the International Development Association. The IDA loans to Government have the requirement that tractor imports are tied to IDA member countries. The requirement that all purchasers of IDA-financed tractors apply for and receive a loan from the ADBP appears to be inconsistent with encouraging investments of privately held funds. This condition, however, forces the buyers of such tractors to deal with the ADBP which facilitates Government monitoring of the imports and their distribution. On the other hand, it ties up substantial Government funds that could be utilized for more productive purposes. The changing of this procedure, therefore, needs serious consideration by Government.

The Government of Pakistan has permitted only Massey-Ferguson 135 tractors to be imported in a partially or in completely knocked-down (CKD) condition. All other tractors are required to be imported completely assembled. A change in this policy to allow all tractor importers to import in CKD condition and to fabricate parts in Pakistan to the

extent possible would maximize the benefits derived by Pakistan from IDA loans and barter agreements as well as generate labour employment in Pakistan.

Small Farmers

Agriculture constitutes the predominant sector of the economy of Pakistan. Farms with less than 12 acres of land account for 79% of the total farms in Pakistan. Therefore, the role of the small farmer in the development of agriculture assumes great significance.

A basic need of the small farmer is for credit facilities to purchase fertilizers and other agricultural inputs. At present, he is not in a position to buy many capital goods or install tubewells. Arrangements should be made to provide credit for appropriate facilities to the farmer through co-operatives. A subsidy on the installation of tubewells may be desirable in particularly deserving cases.

Another possibility might be the installation of smaller tubewells. To date, most of the private tubewells have been in the 15 h.p. range. Several studies have indicated that many tubewells may have more powerful engines than are needed. In the Indian Punjab, 5 h.p. diesel-powered tubewells are very common. These facts, together with the higher capital cost of a 15 h.p. unit, suggest an examination of the potential for smaller units.

If there is a potential for smaller tubewells, the same may be true of other capital inputs. Perhaps greater attention needs to be given to prospects for smaller tractors, smaller threshers, and other mechanical devices. Some of these inputs will be beyond the range of the smallest farmer, for a long time. Yet they provide a way of reaching further into the small farmer category than has hitherto been the case. As such they deserve further study.

Need for Comprehensive Field Survey and Economic Analysis

We have found little recent and comprehensive information on the pricing of capital goods in Pakistan. If enlightened policy decisions are to be made, more systematic and current data are needed at the field level. Fertilizer is at present the most neglected area, whereas there were some studies about tractors and some useful investigations about tubewells.

In the case of fertilizers, for example, more needs to be known about the quantity and type of fertilizers being used at the farm level. Discussion is needed on many aspects of fertilizer distribution and pricing. We were able to interview only a handful of farmers. A comprehensive and extensive survey of the farmer's problems is necessary, in particular, the prices they have actually paid (including the quantity and price paid on the black-market), and their need for farm credit. At the same time, it would be useful to know more about the extent and level of use of fertilizers on various sizes of farms and the types of crops treated.

Nearly all statistical data on tubewells in Pakistan date back to 1969 or earlier. The early pioneering work was done by Ghulam Mohammad at PIDE: the last PIDE study was reported in the spring of 1970. The last comprehensive survey was done in 1969 by the West Pakistan University of Engineering and Technology and was published in June 1970.[88]

Since then no further surveys or studies of any significance concerning private tubewells have been done.[89] In view of the importance of tubewell to Pakistan's agriculture, it would seem essential that more recent information be made available for policy purposes: one current problem is the effect the rise in fuel prices might have on diesel-powered tubewells. Among other things, one needs to know the number of diesel tubewells and the economics of their operation in the new price framework. In view of the previous work of the above two institutions, it would seem logical to have them cooperate on a new survey. Extra funding would, of course, have to be provided.

The question of private and social costs of electric and diesel powered tubewells needs to be reassessed in plotting future policy actions. The only study on this point was issued in March 1969. Since that time, many prices and relationships may have changed. For example, the recent increases in diesel fuel prices and the economic need to import, may have shifted the balance somewhat. This type of analysis could easily be part of the previously suggested survey/analysis of tubewells.

[88]One study on the Punjab was published in April 1972, but, as far as we could tell, it was based on a survey conducted in 1966-67.

[89]Some data are available on tubewells.

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