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DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
Washington, D.C. 20523

PROJECT PAPER

Proposal and Recommendations  
For the Review of the  
Development Loan Committee

PAKISTAN - AGRICULTURAL INPUTS - THIRD TRANCHE

LD-DLC/P-2196/1

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DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

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AID-DLC/P-2196/1  
August 15, 1977

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Pakistan - Agricultural Inputs - Third Tranche

Attached for your review is the recommendation for authorization of an amendment to a loan to the Government of Pakistan ("the Borrower") in an amount of Twenty Five Million United States Dollars (\$25,000,000) for a total not to exceed Ninety Million United States Dollars (\$90,000,000).

This loan is scheduled for consideration by the Development Loan Staff Committee on Monday, August 22, 1977, at 2:30 p.m., in Room 3886 New State. If you are a voting member a poll sheet has been enclosed for your response.

Development Loan Committee  
Office of Development Program Review  
and Evaluation

Attachment:

Summary and Recommendations  
Annexes A - D

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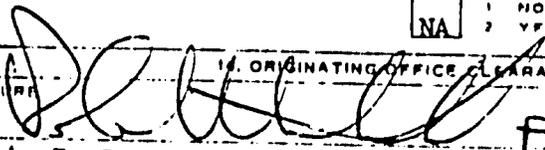
|  |  |  |                             |
|--|--|--|-----------------------------|
| AGENCY FOR INTERNATIONAL DEVELOPMENT<br><b>PROJECT PAPER FACESHEET</b> |  | 1. TRANSACTION CODE<br><input checked="" type="checkbox"/> A ADD<br><input type="checkbox"/> C CHANGE<br><input type="checkbox"/> D DELETE | PP<br>2. DOCUMENT CODE<br>3 |
| 3. COUNTRY/ENTITY<br>PAKISTAN  |  | 4. DOCUMENT REVISION NUMBER<br>NA  |                             |
| 5. PROJECT NUMBER (7 digits)<br>0419<br>[391-4041]                     |  | 6. BUREAU/OFFICE<br>A. SYMBOL ASIA      B. CODE [2]  |                             |
| 8. ESTIMATED FY OF PROJECT COMPLETION<br>FY [7 9]                      |  | 7. PROJECT TITLE (Maximum 40 characters)<br>[Agricultural Inputs - Third Tranche]  |                             |
|  |  | 9. ESTIMATED DATE OF OBLIGATION<br>A. INITIAL FY [7 6]      B. QUARTER [4]<br>C. FINAL FY [7 7]      (Enter 1, 2, 3, or 4)                 |                             |

| 10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$1 - ) |               |        |               |                 |        |               |
|--|---------------|--------|---------------|-----------------|--------|---------------|
| A. FUNDING SOURCE                                | FIRST FY      |        |               | LIFE OF PROJECT |        |               |
|  | B. FX         | C. L/C | D. TOTAL      | E. FX           | F. L/C | G. TOTAL      |
| AID APPROPRIATED TOTAL                           | 40,000        |        | 40,000        | 90,000          |        | 90,000        |
| (GRANT)  |               |        |               |                 |        |               |
| (LOAN)   | 40,000        |        | 40,000        | 90,000          |        | 90,000        |
| OTHER U.S. 1.                                    |               |        |               |                 |        |               |
| 2.   |               |        |               |                 |        |               |
| HOST COUNTRY                                     |               |        |               |                 |        |               |
| OTHER DONOR(S)                                   |               |        |               |                 |        |               |
| <b>TOTALS</b>                                    | <b>40,000</b> |        | <b>40,000</b> | <b>90,000</b>   |        | <b>90,000</b> |

| 11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000) |                         |                    |         |              |               |              |               |              |               |
|--|-------------------------|--------------------|---------|--------------|---------------|--------------|---------------|--------------|---------------|
| A. APPROPRIATION                               | B. PRIMARY PURPOSE CODE | PRIMARY TECH. CODE |         | E. 1ST FY 76 |               | H. 2ND FY 77 |               | K. 3RD FY 77 |               |
|  |                         | C. GRANT           | O. LOAN | F. GRANT     | G. LOAN       | I. GRANT     | J. LOAN       | L. GRANT     | M. LOAN       |
| (1) FN   | 110                     |                    | 010     |              | 40,000        |              | 25,000        |              | 25,000        |
| (2)  |                         |                    |         |              |               |              |               |              |               |
| (3)  |                         |                    |         |              |               |              |               |              |               |
| (4)  |                         |                    |         |              |               |              |               |              |               |
| <b>TOTALS</b>                                  |                         |                    |         |              | <b>40,000</b> |              | <b>25,000</b> |              | <b>25,000</b> |

| A. APPROPRIATION | N. 4TH FY |         | O. 5TH FY |         | LIFE OF PROJECT |         | 12. IN-DEPTH EVALUATION SCHEDULED FOR |
|------------------|-----------|---------|-----------|---------|-----------------|---------|---------------------------------------|
|                  | P. GRANT  | R. LOAN | S. GRANT  | T. LOAN | V. GRANT        | U. LOAN |                                       |
| (1)              |           |         |           |         |                 |         | MM    YY<br>[ ] [ ]                   |
| (2)              |           |         |           |         |                 |         |                                       |
| (3)              |           |         |           |         |                 |         |                                       |
| (4)              |           |         |           |         |                 |         |                                       |
| <b>TOTALS</b>    |           |         |           |         |                 |         |                                       |

13. DATA CHANGE INDICATOR: WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

|  |                     |   |
|--|---------------------|---|
| 14. ORIGINATING OFFICE CLEARANCE<br>SIGNATURE: <br>TITLE: A. R. Love,<br>Director, Office of Project Devel.,<br>Bureau for Asia | NA    1 NO<br>2 YES | 15. DATE DOCUMENT RECEIVED IN AID W. OR FOR AID W. DOCUMENTS: DATE OF DISTRIBUTION<br>DATE SIGNED: MM DD YY<br>08 13 77      08 16 77 |
|--|---------------------|---|

# AGRICULTURAL INPUTS PROJECT PAPER - THIRD TRANCHE

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## I. Introduction

### A. Background

Following Pakistan's 1973 flood, AID made a production loan of \$18 million to finance inputs needed to boost agricultural production and offset flood caused crop losses. During the implementation of the loan, AID and the Government of Pakistan expanded their discussions to cover the various elements of a comprehensive agricultural production strategy. It was agreed during these discussions that first priority ought to be placed on restoration of a strong growth rate in fertilizer use, which at that point was declining both on a national and per acre basis. In part this downward trend was due to the sharp increases in fertilizer prices following the 1972 devaluation which had moved the fertilizer/crop price relationship sharply against farmers. The increases in world prices had also made import of adequate fertilizers unusually difficult for Pakistan, a country with balance of payments difficulties so serious they already had imposed low levels of consumption and developmental investment. These international payments difficulties were (and to some extent still are) reflected in conservative estimates of growth in fertilizer off take and delays in imports to match procurement with anticipated concessional financing. Frequently supplies were inadequate nationally and this naturally led to shortages at the dealer level. This, combined with Government price ceilings, reduced the incentive of private distributors to aggressively market chemical fertilizer, promote its use, and spread knowledge and information about balanced application rates and their benefits. There also were reports of blackmarket activity. This situation helped motivate provincial officials to create a government monopoly in chemical fertilizer distribution meant to protect farmers' access to needed inputs at fixed prices.

The agricultural production strategy adopted emphasized increased and better balanced use of fertilizer, since this was clearly the portion of the known technology that could be applied most quickly and which because of its divisibility offered prospects of benefiting small and medium size farmers at least equally with large farmers. The Government's strategy for increasing fertilizer

use involved the establishment of a favorable fertilizer/crop price relationship, an expansion and freeing of the distribution system, improvement in the nitrogen: phosphate (N:P) balance, and a plant investment program to achieve nitrogen self-sufficiency by 1978. The first steps implemented were holding the domestic price of fertilizer at anticipated longer run equilibrium prices in the face of rapidly rising world prices, reducing to a minimum restrictions on private distributors' entry and operations, and greatly increasing wheat prices. Prices of phosphate were made relatively more attractive and phosphate was made available to distributors who previously handled only nitrogen to stimulate a more rapid growth in phosphate application and a more favorable N:P ratio. The improvement of the farm-gate wheat price strategy also involved both a transformation of the government wheat procurement system to a price support mechanism and the politically difficult decision to allow urban prices to increase to keep wheat subsidy costs within manageable limits. To make achievement of the planned crop outputs and increased fertilizer use possible, the government sought assurance of adequate supplies by imports in the interim period, before the new plants came on stream.

In support of the strategy a FP was prepared in 1975 by a GOP-USAID Committee proposing a \$100 million U.S. contribution to help finance a 2-year import program estimated to cost about \$250 million. AID also agreed to a separate loan of \$40 million to help finance one of the several new plants being undertaken to achieve self-sufficiency in nitrogen by 1978. Unfortunately, rapid rises in steel, machinery, petroleum, and fertilizer prices, a worldwide shortage of fertilizer, and a rush to start new plants around the world led to prolonged negotiations, delivery delays, and other problems that contributed to delays in various plant starts in Pakistan of 12-24 months. Consequently, substantial nitrogen imports are now expected to be required into 1980. Phosphate imports will be required even longer. With the longer period of heavy import dependence, the total import bill from 1975 through 1979 is estimated at \$400 million, compared with \$250 million initially projected in the Project Paper.

The first \$40 million tranche of the original \$100 million plan was approved in December 1975; the second tranche of \$25 million

was approved in the Transitional Quarter and signed in January 1977. The intent of this paper is to update and supplement the original Project Paper and Transitional Quarter supplement and propose that a \$25 million final tranche be approved in FY 1977.

### B. Project Purpose

The project purpose as set forth in the original PP is increased and better balanced use of fertilizer and other production inputs by all farmers, especially low-income farmers. The original PP was concerned primarily with stagnation in the agricultural sector and with special difficulties confronting small farmers in attempting to modernize and increase production and incomes. Production of major crops was virtually at the same levels as 3-4 years before, imports of wheat and vegetable oil were large, and the combined import bill for food was growing. The 1972 Agricultural Census showed that a lower proportion of small farmers used fertilizer than large farmers, and a national rural credit survey indicated that small farmers had very little access to institutional credit.

The project's developmental hypothesis was (and continues to be) that improvements in the fertilizer/crop price ratio and abundant supplies readily available in villages would provide the stimuli to farmers needed to increase their use of this input and hence their output of all crops. The primary indicators used to measure the adequacy of these improvements have been changes in total fertilizer offtake, the N:P ratio, and wheat production.

Between 1974-75 and 1975-76 use of nitrogenous fertilizer increased from 361,000 to 445,000 nutrient tons (23 percent) and consumption of phosphates rose from 60,000 to 103,000 nutrient tons (72%). The N:P ratio thus changed from 6.0 : 1 to 4.3 : 1, a major improvement in the nutrient balance. For 1976-77 to date, N offtake is expected to increase by about 20 percent and P by about 40 percent over 1975-76, thus moving closer to the Government's target N:P ratio of 3:1. The Government expects this dramatic increase in fertilizer use, and resultant greater crop production, to continue, and as part of its development strategy, is committed to maintaining policies and investments which will further such growth. Wheat production over the last 2 years, has increased by 20-25%. This has led to near

self-sufficiency in this crop. Previously wheat imports of 1 - 1.5 million tons per year had been required. Although vegetable oil imports continue to grow, the net foreign trade balance on foods -- mostly wheat, rice and vegetable oil -- apparently has shifted from a serious deficit to a modest surplus. Including cotton and cotton products, there is a substantial agricultural export surplus despite the decline in cotton production in the last 3-4 years.

The equity hypotheses underlying the project were that small farmers were likely to suffer more from constraints such as fertilizer shortage and blackmarket or bureaucratic rationing, from a shortage of outlets which require extensive travel to obtain inputs, and from shortages and rationing of credit, and were likely to suffer at least equally from adverse price relationships. Consequently, they would benefit most from removal or a major lessening of these constraints.

The Government has demonstrated its determination to address the larger issues of increasing equity for small farmers and rural laborers, reducing the constraints to agricultural modernization which specially impact on small farmers, and increasing production from available soil and water resources.

The major government inputs to this project are :

- a) Steps to expand the input distribution system by freeing it from unnecessary restrictions and providing greater distribution allowances for private distributors.
- b) Provision of more credit for purchase of production inputs, particularly by small and medium size farmers.
- c) Maintenance of fertilizer/crop price relationships at incentive levels by raising crop prices, establishing price supports, and taking other measures such as :
  - i) shifting the emphasis of Government wheat market operations from that of meeting needs of ration shops, military, and other institutions to that of supporting farm prices;

- ii) lifting restrictions on internal movement of wheat to permit farmers in surplus areas to benefit from strong market demand in deficit areas;
  - iii) subsidizing fertilizer prices in times of sharp temporary upswings in world prices.
- d) Undertaking to keep domestic supplies of fertilizer adequate by improving internal transport and handling, and by arranging needed imports.

As of May 1977, the inputs planned for the project have been provided on schedule and the outputs and the project purpose as indicated by the End of Project Status Indicators largely achieved. As a result of the policies insuring abundant fertilizer supplies in country and increasing fertilizer outlets, small farmers now find more fertilizer more conveniently available, and small farmer use of fertilizer has apparently reached parity with large farmer use, both in terms of percentage of farmers using the input and nutrients applied per cropped acre. The 1975-76 offtake was 548,000 nutrient tons of N and P combined, compared with a planned 545,000 nutrient tons. For 1976-77 the PP log frame target was 670,000 nutrient tons and 1976-77 offtake estimate as of May, 1977 is about 550,000 nutrient tons. Price relationships are about as planned or better and the number of fertilizer sales outlets much higher than planned. There now is one sales outlet for between 800 and 900 farmers, compared with the log frame plan of one for each 2,500 to be achieved in 1977-78. Assuming supplies are available, fertilizer consumption is expected to increase to 805,000 nutrient tons in 1977-78 and 910,000 nutrient tons in 1978-79. The number of sales outlets is expected to increase to about one for each 500-600 farmers in the next 2 years. Small farmers are expected to increase fertilizer use per cropped acre during this period by 20-30%.

An original project assumption was that the momentum would continue, fueled by greatly increased domestic fertilizer production beginning in 1977. It is of concern to AID that at this time there not be a return to a scarcity psychology and loss of momentum because of plant delays and FX constraints. Therefore, AID proposes to continue support of this so far very successful program.

This project is an integral part of a Government of Pakistan effort to accelerate development in the rural areas. The Government of Pakistan is engaged in complementary projects in water management, rainfed agriculture, agriculture research, village level food processing, and is planning projects in rural credit, rural roads, rural health, rural water supply, rural primary education and grain storage. The Government of Pakistan will be providing substantial additional resources to those activities which are receiving or are being considered for AID support.

The proposed loan would be used to assist Pakistan in financing needed imports of basic agricultural inputs, primarily fertilizer, and thereby help insure that these inputs continue to be available at reasonable prices in all parts of Pakistan so that farmers, particularly small farmers, will not be hindered by their non-availability.

C. Borrower:

The Islamic Republic of Pakistan (Government). The importing agency will be the Federal Directorate of Agricultural Supplies (FDAS).

D. Loan Amount and Terms

\$25 million, to be repaid over 40 years, including a 10-year grace period on the repayment of principal, with interest at 2% per annum during the grace period and 3% per annum thereafter.

E. Total Cost of the Project

It was estimated just prior to authorization of the initial loan that Pakistan would need to import a minimum of \$250 million in fertilizer over a period of approximately 2 years, by which time it would be nearing self-sufficiency in fertilizer. Because of the plant delays noted earlier, this time has been extended by about 2 years, and the total cost of the import program is estimated to be about \$400 million (Table 1) <sup>1/</sup>. AID's total contribution to the total Pakistan import program is planned at \$90 through 1977/78.

F. Summary of Findings

The purpose of this project, which is increased and better

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<sup>1/</sup> In 1980 Pakistan should be self-sufficient in nitrogen but phosphate imports will cost about \$40 million for the year (See Table 1, p. 6-a).

Fertilizer Offtake, Production and Imports  
and FX Costs, 1974-75 through 1980-81 <sup>1/</sup>

|                       | Offtake        |     | Domestic Production  |     | Imports <sup>5/</sup> |     | Cost         |    | Cumulative Cost <sup>6/</sup> |       |  |
|-----------------------|----------------|-----|----------------------|-----|-----------------------|-----|--------------|----|-------------------------------|-------|--|
|                       | ----- Thousand |     | Nutrient M/Tons----- |     |                       |     | (\$ Million) |    | (\$ Million)                  |       |  |
|                       | N              | P   | N                    | P   | N                     | P   | N            | P  | N                             | P     |  |
| 1974-75 <sup>2/</sup> | 361            | 60  | 311                  | 6   | 106                   | 25  | (90)         | 7  |                               | (90)  |  |
| 1975-76 <sup>2/</sup> | 445            | 103 | 312                  | 12  | 74                    | 103 | (56)         |    |                               | (146) |  |
| 1976-77 <sup>3/</sup> | 543            | 151 | 293                  | 17  | 139                   | 145 | (80)         |    |                               | (226) |  |
| 1977-78 <sup>4/</sup> | 595            | 150 | 293                  | 18  | 302                   | 132 | (86)         | 37 |                               | (349) |  |
| 1978-79 <sup>4/</sup> | 665            | 190 | 471                  | 71  | 194                   | 119 | 55           | 34 |                               | (438) |  |
| 1979-80 <sup>4/</sup> | 715            | 240 | 710                  | 90  | 5                     | 150 | 1            | 43 |                               | (482) |  |
| 1980-81 <sup>4/</sup> | 770            | 300 | 847                  | 164 | +77                   | 136 | -            | 39 |                               | (521) |  |

1/ Figures apply to July-June crop year.

2/ Actual

3/ Estimated

4/ Projected

5/ Import requirements for 1977-78 to 1980-81 are derived by subtracting projected production from projected offtake. Thus, they imply no further build-in stocks. Assuming continuation of the spring 1977 price of about \$285 C&F per nutrient ton, total imports from July, 1975 through December, 1979 will cost approximately \$400 million. The imports required for use in Jan-June 1980 must be arranged in 1979.

6/ Combined value for N&P.

balanced use of fertilizer and other agricultural production inputs by Pakistani farmers, including small farmers, is being achieved. Implementation of this project is satisfactory.

### C. Recommendations

It is recommended that a loan to the Government of Pakistan in the amount of \$25 million be authorized for the purpose and on the terms and conditions set forth in the Loan Authorization Amendment attached as Annex A.

## II. Status of Government Inputs

The original Project Paper noted that productivity and incomes of small farmers have been limited due to their restricted access to essential agricultural inputs. When domestic supplies of production inputs were inadequate, the Government sometimes adopted policies which tended (albeit inadvertently) to further restrict small farmers' access to these crucial inputs. Illustratively, because of complaints received in a time of fertilizer scarcity, private dealers were temporarily put out of operation in the important province of Punjab. The resulting shrinkage of the dealer network probably created a more serious obstacle for small than large farmers, since small farmers generally buy in smaller lots and likely face greater difficulties in securing transport than large farmers. Studies undertaken in connection with this project have identified distance to the supplier as a factor affecting use by farmers of all sizes. Presumably adverse price relationships affect small and large farmers about equally. However, data from a recent national marketing study indicate that small farmers in Pakistan more frequently are forced to sell at harvest time when in the absence of effective price supports, prices are depressed. Lack of liquidity to pay off debts and finance consumption is an important reason small farmers are forced to sell at harvest time.

During the past 3 and 1/2 years the Government has instituted liberalizing changes in the fertilizer distribution system, restructured

fertilizer and crop price relationships, improved credit programs to serve small farmers, and arranged financing for liberal fertilizer imports and domestic plant construction. Changes have been made thus far where needs could be clearly identified and defined.

The Government in its numerous public policy statements and its draft 6-year plan has indicated its commitment to continue to direct rural development policies and investment mainly to small and medium size farmers and the rural poor. As a part of this new direction the plan calls for a major increase in credit, directing 90% to operators of small and medium size farms. One of the major problems is designing lower cost methods of credit delivery and loan collection. AID is working with the Government on development of several pilot projects to address this problem and planning a major loan for credit once the administrative machinery is improved. Government and AID officials have agreed that identification of further areas of needed policy change would necessitate collection and analysis of more comprehensive field data on fertilizer distribution and agricultural credit systems, particularly vis-a-vis increasing access by small farmers. AID has, therefore, supported a set of studies to develop required information and establish a small farmer strategy. The results are summarized in Part III, Section E. Meetings are being scheduled to review and make recommendations on appropriate action to be taken (See Implementation, Section IV).

Government policy and other inputs are described in more detail in Section III, A-E. Where possible inputs and outputs are quantified.

#### A. Fertilizer Distribution Network

To stimulate greater fertilizer consumption in conjunction with the U.S. assistance effort, the Government instituted several changes in fertilizer distribution through private dealers and wholesalers. Specific actions were :

1. Partial denationalization of distributor in the Punjab in November, 1973, followed by licensing of dealer applicants simplified almost to the point of being perfunctory.

2. Private sector distributors given access to imported phosphates in addition to nitrogen fertilizers to enable them to offer farmers a full range of nitrogenous and phosphatic products.
3. Private dealers given the right to buy fertilizer stocks from both public and private wholesalers.
4. Marketing margins for dealers increased in 1975 and applied to phosphate when private distributors were given phosphate. (The final decisions for some areas were not reached on phosphate allocation and allowance until February, 1976 .)
5. Geographic restrictions on marketing of fertilizer by private producers removed.
6. The rigid provincial allocation system, which often left one province in surplus while another was short, substantially modified.

The purpose of these actions by the Government was to provide the environment and incentives necessary to facilitate both an increase in the number of dealers and more aggressive marketing by dealers, thereby ensuring that fertilizer moved to points where required. Following these government actions there was a significant expansion in the number of fertilizer dealers.

Table I shows the change in the number of officially listed fertilizer dealers over the past six years<sup>1/</sup>. Data collected in February-March, 1977 show a 100% increase in licensed dealers nationally between 1975 and 1977 (4,306 to 4,612). Most

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<sup>1/</sup> In addition to licensed dealers, many village merchants handling other goods apparently now also buy and distribute fertilizer, especially in villages where wholesalers or licensed dealers do not exist. Licensed dealers are required to have an arrangement with a distributor and are required to make a deposit with either the public or private distributors.

Table-1

Estimated Number of Fertilizer Retail Outlets Operating in Pakistan

|             | PRIVATE |                  |       |       |       |                     | PUBLIC |                  |       |     |       |       | TOTAL |                  |       |       |       |                     |
|-------------|---------|------------------|-------|-------|-------|---------------------|--------|------------------|-------|-----|-------|-------|-------|------------------|-------|-------|-------|---------------------|
|             | 1970    | 73 <sup>1/</sup> | 74    | 75    | 76    | 77                  | 1970   | 73 <sup>1/</sup> | 74    | 75  | 76    | 77    | 1970  | 73 <sup>1/</sup> | 74    | 75    | 76    | 77                  |
| Punjab      | 326     | 0                | 639   | 670   | 1,744 | 1,690 <sup>2/</sup> | 161    | 544              | 600   | 556 | 665   | 1,206 | 1,089 | 544              | 1,257 | 1,226 | 2,409 | 2,896 <sup>5/</sup> |
| Sind        | 603     | NA               | 501   | 476   | 525   | 875 <sup>3/</sup>   | 53     | NA               | 359   | 94  | 134   | 167   | 456   | NA               | 563   | 570   | 659   | 1,042               |
| NWFF        | 101     | NA               | 303   | 315   | 408   | 437 <sup>4/</sup>   | 36     | NA               | 105   | 159 | 180   | 193   | 137   | NA               | 403   | 474   | 588   | 630                 |
| Baluchistan | 11      | NA               | -     | -     | -     | -                   | 4      | NA               | 36    | 36  | 36    | 40    | 15    | NA               | 36    | 36    | 36    | 44                  |
| Pakistan    | 1,143   | NA               | 1,160 | 1,461 | 2,677 | 3,002               | 254    | NA               | 1,100 | 845 | 1,015 | 1,610 | 1,697 | NA               | 2,261 | 2,306 | 3,692 | 4,612               |

1/ It is estimated that just prior to Punjab Government announcement of nationalization of fertilizer distribution in 1973, there were a total of 1,600 retail agents in Punjab, with perhaps another 700 sub-agents. DCL had 600 outlets in Punjab alone, which were put out of business after the nationalization. With the reversal of this policy in November, 1973, licensing of small numbers of dealers was begun initially under very tight control but later liberalized.

2/ Some inactive dealers have been eliminated.

3/ Includes 656 special dealers/commission agents functioning under SASC, FNO not operating in Sind any more.

4/ Includes Bahal Rural Cooperative Corporation coops, special commission agents for ADA and other special private agents.

5/ Total does not include 1,213 Rural Supply Cooperative Corporation coops, for which information on actual activity is not available.

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of the increase has come in the private sector. (The National Fertilizer Corporation and Pakistan National Oils (PNO), as semi-autonomous organizations, operate like and are categorized as private units.)<sup>1/</sup>

The increase in the number of officially listed outlets has been most dramatic in the Punjab, where distribution was nationalized in 1973. By November of 1973 the total number of outlets had fallen to 544 -- the number of public outlets at that time. With the subsequent return of private distributors, the total number of outlets grew rapidly and by early 1977, the number of public and private licensed outlets was 2,896 -- over 5 times that in November, 1973. About 70% of this increase occurred in the private sector, where the number of outlets increased from none in November, 1973 to 670 in 1975 and 1,690 in 1977<sup>2/</sup>. Part of the increase from 665 to 1,206 officially listed public dealers between 1976 and 1977 probably resulted from private dealers who obtained licenses with public distributors.

For a year after the private distributors and dealers were eliminated in Punjab in late 1973, licensing and other entry requirements were difficult to obtain. This was relaxed in stages until at present licensing is almost automatic if the candidate is able to make supply arrangements with a wholesaler and can make a deposit with the wholesaler. The expansion in private outlets of Dawood Corporation Ltd. (DCL) and ESSO in the Punjab, and the creation of a National Fertilizer Corporation (NFC) network of dealers and sub-agents, accounts for much of the increase in the

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1/ The number of officially listed private outlets in 1977 was slightly less than in 1976 because the list was screened and inactive dealers delicensed in 1977.

2/ Rawalpindi Division, a large rainfed area for which data are available, showed a somewhat slower growth in number of officially listed outlets, but a much more rapid growth in fertilizer consumption -- a 100% increase in sales between 1974-75 and 1975-76.

officially listed number of licensed private dealers. NFC is now beginning to market part of its own domestic plant production (formerly this was done by public sector distributors) and also marketing imported nitrogen and phosphate fertilizers in an attempt to build a marketing organization capable of absorbing the greatly expanded domestic production it plans over the next several years.

Much of the nitrophos (NP) fertilizer now being imported from Europe is being used to promote consumer acceptance of the nitrophos which the NFC will produce.

Sind Province has experienced an 83% growth in total fertilizer outlets since 1975, with the number of private dealers growing more than fourfold. In the Northwest Frontier Province the number of private dealers increased by 44 percent between 1975 and 1976 and 54 percent between 1976-77. Some of the recorded increase is in cooperative outlets. Baluchistan does not have private outlets and the number of public outlets has increased relatively slowly.

Recently the Ministry of Food and Agrarian Management announced plans to distribute fertilizer on credit through its network of nationalized rice mills and cotton gins. This initially will provide about 100 more outlets but ultimately may provide several times this number. Credit would be secured with the crop rather than the farmer's land and collected when the crop is delivered for processing.

#### B. Fertilizer Pricing, Distribution Allowances and Subsidies

The Government currently follows a national single-price policy for each type of fertilizer (Table 2). Distributors are given a transportation allowance which is supposed to compensate them for the difference in the cost of transport from the source to the various distributor outlets. Distributors and dealers also are given an allowance for other costs (incidentals) involved in distribution. Tables 3 and 4 show the typical allowances now in effect for distributors and dealers. Currently, the retailer's commission is Rs. 28 per ton for all types of fertilizers. However, the Government has recently decided to increase the commission to Rs. 40 per ton.

Currently, licensed dealers are not given an allowance for transport costs they incur in moving fertilizer from the wholesale

Table -2

Prices of Fertilizers

| Type of fertilizer        | Nutrient Content (%) |    |    | Maximum Retail Sale Price (Rs./bag) | Net Weight per Bag |      |
|---------------------------|----------------------|----|----|-------------------------------------|--------------------|------|
|                           | N                    | P  | K  |                                     | Kilos              | Lbs. |
| <u>Nitrogenous</u>        |                      |    |    |                                     |                    |      |
| Urea                      | 46                   | -  | -  | 68                                  | 50                 | 110  |
| Urea                      | 46                   | -  | -  | 55                                  | 40                 | 88   |
| Urea                      | 46                   | -  | -  | 34                                  | 25                 | 55   |
| Ammonium Nitrate          | 26                   | -  | -  | 39                                  | 50                 | 110  |
| Ammonium Nitrate          | 26                   | -  | -  | 31                                  | 39.5               | 87.5 |
| Calcium Ammonium Nitrate  | 26                   | -  | -  | 39                                  | 50                 | 110  |
| Ammonium Sulphate         | 21                   | -  | -  | 31                                  | 50                 | 110  |
| Ammonium Sulphate (Indg.) | 21                   | -  | -  | 31                                  | 50                 | 110  |
| <u>Compound</u>           |                      |    |    |                                     |                    |      |
| Diammonium Phosphate      | 18                   | 46 | -  | 72                                  | 50                 | 110  |
| Mono-ammonium Phosphate   | 11                   | 48 | -  | 64                                  | 50                 | 110  |
| Nitrophosphate            | 26                   | 14 | -  | 47                                  | 50                 | 110  |
| Nitrophosphate            | 24                   | 24 | -  | 52                                  | 50                 | 110  |
| Nitrophosphate            | 23                   | 23 | -  | 50                                  | 50                 | 110  |
| Nitrophosphate            | 20                   | 20 | -  | 43                                  | 50                 | 110  |
| Nitrophosphate            | 11                   | 52 | -  | 68                                  | 50                 | 110  |
| NPK                       | 15                   | 15 | 15 | 47                                  | 50                 | 110  |
| <u>Phosphatic</u>         |                      |    |    |                                     |                    |      |
| Triple Super Phosphate    | -                    | 46 | -  | 46                                  | 50                 | 110  |
| Single Super Phosphate    | -                    | 18 | -  | 18                                  | 50                 | 110  |

Source: Industries Division (Price Stabilization Wing)  
 Notification No. IND(CC)-6(C)/75 Dated 16th May and 31st May, 1976

Fertilizer Marketing Incidentals

(Rs. per M /ton)

I. Imported

|  |   |              |
|--|---|--------------|
| 1. Organization and Administration             | } |              |
| 2. Commission to Agents                        |   |              |
| 3. Sales Promotion                             |   |              |
| 4. Handling at Rail Head and up to Sale Depots |   | 14.41        |
| 5. Carriage, Handling up to Non-mandi Towns    |   | 18.33        |
| 6. Storage                                     |   | 12.50        |
| 7. Unforeseen                                  |   | 5.00         |
|  |   | <u>89.31</u> |

II. Indigenous

ESSO Urea

|  |              |
|--|--------------|
| 1. Railway Freight   | 50.00        |
| 2. Handling, Administration, and Organization              | 34.00        |
| 3. Dealers Commission                                      | 28.00        |
| 4. Marketing Mark-up<br>(2% on ex-factory cost of Rs. 854) | <u>17.00</u> |
|  | 129.00       |

Dawood Hercules Urea

|   |              |
|---|--------------|
| 1. Railway Freight                              | 41.50        |
| 2. Handling Including Carriage up to Mandi Town | 10.50        |
| 3. Dealer's Commission                          | 28.00        |
| 4. Interest Charges                             | 14.00        |
| 5. Organization and Administration              | <u>10.00</u> |
|   | 104.00       |

N.F.C.

Urea

AS/AN/S3P

|  |              |              |
|--|--------------|--------------|
| 1. Handling at Rail Road                       | 12.50        | 12.50        |
| 2. Dealer's Commission                         | 22.50        | 10.00        |
| 3. Incidentals from Rail Head<br>to Mandi Town | 20.00        | 10.00        |
| 4. Organization and<br>Administration          | 06.00        | 06.00        |
| 5. Interest                                    | 12.50        | 7.50         |
| 6. Railway Freight                             | 15.00        | 15.00        |
| 7. Bank Commission                             | 01.00        | 00.72        |
| 8. Sales Promotion and<br>Unforeseen           | 07.00        | 05.00        |
| 9. Storage                                     | <u>05.00</u> | <u>05.00</u> |
|  | 101.50       | 71.72        |

Table-4

**Official Components Of Retail Sale Prices For Domestically  
Produced And Imported Fertilizer**

| Components                                  | Dawson<br>Hercules<br>Urea | ESSO<br>Urea      | N. F. C.            |                   |                   | Imports           |                           |                           |
|---|----------------------------|-------------------|---------------------|-------------------|-------------------|-------------------|---------------------------|---------------------------|
|   |                            |                   | Urea                | AS                | AN                | SSF               | Urea                      | DAF                       |
| Ex-factory and import costs                 | 763 <sup>1/</sup>          | 856 <sup>1/</sup> | 1,046 <sup>1/</sup> | 456 <sup>1/</sup> | 611 <sup>1/</sup> | 952 <sup>1/</sup> | 1,300 <sup>1/</sup>       | 1,850 <sup>3/</sup>       |
| Marketing Incidentals <sup>2/</sup>         | 104                        | 144               | 101                 | 71.72             | 71.72             | 70.72             | 90<br>(247) <sup>4/</sup> | 90<br>(257) <sup>4/</sup> |
| Sub-total                                   | 869                        | 1,000             | 1,147               | 527.72            | 682.72            | 1,022.72          | 1,337                     | 2,197                     |
| Development surcharge (+)<br>or subsidy (-) | (+) 472                    | (+) 360           | (+) 213             | 92.920            | (+) 97.28         | (-) 642.72        | 23                        | (-) 757                   |
| Retail sale price                           | 1,360                      | 1,360             | 1,360               | 620               | 780               | 360               | 1,360                     | 1,440                     |

<sup>1/</sup> These are "official" ex-factory costs of production and marketing incidentals and not necessarily actual costs of producing and distributing fertilizers.

<sup>2/</sup> These are the incidentals that were in effect in April, 1977. Both ESSO and DIIC have requested the CCP to further increase the incidentals.

<sup>3/</sup> Equals \$130/ton for Urea and \$185/ton of DAF C&F.

<sup>4/</sup> Additional allowances: wharfrage, stevedore payments, bank commission on LC, railway charges, weightment cost, interest charges on funds used for purchase of fertilizers on per annum basis, interest charges for funds arranged for handling for four months which average 247 for Urea and 257 for DAF, paid by provinces.

source to their retail outlets. The Ministry of Agriculture has now decided to give a transport allowance on cost from the railhead to the retail outlet. These actions should substantially increase the number of outlets. Merchants, who in large numbers handle fertilizer, in villages, often are not licensed and must buy the fertilizer at the official retail price shown in Table 2. Reportedly, they transport and retail fertilizer as a service to their customers, usually making a nominal charge to cover costs of transportation and handling. This activity is of particular importance to small farmers who lack means of transport and who, for want of resources, frequently buy in less-than-bag lots from village merchants. Occasionally they receive credit from the merchant. Presumably the cost of this credit is offset by higher prices on other goods or lower prices paid for farm products. Information is not available to AID on the direct or indirect costs to farmers of credit obtained in this way.

As noted earlier, in April, 1977, the Government announced its intention to improve availability of inputs and credit through the government operated cotton gins and rice mills. Under this plan loans for both crops will be recovered from the crop when it is brought in for processing. It is assumed that fertilizer and credit charges under this arrangement will be at regular prices and institutional credit interest rates.

At present world prices, the subsidy on imported fertilizer offset by the tax on domestic production, for which average costs are well below wholesale prices. This is in sharp contrast with the previous situation of high subsidy costs which followed the 1972 devaluation and occurred again during the recent high world prices. Subsidies two years ago were reported to be between \$30 million and \$40 million per year. The policy of the Government is to avoid subsidies during normal times of relative stability in world prices but also to cushion the impact of extensive fluctuations in world prices by providing a temporary subsidy when considered necessary to achieve its fertilizer objectives.

### C. Credit

The Government of Pakistan continues to assign high priority to agricultural credit. Targets for disbursement of agricultural loans have increased from Rs. 1.57 billion in 1975-76 to an annual average of Rs. 2.5 billion during 1976-77 through 1980-81. Actual disbursements increased from Rs. 330 million in 1972-73 to 1.57 billion in 1975-76 and are estimated at Rs. 1.6 billion in 1976-77. It is encouraging to note

that 90 percent of new agricultural credit is targeted for farmers with small farms (upto 12.5 acres) and with medium farms (more than 12.5 and less than 50 acres). The major implementation problem faced by the Government is how to channel credit to these farmers while also holding down administrative costs and achieving high repayment rates.

The earlier update paper (Transitional Quarter) discusses in detail the credit institutions and schemes underway or being considered. The USAID Mission plans to help support a series of pilot credit activities to develop and test low cost credit delivery and administrative techniques. To meet the needs of small farmers AID is proposing to follow this with a major loan program for credit.

#### D. Fertilizer/Crop Price Relationships

Between the summer of 1972 and April of 1974 the Government rapidly raised fertilizer prices to compensate partially for the 1972 devaluation and the rise in world fertilizer prices. Urea prices, for example, were raised 163% -- from Rs. 28.50 per 50 kilogram bag to Rs. 75.00 per bag (Table 5). During the same period prices received by farmers for major crops increased but not sufficiently to prevent a serious deterioration in the crop/fertilizer price relationship. Whereas in the summer of 1972 only 2.8 pounds of wheat at the procurement price were required to purchase one pound of N, 4.8 pounds were needed in April, 1974 (Table 5). Similar trends were observed for rice, cotton, and sugarcane (Table 6). These developments naturally led to an erosion in farmers' incentives to use fertilizer.

In September of 1974, the Government decided to redress the unfavorable crop/fertilizer price relationship. At that time it announced an increase in the procurement price of wheat from Rs. 25.50 to Rs. 37.00 per maund for the 1975 spring harvest.

Table-5

Relationship between Wheat and Fertilizer Prices

| Crop Year     | Price of Wheat                     |         | Price of Fertilizer<br>(Rs. / bag) <sup>1/</sup> | Lbs. of Wheat Needed to Buy One Lb. of N at: |              | Nitrogen Used in Rabi     |                            | Wheat Production       |                         |
|---------------|------------------------------------|---------|--|--|--------------|---------------------------|----------------------------|------------------------|-------------------------|
|               | Procurement<br>-----Ru. / Md.----- | Harvest |  | Procurement Price                            | Market Price | Lbs. / Acre <sup>2/</sup> | Total<br>(Thousand M/Tons) | Yield<br>(Mds. / Acre) | Total<br>(Million Tons) |
| 1961-62       | 13.50                              | 14.22   | 12.00  | 1.4  | 1.4          | -                         | -                          | 3.8                    | 4.0                     |
| 1962-63       | 13.50                              | 13.61   | 24.00  | 2.9  | 2.7          | -                         | -                          | 3.9                    | 4.1                     |
| 1963-64       | 14.00                              | 14.79   | 24.00  | 2.7  | 2.6          | -                         | -                          | 9.0                    | 4.1                     |
| 1964-65       | 14.00                              | 15.00   | 14.00  | 1.5  | 1.5          | -                         | -                          | 3.3                    | 4.5                     |
| 1965-66       |                                    |         |  |  |              |                           |                            |                        |                         |
| (Jul. - Oct.) | 4.00                               | 15.97   | 14.00  | 1.7  | 1.4          | 4.4                       | 20                         | 8.2                    | 3.3                     |
| (Oct. - June) | -                                  | -       | 15.00  | -  | 1.5          | -                         | -                          | -                      | -                       |
| 1966-67       |                                    |         |  |  |              |                           |                            |                        |                         |
| (Jul. - Aug.) | 17.00                              | 19.06   | 25.00  | 2.4  | 2.1          | 7.3                       | 52                         | 8.8                    | 4.3                     |
| (Sep. - Jun)  |                                    |         |  |  |              |                           |                            |                        |                         |
| 1967-68       | 17.00                              | 16.00   | 25.00  | 2.6  | 2.4          | 10.0                      | 75                         | 11.6                   | 5.3                     |
| 1968-69       | 17.00                              | 18.33   | 25.00  | 2.6  | 2.3          | 11.4                      | 88                         | 11.6                   | 6.5                     |
| 1969-70       | 17.00                              | 18.83   | 25.00  | 2.6  | 2.2          | 10.2                      | 127                        | 12.6                   | 7.0                     |
| 1970-71       | 17.00                              | 19.44   | 29.50  | 2.8  | 2.3          | 15.6                      | 114                        | 11.7                   | 7.4                     |
| 1971-72       | 17.00                              | 21.25   | 28.50  | 2.8  | 2.2          | 19.4                      | 140                        | 12.9                   | 6.8                     |
| 1972-73       |                                    |         |  |  |              |                           |                            |                        |                         |
| (Jul. - Aug.) | 20.00                              | 23.56   | 28.50  | 2.3  | 1.9          | 21.3                      | 159                        | 13.5                   | 7.3                     |
| (Sep. - Mar)  |                                    |         | 35.00  | 2.0  | 2.4          |                           |                            |                        |                         |
| Apr. - Jun.)  | 22.50                              | 23.56   | 42.00  | 3.1  | 2.9          |                           |                            | 13.5                   | 7.5                     |
| 1973-74       |                                    |         |  |  |              |                           |                            |                        |                         |
| (Jul. - Aug.) | 22.50                              | 26.50   | 42.00  | 3.1  | 2.6          |                           |                            |                        |                         |
| (Rabi 73)     | 25.50                              | 33.00   | 55.00  | 3.5  | 2.7          | 24.5                      | 187                        |                        |                         |
| April 74)     | 25.50                              | 33.00   | 75.00  | 4.0  | 3.7          | 26.7                      | 194                        |                        |                         |
| (Spring 75)   | 37.00                              | 41.00   | 75.00  | 3.3  | 3.0          |                           |                            | 13.4                   | 7.5                     |
| 1975-76       | 37.00                              | 39.00   | 60.00  | 3.0  | 2.8          | 29.2                      | 223                        | 14.8                   | 9.0 <sup>3/</sup>       |
| 1976-77       | 37.00                              | 40.00   | 68.00  | 3.0  | 2.8          | 38.8                      | 263 <sup>3/</sup>          | NA                     | 8.3-9.0 <sup>3/</sup>   |

<sup>1/</sup> 110 lb. bag of urea containing 50.6 lbs. of N

<sup>2/</sup> Assumes 90% of all fertilizer used in rabi applied to wheat.

<sup>3/</sup> Estimate

Table-5

Relationship between Fertilizer and Major Crops

| Year       | Sale price of N<br>(Rs./bag) <sup>1/</sup> | Procurement price of milled Rice <sup>2/</sup> |        |                                       |        | Cotton               |  | Sugarcane          |   |
|------------|--|--|--------|---------------------------------------|--------|----------------------|--|--------------------|---|
|            |  | Harvest Price<br>(Rs./Md.)                     |        | Lbs. of Rice Needed<br>for 1 lb. of N |        | Price<br>(Rs./Md.)   | Lb. of Cotton<br>needed for 1 lb. of N | Price<br>(Rs./Md.) | Lb. of Sugarcane<br>needed for 1 lb. of N |
|            |  | IRRI-6   | IRRI-8 | IRRI-6                                | IRRI-8 |                      |  |                    |   |
| 1967-68    | 25.00                                      | 10.40  | 9.0    | 3.9                                   | 4.6    | 34.65                | 1.2                                    | 2.24               | 17.0                                      |
| 1968-69    | 26.00                                      | 10.50  | 9.25   | 3.9                                   | 4.6    | 35.75                | 1.2                                    | 2.75               | 15.0                                      |
| 1969-70    | 26.00                                      | 10.50  | 9.25   | 3.9                                   | 4.6    | 36.00                | 1.2                                    | 2.75               | 15.0                                      |
| 1970-71    | 23.50                                      | 10.50  | 9.25   | 4.3                                   | 5.09   | 51.84                | 0.8                                    | 2.75               | 15.0                                      |
| 1971-72    | 23.50                                      | 10.50  | 9.75   | 4.3                                   | 4.66   | 47.74                | 1.0                                    | 2.50               | 18.0                                      |
| 1972-73    | 23.50                                      | 10.50  | 9.50   | 4.3                                   | 4.66   | 56.65                | 0.8                                    | 3.35               | 14.0                                      |
| Sept-Mar.  | 35.00                                      |  |        | 5.3                                   | 5.75   |                      | 1.0                                    |                    | 17.0                                      |
| Apr-Jun    | 42.00                                      |  |        | 5.4                                   | 6.91   | 90.95                | 0.8                                    | 4.25               | 16.0                                      |
| 1973-74    |  |  |        |                                       |        |                      |  |                    |   |
| July-Aug.  | 42.00                                      | 13.00  | 12.0   | 5.19                                  | 5.33   |                      | 0.9                                    |                    | 16.0                                      |
| Febi 73    | 55.00                                      |  |        | 6.8                                   | 7.26   | 95.00                | 0.9                                    | 4.50               | 19.75                                     |
| April 74   | 75.00                                      | 13.50  | 12.50  | 9.25                                  | 9.86   | 80.00-87.00          | 1.4-1.5                                | 5.00               | 24.3                                      |
| Spring 75  | 75.00                                      | 24.00  | 19.0   | 5.10                                  | 6.43   |                      |  | 5.75               |   |
| 1974-75    | 75.00                                      | 28.00  | 23.0   | 4.35                                  | 5.48   | 77.00-85.00          | 1.4-1.6                                | 5.75               | 21.2                                      |
| 1975-76    | 75.00                                      | 27.27  | 21.50  | 4.40                                  | 5.69   | 103.00-110.00        | 1.2                                    | 5.75               | 21.2                                      |
| April 76   | 68.00                                      | 26.75  | 24.00  | 4.18                                  | 4.62   | 107.00               | 1.03                                   | 5.75               | 19.8                                      |
| 1976-77    | 68.00                                      | 33.27  | 26.00  | 3.35                                  | 4.13   | 125.00 <sup>4/</sup> | 0.80                                   | 6.25               | 19.5                                      |
| April 1977 | 68.00                                      |  |        |                                       |        | 137.50 <sup>5/</sup> | 0.79                                   | 6.25               | 19.5                                      |

1/ 110 lb. bag of urea containing 50.6 lbs. of N.

2/ This assumes that the harvest price is about 50% of the procurement price for milled rice.

3/ In April 1976 the cotton price was increased 40% for the fall 1976.

4/ This price was announced in August 1976.

5/ New price announced in April 1977 for following harvest.

Later this was effectively made a floor price (instead of a ceiling) by permitting farmers to sell freely to middlemen. A further step was taken when unrestricted inter-district movement of the 1976-77 crop was permitted. Between 1974 and 1976 rice procurement prices were almost doubled and further increased in 1977. In April of 1976 the Government increased the support price for cotton, a labor intensive crop produced mainly by small farmers, by 40 percent, bringing it to double the 1974 price. Price supports were also announced for the first time for maize, potatoes, and onions. At the same time prices of fertilizer were rolled back an average of about 10%. In April, 1977 the price of cotton was raised a further 10%. The sum of these actions resulted in about a 50% reduction between April, 1974, and 1977 in the number of pounds of each crop required to buy a pound of N (Tables 5 and 6).

An oilseed strategy, now being completed by a special committee, includes establishment of apparently attractive price supports for oilseeds (soybeans, sunflowers, groundnuts, safflowers, rape, and mustard seed), all of which are grown mainly by small farmers and mostly in rainfed areas where incomes are relatively low.

Taken together these price policies represent a major advance in improving the incentives to increase fertilizer use and expand production. In general the price support steps probably have benefited small and low-income farmers more than large farmers because of their greater vulnerability to low harvest time prices.

## E. Adequate Fertilizer Supplies

### 1. Transportation

Fertilizer in Pakistan is primarily transported by rail from the Karachi port or manufacturing plants to provincial distribution points. Private trucks are generally used only to service areas beyond rail heads, to move fertilizer short distances from the port and factory, or to absorb the overflow when sufficient freight cars are not available. Farmers generally transport fertilizer from the closest sales outlets to their fields by pack animals or animal-drawn conveyance if the distance is not too great. Large farmers may

use tractors. For longer distances custom or commercial transportation is often hired jointly by several farmers.

While the system of rescheduling passenger trains introduced two years ago provided additional track time for freight trains and the railroad has reportedly provided the Federal Department of Agricultural Supplies with a sufficient number of freight cars, congestion remains a serious problem at Karachi port. Recently the Government and the World Bank agreed to establish a task force on fertilizer logistics to help identify and eliminate problem areas. The task force would include representatives from the GOP, Pakistan Railways, Karachi Port Trust, and the fertilizer manufacturers.

## 2. Imports

The Government has in general met its input objectives by arranging fertilizer imports to keep domestic supplies adequate to meet demand. However, there have sometimes been delays in placing orders, usually caused by the hesitation of the Ministry of Finance to sanction foreign exchange expenditures while outside financing or reimbursement for all or part of the import was in doubt. The system for arriving at import decisions is discussed at length in section III-C. However, there have been no serious or overall shortages during the project period, and supplies have been adequate.

## III. Other Project Considerations

### A. The Role of Women

The Agricultural Inputs Project was not designed to have a differential impact on women. Women play a selective role in farming activities outside the home, generally restricted to caring for livestock, light harvesting, and grain cleaning and processing. Evidence from intensive village studies on fertilizer use conducted by the National Fertilizer Corporation (NFC) and AID indicates that women, other than those acting as heads of

households, generally participate only indirectly in decisions related to fertilizer. Such decisions are generally considered within the purview of men. The project is thus expected to affect women directly only to the extent that they participate in farm work and the farm management decision-making processes as members of rural households. The increase in crop production resulting from greater use of improved agricultural inputs will further benefit women indirectly as the consequent rise in farm income raises rural family life above subsistence levels.

#### B. Balance of Payments and Repayment Capacity

An important part of the justification for this loan arises from Pakistan's international trade, payments, and reserve positions. Despite the crucial importance of the fertilizer and other agricultural inputs which this loan will finance, Pakistan would find it difficult to import them in the required quantities without foreign assistance. The balance of payments constraints on Pakistan's efforts to mobilize resources for productive investments have been particularly severe in the last few years because of such external and uncontrollable factors as the worldwide recession, the failure of Pakistan's cotton crop, and the need to import large quantities of food, particularly vegetable oil. This proposed loan tranche is part of a series which are helping finance needed fertilizer imports as part of a coordinated effort to improve fertilizer distribution, expand fertilizer use, expand crop production, raise income, and help Pakistan achieve self-sufficiency in wheat. In the coming year, if normal or better weather exists, this last objective will be achieved. Self-sufficiency in wheat will combine with a hoped for recovery in export receipts following the recovery of cotton production to give Pakistan some balance of payments relief.

This loan was requested by Pakistan to finance a portion of the fertilizer and other agricultural inputs needed as part of the Government's program to build on the country's natural resource endowment and eliminate dependence on imported wheat. The country cannot finance the fertilizer without foreign aid unless it is willing to cut other essential imports, including capital imports that are also part of the same development strategy.

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A major factor in Pakistan's balance of payments position is remittances from Pakistani nationals working abroad, particularly in the OPEC countries of the Persian Gulf. The export of such factor services will bring over \$450 million dollars to Pakistan this fiscal year. The amounts are expected to continue to grow, and based upon the experience of other countries in South Asia (notably India), some experts project remittances will reach about \$1 billion annually by fiscal year 1982. (See, for example, IBRD: Pakistan: Current Developments and Issues Report No. 1423-PAK, March 15, 1977, p. 55 ff.)

It is also expected that Pakistan's merchandize exports will continue to improve. Major steps to improve export incentives and curb unnecessary imports are being planned, and will, according to the Minister of Finance's February 18, 1977 letter to the Managing Director of the International Monetary Fund, be implemented in the coming fiscal year. (See IMF Document EBS/77/58, February 25, 1977.)

The combination of these steps, the debt rescheduling and relief agreements with the members of the Aid-to-Pakistan Consortium and other creditors concluded in recent years, and a reduced need for foreign borrowing resulting from the import substitution plan of which this proposed loan is an integral part, should keep Pakistan's ratio of debt service to foreign exchange earnings at a manageable level.

EXHIBIT/STAMP/...  
AW/STAMP/...

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|                                 | <u>1975-76</u> | <u>1976-77</u> | <u>1977-78</u> | <u>1978-79</u> | <u>1978-79</u> |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|
| Imports(FCE)                    | 2130           | 2100           | 2500           | 2750           | 2900           |
| Exports (FCE)                   | 1163           | 1050           | 1450           | 1650           | 1950           |
| Merchandise balance             | -967           | -1050          | -1050          | -1100          | -950           |
| Remittances                     | 353            | 450            | 550            | 700            | 850            |
| Other invisibles(net)           | -179           | -178           | -258           | -288           | -320           |
| Debt service                    | -453           | -430           | -480           | -637           | -708           |
| GAP                             | -1246          | -1208          | -1238          | -1325          | -1128          |
| Aid disbursements               | 1122           | 825            |                |                |                |
| Net private investment          | 100            | 100            |                |                |                |
| IMF (net)                       | 134            | 62             |                |                |                |
| Net official short-term capital | -31            | -18            |                |                |                |
| Change in reserves              | 182            | -239           |                |                |                |
| Errors & omissions              | 103            | -              |                |                |                |

The World Bank, acting as the chair organization of the Aid-to-Pakistan Consortium, has recommended that aid commitments from the Consortium for FY 1978 be maintained at a level of \$800 million. Commitments from non-consortium donors, including OPEC and East Bloc countries, plus increased net flows from the IMF and slightly increased consortium commitments in following years, should enable Pakistan to cover its payments gap, although narrowly, during the next few years.

Taking all these factors together, the repayment prospects for this loan are reasonable.

### C. Responsibility for Fertilizer Data and Decisions

#### 1. Data Collection and Analysis

The original PF outlined plans for improvement in fertilizer data collection and analysis. In furtherance of this objective, the Federal Ministry of Agriculture has recently established the position of Joint Secretary (Agricultural Inputs) with functional responsibility

for monitoring the pesticide and fertilizer situation in Pakistan.<sup>1/</sup> This responsibility includes monitoring and assessing information on current and projected production, imports, consumption, stock level positions, fertilizer movement, and financing required for imports. The Joint Secretary makes recommendations to the Secretary of Agriculture, who has authority for decisions concerning imports and scheduling. These decisions are implemented through the Federal Directorate of Agricultural Supplies (FDAS) which is mainly responsible for arranging imports, scheduling arrivals, monitoring unloading and out-shipment, and allocating fertilizer to the provinces and distributors.

The Joint Secretary (Agriculture Inputs) is assisted by two Deputy Secretaries and four Section Officers; one Deputy Secretary and one Section Officer work specifically on fertilizer. The Joint Secretary receives information on a monthly basis regarding fertilizer availability and offtake from the provincial agricultural supply organizations: Punjab Agricultural Development and Supplies Corporation, Sind Agricultural Supplies Organization, Agricultural Development Authority in the NWFP, and the Agriculture Department in Baluchistan. The provincial agencies, in turn, collect data from a wide variety of sources, including the National Fertilizer Corporation, Dawood Corporation, the ESSC Pakistan Fertilizer Company, private fertilizer dealers and distributors, and the Agricultural Extension Service. The information supplied by the provinces is very aggregated and includes the current stock inventory and past and projected offtake by province, by type of fertilizer, and by brand. The provincial offtake projections are based primarily upon simple trend analysis of past increases in fertilizer use modified to reflect crop and fertilizer targets. The staff of the Joint Secretary (Agricultural Inputs) revises the provincial offtake projections, considering national agricultural production and fertilizer use targets and judgement as to impacts of policies. National fertilizer supply and demand estimates are then prepared and incorporated in the Annual Development Plan.

The FDAS receives supply and offtake information on a weekly and biweekly basis from the provincial supply organizations and provides

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<sup>1/</sup> A Joint Secretary is roughly the equivalent of an Office Director in the U.S. Government.

it to the Ministry of Agriculture on request. The FDAS makes offtake projections using much the same data and procedures as the provinces and regularly submits the data and projections, assembled and compiled on a province-wise basis, to the Ministry of Agriculture, with copies to the Agriculture Section in the Planning Division, Ministry of Finance and Planning, and all other relevant Government agencies.<sup>1/</sup>

This process produces estimates of offtake for 12-18 months in advance which are revised if needed as monthly reports are received. In the past, information has flowed from the provinces to the Ministry of Agriculture with a lag of 6-8 weeks. Recently some improvement in the timeliness of the data has been achieved. Still, 3-4 weeks elapse between the end of the reporting period and the transfer of the field reports to the Ministry of Agriculture.

## 2. Fertilizer Planning and Policy Analysis

The GOP dissolved the Fertilizer and Pesticide Review Committee, established in January 1971, on May 3, 1977 and set up in its place the Central Fertilizer Coordination Committee (CFCC). The Chairman of the Committee is the Secretary, Ministry of Agriculture, Cooperatives and Land Reforms. The Joint Secretary (Agricultural Inputs) acts as Secretary of the Committee and implements decisions. Other Committee members include the Provincial Secretaries of Agriculture, the Joint Secretaries of E&D, Commerce, Industries, Production, and Railways, the Chief of the Agriculture Planning Division, and the General Manager of FDAS. Representatives of fertilizer manufacturers and distributors may also be invited to attend meetings by special invitation. The functions of this committee are as follows :

1. To fix and periodically review consumption targets for various types of fertilizers in Pakistan on a yearly and crop-wise basis;
2. To review and formulate import programs for fertilizers, keeping in view rupee and foreign exchange availabilities;

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<sup>1/</sup> These include the Ministries of Railways, Commerce, Industries and Production, the E&D, and the provincial agriculture departments.

3. To fix and periodically review the incidental expenditure admissible on various types of fertilizers;
4. To review and appraise, from time to time, actual consumption of fertilizer in the country;
5. To formulate policy proposals with regard to marketing and distribution in Pakistan of fertilizers, both imported and indigenous;
6. To approve new types of fertilizers for use in Pakistan;
7. To review the price structure, subsidy requirements, and fixation of fertilizer sale rates;
8. To recommend types of fertilizers to be produced indigenously in Pakistan and the location of plants;
9. To consider any other issues relating to fertilizer policy, planning, production, procurement and distribution.

The dissolved Fertilizer and Pesticide Review Committee had met only once or twice a year, hence was unable to supervise and direct fertilizer operations. The newly established CFCC is expected to meet more frequently to review the overall fertilizer strategy, including price and distribution policies and production and import plans. This will enable the Ministry of Agriculture and FDAS to make more timely import decisions.

#### D. Fertilizer Requirements

##### 1. Fertilizer Use Background

Increasing fertilizer offtake remains a cornerstone of Pakistan's agricultural strategy to upgrade agricultural production and achieve foodgrain self-sufficiency in 1977-78. Fertilizer application per cultivated acre is expected to increase from 24 pounds in 1975-76 and 30 pounds in 1976-77 to a target of over 50 pounds in 1980-81. This

optimistic projection of growth in fertilizer use is based mainly on continuation of favorable fertilizer/crop price relationships, a rapidly growing distribution system, increased availability of water from Tarbela Dam and other sources which will permit increased cropping intensity and crop acreage, extension of high yielding varieties to new areas, and the efforts underway to extend improved technology into rainfed areas.

AID and the GOP assumed continued greater promotion of phosphatic fertilizers in projecting the FY 1976-77 and FY 1977-78 offtake levels. Funds provided by AID under this project have been used primarily to buy phosphatic fertilizer (DAP) As a result of more abundant supplies, preferential prices, and improved distribution, use of phosphate relative to use of nitrogen has been increasing rapidly over the past three years (See Table 7). This is a positive development since agronomists feel that more P per unit of N should be applied on most farms in Pakistan. The Government hopes to attain a ratio of 3:1 which was widely recommended by Borlaug et. al. for the new varieties. Some agricultural specialists advocate a 2:1 ratio of N and P, but in the absence of more research on crop response and more soil analyses, it appears difficult to justify a 2:1 ratio of N to P over a 3:1 ratio.

Total offtake of fertilizer for the July to April period of fiscal year 1976-77 reached 366,000 nutrient tons, compared with 294,000 nutrient tons for the same period in FY 1975-76. Consumption of N and P increased 22 and 47 percent, respectively, above that of the previous year. In light of the extent of the 10 month increases, the Government now expects effective fertilizer demand to reach 519,000 nutrient tons of N and 128,000 nutrient tons of P (See Table 8).

For July 1, 1976 through April 1977 total offtake was about 524,000 nutrient tons.

## 2. Projected Offtake

GOP fertilizer demand has been estimated for FY 1977-78, to be 805,000 nutrient tons, an increase of approximately 24% over

Table 7

Annual Fertilizer Offtake

| <u>Fiscal Year ( July-June)</u> | <u>N</u><br>(Thousand Nutrient | <u>P</u><br>M/Tons) |
|---------------------------------|--------------------------------|---------------------|
| 1965-66                         | 69.8                           | 1.2                 |
| 1966-67                         | 112                            | 3.9                 |
| 1967-68                         | 177                            | 17.2                |
| 1968-69                         | 205                            | 39.5                |
| 1969-70                         | 274                            | 36.6                |
| 1970-71                         | 252                            | 30                  |
| 1971-72                         | 344                            | 37                  |
| 1972-73                         | 386                            | 49                  |
| 1973-74                         | 342                            | 58                  |
| 1974-75                         | 363                            | 60                  |
| 1975-76                         | 445                            | 103                 |
| 1976-77 <sup>1/</sup>           | 519                            | 128                 |

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1/ Estimates; second semester data not yet available.

Table 8

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## Pakistan's Fertilizer Supply-Demand and Import Plan 1976-78

|  | July-Dec. <sup>1/</sup><br>1976      |     | Jan.-June<br>1977 |       | July-Dec.<br>1977 |                  | Jan.-June<br>1978 |        |
|--|--------------------------------------|-----|-------------------|-------|-------------------|------------------|-------------------|--------|
|  | N                                    | P   | N                 | P     | N                 | P                | N                 | P      |
|  | ----- Thousand Nutrient M/Tons ----- |     |                   |       |                   |                  |                   |        |
| 1. Beginning Stocks <sup>2/</sup>                | 206                                  | 60  | 137               | 39    | 146 <sup>1/</sup> | 92 <sup>3/</sup> | 156               | 88     |
| 2. Local Production                              | 163                                  | 6   | 163               | 5     | 157               | 6                | 157               | 7      |
| 3. Imports: Actual                               | 62                                   | 45  | -                 | -     | -                 | -                | -                 | -      |
| Confirmed <sup>3/</sup>                          | -                                    | -   | 77                | 91    | 12                | -                | -                 | -      |
| 4. Total Availability                            | 431                                  | 110 | 377               | 135   | 315               | 98               | 313               | 95     |
| 5. Projected offtake                             | 294                                  | 71  | 225               | 57    | 337               | 91               | 285               | 84     |
| 6. Ending Stocks                                 | 137                                  | 39  | 146               | 92    | (-) 22            | (+) 7            | (+)28             | (+)11  |
| 7. Desired ending stock<br>balance <sup>4/</sup> | 137                                  | 39  | 156               | 88    | 156               | 88               | 175               | 100    |
| 8. Additional required                           | 0                                    | 0   | (-) 10            | (+) 4 | (-) 178           | (-) 81           | (-)147            | (-) 89 |

<sup>1/</sup> Actual amounts.

<sup>2/</sup> Assumes that timing and financing of imports are such that previous term deficits can be made up by beginning of period, unless otherwise noted.

<sup>3/</sup> Imports which are expected but not yet delivered.

<sup>4/</sup> Desirable closing balance has been calculated on the basis of 25% of projected annual offtake for nitrogen and 50% of projected annual offtake for phosphate.

the 1976-77 level. For 1978-89 offtake is estimated by the GOP at 910,000 nutrient tons. This represents an increase of 40% for the two years, which seems realistic based on recent growth rates.

### 3. Import Plan

According to the offtake, production, and desired stock level forecasts shown in Table 8, the GOP has an estimated total import requirement for calendar year 1977 of 261,000 nutrient tons of N and 186,000 nutrient tons of P. Only a portion of that requirement has been programmed against confirmed or anticipated financing (Tables 9, 10, and 11).

Financing has been confirmed and orders placed for 77,000 nutrient tons of N and 91,000 nutrient tons of P to help meet the fertilizer imports required during the January to June, 1977 period.

The import requirement for the July to December period is 190,000 nutrient tons of N and 81,000 nutrient tons of P. Of this, 12,000 nutrient tons of N has been confirmed for the July-December period.

Pakistan's Fertilizer Import Plan FY 1976-77:

July-December, 1976- Actual Imports

| Type of Fertilizer | Product M/Ton (thousand) | <u>N</u><br>Nutrient M/Tons | <u>P</u><br>Nutrient M/Tons | <u>K</u><br>Nutrient M/Tons | <u>Total</u> | Source of funds   | Amount (Million Dollars) |
|--------------------|--------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|-------------------|--------------------------|
| NP                 | 100                      | 23.0                        | 23.0                        | -                           | 46.0         | FX                | 15.90                    |
| NP                 | 11                       | 2.5                         | 2.5                         | -                           | 5.0          | Dutch Credit      | 1.80                     |
| NP                 | 15                       | 3.5                         | 3.5                         | -                           | 7.0          | EEC (grant)       | 2.35                     |
| NP                 | 28                       | 6.4                         | 6.4                         | -                           | 12.8         | Norway (grant)    | 4.00                     |
| DAP                | 20                       | 3.6                         | 9.2                         | -                           | 12.8         | AID (loan)        | 3.40                     |
| UREA               | 50                       | 23.0                        | -                           | -                           | 23.0         | Suppliers' Credit | 6.87                     |
| SCP                | <u>5</u>                 | <u>-</u>                    | <u>-</u>                    | <u>2.5</u>                  | <u>2.5</u>   | EEC (grant)       | <u>0.65</u>              |
| TOTAL:             | 229                      | 62.0                        | 44.6                        | 2.5                         | 109.1        |                   | 34.97                    |

Table 10

Pakistan's Fertilizer Import Plan FY 1976-77:  
January - June, 1977 - Confirmed Imports

| Type of Fertilizer | Product M./Tons (Thousand) | N<br>Nutrient M./Tons<br>(Thousand) | P            | K        | Total         | Source of Funds               | Amount<br>(Million Dollars) |
|--------------------|----------------------------|-------------------------------------|--------------|----------|---------------|-------------------------------|-----------------------------|
| DAP                | 146                        | 26.20                               | 67.02        | -        | 93.22         | AID Loan                      | 25.00                       |
| DAF                | 42                         | 7.49                                | 19.13        | -        | 26.62         | CIDA Loan                     | 7.54                        |
| NP                 | 20                         | 4.65                                | 4.65         | -        | 9.30          | Holland Credit                | 3.18                        |
| Urea               | 35                         | 16.10                               | -            | -        | 16.10         | Suppliers' Credit<br>(Kuwait) | 4.80                        |
| Urea               | 18                         | 8.28                                | -            | -        | 8.28          | USSR Barter                   | 2.06                        |
| Urea               | 10                         | 4.83                                | -            | -        | 4.83          | Hungary Barter                | 3.0                         |
| Urea               | 20                         | 9.20                                | -            | -        | 9.20          | Afghanistan<br>Cash/          | 2.54                        |
| <b>Total:</b>      | <b>291</b>                 | <b>76.75</b>                        | <b>90.80</b> | <b>-</b> | <b>167.55</b> |                               | <b>48.12</b>                |

Table II

Fakistan Fertilizer Import Plan FY 1977-78:  
July-December, 1977 - Planned Imports

| Type of fertilizer  | Product M/<br>Tons (thousand) | N                              | P            | K          | Total         | Source of funds           | Amount<br>(Million Dollar) |
|---------------------|-------------------------------|--------------------------------|--------------|------------|---------------|---------------------------|----------------------------|
|                     |                               | Nutrient M/Tons<br>( thousand) |              |            |               |                           |                            |
| <u>Confirmed</u>    |                               |                                |              |            |               |                           |                            |
| Urea                | 14                            | 6.67                           | -            | -          | 6.67          | Hungary barter            | 1.66                       |
| Urea                | 13                            | 5.90                           | -            | -          | 5.90          | Japan 13th yen.           | 1.80                       |
| SOP                 | 10                            | -                              | -            | 5.0        | 5.0           | Cash                      | 1.30                       |
|                     | <u>37</u>                     | <u>12.57</u>                   |              |            | <u>17.57</u>  |                           | <u>4.76</u>                |
| <u>Planned</u>      |                               |                                |              |            |               |                           |                            |
| DAP                 | 185                           | 24.30                          | 62.10        | -          | 86.4          | AID loan yet to be signed | 25.00                      |
| DAP                 | 52.6                          | 9.36                           | 23.92        |            | 33.28         | CIDA loan                 | 10.00                      |
| Urea                | 40                            | 18.40                          | -            | -          | 18.40         | USSR barter               | 6.00                       |
| Urea                | 33                            | 15.33                          | -            | -          | 15.33         | Japan credit              | 5.00                       |
| Urea                | 11                            | 4.90                           | -            | -          | 4.90          | North Korea barter        | 1.60                       |
| Urea                | 27                            | 12.26                          | -            | -          | 12.26         | Poland barter             | 4.00                       |
| Urea                | 57                            | 26.00                          | -            | -          | 26.00         | Holland credit            | 8.50                       |
| NP                  | 60                            | 13.87                          | 13.87        | -          | 27.74         | Holland grant             | 10.26                      |
| Urea                | 50                            | 23.00                          | -            | -          | 23.00         | Kuwait supplier credit    | 6.87                       |
| <b>Grand Total:</b> | <b>502.6</b>                  | <b>159.99</b>                  | <b>99.89</b> | <b>5.0</b> | <b>264.88</b> |                           | <b>81.99</b>               |

#### 4. Conclusions - Project Costs and Disbursements

Pakistan's foreign exchange cost of importing fertilizer is expected to reach \$125 million for CY 1977 (Tables 13 and 14). This estimate is largely based upon the March, 1977 landed cost of fertilizer. Fertilizer prices, however, are highly volatile and total import charges will certainly change from the projected amount. Based on current estimates there is need for an AID contribution of \$25 million along with GOP funds and anticipated other donor support to meet the GOP's fertilizer import deficit for CY 1977 and help meet the DAP deficit for the first couple of months of CY 1978. The AID loan is expected to finance between 110,000 and 110,000 product tons of DAP and up to 500 tons of forage seed.

#### E. AID-NFC Farmer Survey: Summary of Findings

Results from the first phase of the joint AID-National Fertilizer Corporation study of fertilizer distribution and use (The "General Farmer Survey") are now available. This survey, carried out in the provinces of Punjab, Sind, and the Northwest Frontier Province during March and April of 1976, was designed to contribute to the study objectives of a) providing baseline data to facilitate measurement of changes in selected characteristics of the fertilizer distribution system and fertilizer use; b) identifying social, economic, and physical factors related to fertilizer use; and c) providing a factual basis for evaluation of policy alternatives open to the Government of Pakistan to increase low-income and other farmers' access to and use of fertilizer.

A full report of findings and accompanying analysis from the General Farmer Survey is attached at Annex I. Briefly, however, the major findings and their implications for policy may be

Pakistan Fertilizer Import Plan CY 1977

(Thousand Nutrient M/Ton)

| Imports            | Jan. - June |          | July - December |          |
|--------------------|-------------|----------|-----------------|----------|
|                    | <u>N</u>    | <u>P</u> | <u>N</u>        | <u>P</u> |
| Required           | 87          | 87       | 190             | 81       |
| Confirmed          | 77          | 91       | 12              | -        |
| Planned Financing: |             |          |                 |          |
| Non-USAID          | -           | -        | 65              | 38       |
| GOP                | -           | -        | 59              | -        |
| AID                |             | -        | 24              | 62       |
| Surplus (Deficit)  | (-)10       | (+) 4    | (-) 30          | (+) 19   |

1/ 135,000 metric tons of DAP.

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CY 1977 Foreign Exchange Cost of Fertilizer

| <u>N</u><br>(thousand nutrient<br>tons) | <u>F</u> | <u>K</u> | <u>Product Tons</u><br>(thousand) | <u>Landed</u><br>Cost/Ton<br>Dollars) | <u>Value</u><br>(Million) |
|---|----------|----------|-----------------------------------|---------------------------------------|---------------------------|
| 50                                      | -        | -        | 110 Urea <sup>1/</sup>            | 145                                   | 16                        |
| 100                                     | -        | -        | 218 Urea <sup>2/</sup>            | 147 <sup>2/</sup>                     | 32                        |
| 33.6                                    | 86       | -        | 188 DAP <sup>1/</sup>             | 176                                   | 33                        |
| 38                                      | 97       | -        | 188 DAP <sup>2/</sup>             | 186 <sup>2/</sup>                     | 35                        |
| 14                                      | 14       | -        | 60 NP <sup>2/</sup>               | 167                                   | 10                        |
| 4.6                                     | 4.6      | -        | 20 NP <sup>1/</sup>               | 155                                   | 3                         |
| -                                       | -        | 5        | 10 SOP <sup>1/</sup>              | 100                                   | 1                         |
| <u>Total:</u>                           |          |          |                                   |                                       | 130                       |

<sup>1/</sup> Confirmed, GOP estimate

<sup>2/</sup> Estimated.

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CY 1977 Fertilizer Financing by Anticipated Source

| Source  | Status                       | <u>Amount</u><br>(Million Dollars) |
|---------|------------------------------|------------------------------------|
| GOP     | Expended (cash or barter)    | 4                                  |
|         | Anticipated (cash or barter) | 18                                 |
| Non-GOP | Confirmed <u>1/</u>          | 49                                 |
|         | Anticipated <u>2/</u>        | 34                                 |
| AID     | Anticipated                  | <u>35.00</u>                       |
|         |                              | 130.00                             |

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1/ Include both U.S. and non-U.S. financing

2/ Non-U.S. financing only.

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summarized as follows :

1. Adoption of Fertilizer

Findings:

- \* Statistically significant increases occurred between 1971-72 and 1975-76 in the proportion of farms on which some fertilizer was used (52 percent versus 70 percent). These increases occurred on small as well as large farms and on farms operated by tenants as well as owners.
- \* In the 1975-76 crop year there was no significant difference either among farm size categories or tenurial classes in the proportion of sample farmers using some fertilizer within each of predominantly irrigated and mainly rainfed (barani) areas.
- \* Although about the same proportion of large and small farmers, tenants and non-tenants, applied some nitrogen to each of wheat, rice and cotton during the study period, the proportion of some farmer groups applying phosphate to wheat and cotton was significantly higher than for others. Farmer groups for which this was true were :
  - owner operators for irrigated wheat and cotton;
  - large farmers for barani wheat.
- \* Compared to the proportion of those applying nitrogen, a low percentage of farmers in both irrigated and barani areas applied phosphate to their crops (30, 3, 17 and 21 percent of those who grew irrigated wheat, barani wheat, rice and cotton respectively). However, the percentage of farmers using phosphate on irrigated wheat was more than four times that reported in a 1969-70 study carried out in the Multan District of Punjab.

### Policy Implications:

That significant increases in the proportion of fertilizer users have occurred over the past few years is important evidence that Government policies to increase fertilizer adoption have been successful. Equally important, however, these actions have enabled small farmers and tenants as well as other farmer groups to participate in the adoption process. Such policies should be continued.

On the other hand, the results of this study indicate that at the time of the study, farmer acceptance of phosphates lagged far behind that of nitrogen, particularly in the barani areas, for small farmers who grew barani wheat, and among tenants in irrigated areas who grew wheat and cotton.<sup>1/</sup> This implies the need for enhanced efforts to encourage adoption and increased use of phosphate in combination with nitrogen. Such measures as increasing the quantity and quality of field demonstrations and promoting more aggressive marketing of phosphate fertilizers, especially in areas where they are now little used, are urgently required.

## 2. Fertilizer Application Rates

### Findings:

- \* Nitrogen: Farmers operating small holdings (less than 6 acres) applied on the average as much or more nitrogen per acre of wheat, rice, and cotton as those operating larger holdings. Owner operators applied on the average significantly more nitrogen per acre than :
  - Owner-cum-tenants for irrigated wheat;
  - Owner-cum-tenants and tenants for cotton and barani wheat.

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<sup>1/</sup> Since the survey was conducted there has been a large increase in national consumption of phosphate, much of which has been supplied under the Agricultural Inputs Loan. A follow-on survey planned for the spring of 1978 should provide information about how this increment has been distributed among areas, crops, and farmer groups.

- \* Phosphate: With one minor exception there was no significant difference either among farm size categories or tenurial classes in the average application rate of phosphate to wheat, rice and cotton.

#### Policy Implications:

The clearest implication of these findings is that small farmers who used fertilizer at the time of the survey applied as much per acre as large farmers. This, together with the finding that about the same proportion of small farmers was using nitrogenous fertilizer as large farmers, suggests that price, distribution and related policies which have contributed to this situation should be continued.

### 3. Factors Related to Fertilizer Adoption - Irrigation

#### Findings:

- \* Regression analysis indicates that in terms of relative significance use of irrigation was the most important variable associated with the probability that a given farmer used some fertilizer.
- \* Insufficient water was the most common reason given in the barani areas for not using fertilizer (33 percent of all responses) and the third most common reason in irrigated areas (18 percent).
- \* Eighty percent of sample farmers used some fertilizer in irrigated areas as compared to 45 percent in barani areas.

#### Policy Implications:

The perceived critical importance of adequate supplies of water in influencing farmers' decisions to use fertilizer

implies that any strategy for increasing rates of fertilizer adoption must take this variable into account. In barani areas some alternative actions which address the water constraint include a) introducing water conserving techniques, b) effectively demonstrating the profitability of fertilizer use on varieties and with practices capable of yielding highly profitable returns under barani conditions, and c) providing financial and other assistance to farmers to adopt water conserving and water harvesting techniques which permit more efficient use of available rainfall. In irrigated areas improved design and maintenance of water courses can make additional water available to land now receiving little or no irrigation. Further research is needed a) to evaluate the relative costs and benefits of these alternatives and b) to determine which alternatives best suit the needs of low-income farmers.

#### 4. Factors Related to Fertilizer Adoption - Physical Access

##### Findings:

Regression analysis indicates that both distance of the farm from the fertilizer source and quality of the road linking the farm to the fertilizer source are significantly related to fertilizer adoption.

##### Policy Implications :

That physical access to the fertilizer source is significantly related to fertilizer use highlights the importance of a) bringing the fertilizer sales outlet as close as possible to all farm households by establishing sales points in all but very small villages and b) increasing the number and quality of farm to market roads. It supports the continuation of policies already in effect to facilitate growth in the number of private retail sales points in villages.

#### 5. Factors Related to Fertilizer Adoption - Credit

##### Findings:

- \* Shortage of funds was the second most common reason cited in irrigated areas for not using

fertilizer (18 percent of all responses) and the fourth most common reason in the barani areas.

Most farmers applying fertilizer who reported using credit to obtain it borrowed from non-institutional sources. In the irrigated areas only about 9 percent of farmers who borrowed and 4 percent of those who used fertilizer said they had used institutional credit. However, among those who did borrow from institutional sources in these areas, significantly higher proportions of large farmers and owner operators obtained fertilizer credit than small farmers and tenants. The number of farmers in the sample in the barani areas who obtained institutional credit was too small to determine differences among farmer groups.

#### Policy Implications:

The substantial percentage of sample farmers citing lack of funds as a reason for not using fertilizer indicates that many low-income farmers not using fertilizer will require credit if they are to begin using the input. The low proportion of sample farmers, particularly small farmers, financing fertilizer through institutional sources implies that considerable scope remains for improving the institutional credit delivery system. Both the GCP and MID should place high priority on development and implementation of low cost small farmer credit delivery systems and on provision of an adequate amount of funds.

#### 6. Factors Related to Fertilizer Adoption - Information

##### Findings:

- \* The most commonly cited source of information about fertilizer was other farmers. Other important sources were the farm radio programs and relatives. A low proportion of farmers reported receiving information from the agricultural extension staff, newspapers, and fertilizer dealers.

- \* A substantial proportion of farmers not using fertilizer could not name a single type of fertilizer. The percentage was significantly higher in barani than in irrigated areas (75 percent versus 26 percent).
- \* Less than one percent of fertilizer users had ever had their soil tested.

#### Policy Implications:

The lack of basic awareness of fertilizer among many non-users of the input, especially in the barani areas, suggests that further efforts will be required to inform these farmers about the potential profitability and properties of various fertilizer types, and proper use of fertilizer. Equally important, steps should be taken to improve fertilizer users' knowledge of the benefits of adopting the entire package of practices associated with fertilizer, only a part of which has been accepted by most fertilizer users. The fact that few farmers interviewed received information about fertilizer from the agricultural extension agent is a cause for concern and indicates that priority attention should be given to increasing the effectiveness of the extension service. Strong consideration should also be given to a) improving the content and expanding the coverage of the farm radio programs, b) establishing training programs for fertilizer dealers to help them advise their customers on the use of fertilizer and c) making soil testing facilities available to farmers.

#### F. Environmental Assessment

In a few parts of the world ground waters containing high concentrations of nitrates have caused hemoglobinemia in infants. The United States Drinking Water Standards have set a nitrate limit of 10 milligrams per liter (determined as nitrogen) and the WHO International Standard for Drinking Water has recommended a limit concentration of 45 milligrams per liter. In Pakistan there has been any evidence of the incidence of hemoglobinemia; consequently, testing for nitrates in drinking water is not regularly done and data have not been available to show the nitrate content of drinking water in Pakistan.

A limited study was recently completed by the Institute of Public Health Engineering and Research, Lahore, and the Punjab Public Health Engineering Department to survey the nitrate levels in rural individual and small community water supplies in the Punjab. The results of the survey indicated that 78% of the samples showed no measurable nitrates. The nitrate concentration of the remaining samples were low in terms of health significance, ranging from a trace to a maximum of 14.6 mg. per liter. The survey indicated the higher nitrate contamination resulted from a combination of the relatively shallow depth of the water source and the proximity to dwellings and animal yards.

This generally satisfactory condition is unlikely to be aggravated by the small amount of fertilizer normally applied in Pakistan and by the even smaller amounts that would enter the ground water if the fertilizer is properly applied.

#### G. Research & Extension

The new varieties of wheat and rice, due largely to their divisibility, compatibility with established farmer practices, and substantially higher yield potential, spread rapidly from farmer to farmer when introduced in 1966-67. Within 4 to 5 years 57% of the wheat area was planted to new varieties. Then, however, the spontaneous expansion came to a halt. For rice the percentage planted to HYV reached 50% in 1970-71 but by 1973-74 had dropped to 40%.<sup>1/</sup>

The increase in average yields after introduction of the improved varieties was significant. Wheat yields rose from 9.0 maunds (738 lbs) per acre in 1963-65 to 12.7 maunds in 1971-73 and 14.3 maunds in 1974-75, while rice yields increased from 10.8 maunds in 1963-65 to 16.6 maunds in 1971-73.<sup>2/</sup> However, the potential as evidenced by average

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<sup>1/</sup> In the case of wheat the halt in expansion of HYV appears to have been related largely to failure until recently to develop and extend varieties and fertilizer to rainfed and irrigation-water-short areas. For rice it was an inadequate package for irrigated areas, poor processed quality of HYV, and the large premium for basmati in Pakistan and in the Gulf importing countries.

<sup>2/</sup> The experience was somewhat similar earlier when Deltapine cotton seed was introduced. However, floods and lack of insect and disease control have created additional problems for cotton. The result has been a decline in production from a high of 4 million bales in 1972 to slightly over 2.5 million in 1976.

yields in other major countries growing these crops is 2-3 times the current average yield in Pakistan. Achieving yields of this magnitude in Pakistan will require a better designed and applied package of improved technology. This includes not only irrigation, but the right amount of water applied uniformly on the field at the right time, seed properly sown in a good seed bed, fertilizer correctly placed, and good weed and pest control. Use of the entire package requires a degree of technical knowledge and in some cases specialized equipment that most farmers do not possess. In general the research centers are not producing information at an adequate rate but, more serious, information available is only very slowly being extended to farmers. On-farm soil testing is virtually non-existent. Poor handling and processing of IRRI rice has resulted in low quality and low prices domestically and for export.

The IBRD has under development a major project to improve the extension services in irrigated areas. AID through its Rainfed Agriculture Project is assisting in extension of improved technology in unirrigated areas, including pilot activities aimed at making extension more effective.<sup>1/</sup> It has a Water Management Project which will be carried out in irrigated areas. However, together these projects will cover only a very small part of Pakistan's crop area. The fertilizer distributors provide little technical guidance on fertilizer use. This needs to be stepped up and soil testing facilities made widely available through the government services and fertilizer distributors. Improvement and standardization of soil analysis is one of the activities planned for the AID-assisted research project. Discussions are underway on additional steps which might be taken to disseminate information, including using credit agencies to finance fertilizer and small farm equipment.

#### IV. Recommendations for Improvement in Fertilizer System.

A number of suggestions for improvement in the Government's capacity to monitor and react to changes in Pakistan's fertilizer

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<sup>1/</sup> The latest required data on fertilizer offtake showed an over 100% increase in rabi season offtake between 1974-75 and 1975-76 in Rawalpindi Division, in part at least attributable to large scale field demonstrations in that area.

situation should be considered :

A. Data and Decision Making

1. Only a small staff is available for assembling world-wide data on fertilizer from a wide variety of sources, including Pakistan Embassies abroad, international firms, and donor agencies. Although performance in monitoring the world fertilizer market has in the past been as good as could be expected with the erratic world conditions of recent years, there remains an urgent need to strengthen this capability. Therefore, it may be advisable for the GOP to assign full-time Officer on Special Duty/Advisor to monitor world fertilizer market and make timely, detailed recommendations on schedules, sources, and types of fertilizer purchased. He would consider all relevant factors such as differentials in shipping costs and delivery times in making recommendations. This individual should probably be located in the Ministry of Agriculture and be in regular contact with FDAS. He should have sufficient experience and adequate staff to effectively carry out his responsibilities.
2. Current data are available on total fertilizer offtake, but not on use per acre for different crops. Hence, it is difficult to predict the effects of individual crop policies on fertilizer offtake and the effect of fertilizer policies<sup>on</sup> production of individual crops. It would be desirable to collect up-to-date information by periodic sampling of fertilizer rates per acre by major crops for use in making fertilizer offtake and crop estimates. The Federal Ministry of Agriculture is now planning to collect such data, an action which has also been recommended by the Agricultural Inquiry Committee.
3. Information on the stock position and its components (e.g. offtake, ~~delivery~~, etc.) by distributors and areas is currently available with the individual distributors

and provincial organizations. This information should be supplied to the Ministry of Agriculture on a regular basis so as to help the Ministry's fertilizer staff avoid local shortages and improve the efficiency with which existing stocks are used.

B. Fertilizer Bagging

Non-uniformity in the weight of bags delivered to farmers is a much discussed problem (A full discussion is attached hereto in Annexure B).

Consequently, AID will require clear evidence, per section 5, sub-section D1, before the next IFB is issued of concrete steps toward satisfactory resolution of the bagging problem on a long-term basis and an interim arrangement for adequately standardizing and sewing bags when the first shipments arrive.

Available cost data clearly favor bulk importation over bagged import of any part of the procurement.

V. Implementation

A. Analysis of the Recipient's and AID's  
Administrative Arrangements

1. Recipient

For implementation of the project, prime policy and implementation responsibility rests with the GOP's Ministry of Agriculture (MOA). However, for procurement actions other agencies like the Federal Directorate of Agricultural Supplies (FDAS), Food and Agriculture Counselor in the Pakistan Embassy in Washington D. C. and public and private distributors will all be involved.

Based on national import plans (as discussed in Part III, para D. 1 of the paper), the MOA will decide when to issue Invitation for Bids and what delivery schedules are desirable. The Ministry will authorize the Food and Agriculture Counselor, in the Pakistan Embassy in Washington to initiate procurement action in consultation with AID/W. The MOA will also advise the FDAS, Karachi as to the allocation of the imported fertilizer, as among provinces and public and private secot distributors. The ability of the MOA to implement the project has already been shown.

The FDAS is adequately staffed at Karachi and acts as a clearing and forwarding agent of the MOA. Upon arrival of the cargo at the Karachi port, the FDAS arranges for unloading of the cargo from the vessels under a stevedore contract. This agency, based on the information supplied by MOA, arranges for availability of railway wagons and trucks for delivery of the imported material from the Karachi port to the public and private distributors' bulk warehouses. This agency has been successfully discharging its responsibilities.

2. A. L. D.

AID continues to monitor the implementation of the policies by the Government as stipulated in the original and amendment No. 1 of the Loan Agreement. Since it is expected that the Government of Pakistan will be using its own free foreign exchange for procurement of project commodities and commodity-related services prior to meeting the Conditions Precedent, AID's disbursements will be financing such procurements through direct Letters of Commitment to a U. S. banking institution or to suppliers.

B. Procurement Procedures

As in the original and the T. Q. loans, funds from the proposed loan will be available to finance the procurement and freight of fertilizer and seeds. Such procurements will be undertaken in accordance with AID Regulation I procedures unless AID agrees to modification. Procurement documents, such as IFBs, evaluations, recommendation for awards, and contract and chartered party agreements, will be subject to approval by AID prior to issue.

MICROFILMED FROM ORIGINALS  
AVAILABLE FROM

D. Conditions, Covenants and Negotiating Status

1. Fertilizer Bagging

AID-financed DAP fertilizer has been imported into Pakistan in bulk form, with bagging of material carried out in the port of Karachi. The unsatisfactory experience with the bagging operation has caused serious problems for fertilizer distributors and dealers because the non-standard weights of the bags have met with strong farmer resistance. Farmers, accustomed to carefully weighed and sewn nitrogenous fertilizer bags - bagging having taken place under controlled circumstances at overseas or domestic factories - have objected to phosphatic fertilizer when it has been offered to them in irregularly filled and hand sewn bags, the product of the Karachi port operation.

Since 1972, AID has financed for Pakistan more than 500,000 metric tons of DAP fertilizer, all of it brought to Pakistan in bulk form and bagged in the port. Over the five years there has been little or no improvement in the bagging operation<sup>7</sup>. Shortcomings in the port system bagging, wastage of loose material, non-standard bags, farmer dealer and distributor complaints continue.

Foreign exchange costs of supplier-bagging and higher cost bagged shipping charges are believed to be significant -- between four and seven million dollars on a current purchase of valued at \$37 million C&F. To realize such savings, the GOP has continued to import bulk DAP and since the summer of 1976

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\*In telegram State 273161 of November 19, 1975 in response to a query whether AID might finance supplier-bagged DAP fertilizer, it was stated that "-- AID maintains a policy of financing bagged fertilizer only to those countries, where it is not possible for one reason or another for the country to receive fertilizer in bulk. Pakistan has in the past proven (its) capability to bag fertilizer in Karachi port in approximate quantities/time period proposed for this procurement, i. e. 100,000 M/Tons in shipment period covering 4 to 5 months. Therefore, in keeping with AID's aforementioned policy - we cannot consider financing bagging costs of fertilizer procurement of this magnitude without strong justification --". In retrospect, the statement that "Pakistan has in the past proven (its) capability to bag fertilizer in Karachi (etc.) is seen to be not correct. Bagging of bulk fertilizer in Karachi has been unsatisfactory from the first (1972) AID financing (See Audit Report 5-391-74-48, March 12, 1974 'Fertilizer Imports and Distribution'.)

has sought AID advice in improving the Karachi port bagging operation. (AID-GOP consultations are recounted in Annex B).

The GOP has recently informed AID of its decision, after consideration of alternative arrangements, to purchase two (2) mobile bagging unit machines. The machines, with a capacity of bagging 50 M.T. of fertilizer per hour, or 1,000 M.T. of product in a twenty hour day, will be moved alongside vessels as they are docked. Tarpaulin slings will lift the fertilizer out of the holds of the ships and drop it into a hopper above the unit. The machines will weigh and mechanically sew each bag. Systems of this type are already installed in various ports around the world.

IFB's for these bagging systems will have been issued and bids were due July 31. Awards and subsequent purchase contract are expected momentarily. Arrival of the machines is expected within six (6) months, hopefully somewhat sooner so as to be ready for the earliest expected arrival of bulk DAP fertilizer. Pakistan's own foreign exchange has been earmarked for the machinery purchase. The GOP estimates that the cost of a single bagging machine will be about \$90,000.

Consequently, the following approval schedule is proposed which links satisfactory improvement of fertilizer bagging to preliminary stages in the AID project approval process such that an early resolution of the port bagging problems will not jeopardize the timely arrival of AID financed phosphatic fertilizer;

A. Loan authorization is contingent upon submission by the GOP of bagging equipment specifications acceptable to AID and subsequent issuance of a bagging equipment IFB.

B. Loan authorization will contain condition requiring that Loan Agreement signing be contingent upon the award of a bagging equipment contract at which point fertilizer IFB's may be issued.

C. Loan disbursement is contingent upon the installation and operation of the acceptable bagging system. AID will not finance any fertilizer shipments off loaded prior to installation of the new system, except for emergency procurement.

## 2. Data Collection and Analysis

Part III C. of this Paper describes the actions taken by the GOP to strengthen its ability to collect data on supply and demand indicators.

In a letter dated January 24, 1977 from the Secretary of Pakistan's Economic Affairs Division to the AID Mission Director, following the signing of the second Agriculture Inputs loan tranche, the GOP informed AID:

"The Ministry of Food and Agriculture is acting to strengthen its capability to plan, execute and monitor various fertilizer activities. A Joint Secretary in the Ministry has now been assigned, on a full-time basis, to analysis of fertilizer data and making recommendations for Government action. This officer will also implement major actions and his supporting staff will be substantially increased."

Pursuant to the needs for additional data collection and analysis, explained in III C, the loan agreement amendment will contain a condition precedent to the effect that

"Evidence that the Ministry of Agriculture's Joint Secretary (Agriculture Inputs), has been provided with additional staff to carry out analytical tasks associated with fertilizer program management, for example, supply and demand data evaluation and projections, monitoring of imports, world market prices and trends, recommendations on timing for purchases."

### 3. General Farmer Survey

Survey findings and policy implications are summarized in part III. F. of this Paper. As noted, the survey's results suggest strengthening of information systems, additional credit for small farmers, further expansion of fertilizer distribution networks and other actions.

In the April 1, 1975 letter to AID from the GOP, applying for \$100 million of Agricultural Inputs financing, it was noted:

"To make the fulfillment of these targets possible, the Government will or has already taken a number of steps. Crop and production input price relationships are being reviewed regularly and adjustments made as necessary to insure that use of production increasing inputs such as fertilizer, improved seed, and pesticides is increased at sufficient rates to meet crop targets. Measures are being taken to expand the amount and efficiency in use of irrigation water. Already the Government has taken steps to assure that excess fertilizer stocks that existed at the end of 1974 at private sector are being cleared at an adequate rate. The Government will make phosphate and potash fertilizer available alongwith nitrogenous fertilizer at all points. To enable new organizations, constructing new fertilizer plants to develop marketing experience in advance of their plants coming into production, the Government intends to make imported fertilizer available to them on at least the same basis as to other distributors. The Government is reviewing its procedures for allocating fertilizer among the provinces so as to avoid simultaneous shortages or surpluses among the different geographic regions of the country. It is expanding the credit availability for purchase of fertilizer and other production increasing inputs."

These statements were confirmed in Section 5.1 of the Statement of Agricultural Policy of the original loan agreement

AID will request, as a condition precedent to disbursement of the tranche, an updated report on how the Borrower is continuing to implement Section 5.1 policies. The Borrower will be asked to indicate in the response, the relationship of policy actions to Survey results.

3. Formal Meeting

AID will also propose a formal meeting of federal and provincial government agriculture and other officials to review the AID-NFC General Farmer Survey. At the meeting, decisions would be made on implementation of Survey results. These decisions would be reported to AID prior to signature of the agreement.

As a condition precedent, AID will expect evidence that the Government has established a schedule for review of the results of the study, and development of recommendations, including, if appropriate, additional data collection and analysis.

A covenant will require that

"The Borrower shall review the AID-National Fertilizer Corporation General Farmer Survey and other relevant data based upon the results of that review, implement appropriate policy modifications".

4. Negotiating Status

The loan will be obligated by a second amendment to the loan agreement dated March 9, 1976. Although the precise wording of the conditions precedent and covenants discussed above has not been firmly agreed, the Government is generally agreeable to these - and we anticipate no negotiating difficulties.

A.I.D. Project No. 391-4041  
A.I.D. Loan No. 391-T-166

LOAN AUTHORIZATION AMENDMENT

Provided from: Food and Nutrition  
(Pakistan : Agricultural Inputs)

Pursuant to the authority vested in the Administrator, Agency for International Development ("A. I. D. "), by the Foreign Assistance Act of 1961, as amended, (the "Act") and the Delegations of Authority issued thereunder, I hereby authorize, pursuant to Part I, Chapter I, Section 103 and Chapter 2, Title I, the Development Loan Fund, an amendment of the loan authorization for Agricultural Inputs dated December 31, 1975, as amended September 21, 1976 to increase the loan to the Government of Pakistan ("the Borrower"), in an amount of Thirty-Five Million United States Dollars (\$35,000,000) for a total not to exceed One Hundred Million United States Dollars (\$100,000,000).

1. Other Terms and Conditions

A. Paragraph 2. A. (a) of the loan authorization dated December 31, 1975 is hereby deleted and the following substituted in lieu thereof:

"With the exception of the procurement of phosphate fertilizer, goods and services financed under the loan shall have their source and origin in countries included in A. I. D. Geographic Code 941. Phosphate fertilizer procurement shall be restricted to United States source and origin."

E. Except as amended hereby, said loan authorization shall remain in full force and effect.

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Administrator

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Date

Fertilizer Bagging at Karachi Port

Background

Manual bagging in the Karachi port continues to be a serious problem in bulk fertilizer shipment because of lack of both standardization and machine sewing. Bulk shipment of fertilizer with port bagging continues to present serious problems in the distribution system. Farmers and dealers regularly complain of underweight bags or adulterated DAP bags received from the port. One major distributor has recently expressed reluctance to accept unweighed bags of fertilizer and is considering discontinuing handling of DAP. There is apparently little quality control over the present manual bagging operations in the ship's holds and the amount of fertilizer loaded into bags is largely judgemental on the part of the individual filling-crew members. Hand sewn bags are more susceptible to spillage and to adulteration between ship and farm, and dealers and farmers are naturally suspicious of bags which are not machine sewn. Standardization and machine sewing are difficult to carry out after the fertilizer leaves the port because facilities upcountry for weighing and sewing are generally not accessible to distributors.

While the Government ultimately assumes the financial cost of the gratuitous fertilizer provided in overweight bags, the farmer faces the loss from underweight bags or adulteration in the bags he buys. Recently those dealers and distributors selling underweight bags have been subject to penalty, thereby shifting more of the risk and losses to distributors. The extent of farmer dissatisfaction with DAP bagged at Karachi port was not conclusively assessed by the National Fertilizer Corporation (NFC) Farmer Survey. Farmers' charges of underweight or adulterated bags (with sand or low cost fertilizer such as nitrophos) could be based largely on unfounded concern on the part of buyers that poorly stitched bags have been tampered with. Even if this is true it is a serious problem, for such loss of farmer confidence could result in reduction in the use of DAP and consequently inhibit the desired increase in the use of phosphatic fertilizer. It was these concerns which precipitated the conditions precedent to the second loan tranche

related to bagging procedures.

The Federal Directorate of Agricultural Supplies (FDAS) reports that it has been routinely sampling 5 to 10 percent of the hand-filled bags for weight accuracy. The sampled bags are not standardized. Instead the FDAS informs the bagging contractor of the results and the contractor is expected to tell his workers to adjust the amount as appropriate. The situation was further complicated recently when the railroad administration temporarily refused to permit weighing of loaded freight wagons prior to leaving for provincial distribution, citing the impact on port congestion of the extra time involved in weighing. We have been told that weighing has been resumed.

AID has suggested to the GCF that one method of promoting greater contractor concern for weight standards is to require bagging contractors to re-bag any fertilizer consignment in which a random sample does not fall within predetermined weight limits around the desired weight.<sup>1/</sup> The GCF has not formally responded to this proposal, but has expressed concern over delays this would cause in unloading. The Government has consistently maintained that a general inability to impose and enforce stringent work standards on the port labor union crews inhibits any significant improvement in the quality of the manual bagging in the hold. American specialists who have observed the port have not disputed this.

The GCF has undertaken several actions to identify and test potentially more effective bagging alternatives. In December, 1976 the GCF attempted to reduce spillage losses through hand-stitched bag seams and discourage fertilizer adulteration enroute to the farmer by giving the stitching crews hand-held sewing machines supplied by the Government of Norway. However, the machines were reportedly too heavy for the crews to hold for extended periods of time. Further, snapped needles and broken thread served to slow the process to a rate below that of a fully manual operation.

In September, 1976, the GCF requested AID assistance in reconditioning a modular bagging machine financed in 1971 with AID grant funds. The machine had been provided in an earlier effort to re-bag broken bags and loose fertilizer at the Karachi port; however, the equipment was employed only sporadically

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<sup>1/</sup> See FP amendment for Second Tranche, p. 19.

and its use was discontinued in 1973. In October, under an AID contract, the president of the manufacturing firm visited Pakistan, viewed the machine, and proposed that an engineer be sent to Pakistan along with parts to undertake the necessary repairs. It was felt, however, that the foreign exchange cost would be too high, and it was decided to have the machine repaired locally. The Government subsequently arranged for the ESSO Pakistan Fertilizer Company in the Sind Province to refit the machine and test it at the Karachi Port.

In January, 1977 the GCP submitted a plan for evaluating and, if feasible, undertaking machine dockside bagging designed to satisfy the conditions precedent requirements of the T.Q. loan. Central to the Government's plan was the test operation of the refurbished modular bagging machine. The test, however, proved inconclusive. ESSO technicians reported in early February that the machine was not sufficiently sturdy for continuous heavy duty operation. In addition the unit was relatively slow, producing only three to four bags per minute, and the weighing mechanism was difficult to adjust accurately. Pneumatic offloading equipment was also investigated at this time but was determined to be unsuitable for fertilizer handling.

In early December, a transportation economist under AID contract evaluated bulk fertilizer handling procedures at Karachi port. The contractor suggested a two-stage handling process under which the fertilizer would be hand bagged in the ships' holds and then shuttled to a warehouse outside the port where the bags would be reweighed and standardized as necessary.

After further discussions in February and March 1977 the GCP agreed to investigate machine bagging alternatives based upon the assumption that the quality of port hand bagging could not be reasonably controlled. Under these options fertilizer would either be trucked to a separate warehouse for mechanized bagging or be mechanically bagged dockside using portable units. A preliminary description of the options follows.

### Unloading

Regardless of the type or location of the bagging equipment selected, fertilizer would be bulk unloaded from the ships' holds using either a clam shell grab or tarpaulin - covered wire mesh sling. The mesh sling appears preferable to the clam shell. The sling, which utilizes hand filling, would cause minimal labor displacement. Unlike the clam shell grab, it would not require modification of existing cranes, and it is uncomplicated to produce, operate, and store. Because of its lighter weight a sling can probably take larger amounts of fertilizer each trip than a grab and thus unload faster.

### Alternative Bagging Arrangements

Dockside bagging requires sturdy portable machines capable of processing at least 25 tons per hour (500 tons per machine per 20 hour multi-shift day). Eight machines plus an auxiliary unit would be necessary to effectively unload two ships (4 holds each) simultaneously during peak periods. Under this process, fertilizer would be emptied from clam shells or slings directly into a ten ton machine hopper for bagging; the bagged fertilizer would then be loaded into rail cars for inland transportation. Since no single port berth can be allocated solely for fertilizer off-loading, the bagging equipment specifications would have to be such that the machines could withstand repeated relocation as well as sustained operation. A National Fertilizer Corporation (NFC) engineer had reservations as to the technical feasibility of such bagging machines.

A critical weakness of the system is its propensity to create port bottlenecks, particularly if one or more machines malfunction. There is also some concern as to whether there is sufficient working space between the dock and railroad lines to allow safe operation of the machines and cranes. Finally, unprotected machines on the dock would be exposed to damage from weather, accident or vandalism.

Under the enclosed (warehouse) bagging system, fertilizer would be emptied from clam shells or slings directly into dump trucks and shuttled to a warehouse. At the warehouse the fertilizer

would be dumped into a receiving hopper; carried by rubber conveyor or other elevating device to an overhead hopper (or hoppers) and fed into four bagging machines. A warehouse with bulk storage facilities to absorb overflows and space for four bagging machines with an aggregate capacity of 3,000 tons per day should have sufficient capability to process fertilizer unloaded from two ships at a peak rate of 4,000 tons per day.

The warehouse bagging alternative provides considerable shipping flexibility. Bagged fertilizer can be moved directly to railroad cars for national distribution, transported by trucks for local use, or stored temporarily in the warehouse. It is expected that many of the bagging machine components (e.g. hoppers and elevators) could be manufactured in Pakistan. The bagging, weighing, and sewing mechanism would have to be imported. This method might require a substantial investment in dump trucks to shuttle the fertilizer from ship to warehouse; however, the possibility of using idle trucks from the Tarbela Dam Project will be explored. This option offers the possibility of an interim improvement over current hand bagging methods by standardizing and sewing in the warehouse until the machines arrive. The NFC engineer prefers this approach and, in fact, NFC has been successfully using two machines of the type proposed for bagging domestically produced fertilizer. NFC engineers are developing detailed designs for the bagging operation, including machine specifications.

A third alternative would be to continue to bag in the hold, taking the bags out by truck or rail to one or several warehouse standardization points where they would be standardized by hand under adequate supervision and machine sewn. The possibility of this as an interim measure pending arrival of bagging machines is being examined. The GCF might contract with present large manufacturers/distributors to do standardizing or carry out the operation in the port warehouse where it ultimately plans to put machines.

#### Bulk versus Bagged Fertilizer

The potential 1977 foreign exchange savings accruing to Pakistan by purchasing DAP fertilizer in bulk rather than bagged

form is estimated at \$20 per ton or a total of about \$4 million for the remainder of CY 1977. The incremental local currency cost of manually bagging fertilizer in Karachi port is approximately \$2 per ton. Imported equipment for a mechanized bagging system financed by AID with loan funds is expected to cost less than \$500,000. Consequently, consistent with AID policy applied to the initial and second tranche of the Agricultural Inputs Loan, if the differential between bagged and bulk fertilizer remains substantial, it is proposed that DAP fertilizer from the U.S. will be eligible for financing under the FY 1977 tranche only if imported in bulk. Evidence of concrete steps taken by the GOP to implement one of the above described bagging systems or other satisfactory resolution of the fertilizer bagging problem will be a prerequisite to signature of the third tranche of the loan.

Summary Report for the First Phase of A Study of Fertilizer  
Distribution and Use in Pakistan

I. Introduction

This paper summarizes some major findings of the first phase of a study of fertilizer distribution in Pakistan jointly sponsored by AID and the National Fertilizer Corporation of Pakistan. The report deals with the results of a national sample survey of farmers (The General Farmer Survey) carried out during March and April, 1976. Subsequent reports will be prepared covering surveys of (a) fertilizer dealers and (b) representatives of banks, as well as a more in-depth study of farmers which utilized anthropological approaches to data collection and analysis.

The objectives of the study have been to a) provide baseline data necessary to permit measurement of changes in selected characteristics of the fertilizer distribution system and fertilizer use, b) identify social, economic, and physical factors affecting fertilizer use, and c) provide a factual basis for evaluation of policy alternatives open to the Government of Pakistan to increase access to and use of fertilizer by different farmer groups.

The study is the outgrowth of negotiations between the Governments of the United States and Pakistan which culminated in a loan agreement (the first of a series) signed in March 9, 1976 which financed the import into Pakistan of agricultural inputs, primarily phosphatic fertilizer. The Government of Pakistan had recently made major changes in its policies governing fertilizer use and distribution. These included a) increasing marketing margins for fertilizer distributors, b) permitting essentially unlimited licensing of private dealers, c) removing geographic restrictions on fertilizer marketing by producers, d) providing for distribution of imported phosphatic fertilizers through private as well as public distributors and dealers, and e) changing crop-fertilizer price relationships to increase farmer profit incentives to use fertilizer. These measures were a major factor in the recent significant increases in fertilizer offtake, and the corresponding bumper wheat harvest of 1975-76 and anticipated large 1976-77 harvest.

While these developments have been encouraging, there remains considerable potential for boosting crop production through wider

application of improved agricultural technologies. Foremost is the potential arising from use of more adequate and better balanced amounts of chemical fertilizer.<sup>1/</sup> Research conducted in several countries suggests that fertilizer provides more rapid, quicker, and greater increases in yield at less cost per acre than any other agricultural input, especially as in Pakistan where high yielding varieties are widely available. Hence this provides an effective and efficient way to move quickly toward food self-sufficiency.<sup>2/</sup> Identification of factors which act as barriers to adoption and increased use of fertilizers by farmers (and particularly "small" or low-income farmers) is therefore of critical importance to a nation such as Pakistan which has established goals of self-sufficiency in foodgrain production and an improved standard of living for its rural population. These studies are intended to do this, while also providing a benchmark for measuring progress under the project.

## II. Sampling Methods

The sampling frame for the General Farmer Survey was designed to meet the dual purpose of providing baseline data and diagnostic insights. A multi-stage sampling technique was used to select study areas (tehsils in the Northwest Frontier Province and Punjab, talukas in Sind), villages within these areas, and respondents within these villages.

Fifteen study areas (3 tehsils in NWFF, 7 tehsils in Punjab, and 5 talukas in Sind) corresponding to about a 10 percent sample of these administrative units in the three provinces were selected randomly after stratification for cropping pattern and availability of irrigation water. These two stratification variables were used because of their strong theoretical association with fertilizer use.

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- <sup>1/</sup> It should be noted that the term "fertilizer" as used in this report refers only to manufactured fertilizers such as urea and DAP. Our original intent had been to study farmers' use of farmyard manure as well as manufactured fertilizer, including estimation of quantities of farmyard manure applied to major crops and analysis of substitution relationships between farmyard manure and manufactured fertilizers. Unfortunately, problems of measurement arising from such factors as the heterogeneous physical properties of manure and differences in the size of containers used to transport manure to the field (bullock carts, donkey bags, etc.) made this impossible.
- <sup>2/</sup> See for example E. C. Heady, et. al: Roots of the Farm Problem (Iowa State University), 1965, and T. W. Allen et. al. : Food and Fertilizer: The Road to Self-Sufficiency (Shakpur Chemical Co., Ltd., Tehran, Iran), 1957.

Data for percentages of cultivated area irrigated and under individual crops were obtained from the Agricultural Census of 1972. The fifteen study areas selected represent nine major cropping patterns and 11 irrigated and 4 rainfed (barani) tehsils/talukas).

Six villages per study area or 90 villages in all were selected randomly after stratification within the tehsil or study area for distance of the village from, and ease of access to, the tehsil/taluka headquarters. Ease of access was measured in terms of the percentage of total distance made up by metalled (pacca) road and unmetalled (kaccha) road or track. The purpose of stratifying the sample villages in this manner was to attempt to facilitate testing of the hypothesis that access to a market center offering a variety of services and supplying agricultural inputs including credit and fertilizer influences farmers' use of fertilizer. Three pairs of villages (a) near, (b) at an intermediate distance, and (c) far from the market center, respectively, were selected with the help of maps and on-site inspection. Insofar as possible each pair was made up of one village linked to the market center primarily by pacca road and one primarily by kaccha road. No village was selected within two miles of the city limits of the tehsil/taluka headquarters or within four miles of the city limits of a tehsil -cum - district headquarters in order to avoid selecting villages atypical of the study area in terms of cropping pattern, fertilizer use, and other characteristics.

Approximately 10 farmers per village or 900 in all were selected as respondents. Based on tehsil-wise data from the Agricultural Census of 1972 showing the distribution of farms by size and tenurial class, a quota was established for each farm size-tenure class in a given tehsil or taluka before the interviewers went to the field. The distribution of the sample was made roughly proportional to the distribution reported in the census. The interviewers were instructed to obtain names of farmers in the village from a village leader or key informant. At least three times as many names were to be recorded for a given farm size-tenure class as required for a given village and names randomly selected from the lists. While it would have been desirable to draw a completely random stratified sample, this would have required a census of all households in the village, an approach which was not judged feasible due to time and financial constraints. The procedure adopted was expected to eliminate most of the bias resulting from interviewing each of a small number of respondents named by the village headman, a common practice in survey research in Pakistan.

### III. Presentation and Analysis of Baseline Data

Cross-sectional data were collected for a number of characteristics related to farmers' use of and access to fertilizer. Key questions to be answered were :

1. What percentage of farmers use fertilizer? How does this vary by crop, farm size, tenurial class, and access to irrigation?
2. How much and what kinds of fertilizers do farmers who use fertilizer apply to major crops? How do these characteristics vary by farm size, tenurial class, and access to irrigation?
3. What changes have occurred in the proportion of farmers using fertilizer, as classified by farm size and tenurial class?
4. How do farmers using fertilizer finance their fertilizer purchases? What sources of credit do they have, and what is the relative importance of each? How do these characteristics vary by farm size, tenurial class, and region?
5. What sources of information about fertilizer do fertilizer users utilize and what is the relative importance of each?
6. What are fertilizer users' attitudes toward (a) convenience of access to fertilizer outlets and (b) the performance of the distribution system in supplying fertilizer types desired at the time required and in providing bags of fair weight?
7. What reasons do farmers not using fertilizer give for not using the input? What is the relative importance of each in irrigated and barani regions?

Responses to these questions are provided in the following discussion through tabular presentation of the data and, for some characteristics, also with the aid of statistical analysis. Statistical tools (described below) were used to test hypotheses that there was no significant difference among various regions, crops, farm size categories, and tenurial classes in incidence of fertilizer use and average fertilizer application rates.

### Incidence of Fertilizer Use

Table I shows the number and percentage of sample farmers using and not using some fertilizer during the 1975-76 crop year. Application of the chi-square test of difference of sample proportions reveals that as of 1975-76, there was no significant difference among either farm size categories or tenurial classes in the percentage of farmers using some fertilizer within predominantly irrigated and mainly rainfed (barani) areas.<sup>1/</sup> However, there was a significant difference between irrigated and barani areas in the percentage of farmers using fertilizer (80% versus 45%). The difference is actually understated because some farmers not using fertilizer in "irrigated" areas operated under non-irrigated conditions, while some farmers using fertilizer in non-irrigated areas had access to irrigation water. In the "barani" areas, for example, 31% of farmers using fertilizer irrigated at least part of the land they fertilized.

The fact that within areas stratified for availability of irrigation water there was little difference in the percentage of farm operators who were fertilizer users among farms of different sizes and operated under various tenurial arrangements has special significance. It appears that small farmers and tenants -- those farmers that AID is particularly concerned use the inputs it finances -- have now adopted fertilizer to about the same extent as other farmers. However, in evaluating farmers' access to fertilizer it is not enough to make comparisons of "use" and "nonuse" alone since in practical terms the potential for increasing yields and farm income depends upon the quantity and nutrient balance of fertilizer applied, as well as upon other factors. Quantities and types of fertilizers applied by sample farmers to major crops are discussed below.

The sharp difference in the incidence of fertilizer use among all farmer groups between mainly irrigated and primarily barani areas indicates

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<sup>1/</sup> The term "significant difference" as used in this paper refers to a difference between two or more statistics (such as sample proportions or means) which has at least a 90 percent probability of not being due to chance.

Table I

Number and Percentage of Farmers Using  
and Not Using Fertilizer

|   | <u>Users</u> |          | <u>Non - Users</u> |          | <u>Standard Error<br/>of Proportion</u> |
|---|--------------|----------|--------------------|----------|---|
|   | <u>No.</u>   | <u>%</u> | <u>No.</u>         | <u>%</u> |   |
| <u>Irrigated Areas:All</u><br><u>Farm Size(Acres)</u> | 514          | 79.6     | 132                | 20.4     | 1.6                                     |
| 1-5   | 137          | 79.2     | 36                 | 20.8     | 3.1                                     |
| 6-12  | 202          | 78.6     | 55                 | 21.4     | 2.6                                     |
| 13-25   | 121          | 79.1     | 32                 | 20.9     | 3.3                                     |
| 26 and above  | 54           | 85.7     | 9                  | 14.3     | 4.4                                     |
| <u>Tenurial Class</u>                                 |              |          |                    |          |   |
| Owner   | 165          | 79.3     | 43                 | 20.7     | 2.8                                     |
| Owner-cum-Taxat                                       | 98           | 79.0     | 26                 | 21.0     | 3.7                                     |
| Tenant  | 251          | 79.9     | 63                 | 20.1     | 2.3                                     |
| <u>Rainfed Areas:All</u><br><u>Farm Size(Acres)</u>   | 107          | 45.3     | 129                | 54.7     | 3.2                                     |
| 1-5   | 64           | 46.0     | 75                 | 54.0     | 4.2                                     |
| 6-12  | 29           | 43.9     | 37                 | 56.1     | 6.1                                     |
| 13-25   | 9            | 45.0     | 11                 | 55.0     | 11.1                                    |
| 26 and above  | 5            | 45.4     | 6                  | 54.6     | 15.0                                    |
| <u>Tenurial Class</u>                                 |              |          |                    |          |   |
| Owner   | 77           | 49.0     | 80                 | 51.0     | 4.0                                     |
| Owner-cum-Taxat                                       | 21           | 38.9     | 33                 | 61.1     | 6.6                                     |
| Tenant  | 9            | 36.0     | 16                 | 64.0     | 9.6                                     |

clearly that farmers' adoption of fertilizer is influenced by the availability of adequate and dependable supplies of irrigation water. This probably reflects primarily difference in risk perception and resource constraints. Although not found statistically significant, the considerably lower percentage of full or part tenants compared with full owners who used fertilizer suggests an interaction of risk and resource limitation in rainfed areas. More will be said about this under the section of the report dealing with multivariate analysis of the data.

Another question of interest is the incidence of use of nitrogenous and phosphatic fertilizers on major crops. Table II shows the percentage of sample farmers growing wheat, rice, and cotton who reported applying nitrogenous (N) and phosphatic (P) fertilizers to these crops. As in Table I farmers are classified by farm size, tenurial class and area (irrigated versus rainfed).

The chi-square test was used to test the hypotheses that the differences in the proportions of sample farmers applying nitrogen and phosphate between crops, areas, farm size categories, and tenure classes could be explained by chance.

The results of the analysis indicate first that there was no significant difference among farm size and tenure groups with respect to percentages of farmers applying nitrogenous fertilizers to each of wheat, rice, and cotton during the period covered by the survey. This is consistent with the result reported earlier that farm size and type of tenurial arrangement was not associated with use (or non-use) of some fertilizer on at least one crop during the 1975-76 crop year.

Second, significant differences among farm size and tenure groups with respect to percentages of farmers applying phosphatic fertilizers to each of the three crops were found only for the following cases: 1) There was a significant difference in the proportion of farmers in different size categories using phosphates on cotton and barani wheat; and 2) the percentage of owner operators applying phosphates to irrigated wheat and cotton was significantly higher than for other tenurial classes. With regard to "1)" there is no clear trend in the percentage of farmers using phosphates on irrigated wheat among

Percentage of Farmers Applying Nitrogenous (N) and Phosphatic (P) Fertilizer to Wheat, Rice and Cotton <sup>1/</sup>

(Standard Errors of Proportions in Parentheses)

|                             | 646 | Wheat    |          | Rice     |          | Cotton   |          |       |
|-----------------------------|-----|----------|----------|----------|----------|----------|----------|-------|
|                             |     | <u>N</u> | <u>P</u> | <u>N</u> | <u>P</u> | <u>N</u> | <u>P</u> |       |
| <u>Irrigated Areas: All</u> |     |          |          |          |          |          |          |       |
| Farm Size (Acres)           |     | 78       | 564      | 30       | 63       | 17       | 78       | 21    |
|                             |     | (1.8)    | (2.0)    | (2.9)    | (2.3)    | (2.4)    | (2.4)    | (2.4) |
| 1-5                         | 173 | 76       | 27       | 65       | 17       | 72       | 20       |       |
|                             |     | (3.6)    | (3.8)    | (5.9)    | (4.7)    | (6.1)    | (5.4)    | (5.4) |
| 6-12                        | 257 | 75       | 30       | 60       | 19       | 81       | 22       |       |
|                             |     | (3.0)    | (3.2)    | (4.5)    | (3.6)    | (3.6)    | (3.8)    | (3.8) |
| 13-25                       | 153 | 81       | 28       | 64       | 12       | 73       | 14       |       |
|                             |     | (3.4)    | (3.9)    | (5.9)    | (4.0)    | (4.8)    | (3.8)    | (3.8) |
| 26 and above                | 63  | 92       | 43       | 71       | 17       | 91       | 39       |       |
|                             |     | (3.9)    | (7.1)    | (9.3)    | (7.7)    | (5.0)    | (8.5)    | (8.5) |
| <u>Tenurial Class</u>       |     |          |          |          |          |          |          |       |
| Owner                       | 208 | 81       | 38       | 63       | 16       | 78       | 34       |       |
|                             |     | (3.0)    | 3.7)     | (5.2)    | (4.0)    | (4.3)    | (4.9)    | (4.9) |
| Owner-cum-Tenant            | 124 | 80       | 28       | 65       | 14       | 79       | 18       |       |
|                             |     | (3.8)    | (4.3)    | (6.8)    | (5.0)    | (5.4)    | (5.1)    | (5.1) |
| Tenant                      | 314 | 76       | 26       | 62       | 18       | 78       | 15       |       |
|                             |     | (2.7)    | (2.8)    | (4.1)    | (3.2)    | (3.5)    | (3.0)    | (3.0) |
| <u>Rainfed Areas: All</u>   |     |          |          |          |          |          |          |       |
| Farm Size (Acres)           | 198 | 29       | 3        |          |          |          |          |       |
|                             |     | (3.2)    | (1.2)    |          |          |          |          |       |
| 1-5                         | 139 | 29       | 0        |          |          |          |          |       |
|                             |     | (4.7)    | NA       |          |          |          |          |       |
| 6-12                        | 66  | 28       | 0        |          |          |          |          |       |
|                             |     | (5.9)    | NA       |          |          |          |          |       |
| 13-25                       | 20  | 23       | 12       |          |          |          |          |       |
|                             |     | (8.3)    | (6.4)    |          |          |          |          |       |
| 26 and above                |     | 37       | 11       |          |          |          |          |       |
|                             | 11  | (11.1)   | (7.2)    |          |          |          |          |       |
| <u>Tenurial Class</u>       |     |          |          |          |          |          |          |       |
| Owner                       | 157 | 33       | 3        |          |          |          |          |       |
|                             |     | (4.3)    | (1.6)    |          |          |          |          |       |
| Owner-cum-Tenant            | 54  | 21       | 1        |          |          |          |          |       |
|                             |     | (5.4)    | (1.3)    |          |          |          |          |       |
| Tenant                      | 25  | 26       | 4        |          |          |          |          |       |
|                             |     | (9.1)    | (4.1)    |          |          |          |          |       |

<sup>1/</sup> Farmers who applied compound fertilizers such as DAP and Nitrophos are credited with having applied both N and P to the crop.

farm size categories, so it is difficult to explain why the variations occur. Among growers of barani wheat, however, there appears to be a greater tendency for operators of large holdings to apply phosphates than those farming small holdings. This suggests that small farmers and tenants are less willing and able to take risks with new technology, until they see it proven on farms of their more affluent neighbors. There are other possible explanations, of course, including the possibility that owners and larger farmers used N first and consequently have first encountered phosphate deficiencies.

Third, only a low percentage of sample farmers had used any phosphatic fertilizer on each of wheat, rice, and cotton. Just 5 of the 198 farmers who grew barani wheat (2.5 percent) reported using any phosphates. The highest percentage of farmers using phosphates was found for irrigated wheat, and that was only 30 percent of those who grew the crop. On the other hand, this is a substantially higher percentage than the 7 percent of dwarf wheat farmers who reported using phosphates in a 1969-70 study carried out in the Multan District of Punjab.<sup>1/</sup> Thus, while the percentage of farmers using phosphates remains low, it appears to have increased several fold, at least for irrigated wheat, during the 1969-70 to 1975-76 period. With the much more rapid increase in sales of P than N from 1975 to 1977, we would hypothesize that the 1978 survey will show another large jump in the percentage of farmers using phosphate.

Fourth, the percentage of farmers using some fertilizer on rice was significantly lower than for irrigated wheat and cotton. The lower percentage of rice planted to HYV may be an explanation. Additional analysis will be needed to explore the reasons.

Finally, the percentage of farmers applying both nitrogenous and phosphatic fertilizer to wheat grown under barani conditions was significantly lower than the percentage of those growing irrigated wheat.

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<sup>1/</sup> Max K. Lowdermilk, Diffusion of Dwarf Wheat Production Technology in Pakistan's Punjab, Summary Report (Cornell University Press), April, 1972, P. 39.

### Fertilizer Application Rates for Different Crops

Table III provides a crop-wise comparison of application rates of nitrogen and phosphate by sample farmers using some fertilizer. Data are provided for wheat, rice, and cotton. As before, farmers are classified by farm size, tenurial class, and area (irrigated versus rainfed).

A t-test of difference of means was used to test the hypotheses that the differences in mean application rates of nitrogen and phosphate between crops, areas, farm size categories, and tenurial classes could be explained by chance, i.e. were not statistically significant. Results of the analysis are as follows:

1. Growers of irrigated wheat and cotton applied significantly more nitrogen per acre than rice growers <sup>1/</sup>
2. Growers of irrigated wheat used significantly more phosphate per acre than rice growers but not significantly more than cotton growers.
3. Growers of irrigated wheat applied significantly more nitrogen and phosphate per acre than those growing wheat under barani conditions.
4. For some crops small farmers already use more fertilizer per acre than larger farmers. Farmers in the 1-5 acre farm size category used significantly more nitrogen per acre than those in the 13-25 acre category for irrigated wheat, more than those in the 6-12 and 26 and above categories for barani wheat, more than those in the 13-25 acre category for rice, and more than those in the 6-12 and 13-25 acre categories for cotton.
5. Owner operators applied significantly more nitrogen per acre than owner-cum-tenants for irrigated wheat, more than owner-cum-tenants and tenants for barani wheat, and more than owner-cum-tenants and tenants for cotton.
6. There was no significant difference among either farm size categories or tenurial classes in the mean application

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<sup>1/</sup> This finding is consistent with results of a 1974 survey of farmers done by ESSO which indicated that farmers applying some fertilizer used an average of 54, 54, and 41 nutrient pounds of nitrogen, respectively, on Mexipak wheat, cotton, and IRRI rice. (See ESSO Pakistan Fertilizer Company Ltd., Pakistan Nitrogen Demand Forecast Study (Karachi, Pakistan.), October 1974, Tables 26, 29 and 31.)

Average Application Rates of Nitrogen (N) and Phosphate(F) to Wheat, Cotton, and Rice by Farmers Using Some Fertilizer<sup>1/</sup>

-----Nutrient Pounds Per Acre -----  
(Standard Errors of Means in Parentheses)

|                            | Wheat         |               | Rice          |              | Cotton        |               |
|----------------------------|---------------|---------------|---------------|--------------|---------------|---------------|
|                            | N             | P             | N             | F            | N             | F             |
| <u>Irrigated Areas:All</u> | 55.1<br>(1.5) | 16.8<br>(1.1) | 47.0<br>(1.5) | 7.4<br>(0.9) | 58.5<br>(1.8) | 12.5<br>(1.3) |
| <b>Farm Size(Acres)</b>    |               |               |               |              |               |               |
| 1-5                        | 58.8<br>(2.8) | 17.9<br>(2.7) | 53.0<br>(2.8) | 8.8<br>(2.3) | 69.9<br>(4.5) | 12.5<br>(2.9) |
| 6-12                       | 54.6<br>(2.1) | 17.3<br>(1.8) | 46.7<br>(2.5) | 9.2<br>(1.5) | 58.7<br>(2.6) | 13.4<br>(2.2) |
| 13-25                      | 50.0<br>(3.1) | 12.2<br>(1.7) | 43.5<br>(3.2) | 5.2<br>(1.6) | 50.0<br>(2.7) | 6.0<br>(1.5)  |
| 26 and above               | 60.4<br>(5.6) | 22.9<br>(3.6) | 42.4<br>(4.8) | 1.5<br>(1.3) | 60.3<br>(6.4) | 23.1<br>(5.0) |
| <b>Tenurial Class</b>      |               |               |               |              |               |               |
| Owner                      | 59.6<br>(2.7) | 20.6<br>(2.0) | 47.2<br>(2.8) | 6.9<br>(1.7) | 65.0<br>(3.4) | 19.4<br>(2.6) |
| Owner-cum-tenant           | 50.2<br>(2.8) | 16.3<br>(3.0) | 42.9<br>(3.1) | 4.6<br>(1.7) | 52.1<br>(3.3) | 8.3<br>(2.4)  |
| Tenant                     | 54.0<br>(2.1) | 14.2<br>(1.5) | 48.4<br>(2.2) | 8.7<br>(1.4) | 56.9<br>(2.5) | 9.8<br>(1.8)  |
| <u>Rainfed Areas:All</u>   | 27.2<br>(1.4) | 2.3<br>(0.7)  |               |              |               |               |
| <b>Farm Size (Acres)</b>   |               |               |               |              |               |               |
| 1-5                        | 36.0<br>(2.0) | NA            |               |              |               |               |
| 6-12                       | 15.9<br>(1.2) | NA            |               |              |               |               |
| 13-25                      | 22.1<br>(4.5) | 7.7<br>(2.5)  |               |              |               |               |
| 26 and above               | 21.1<br>(5.2) | 10.3<br>(4.7) |               |              |               |               |
| <b>Tenurial Class</b>      |               |               |               |              |               |               |
| Owner                      | 31.9<br>(1.8) | 2.0<br>(0.9)  |               |              |               |               |
| Owner-cum-tenant           | 19.6<br>(2.8) | 3.9<br>(1.6)  |               |              |               |               |
| Tenant                     | 15.1<br>(2.9) | 0.3<br>(0.2)  |               |              |               |               |

<sup>1/</sup> Confidence intervals for the means are shown in Annex B.

rates of phosphate for wheat, rice, and cotton.<sup>1/</sup>

Several comments should be made about these findings. First, although application rates for all three crops were considerably lower than the recommended rates, actual application rates by sample farmers as a proportion of recommended rates were highest for cotton, followed by wheat and rice.<sup>2/</sup> Second, item "4" above together with the analysis accompanying Table I indicate that supplies of fertilizer in the distribution system during the year of the study were not only adequate to allow about the same percentage of small farmers to use some fertilizer as large farmers, but also to permit small farmers to use as much or more fertilizer per acre as operators of larger holdings within irrigated and barani areas. Third, that owner operators in the sample generally applied more nitrogen per acre than tenants and owner-cum-tenants may indicate that some features of tenancy act as barriers to more optimal fertilizer use rates. Finally, while it is true that small farmers and owner operators using fertilizer tended to apply significantly more fertilizer than other farmer groups in the statistical sense, in absolute terms the average difference in the rate was usually not great, seldom exceeding the equivalent of 10 nutrient pounds or one-fifth of a bag of urea per acre.

#### Changes in Fertilizer Use

Data from the Agricultural Census of 1972 permit us to document changes in the proportion of farmers using fertilizer during the years between the census and the present survey. As shown in Table IV, there have been substantial increases in the percentage of farmers in all tenurial classes using fertilizer. These increases are statistically highly significant. Similar significant increases have occurred in the proportion of farmers in all farm size categories <sup>using fertilizer</sup> (Table V). While the percentage increase is greatest in the largest and smallest size categories, the absolute increase is greatest in the 6 to 12 acre farm category, which includes about 40 percent of the country's farms. It seems clear, then, that all farmer groups including tenants and those operating small

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1 / Where differences in means appear by inspection to be significant the null hypotheses can not be rejected because of the combination of small numbers of observations and high variation in the sample application rate.

2 / For recommended application rates see Pakistan Nitrogen Demand Forecast Study op.cit., Table 16, and Central Treaty Organization "CENTC Seminar on Fertilizer Analytical Methods, Sampling and Quality Control", 1974, pp. 74 and 75.

Table IV

Percentage of Farmers Classified by Tenurial Class Using Fertilizer

| <u>Year</u> | <u>All Farms</u> | <u>Owner Operated Farms</u> | <u>Owner-cum-Tenant Farms</u> | <u>Tenant Farms</u> |
|-------------|------------------|-----------------------------|-------------------------------|---------------------|
| 1972        | 52               | 45                          | 52                            | 59                  |
| 1976        | 70               | 66                          | 67                            | 77                  |

Table V

Percentage of Farmers Classified by Farm Size Using Fertilizer (Irrigated and Earani Areas Combined)

----- Acres -----

| <u>Year</u> | <u>All Farms</u> | <u>1 - 5</u> | <u>6-12</u> | <u>13 - 25</u> | <u>26 and above</u> |
|-------------|------------------|--------------|-------------|----------------|---------------------|
| 1972        | 52               | 44           | 54          | 58             | 51                  |
| 1976        | 70               | 64           | 72          | 75             | 80                  |

holdings, have participated in the process of fertilizer adoption and consequent gains in productivity. The data further suggest that the percentage of farmers using fertilizer in the smallest size category has increased by almost 50% (44% versus 64%) between 1972 and 1976, as compared to about 25% in the larger size categories (54% versus 68%).

### Credit

Farmers using fertilizer were asked how they had financed their most recent fertilizer acquisition. As shown in Table VI, 48 percent of sample farmers using fertilizer in irrigated areas reported purchasing fertilizer wholly or partially on credit, as compared to 23 percent of farmers in barani areas<sup>1/</sup>. The difference in these proportions is significant.

Within the irrigated areas the proportion of tenant farmers using credit was significantly greater than that of farmers operating under other tenurial arrangements (62 percent versus 42 percent and 25 percent for owner-cum-tenants and owners, respectively). Credit received by tenants was mostly in the form of fertilizer provided by landlords. When the effect of tenurial status was controlled for, there was no significant difference among farm size categories in the percentage of farmers using some credit for fertilizer. This indicates that the variations in the percentages of farmers using credit among farm size categories in the irrigated areas (shown in Table VI) simply reflected variations in the frequency of use of credit among farmers within the three tenurial classes.

In the barani areas the hypothesis could not be rejected that there was no significant difference in the proportion of farmers using credit to finance fertilizer either among farm size categories or tenurial classes.

These results indicate that for the areas surveyed, farm size is not significantly correlated with whether a farmer using fertilizer finances it at least partly with credit or with his own resources. In addition,

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<sup>1/</sup> Credit includes institutional and non-institutional credit in cash and in kind, i. e. fertilizer.

Number and Percentage of Farmers Using  
Fertilizer Credit

|                       | <u>Credit</u><br><u>NO.</u> | <u>Users</u><br><u>%</u> | <u>Standard Error of</u><br><u>Proportion</u> |
|-----------------------|-----------------------------|--------------------------|---|
| <u>Irrigated: All</u> | 248                         | 48                       | 2.2   |
| <b>Farm Size</b>      |                             |                          |   |
| 0-5                   | 60                          | 44                       | 4.1   |
| 6-12                  | 116                         | 57                       | 3.5   |
| 13-25                 | 57                          | 47                       | 4.5   |
| 26 and above          | 15                          | 28                       | 6.1   |
| <b>Tenurial Class</b> |                             |                          |   |
| Owner                 | 41                          | 25                       | 3.4   |
| Owner-cum-Tenant      | 41                          | 42                       | 5.0   |
| Tenant                | 166                         | 66                       | 3.0   |
| <u>Barani: All</u>    | 25                          | 23                       | 4.2   |
| <b>Farm Size</b>      |                             |                          |   |
| 0-5                   | 15                          | 23                       | 5.3   |
| 6-12                  | 9                           | 31                       | 8.6   |
| 13-25                 | 0                           | 0                        | n.d.  |
| 26 and above          | 1                           | 20                       | 17.9  |
| <b>Tenurial Class</b> |                             |                          |   |
| Owner                 | 13                          | 23                       | 4.8   |
| Owner-cum-Tenant      | 4                           | 19                       | 3.6   |
| Tenant                | 3                           | 33                       | 15.7  |
| <u>All Farmers</u>    | 273                         | 44                       | 2.0   |

it is apparent that a higher proportion of tenants in irrigated areas use credit for fertilizer than farmers in other tenurial classes, probably because landlords often arrange for purchase and delivery of the input to the village or field, recovering the tenant's share of the cost at or shortly after harvest. These data do not shed light, however, on the important question of whether lack of access to credit is a principal reason for not using fertilizer or for using less than the amount the farmer desires. This question is discussed below under the section of this paper dealing with reasons farmers give for not using fertilizer.

Table VII shows the percentage of credit using farmers who used the indicated sources of credit for purchasing fertilizer. It is clear that bank credit was of relatively minor importance in financing fertilizer purchases. Of those farmers in the irrigated survey areas who borrowed to finance fertilizer, only 9 percent reported obtaining institutional credit. This means that only about 4 percent of the farmers in these areas who used fertilizer financed it wholly or in part with institutional credit. Of the remaining 91 percent of farmers obtaining fertilizer credit who borrowed from non-institutional sources, landlords were by far the most frequent source of credit, followed by friends and relatives. Commission agents, shopkeepers, and agricultural processors were not very important sources of fertilizer credit.

Because of the small size of the farmer sample in the barani area and the chance selection of a single village with a very active banking agent, the data are not considered representative, at least of institutional credit.

In the barani areas surveyed, friends and relatives were the most frequent source of fertilizer credit. Bank credit was important in the one village which had an active banking agency lending to farmers. The acceptance of institutional credit in the one village does strongly suggest that such credit is needed and desired and if made available will be widely used by farmers. In fact, 6 of the 7 sample farmers in the barani areas surveyed who received institutional fertilizer credit were located in this village. Thus, in 22 of the 24 barani villages sampled, no one obtained institutional fertilizer credit.

Table VII

- 17 -

Percentage of Farmers Borrowing for Fertilizer  
Using Various Sources of Fertilizer Credit

|                                 | Institutional         |                      | Noninstitutional |                   |             |                        |        | All Non-institutional |
|---------------------------------|-----------------------|----------------------|------------------|-------------------|-------------|------------------------|--------|-----------------------|
|                                 | (Bank or Cooperative) | Friends or Relatives | Land-lord        | Commissions Agent | Shop-keeper | Agricultural Processor | Others |                       |
| <u>Aggregated All</u>           | 9                     | 12                   | 65               | 5                 | 3           | 3                      | 3      | 91                    |
| <u>Farm Size</u>                |                       |                      |                  |                   |             |                        |        |                       |
| 0-5                             | 7                     | 20                   | 58               | 12                | 3           | 0                      | 0      | 93                    |
| 6-12                            | 7                     | 9                    | 73               | 2                 | 2           | 3                      | 5      | 94                    |
| 13-25                           | 11                    | 9                    | 63               | 6                 | 4           | 7                      | 0      | 89                    |
| 26 & above                      | 29                    | 14                   | 43               | 7                 | 0           | 7                      | 0      | 71                    |
| <u>Tenurial class</u>           |                       |                      |                  |                   |             |                        |        |                       |
| Owner                           | 23                    | 20                   | 13               | 13                | 8           | 5                      | 8      | 77                    |
| Owner-cum-tenant                |                       | 18                   | 50               | 5                 | 5           | 3                      | 0      | 81                    |
| Tenant                          | 4                     | 8                    | 81               | 4                 | 1           | 1                      | 2      | 97                    |
| <u>Barani: All<sup>1/</sup></u> | 28                    | 52                   | 4                | 0                 | 0           | 16                     | 0      | 72                    |

<sup>1/</sup> The small number of farmers in the barani areas surveyed who both used fertilizer and borrowed to finance it (25) makes it of little value to disaggregate the data into farm size and tenure groups.

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### Sources of Information

Farmers who used fertilizer were asked if they had received information about fertilizer from various possible sources. As shown in Table VIII, the most commonly cited source in both irrigated and barani areas was other farmers. Another major source was the farm radio program, as 35 percent of farmers in irrigated areas and 21 percent in barani areas reported receiving information about fertilizer over the radio. A third important source was relatives, particularly in the barani areas. A much lower percentage of farmers in both irrigated and barani areas learned about fertilizer from the agricultural extension staff and newspapers. Almost no farmers said they had received information from fertilizer dealers or had received advice about use of fertilizers based on soil tests. Only about 1 percent of farmers using fertilizer in irrigated and barani areas reported receiving no information from any source.

To test farmers' familiarity with types of fertilizer marketed in Pakistan, farmers who said that they had never used fertilizer were asked if they could name at least one kind of fertilizer. In irrigated areas 74 percent of nonusers of fertilizer could name at least one type as compared to 25 percent in the barani areas, a significant difference. This supports the hypothesis that in areas where a high percentage of farmers use some fertilizer most farmers not using fertilizer have at least a rudimentary familiarity with types of fertilizer available, whereas the opposite holds true in areas where few farmers use fertilizer.

### Fertilizer Outlets: Convenience and Quality of Service

To assess fertilizer users' attitudes towards the convenience of access to sources of fertilizer and the quality of the service they received from fertilizer dealers, farmers using fertilizer were asked several questions. As shown in Table LX, 59% and 58%, respectively, of farmers in irrigated and barani areas surveyed considered the distance they had to travel to get fertilizer convenient. A higher proportion of farmers in the barani areas (76 percent) said that the types of fertilizer they desired were available when needed than in the irrigated areas (62 percent). Only slightly more than half of farmers in irrigated areas and less than half of those in barani areas reported that the fertilizer bags they purchased were usually of fair weight. The remainder were critical to very critical of weight of bags.

Percentage of Farmers in Irrigated and Barani  
Areas Receiving Information About Fertilizer  
From Various Sources

| <u>Area</u>   | Source                             |       |                |                       |                |                       |        |
|---------------|------------------------------------|-------|----------------|-----------------------|----------------|-----------------------|--------|
|               | Agricultural<br>Extension<br>Staff | Radio | News-<br>paper | Other<br>Far-<br>mers | Rela-<br>tives | Fertilizer<br>Dealers | Others |
| Irrigated     | 8                                  | 35    | 3              | 39                    | 11             | 1                     | 1      |
| <u>Barani</u> | 6                                  | 21    | 4              | 38                    | 29             | 0                     | 2      |

Interpretation of these data should be made with caution. First, the data apply only to fertilizer users. The presumption is that these farmers had a reasonable degree of access to fertilizer or they would not have used it at all. For farmers who did not use fertilizer, particularly in the barani areas, poor access was probably a more serious problem. Second, and somewhat surprisingly, statistical analysis indicates that there was an inverse relationship between the application rate of fertilizer per acre of wheat and the direction of responses to questions about convenience of the sales point and availability of fertilizer. Perhaps those farmers who used more fertilizer had to go further or more often and commit more time and energy to obtain the types or quantities of fertilizer they wanted than those who used less fertilizer. This could also explain why a lower proportion of farmers in irrigated areas said availability of fertilizer was satisfactory than in the barani areas where average application rates were lower. On the other hand, the low percentage of farmers who said the bags of fertilizer they received were usually full may indicate problems of weight standardization prevailing at the time of the survey, or at least the farmer's perception that this was so.

#### Reasons for Not Using Fertilizer

Farmers reporting that they had not used fertilizer during the 1975-76 crop year were asked why they had not. As shown in Table X, the response occurring most frequently in the predominantly irrigated areas covered was that fertilizer was too expensive (22 percent of all responses), followed by shortage of funds, insufficient water, nonavailability of fertilizer, and source too far away (18, 18, 12, and 8 percent of all responses, respectively). Together these reasons accounted for 78 percent of the responses farmers gave for not using fertilizer.

In the mainly barani areas surveyed the reasons given were largely the same, but the relative importance of responses was somewhat different. Here the most common reason given for not using fertilizer was that the farmer could not get sufficient water or because of water shortages in the barani area (33 percent of all responses). Other frequently cited reasons were that fertilizer was too expensive (25 percent), the fertilizer source was too far away or not available (16 percent), and the farmer could not raise sufficient funds to buy fertilizer (10 percent).

Farmers' Reasons for Not Using Fertilizer

| Area          | Percent of All Responses   |                            |                  |                           |                     |                              |                   |        |
|---------------|----------------------------|----------------------------|------------------|---------------------------|---------------------|------------------------------|-------------------|--------|
|               | Insuffi-<br>cient<br>water | Too<br>exp-<br>ens-<br>ive | Lack of<br>funds | Source<br>too far<br>away | Unavail-<br>ability | Lack<br>of<br>know-<br>ledge | Water-<br>logging | Others |
| Irrigated     | 18                         | 22                         | 18               | 8                         | 12                  | 7                            | 6                 | 9      |
| <u>Barani</u> | 33                         | 25                         | 10               | 12                        | 4                   | 8                            | -                 | 8      |

The central importance of water availability as it affects farmers' decisions to use or not use fertilizer is once again evident. Even in the pre-dominantly irrigated areas lack (or shortage) of water was one of the most frequently cited reasons for not using fertilizer. The response that fertilizer was too expensive was also important in both irrigated and barani areas, but reflected crop-fertilizer price ratios prior to the April, 1976 Government decision to lower the retail price of fertilizer and support the price of major crops. It appears that lack of funds may currently be relatively more important as a constraint to adoption of fertilizer in irrigated than in barani areas because some of the other barriers to use of the input (such as water availability and physical access to fertilizer outlets) are less serious in most irrigated areas. However, in both areas financial constraints make it difficult for many low-income farmers to obtain fertilizer, a finding which has been confirmed by several other studies in Pakistan.<sup>1/</sup>

An analysis of the relative importance of barriers to adoption of fertilizer follows.

#### V. Multivariate Analysis

A major objective of this study was to identify and assess the relative importance of factors affecting farmers' use of fertilizer. Multiple regression analysis was used to test null hypotheses that the following factors do not significantly affect the probability that a given farmer uses fertilizer :

1. Farmer's use of irrigation
2. Distance of the farm from the fertilizer outlet
3. Quality of the road linking the farm with the fertilizer outlet
4. Size of the operational farm unit
5. Tenurial arrangements under which the farm is operated
6. Farmer's educational level
7. Farmer's age

The regression model used was of the following form :

$$Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + b_7 x_7 + c$$

<sup>1/</sup> See for example Max K Lowdermilk, Diffusion of Dwarf Wheat Production Technology in Pakistan's Punjab, op. cit., pp. 43-45, and Government of Pakistan, Office of the Economic Advisor, Pakistan Economic Survey, 1969-70 (Islamabad: Ministry of Finance, Government Press, 1970), pp. 67-68.

Where :

$Y$  = 1 if farmer used nitrogenous fertilizer; 0 if not

$x_1$  = 1 if farmer used irrigation; 0 if not

$x_2$  = distance to the fertilizer source in miles <sup>1/</sup>

$x_3$  = ratio of miles of pacca road to total miles between the farm and fertilizer source <sup>2/</sup>

$x_4$  = farm size in acres

$x_5$  = 1 if farmer is a tenant; 0 if not

$x_6$  = farmer's education in years of formal schooling

$x_7$  = farmer's age in years

The model was applied to the portion of the sample which included all wheat growers, whether or not they used nitrogenous fertilizer on the crop. This assured that observations from both irrigated and barani areas would be included, as well as that a large number of observations (724) would be available for the analysis. The effect of access to credit on the probability of a farmer's using fertilizer could not be determined by the model because there was no practical way of determining a measure of access to credit for nonusers of fertilizer.

Table XI shows the results of the analysis, including regression coefficients, F-statistics, and levels of statistical significance of the individual independent variables.

<sup>1/</sup> For farmers who used fertilizer  $x_2$  is the number of miles the farmer reported travelling to obtain fertilizer; for farmers not using fertilizer in villages where at least one sample farmer used fertilizer  $x_2$  is the median distance sample fertilizer users in the village travelled to obtain fertilizer; and for farmers not using fertilizer in villages where no one interviewed used fertilizer  $x_2$  is the estimated distance from the village to the nearest public or private outlet.

<sup>2/</sup> For farmers who used fertilizer  $x_3$  is the ratio for miles actually travelled; for farmers not using fertilizer in villages where at least one sample farmer used fertilizer  $x_3$  is the average of the ratio for sample farmers who used fertilizer; and for farmers not using fertilizer in villages where no one interviewed used fertilizer  $x_3$  is the ratio for the estimated distance to the nearest public or private outlet.

Table XI

Regression Coefficients, F- Statistics, and Levels of Significance of Variables Related to the Probability of Farmers' Use of Nitrogenous Fertilizer on Wheat, Barani and Irrigated Areas

| <u>Independent Variable</u>          | <u>Unstandardized Regression Coefficient</u> | <u>F - Statistic</u> | <u>Level of Significance</u> |
|--------------------------------------|--|----------------------|------------------------------|
| Use of irrigation                    | 0.449  | 135.54               | .001                         |
| Distance to fertilizer source        | - 0.018                                      | 24.72                | .001                         |
| Farmer's education                   | 0.020  | 16.38                | .001                         |
| Farm size                            | 0.002  | 4.51                 | .05                          |
| Ratio of <u>pacca</u> to total miles | 0.075  | 3.63                 | .10                          |
| Farmer's age                         | - 0.001                                      | 0.26                 | N.S.                         |
| Farmer's tenurial status             | - 0.003                                      | 0.01                 | N.S.                         |

The F-statistic for the equation as a whole was 37.11, a value which is highly significant. This means that the probability that the regression results occurred by chance sampling error and that the independent variables are really not associated with the probability that a farmer uses fertilizer is considerably less than one-in-a-thousand.

As can be seen in the table, the independent variables "use of irrigation", "distance to fertilizer source", and "farmer's education" were all highly significant. "Farm size" was significant at the 5% and "ratio of paces to total miles" (a proxy for quality of road) at the 10% level. The other two variables -- "farmer's age" and "farmer's tenurial status" -- were not significant.

Turning now to the regression coefficients, the signs of the coefficients seem logically consistent. As expected, use of irrigation, education, and better road quality are positively (directly) correlated with adoption of fertilizer. Also as expected, a negative (inverse) relationship exists between distance to the fertilizer source and adoption of fertilizer.

The size of the unstandardized regression coefficients, like the significance levels for the individual independent variables, varied widely. However, this simply reflects the different units in which these variables are measured. These coefficients are most usefully interpreted by incorporating them into the regression model to calculate the probability that a given farmer uses fertilizer. This is done by summing the intercept coefficient and the products of the coefficients of the individual independent variables times any given values of these variables. For example, the model predicts that a farmer using irrigation, living 5 miles by pace road from a fertilizer outlet, having 3 years of education, and operating 10 acres of land has a probability of using fertilizer of .33 (the intercept coefficient) + (.449x1) + (-.018 x 3) + (.075 x 1) + (.02x3) + (.002x10) = .844 or about 84%. If the farmer does not use irrigation, holding other characteristics constant, the probability of his using fertilizer decreases from .844 to .395 (= .844 - .499), a fall of 53%. In contrast, changing farm size from 10 to 2 acres, other factors unchanged, results in a decrease in the probability of a farmer's using fertilizer from .844 to .828, a fall of less than 2%. The model thus provides a means

for predicting the effect on a given farmer's behavior (use or nonuse of fertilizer) when one explanatory variable is changed, other variables held constant.

To summarize, the null hypotheses that access to irrigation, distance to the fertilizer source, education of the farmer, farm size, and quality of road linking the farm to the fertilizer source are not correlated with adoption (use versus non-use) of fertilizer are rejected. As measured by their relative significance, use of irrigation is by far the most important explanatory variable, followed by distance to the fertilizer source, farmer's education, farm size, and quality of the road linking the farm to the fertilizer source. The hypotheses that the farmer's age and tenurial status do not affect adoption of fertilizer cannot be rejected.

#### V. Policy Implications

The findings of the first phase of this study lead us to a number of observations about policy actions which might be considered by the Government of Pakistan as it seeks to increase domestic fertilizer use, crop production, and farm incomes.

First, the availability of adequate supplies of water has been shown to play a dominant role in determining whether or not a farmer decides to use at least some fertilizer on his crops. This is particularly true in areas which are predominantly barani but also in those which are mainly irrigated. In low to medium rainfall barani areas it seems likely that the rate of adoption of fertilizer by current nonusers can be enhanced substantially through one or more of several alternative strategies. These include a) improving farmers' access to water harvesting facilities such as tubewells, b) effectively demonstrating the profitability of fertilizer use on varieties especially suited to barani conditions, and c) assisting farmers to adopt water conserving techniques which permit more efficient use of available rainfall, much of which now runs off the land and contributes to soil erosion. Examples of the latter approach include land levelling and bunding; contour farming, using

cultivation implements such as listers which create deep furrows which hold water and increase its rate of infiltration; cultivation techniques which create a mulch of soil aggregates on the surface and allow more rapid infiltration; and crop and crop residue management which reduce evaporation and permit higher infiltration rates. In areas which are primarily irrigated it is probable that increased fertilizer use can be promoted through such measures as improving the design and maintenance of watercourses and precision land leveling. This will make additional water available to fields or parts of fields currently receiving little or no irrigation. More research is urgently needed to evaluate the relative costs and benefits of these alternative strategies so as to provide the basis for selection of the best mix of policy actions. At the same time more attention should be given to designing a strategy for low-income farmers which takes into account their precarious financial position and emphasizes low cost, rapid return investments such as drought resistant, high yielding seed varieties and water conserving cultural practices.

Second, this study has indicated that a farmer's physical access to the fertilizer source significantly affects the probability that he uses fertilizer. Other factors constant, farmers situated near the fertilizer outlet, or able to reach it by improved road, are more likely to use fertilizer than those far from the outlet or able to reach it only by unimproved road. This finding highlights the importance of a) bringing fertilizer as close as possible to the farm, preferably within the village, and b) increasing the number and quality of farm to market roads. It also supports the continuation of policies already in effect to facilitate growth in the number of retail sales points. However, additional measures such as increased dealer credit may be necessary to encourage shopkeepers, particularly in isolated areas and where fertilizer consumption is low, to become fertilizer sellers.

Third, the substantial percentage of sample farmers citing lack of funds as a reason for not using fertilizer may be interpreted as evidence that many small farmers not using fertilizer will require credit if they are to begin using the input. This finding lends support to the Government of Pakistan's policy to significantly expand credit for agricultural inputs, including fertilizer. The low proportion of sample farmers, particularly small farmers, both using fertilizer and financing it with institutional credit indicates, however, that considerable scope remains for improving the credit delivery system. The issues involved here will be explored in more depth in a subsequent report dealing with the survey of institutional credit sources.

Fourth, that the farmer's educational level was positively correlated with the probability that he uses fertilizer is open to a number of possible interpretations. It may be, for example, that greater formal education leads to more rapid acceptance of new ideas because it increases a farmer's access to knowledge, a factor which reduces the risk of experimenting with new techniques. Diminished risk, in turn, increases expected returns to fertilizer and complementary inputs such as high yield seeds and irrigation. Although formal schooling does not provide most farmers technical information about improved practices, it may better equip them through literacy and awareness of new ideas to obtain this kind of information. Another possible explanation is that farmers with more education also tend to be wealthier, hence better able to afford fertilizer and bear the initial risks of adoption than less educated (poorer) farmers. Finally, more educated farmers may enjoy a higher social standing in the community, making it easier for them to gain access to fertilizer or credit to purchase fertilizer. To discover which of these or other interpretations are valid and design appropriate policies based on them will require further research.

Fifth, although the role of formal education in promoting adoption of fertilizer is not clear, there is good reason based on the results of this study to believe that lack of basic awareness of fertilizer, its properties, and its benefits is an impediment to adoption. This is especially true in barani areas, where nearly three-fourths of the farmers interviewed not using fertilizer could not even name one type of fertilizer. The traditional approach has been to rely on the agricultural extension service to educate the farmer on the benefits of using fertilizer and other improved inputs. However, the findings of this study (as well as those of several others) indicate that the extension agent is not a very important source of information to most farmers. We therefore conclude that to complement the efforts of the extension service increased attention should be given to such measures as improving the content and expanding the coverage of the farm radio programs, especially since so many of the farmers interviewed in the study reported receiving fertilizer information from this source. Radio seems particularly well suited to isolated or difficult-to-reach areas where the

agricultural extension agent seldom if ever visits. Strong consideration should also be given to establishing training programs for fertilizer dealers to enable them to advise their customers on the use of fertilizer. Virtually no dealers now provide information to farmers, a finding which highlights the unrealized potential of this information source. In addition, soil testing services, now virtually nonexistent, should be expanded to provide farmers with better information on which to base decisions concerning types and quantities of fertilizers to apply.

Finally, both trends in annual national consumption and comparison of the results of the study with those of the 1969 study previously cited verify that substantial increases in use of phosphatic fertilizers have occurred over the past few years. Still, the percentage of farmers in the present study who used any phosphatic fertilizer as well as the average application rates of phosphates per unit of nitrogen among those who did were fairly low, particularly in the barani areas and among small farmers who grew barani wheat. This signals the need for continued efforts to encourage adoption and enhanced use of this nutrient in combination with nitrogen. The profitability of use of phosphate on wheat in Pakistan has already been demonstrated in a number of studies, and its effect in promoting root development of wheat seedlings and increasing the yield and ratio of grain to straw are well known among biological scientists. What is needed is better dissemination of information about these benefits to farmers through such measures as carefully designed and executed demonstrations. In addition, steps should be taken to promote more aggressive marketing of phosphates, especially in areas where they are now little used.

Annex A

**Confidence Intervals for Proportions of Farmers Using Nitrogen (N) and Phosphate (P) on Wheat, Rice and Cotton**

| Farm Size/<br>Tenurial Class | Wheat,<br>Irrigated |                  | Wheat,<br>Barani |                 | Rice             |                  | Cotton           |                  |
|------------------------------|---------------------|------------------|------------------|-----------------|------------------|------------------|------------------|------------------|
|                              | <u>N</u>            | <u>P</u>         | <u>N</u>         | <u>P</u>        | <u>N</u>         | <u>P</u>         | <u>N</u>         | <u>P</u>         |
| <u>All</u>                   | 78<br>(81<br>75)    | 30<br>(33<br>27) | 29<br>(34<br>24) | 3<br>(5<br>1)   | 63<br>(68<br>58) | 17<br>(21<br>13) | 78<br>(82<br>74) | 21<br>(25<br>17) |
| 1-5                          | 76<br>(82<br>70)    | 27<br>(33<br>21) | 29<br>(37<br>21) |                 | 55<br>(75<br>55) | 17<br>(25<br>9)  | 72<br>(82<br>62) | 20<br>(29<br>11) |
| 6-12                         | 75<br>(80<br>70)    | 30<br>(35<br>25) | 28<br>(38<br>18) |                 | 60<br>(63<br>52) | 19<br>(25<br>13) | 81<br>(87<br>75) | 22<br>(23<br>16) |
| 13-25                        | 81<br>(87<br>75)    | 28<br>(35<br>21) | 23<br>(37<br>9)  | 12<br>(23<br>1) | 64<br>(74<br>54) | 12<br>(19<br>5)  | 73<br>(81<br>65) | 14<br>(20<br>8)  |
| 26 & over                    | 92<br>(99<br>85)    | 43<br>(55<br>31) | 37<br>(56<br>18) | 11<br>(24<br>*) | 71<br>(87<br>55) | 17<br>(30<br>4)  | 91<br>(99<br>83) | 39<br>(53<br>25) |
| <u>Owner</u>                 | 81<br>(86<br>76)    | 38<br>(44<br>32) | 33<br>(40<br>26) | 3<br>(6<br>0)   | 63<br>(71<br>54) | 16<br>(23<br>9)  | 78<br>(85<br>71) | 34<br>(42<br>25) |
| <u>Tenant</u>                | 76<br>(81<br>72)    | 26<br>(31<br>21) | 26<br>(42<br>10) | 4<br>(11<br>*)  | 62<br>(69<br>55) | 18<br>(23<br>13) | 73<br>(84<br>72) | 15<br>(20<br>10) |
| <u>Owner-curr. - Tenant</u>  | 80<br>(86<br>74)    | 28<br>(35<br>21) | 21<br>(30<br>12) | 1<br>(3<br>0)   | 65<br>(76<br>54) | 14<br>(22<br>6)  | 70<br>(88<br>70) | 13<br>(27<br>0)  |

1/ Confidence interval at 90% given in parentheses below the sample proportion.

\* Negative number

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Annex B

**Confidence Intervals for Average Application Rates of Nitrogen(N)  
and Phosphate (P) to Wheat, Rice, and Cotton by Farmers Using  
Some Fertilizer 1/**

| Farm size/<br>Tenorial class | Wheat,<br>Irrigated    |                        | Wheat,<br>Barani       |                       | Rice                   |                      | Cotton                 |                        |
|------------------------------|------------------------|------------------------|------------------------|-----------------------|------------------------|----------------------|------------------------|------------------------|
|                              | <u>N</u>               | <u>P</u>               | <u>N</u>               | <u>P</u>              | <u>N</u>               | <u>P</u>             | <u>N</u>               | <u>P</u>               |
| <u>All</u>                   | 55.1<br>(57.5<br>52.7) | 16.5<br>(18.7<br>14.9) | 27.2<br>(29.6<br>24.8) | 2.3<br>(3.4<br>1.2)   | 47.0<br>(49.6<br>44.4) | 7.4<br>(8.9<br>5.9)  | 58.5<br>(61.4<br>55.6) | 12.5<br>(14.7<br>10.3) |
| 1-5                          | 58.8<br>(63.5<br>54.1) | 17.9<br>(22.4<br>13.4) | 36.0<br>(39.3<br>32.7) |                       | 53.0<br>(57.6<br>48.4) | 8.8<br>(12.6<br>5.0) | 69.9<br>(77.2<br>62.6) | 12.5<br>(17.2<br>7.3)  |
| 6-12                         | 54.6<br>(58.0<br>51.2) | 17.3<br>(20.2<br>14.4) | 15.9<br>(17.3<br>14.0) |                       | 46.7<br>(50.3<br>42.6) | 9.2<br>(11.6<br>6.3) | 58.7<br>(63.1<br>54.3) | 13.4<br>(17.0<br>9.8)  |
| 13-25                        | 50.0<br>(55.1<br>44.9) | 12.2<br>(15.0<br>9.4)  | 22.1<br>(29.3<br>14.4) | 7.7<br>(12.0<br>3.4)  | 43.5<br>(43.9<br>33.1) | 5.2<br>(7.9<br>2.5)  | 50.0<br>(54.4<br>45.6) | 6.0<br>(8.5<br>3.5)    |
| 26 & over                    | 60.4<br>(69.7<br>51.1) | 22.9<br>(28.9<br>16.9) | 21.1<br>(30.0<br>12.2) | 10.3<br>(18.5<br>2.1) | 42.4<br>(50.6<br>34.2) | 1.5<br>(3.7<br>*)    | 60.3<br>(71.2<br>49.4) | 23.1<br>(31.5<br>14.7) |
| <u>Cwner</u>                 | 59.6<br>(64.1<br>55.1) | 20.6<br>(23.9<br>17.3) | 31.9<br>(34.3<br>29.0) | 2.0<br>(3.4<br>0.6)   | 47.2<br>(51.8<br>42.6) | 6.9<br>(9.7<br>4.1)  | 65.0<br>(70.6<br>59.4) | 19.4<br>(23.7<br>15.1) |
| 1-5                          | 65.3<br>(74.5<br>57.1) | 20.8<br>(27.2<br>14.4) | 37.2<br>(40.9<br>33.5) |                       | 53.3<br>(61.1<br>45.5) | 7.8<br>(14.1<br>1.5) | 63.1<br>(77.7<br>53.5) | 14.1<br>(21.6<br>6.6)  |
| 6-12                         | 55.7<br>(62.3<br>48.6) | 23.5<br>(29.9<br>17.1) | 19.1<br>(21.4<br>16.3) |                       | 44.0<br>(49.7<br>33.1) | 9.3<br>(15.3<br>3.3) | 62.9<br>(64.6<br>61.2) | 21.6<br>(23.0<br>20.2) |
| 13-25                        | 54.1<br>(61.7<br>46.5) | 15.6<br>(21.0<br>10.2) | 20.7<br>(31.5<br>9.9)  | 10.2<br>(19.4<br>1.0) | 44.2<br>(56.4<br>32.0) | 5.9<br>(10.7<br>0.9) | 55.3<br>(63.9<br>46.7) | 10.7<br>(16.4<br>5.0)  |

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| Farm size/<br>Tenurial class          | Wheat<br>irrigated     |                        | Wheat<br>Barani        |                     | Rice                   |                       | Cotton                 |                        |
|---------------------------------------|------------------------|------------------------|------------------------|---------------------|------------------------|-----------------------|------------------------|------------------------|
|                                       | N                      | P                      | N                      | P                   | N                      | P                     | N                      | P                      |
|                                       |                        |                        |                        |                     |                        |                       |                        |                        |
| 26 & over                             | 63.3<br>(77.8<br>48.8) | 20.8<br>(28.9<br>12.7) | 30.7<br>(44.2<br>17.2) | 16.8<br>(35.7<br>*) | 47.4<br>(62.1<br>32.7) | 2.9<br>(7.4<br>*)     | 75.1<br>(96.3<br>53.9) | 31.6<br>(45.9<br>17.3) |
| <u>Tenant</u><br><u>All</u>           | 54.0<br>(57.5<br>50.5) | 14.2<br>(16.6<br>11.3) | 15.1<br>(20.1<br>10.1) | 0.3<br>(0.6<br>0.0) | 48.4<br>(52.1<br>44.7) | 8.7<br>(11.0<br>6.4)  | 56.9<br>(61.1<br>52.7) | 9.8<br>(12.8<br>6.8)   |
| 1-5                                   | 54.7<br>(60.5<br>48.9) | 15.1<br>(19.6<br>10.6) | 33.7<br>(46.1<br>21.3) |                     | 50.3<br>(56.5<br>44.1) | 9.1<br>(14.3<br>3.9)  | 72.2<br>(85.4<br>59.0) | 13.1<br>(20.6<br>5.6)  |
| 6-12                                  | 55.7<br>(60.1<br>51.3) | 15.3<br>(19.1<br>11.5) | 16.4<br>(24.7<br>8.1)  |                     | 48.7<br>(54.5<br>42.9) | 10.0<br>(13.2<br>6.8) | 59.1<br>(65.0<br>53.2) | 11.2<br>(16.0<br>6.4)  |
| 13-25                                 | 50.5<br>(60.2<br>40.8) | 9.7<br>(13.7<br>5.7)   | 3.2<br>(7.9<br>*)      | 1.2<br>(3.7<br>*)   | 46.7<br>(54.1<br>39.3) | 5.7<br>(10.4<br>1.0)  | 45.3<br>(51.1<br>40.5) | 5.3<br>(9.1<br>1.5)    |
| 26 & over                             | 54.7<br>(66.2<br>43.2) | 36.0<br>(68.4<br>3.6)  | 1.2<br>(3.7<br>*)      |                     | 36.5<br>(125.5<br>*)   |                       | 46.6<br>(67.2<br>26.0) | 10.1<br>(31.6<br>*)    |
| <u>Owner-cum-Tenant</u><br><u>All</u> | 50.2<br>(54.9<br>45.5) | 16.3<br>(21.3<br>11.3) | 19.6<br>(24.2<br>15.0) | 3.9<br>(6.6<br>1.2) | 42.9<br>(48.1<br>37.7) | 4.6<br>(7.4<br>1.8)   | 52.1<br>(57.6<br>46.6) | 8.3<br>(12.2<br>4.4)   |
| 1-5                                   | 53.0<br>(64.3<br>41.7) | 19.5<br>(42.9<br>*)    | 25.4<br>(35.1<br>15.7) |                     | 63.8<br>(85.6<br>42.0) | 10.1<br>(31.6<br>*)   | 67.4<br>(92.9<br>41.9) |                        |
| 6-12                                  | 49.1<br>(57.4<br>40.8) | 13.1<br>(19.1<br>7.1)  | 10.5<br>(12.0<br>9.0)  |                     | 42.2<br>(51.6<br>32.8) | 5.7<br>(9.9<br>1.5)   | 51.0<br>(59.4<br>42.6) | 8.4<br>(15.3<br>1.3)   |
| 1-12                                  | 50.5<br>(56.9<br>44.1) | 15.5<br>(24.4<br>5.6)  | 16.1<br>(20.1<br>12.1) |                     | 48.9<br>(57.6<br>40.2) | 7.1<br>(12.2<br>2.0)  | 53.6<br>(61.4<br>45.8) | 7.1<br>(12.9<br>1.3)   |

| Farm size/<br>Temurial class | Wheat,<br>irrigated |          | Wheat,<br>Barani |          | Rice     |          | Cotton   |          |
|------------------------------|---------------------|----------|------------------|----------|----------|----------|----------|----------|
|                              | <u>N</u>            | <u>P</u> | <u>N</u>         | <u>P</u> | <u>N</u> | <u>P</u> | <u>N</u> | <u>P</u> |
| 13-25                        | 44.2                | 13.1     | 24.0             | 4.4      | 36.8     | 3.3      | 53.2     | 3.0      |
|                              | (49.8               | (18.6    | (37.6            | (6.0     | (45.0    | (8.1     | (65.6    | (5.8     |
|                              | 38.6)               | 7.6)     | 10.5)            | 2.8)     | 28.6)    | *)       | 40.8)    | 0.2)     |
| 26 & over                    | 58.2                | 22.6     | 22.5             | 10.1     | 36.9     |          | 47.8     | 13.4     |
|                              | (73.8               | (33.1    | (38.6            | (23.4    | (46.2    |          | (57.4    | (30.9    |
|                              | 42.6)               | 12.1)    | 6.4)             | *)       | 27.6)    |          | 38.2)    | 5.9)     |

1/ Confidence interval at 90% given in parentheses below the mean.

\* Negative number

PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT

1. App. Unnumbered; FAA Sec. 653(b).

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$ 1 million over that figure plus 10%)?

(a) This project was included in the FY 1977 Congressional presentation.

(b) Assistance is within operational year budget.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Yes. Financial and other plans necessary to carry out the assistance are completed.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No legislative action is required.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

Not applicable.

5. FAA Sec. 611(e). If project is capital assistance (e. g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project? **Yes. See Annex H to the October 1975 PP for the Project.**
6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate? **Not applicable.**
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to; (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperative credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions. **(a) Will have an insignificant and little effect on international trade other than to finance needed imports for the period during the program.  
(b) No effect.  
(c) Will have indirect effect on cooperatives, credit unions and savings and loan association,  
(d) No effect.  
(e) Will increase the agricultural output.  
(f) No effect.**
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise). **This loan is not expected to directly foster U.S. investment abroad except that the purchase of agricultural inputs from U.S. will invite participation by private U.S. enterprise.**

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

The Government of Pakistan will pay for all the local currency expenses of the project. All of the loan proceeds will be used for off-shore procurement of agricultural inputs.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?

The U.S. owns excess Pakistani rupees that are programmed for use in a number of projects - though it is not suitable to use excess rupees on this project.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

- a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

The project will involve the low-income rural areas. Increased availability of agricultural inputs and use thereof by the low-income farmers will increase agricultural production.

- b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e. g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

FAA Section 103.

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

The use of fertilizer and other agricultural inputs to be financed under this loan will increase agricultural production, which will have a direct impact on the increased income and improvement in the life of the rural poor.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25 of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

The Government of Pakistan expected to import fertilizer for the year 1977 costing up to \$110 million. AID's contribution will be 32% of the total program and the rest of the requirement will be met from Government's own and other sources. An appropriate covenant on the Government's contribution is included in the loan agreement.

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?

Not applicable.

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political and social development, including industry; free labor unions, co-operatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

(2) The Government is making continuous efforts to raise food production with maximum self-help measures. However, external assistance to allow procurement of agricultural inputs is presently imperative to sustain agricultural production until the domestic production capability is improved.

NOTE: (1), (3), (4), (5), and (6) not applicable.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

Not applicable.

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

The import of agricultural inputs is a comparatively short term step. Significant activity supportive of the Government's long range objective is to increase the agricultural growth rate to attain self-sufficiency at the earliest possible time.

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance of payments position.

The loan will be administered in line with existing U.S. Government regulations. Procurement of phosphate fertilizer will be restricted to U.S. whereas urea may be purchased from any Code 941 country. Therefore, the majority of the loan funds will benefit the U.S. economy. No direct effect on areas of labor surplus is expected.

2. Development Assistance Project Criteria  
(Loan only)

a. FAA Section. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

In addition to importing agricultural inputs from U.S. sources using AID funds, Pakistan has also been importing fertilizer using its own foreign exchange and barter or other financial arrangements to the extent such arrangements could be effected. Lately, OPEC countries have been a source of substantial financial assistance to Pakistan in agriculture as well as other related areas.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

Pakistan is capable to repay the loan amount because its current foreign exchange position is adequate and this loan's direct contribution will increase the country's productive capacity. The repayment prospects for this loan are therefore, reasonable. The funds will be loaned in compliance with the laws of the U.S. and of Pakistan Governments. The lending terms, 40 years including 10 years' grace period, 2% interest during the grace period and 3% thereafter, are considered reasonable. The rate of interest is less than Pakistan's discount rate.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

A loan application has been received from the Government.

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

Increased agricultural production is essential to Pakistan's economic development. In order to increase production and grain yield per acre, increased quantities and timely availability of agricultural inputs such as fertilizer are required.

e. FAA Sec. 202 (a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

Importation under the loan will be done by public sector. Purchase will be made from private sector suppliers for distribution.

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 of the enterprise's annual production during the life of the loan?

Not applicable.

3. Project Criteria Solely for Security supporting Assistance

FAA Sec. 531. How will this assistance support promote economic or political stability?

Not applicable.

4. Additional Criteria for Alliance for Progress

Note: Alliance for Progress projects should add the following two items to a project checklist.

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

Not applicable.

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the CAS) in its annual review of national development activities?

Not applicable.