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367.1

PD-AAD-113-E1

PROJECT COMPLETION REPORT

27p.

AGRICULTURAL INPUTS PROJECT

FERTILIZER

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AUGUST 1973

## COMPLETION REPORT

### Agriculture Inputs Project.

Sub-Project No. 386-11-190-367.1, Fertilizer

1967 - 1972

#### PART One: Narrative Report

##### I. Introduction

The Fertilizer Sub-Project of the Agricultural Inputs Project completed a major, long-term technical assistance activity of USAID/India.

The original proposals of 1951 for technical and economic assistance to Indian agricultural development included fertilizer as a priority topic. Mr. Frank W. Parker took up his assignment in December 1952 with the original U.S. Technical Cooperation Mission team and his foresight and planning has been the background of USAID program through the 1970's. In 1952, TCM imported 114,750 tons of ammonium sulphate and 10,000 tons of fertilizers for trials and demonstration including urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphate and triple superphosphate. During the seven years, 1952-1958, TCM financed, by grants and loans the importation of 354,320 tons of nitrogen fertilizers. One of the first steps in the fertilizer manufacturing development program was a tour by three senior officials and representative of the National Academy of Sciences for a study of the fertilizer industry and processes in Japan, Canada, United States and Europe. The Fertilizer Association of India, an industry trade association, was founded in 1956 with a professional staff of six, a monthly "Fertilizer News", and a program of technical,

statistical and other industry services. The Government of India established the Fertilizer Control Order of 1954 for collection of Fertilizer samples at the plants and in channels of trade for quality control analysis and regulation.

The Indo-American Fertilizer Demonstration Scheme was started in 1954-55 and continued through 1956-57. More than 200,000 three-plot demonstrations were put out each year with the results of 50,000 demonstrations summarized and published by districts, states, soil classes and years. The original program also included provisions for establishment of a nation-wide soil testing service with the objective to have sixteen soil testing laboratories. By March 1963 there were twenty-four laboratories operating in the national system.

The Indo-American fertilizer program of 1951 through 1958 had a significant impact on fertilizer use in India. Nitrogen consumption increased from 58,700 tons to 186,000 tons in 1958. With the impressive benefits of fertilizer well demonstrated the Government of India invited participation of foreign capital in manufacturing. However, the fertilizer industry did not develop an adequate level of self-generating growth and the expectation that fertilizer technical assistance would be completed in 1960 was postponed considerably.

Under the AID Crop Production Project, 1958-1966, technical assistance in fertilizer technology was continued in three areas of technology. The technology of soil chemistry and testing, plus the soil testing service, was assisted with major inputs through 1964. The service included 24

laboratories, four of them equipped to handle 30,000 samples per year. In addition, a mobile van was in operation to promote soil testing and an extensive soil fertility research program was established at the Indian Agricultural Research Institute. Dr. Gilbert Muhr's end-of-tour report recommended that further assistance was required in a research program to correlate soil test results with crop response as well as several specific recommendations for more effective function of the soil testing laboratories.

An Advisor on Quality Control in Fertilizers was provided from 1963 to 1968. Dr. John Malcolm assisted in the drafting of an amendment of the original Quality Control legislation. This draft amendment was circulated to the states, however the features of the amendment were implemented by administrative directives under the original Act. Dr. Malcolm's end-of-tour report noted particularly the critical production limitations of the India fertilizer industry and noted a potential constraint on the potential for agricultural production.

The Fertilizer Association of India was assisted by Mr. Myron G. Smith from 1962 to 1966. Mr. Smith's assignment was requested to assist in fertilizer promotion and sales programs. Most of his time was spent in analysis of the marketing requirements both as to the needs of the market and appropriate methods of marketing. This required a considerable portion of time with demonstration and social programs to develop techniques and organization guidelines. Mr. Smith also greatly assisted the Fertilizer Association develop trade service

practices. The end-of-tour report of Mr. Smith noted particularly the sluggish performance of the fertilizer industry, specific constraints on production and use and the evolving changes in patterns of fertilizer distribution and sale.

Under the Crop Production Project participant training and consultants were also provided to assist the technicians in their respective assignments. Several tours of senior GOI personnel were supported at various steps of project development and the reports of these tours were vital steps in redefinition of needs and program priorities. The Mukerjee report of 1955-56 and the Naidu team of 1966 were particularly noteworthy.

During the 1967 the GOI made a bold change of policy to encourage greater investment in fertilizer production. Private investment in production and marketing was encouraged with the stipulation that the GOI could if desired take over up to 30% of the production for distribution at negotiated prices. Prior to this time all production and imports were officially managed through state government and cooperative channels. The GOI planned to retain the Pool distribution system for imported fertilizers, but opened the door wide for private marketing as a manufacturing investment incentive. This was a vital step toward a production oriented agricultural strategy which required that "distribution of fertilizer" should be replaced by "production and marketing of fertilizer". This did result in new investment and a new industry situation. It did not produce a national surplus for demand

continued to outgrow production and require major import. However, the growing industry experienced many local pockets of unusual surplus and scarcity and the needs for improved systems of marketing became increasingly critical and more widely recognized since 1967.

#### The Agricultural Inputs Project

The reorganization of the Ministry of Agriculture of 1966 was intended to more effectively deal with the sluggish growth in agricultural productivity. The Minister of Agriculture, Mr. C. Subramaniam, directed the establishment of an Inputs Wing in the Department of Agriculture under charge of a Joint Secretary. The Inputs Wing was responsible for Fertilizer, Seeds and Plant Protection (Pesticides). With this reorganization, a new AID technical assistance project was established. The continuing assistance in fertilizer technology and new elements for seeds, plant protection and farm machinery were the sub-projects of the Agricultural Input Project.

During the period 1966-69, the GOI development priorities were defined by annual plans. This period was characterized by considerable uncertainty as a result of the border troubles with Pakistan and China as well as the severe famine of 1965-66. The impact of the high yielding wheat varieties, the Intensive Agricultural District Programs and the input development efforts produced a significant increase in agricultural production. By 1969, India had again achieved a trend of stabilized growth and the IVth Plan was taken up.

The IVth Plan established the following targets for manufacturing capacity and actual production.

	Capacity	(million tons) Production
Nitrogen	3.0	2.5
P <sub>2</sub> O <sub>5</sub>	1.2	0.9

The IVth Plan indicated the 1968-69 manufacturing capacity and production as:

	Capacity	(million tons) Production
Nitrogen	1.021	0.541
P <sub>2</sub> O <sub>5</sub>	0.421	0.210

Thus, the IVth Plan projected a high rate of growth but a continuing critical supply-demand situation for fertilizer. The Ministry of Agriculture planned a heavy emphasis on programs to increase consumption of fertilizer as a key element in achieving the national food production targets. The industries ministries were apparently doubtful of the demand or the capability to expand production. Hence, the Ministry of Agriculture retained a fertilizer import and central distribution pool as a supply balancing mechanism throughout the IVth Plan. The production, import and consumption performance for fertilizer upto the present time is (table attached).

These performance statistics indicate that the fertilizer industry continues to be faced with less than desired rates of growth in both use and production making a necessary continued reliance on imports thereby using scarce foreign exchange. In this context technical assistance was requested for fertilizer marketing and production technology through June 1972.

The Agricultural Input Project PROP provided for technical assistance to the Fertilizer Association of India, the Fertilizer Corporation of India and the Indian Farmers Fertilizer Cooperative. The assistance was to be provided for marketing and production technology by technicians, consultants and participants. The technical assistance inputs were jointly managed by USAID in the offices of Agricultural Development and Capital Development. The Agricultural Services Division managed the marketing assistance to the FAI and FCI. Capital Development managed the production consultants and participants. The IFFCO technical assistance was also managed by CD, but under a separate project.

The design of the Agricultural Inputs Project was <sup>for</sup> maximum institution building with a low-profile and high potential multiplier-effect. The shape of the project was to build the technology transfer capabilities of FAI and FCI in marketing manpower training. The FAI had industry-wide responsibilities and had a well defined program with identified needs that could be met with USAID inputs. While there were some reservations in assisting the public sector corporation, the request for technical assistance specified a need that fit the design parameters of the project. The design

Table 1

## FERTILIZER INDUSTRY PERFORMANCE

(thousand tons)

Year	Consumption target	Nitrogen			Consumption
		Indigenous production	Imports		
1966-67	1,000	309	632	738	
1967-68	1,350	403	867	1,035	
1968-69	1,700	563	842	1,206	
1969-70	1,700	731	667	1,360	
1970-71	2,000	846	477	1,480	
1971-72	2,400	952	481	1,756	
1972-73	2,700	1,200 (E)	900 (E)	2,100 (E)	
1973-74	3,200	1,600 (E)	800 (E)	2,400 (E)	

  

Phosphoric Acid				
1966-67	370	146	148	249
1967-68	500	207	349	335
1968-69	650	213	138	382
1969-70	650	224	93	420
1970-71	750	244	32	462
1971-72	930	285	248	565
1972-73	1,150	375 (E)	325 (E)	700 (E)
1973-74	1,400	430 (E)	420 (E)	850 (E)

  

Potash				
1966-67	200	=	114	114
1967-68	300	-	170	170
1968-69	450	-	170	170
1969-70	450	-	176	209
1970-71	550	-	226	228
1971-72	700	-	268	302
1972-73	820	-	390 (E)	390 (E)
1973-74	900	-	500 (E)	500 (E)

- Note: 1. On reappraisal fertilizer consumption targets from 1969-70 onwards were scaled down by GOI.  
 2. Figures of production, imports and consumption for 1966-67 thru 1971-72 taken from GOI publication.  
 3. Figures relating to production, imports and consumption pertaining to 1972-73 and 1973-74, are estimates.  
 4. There is no indigenous production of potashic fertilizers.

of this project as described in the PROP did not permit easy identification of project output and presumed that the manpower trained would contribute to achieving official target. During 1970-71, while drafting a Project Logical Framework, the outputs were defined somewhat, but no major revision of the project was then attempted as FY 1972 termination was then visualized.

#### Fertilizer Corporation of India

From October 1967 to May 1970 the Fertilizer Corporation was assisted by Mr. William D. Burgess, Jr. in developing with management-level staff a corporation-wide marketing program. In 1967 the FCI consisted of five government owned and operated plants and with several new plants and expansion programs in advanced stages of planning. Because of the change in GOI policy of 1966 which permitted, in fact encouraged, private investment in fertilizer production and marketing, the FCI recognized the need for developing a new attitude and program for fertilizer distribution and retail operations. Perhaps FCI was tardy in recognizing this need, and it was hindered by bureaucracy in adopting a new strategy but a transition was made in the FCI marketing program during 1967-68.

The FCI established a Marketing Consultative Committee for developing an improved marketing organization and operation. Mr. Burgess worked with this committee in planning. The recommendations of the committee were cautiously instituted and Mr. Burgess then worked with the Director of Marketing and his staff in building a modern marketing organization. During Mr. Burgess' assignment the FCI increased its sales and sales promotion staff from 200 to more than 1000. The FCI also established Training Program

for agricultural graduates to become entrepreneurs in fertilizer retail and distribution trade. The FCI put into operation twelve soil testing and audio-visual vans for fertilizer use education and promotion. And several thousand fertilizer demonstrations were sponsored by FCI and conducted in cooperation with the Extension Service of the Five eastern states. These major elements of the program were supported with some very successful rupee activities which included: A guide to Proper Storage of Fertilizer, A NPK Calculator for retail dealers and extension agents, an FCI Marketing Library, and fertilizer use education audio-visuals.

At the completion of Mr. Burgess' assignment the FCI had converted the fertilizer dispatch and distribution operation to a marketing organization. However not everyone in FCI fully appreciated the need for the public sector corporation to establish a dynamic market organization and consequently marketing did not receive the full support of the corporation. As a new organization, the marketing staff also needed to improve procedures, gain experience, establish training and staff development programs and generally improve marketing effectiveness. The major objectives of Mr. Burgess' assignment had been achieved and consequently this program was terminated after one three-year tour rather than two tours projected in the PROP. The FCI has continued to build its marketing program but with continued heavy dependence on pool distribution and cooperative retailing therefore a competitive marketing attitude is developing somewhat slowly.

Fertilizer Association of India

From April 1967 until June 1972 the Fertilizer Association of India was assisted by Mr. Delbert Rucker in industry wide fertilizer promotion and marketing programs. The FAI had requested this assistance particularly to develop fertilizer marketing training programs as a service to its member companies. Much of the background for this training activity had been done by Myron Smith. During his assignment Mr. Rucker also assisted the FAI in improving a number of other trade association functions.

The Fertilizer Marketing Training Program has from the outset been a self-supporting FAI activity. Two weeks courses have been held at approximately four-six month intervals at various locations in India. The course has been revised nearly every session to improve and update content as well as to utilize local talent and minimize cost. It is to FAI's credit that its staff and Mr. Rucker maintained very good information on personnel capabilities throughout the fertilizer industry and were able to select a capable and largely local faculty for training programs in several locations. Through July 1972 two hundred marketing executive level personnel have attended the six FAI courses and the industry shows keen interest in continuing the program to offer more of their staff this training. An interesting point about the marketing course is the FAI attitude that this course is not a permanent FAI program but will be offered only so long as it continues to provide the fertilizer industry a real service.

The FAI conducts a large number of technology development activities as a service to the fertilizer industry. The annual one-week fertilizer seminars treat major problems such as Coordinated Marketing of Inputs (1970), Production Technology (1971) and Technology for Self-Reliance (Scheduled for 1972). The fertilizer lectures held throughout India and the Fertilizer News and Marketing News are also elements of the total in-service manpower development services. Mr. Rucker was involved in all of these activities as an associate staff member. While these activities had reached the stage of independence from an "advisor" the FAI utilized Mr. Rucker's services quite extensively to improve the quality of the service offered to the fertilizer industry.

In 1969 the FAI undertook a Fertilizer Demand and Marketing Study under contract with USAID. The FAI study was to utilize a more comprehensive approach and sophisticated analytical methodology than had been utilized in India. It was planned that FAI would establish a new capability for fertilizer demand projection. The FAI planned to utilize this capability in providing certain demand projections as a public service and conducting specific demand studies under contract. Mr. Rucker served as the USAID Contract Representative, and also as an advisor to FAI, in this study. The original timetable has not been maintained but the objectives have been or will be achieved and the contract to study completed by June 1973.

During 1971-72 Mr. C. R. Ranganathan who had served the FAI as Executive Director since the association was organized, retired and Mr. Satya Nand was appointed. During this year the FAI also moved into

association owned and newly constructed office building. Also, the FAI was reorganized to provide much greater staff strength in marketing service. Because of these planned changes the FAI requested Mr. Rucker's services be continued through June 1972, particularly to assist in the organization of the marketing division.

At the completion of Mr. Rucker's assignment in June 1972 the FAI had become a well established trade association. As a result of the example set by the FAI, the Pesticides Association of India had been formed and the farm machinery manufacturers were seriously considering an association. The FAI was receiving somewhat reserved support from the public sector Fertilizer Corporation of India, but all private-sector fertilizer producers and distributors looked upon the FAI as a valuable permanent institution. The FAI continues to respond to industry needs in a constantly changing context consequently the association will continue to face new needs and opportunities to serve the fertilizer trade. Some of these technological problems may be effectively and economically resolved through technical assistance from U.S. or another country. In other words, the FAI has reached the stage of institutional maturity which does not require continued assistance and which can be very effective in transferring technology from any source to any part or all of the Indian fertilizer industry

#### Consultants

The Agriculture Inputs Project utilized a large number of fertilizer consultants to deal with the specific problems encountered during the project

life. A number of the consultants in each year participated in the annual FAI seminars in addition to their on-site trouble shooting and other assistance. The Seminar on Fertilizer Plant Maintenance and the Seminar on Coordinated Marketing of Inputs produced two very helpful textbooks for the production and retail element of the fertilizer industry. From 1968 through December 1970 thirty-six consultants provided approximately forty-seven man-months of service in fields of fertilizer production and marketing technology. The list of consultants is attached as Table II.

### Participants

The participant training program was a major element in selecting fertilizer technology and in developing manpower for administration and management. In the first years of technical assistance, senior government officers were introduced to the available technology during extended study tours. The pattern of training programs gradually shifted to specific and sophisticated programs of study on such topics as bulk blending, plant tissue testing, preventive maintenance, etc. From 1951 to December 1971 two hundred forty-nine fertilizer participants travelled to U.S. and third countries under Agriculture Inputs Project and its predecessors. The Directory of Returned USAID Participants provides details for these participants and their training.

Under the Agriculture Inputs Project the MOA requests for participant training shifted toward short periods of training in a number of specific and sophisticated disciplines for a large number of participants. Many of these training programs required extended periods of on the job training in fertilizer manufacturing plants or marketing organizations. The demands of programming

Table II - Fertilizer Consultants

	<u>Consultants</u>	<u>Location</u>	<u>Date Arrived</u>	<u>Date Departed</u>
1.	R. D. Young (Chemical Engineer - FAI Fert. Seminar)	FAI, ND	12/6/66	12/16/66
2.	H. Gordon (Feasibility Study on coop. Fert. Plant Mgt. & Econ.)	MFA, ND	9/5/66	11/27/66
	W. H. Mitchell (Dist. and Mktg.)	MFA, ND	9/5/66	12/11/66
	A. J. Soday (Chem. Engineer)	MFA, ND	9/5/66	11/27/66
3.	H. Gordon (Fertilizer)	MFA, ND	4/8/67	4/21/67
4.	D. H. Thomas (Econ. Analyst - Feasibility study, Coop. Fert. Plants)	MFA, ND	6/21/67	7/23/67
	J. H. Wiley (Mktg. Specialist)	MFA, ND	6/21/67	7/14/67
	H. H. Gordon (Coop. Orgn. Spec.)	MFA, ND	6/25/67	7/16/67
	A. J. Soday (Proc. Engineer)	MFA, ND	6/21/67	7/21/67
5.	L. B. Nelson (Public Sector Fert. Review Team - Agr. & Chem. Dev. Manager)	MFA, ND	6/19/67	7/2/67
	A. V. Slack (Chemical Engineer)	MFA, ND	6/19/67	7/1/67
	R. D. Grisso (Ecommist)	MFA, ND	6/19/67	7/2/67
6.	W. F. Emmons (TVA Public Sector Team-Design Engineer)	Min. of Pet. & Chem.	10/9/67	12/17/67
	R. D. Grisso (Project Analyst)	"	10/9/67	12/17/67
	E. J. Best (Test. & Demons.)	"	10/9/67	12/17/67
	L. W. Copp (Orgn. & Mgmt.)	"	10/9/67	12/17/67
7.	J. L. Snyder (TVA Fert. Team-Trombay Unit Ammonia Plant Oper.)	"	10/8/67	12/14/67
	H. Nash (Ammonia Plant Maint.)	"	10/8/67	12/14/67
8.	W. Ballew (Fert. - FAI Seminar)	FAI, ND	12/4/67	12/15/67
	H. Miles (Farm Credit-FAI Seminar)	FAI, ND	12/4/67	12/15/67
9.	R. Mueller (FAI Seminar)	FAI, ND	12/4/68	12/11/68
	O. Englestad (FAI Seminar)	FAI, ND	12/4/68	12/18/68
	F. W. Parker (FAI Seminar)	FAI, ND	11/24/68	12/19/68

10.	G. R. Muhr (Soil Testing)	MFA, ND	6/2/69	10/22/69
11.	T. P. Hignett (FAI Seminar)	FAI, ND	12/6/69	12/21/69
	A. V. Slack (FAI Seminar )	FAI, ND	12/6/69	12/19/69
	D. W. Bixby (FAI Seminar)	FAI, ND	12/7/69	12/21/69
12.	J. C. Brown (Micro-Nutrients)	MFA, ND	10/19/69	11/14/69
13.	C. Rose (Mech. Maint.)	Min. of Pet. & Chern.	4/20/70	8/19/70
	J. W. Moffelt (Inst. Maint.)	"	4/20/70	5/29/70
	G. C. Crow (Inst. Maint.)	"	6/28/70	9/30/70
14.	G. C. Puppe (FAI Seminar)	FAI, ND	12/4/70	12/21/70
	J. Strauss (FAI Seminar)	FAI, ND	12/7/70	12/25/70
	D. Gaumer (FAI Seminar)	FAI, ND	12/9/70	12/14/70
15.	V. Lyons (Fert. Plant Maint. Seminar)	FACT	11/4/70	11/9/70
	C. Rose ( " " " " )	FACT	11/4/70	11/9/70

these participants severely taxed the Office of International Training, AID/W. In fact, the U.S. fertilizer industry practically lost interest in cooperating because of the large numbers, some problems of attitude and the generally tight industrial financial situation. As a result the training back log increased markedly. The Tennessee Valley Authority was eventually successful in developing a special training program to cover some of the marketing and production objectives, but this program was not fully developed at the close of the project.

#### The Fertilizer Picture -- 1972

Fortunately fertilizer use by Indian farmers has generally been more efficient than was projected in Plan calculations. While fertilizer production and use has remained significantly below Plan levels the food production has nearly achieved the targets through the 1971 harvests. However the shortfall in fertilizer supplies, and other inputs, is expected to have a serious effect in subsequent years. In spite of a continuous increasing trend of about 15% per year the performance of the fertilizer industry is significantly less than 27% growth rate projected to meet agricultural needs.

The growth of the fertilizer industry is characterized by progressive addition of new capabilities. The fertilizer use and management technology was introduced to farmers through the demonstration programs of 1950-55. The public sector production and distribution capability was developed during the period 1955-65. The private sector production and retailing capabilities are the results of the 1965-75 period. And the future period will see major improvement in economic and effectiveness indicators for all of these capabilities. The achievement of target levels of fertilizer use

and production within the limits of available resources is going to require major improvement in manufacturing productivity, distribution economy and use management.

Fertilizer supplies have been the critical constraint on fertilizer use, although other constraints would become critical with quite modest increases in production. The high levels of fertilizer imports, 500,000 to 1,000,000 tons per year are a serious drain on foreign exchange. Both a slow rate of development of production capacity and a low utilization of available capacity contribute to low production and will continue to contribute until drastic policy changes are made. It appears that the Industries Ministry does not accept the Agriculture Ministry projections of demand which may be the major factor contributing to the inadequate capacity. Under estimating of construction periods coupled with unusual delays in plant start up contribute further to the slow growth rate in production. The available production capacity is at the same time hampered by interruptions in supplies of raw materials, power and labor. All of these problems appear to be persistent throughout the foreseeable future although there are indications that fertilizer should receive a higher priority.

The Ministry of Agriculture has attempted to fill the gap between supply and demand by imports. This is a difficult operation to manage. First, is the problem of foreign exchange; availability has been difficult to predict and has frequently limited source of supply. Second, is the logistics

problems of a world-wide supply and widely dispersed user. Third, is the inventory management problems of estimating, compiling and analyzing requirements and scheduling shipments plus intermediate storage. The growing market and the changing indigenous supplies produce a high level of uncertainty in predicting needs. The occasional inventory accumulations, some for long periods, raises problems of credibility in securing future foreign exchange and industrial cooperation. The official attitude is that the Pool which handles the imported fertilizer, is a temporary institution therefore it does not merit much investment in management personnel and equipment. Yet it appears that the Pool will be necessary for several years and a modest improvement in its operations would more than justify an investment in inventory management.

It is frequently claimed that fertilizer use is limited by lack of former credit, poor understanding of modern farming methods by farmers, and poor retail and service programs. These and other factors may be the reasons that individual farmers have not used larger quantities of fertilizer, but these factors have not restricted the sales of available supplies. However the improvement of retailing, including distribution and credit is a vital factor in making fertilizer use more common among small farmers. This group, which is the subject of much interest, is quite seriously limited in its ability to assimilate new practices. The organization and operation of a system to supply fertilizer, know-how and credit to millions of very small farmers of severely limited means is a major challenge and may require unique organizational and administrative

techniques to serve this group effectively and economically with available transport and communication facilities.

The improvement of efficiency in fertilizer use is required in two aspects particularly; that is distribution management and use management. The fertilizer industry faces a difficult task in assimilating the rapidly developing agricultural technology and planning to distribute the available fertilizer supplies to economically contribute to maximum production. This task is greatly complicated by the extreme seasonal weather fluctuations. Coordinated inventory management will require an elaborate network of information collecting, compiling, analysis and reporting among the fertilizer industry and those who supply and serve that industry. At the same time, farmers also require much more specific fertilization programs tailored to the individual soil climate and management practices. The "package of practices" fertilizer recommendations are an inefficient compromise for the illiterate farmers. Soil test and crop correlations, improved soil sampling and test result reporting systems, better retail information services, etc. are some of the practices which will be needed to improve the effectiveness with which farmers use available fertilizer supplies.

In brief, the fertilizer industry in India does not have the capacity to meet India's fertilizer demand. Further, many improvements in production, distribution and use would result in significant economic benefit to the country.

Many of these aspects are potential areas of technical assistance. A basic framework has been set up and the needs of the future are to improve specific elements or components of the fertilizer input systems.

Part Two - Structural Evaluation

I. Project Purposes:

Develop within the major Indian fertilizer agencies (Fertilizer Association of India and the Fertilizer Corporation of India) effective mechanisms and facilities for production, distribution and marketing of fertilizer.

II. Conditions Expected at End of the Project:

1. Total fertilizer production in 1973-74 at 3.75 million tons of Nitrogen, 1.74 million tons of Phosphorous (P<sub>2</sub>O<sub>5</sub>), and 1.11 million tons of Potassium (K<sub>2</sub>O).

2. A marketing structure capable of generating and handling a 20% per year growth rate in fertilizer use.

3. Improved marketing and production development programs conducted by the fertilizer trade associations.

4. Improved efficiency in operation of both existing and new fertilizer plants to maximum output.

III. Performance Summary (See Appendix I for Details)

	<u>Unsatisfactory</u>		<u>Satisfactory</u>			<u>Outstanding</u>		
	1	2	3	4	5	6	7	
Participating Agency			Not applicable					
Cooperating Country							x	
AID/W					X			
USAID					X			
Participant Training					X			

#### IV. Progress towards Conditions Expected at the End of the Project:

1. The fertilizer production is significantly below the projected target growth. See page 8 for details. The primary constraints have been tardy licensing of new plants and the prolonged delays in construction and full stream operation. These factors were outside the scope of the Agriculture Inputs project.

2. The marketing structure of the fertilizer industry is experiencing growing pains, but moves the fertilizer available and has a strong interest in improving the capability to distribute fertilizer in a timely and economic manner. The FAI marketing training program is rated very high by the fertilizer industry as a vital staff training program. The potential of the fertilizer marketing program for handling a 20% growth rate is established for the foreseeable future. The capability to handle this expansion with minimum costs and high effectiveness is doubtful, but an active field of improvement.

3. Both the Fertilizer Association of India and Fertilizer Corporation of India have marketing training programs which have received major assistance from USAID. Also, the FAI has a seminar program for production technology. These programs are effectively based upon several sources of technology, both indigenous and U.S. and maximum dispersion throughout the fertilizer industry.

4. The project has contributed consultants and participant training toward improved plant operations. The quantitative impact of these inputs is difficult to determine. The opinion of fertilizer plant executives indicate that the project contributions have been significant. As a matter of

perspective a mere 1% of the 1972 Nitrogen production would be a product value of \$1 million -- a benefit not unreasonable to claim from the improved management capabilities of the returned participants and consultants. At this point many of the limiting factors on production are conditions beyond the control of the plant management and engineering staff and beyond the framework of the Agriculture Inputs Project.

#### V. Follow up Action Required:

India will require a heavy investment in fertilizer production for many years in the future. External resources for investment and manpower development are vital for achieving the target growth rate. The failure to achieve these targets is potentially critical constraint on agricultural production.

For the foreseeable future fertilizer imports will be necessary to fill the gap between domestic production and requirements. Improved techniques for estimating import needs and managing import inventories are essential. Hasty procedures in negotiating for imports and irregular utilization of import supplies have had a consistently adverse effect on justification of import requirements.

MOA program in Fertilizer Promotion, Fertilizer Credit Guarantee Corporation, Small Farmers Development Agency and others are all important contributors toward increased use of fertilizer. In general these programs themselves will not require assistance but they may require support in program elements dealing with several critical problems of improved fertilizer use. Credit is a potential critical problem. Another potential constraint is soil fertility testing and reporting systems, including the compilation of basic data on soil test and crop response correlations. Specific technical

assistance, probably by consultants or through participant training, may be very effectively utilized through these programs in tackling these basic potential limitations on effective and economic increase of fertilizer use.

The experience with participant training under the Agriculture Inputs Project suggest that in-country training programs, developed with consultants may be necessary to accomplish the manpower development objectives for the operating and middle level personnel. The U.S. fertilizer industry is not capable or interested in in-service participant programs of the kind and for the numbers required. The size of Indian industry would justify building some institutional capability. The response to the FAI marketing training program suggests that other programs would also be well received. Training participants and consultants would then work in some association over an extended period to define a training objective, review U.S. approaches to the extent that similar objectives exist, develop Indian training programs and refine these programs through experience. A thorough analysis of Indian manpower needs will be essential prerequisite to identifying the areas where this approach is needed. The FAI has initiated such a manpower study

APPENDIX I

Performance Analysis

A. Participating Agency  
     Not Applicable

B. Cooperating Country:  
     Personnel:

	<u>Not</u> <u>Applicable</u>	<u>Negation</u>	<u>As</u> <u>Planned</u>	<u>Superior</u>	
1. Competence/Continuity of Project Leadership			x	x	*
2. Ability to Implement Project Plans			x		
3. Use of Project Trained Manpower			x	x	
4. Technical Skills of Project Personnel			x		
5. Planning & Management Skills			x		
6. Technical Man-years Available			x		
7. Continuity of staff		x	x	x	
8. Willingness to work in Rural Areas			x		
9. Adequacy of Pay & Allowances			x		
10. Counterpart Acceptance of and association with Project Purpose		x	x	x	
11. Management of Commodities	x				
Other Factors:					
1. Cooperation within host Govt.			x		
2. Host Govt. cooperation with non Govt. organization			x		
3. Availability of Reliable data statistics		x	x		
4. Adequacy of Project Funding			x		
5. Legislative changes relevant to the Project		x	x		
6. Adequacy of Project related organization		x	x	x	
7. Physical Resource Inputs			x		
8. Maintenance of Facilities & Equipment			x		
9. Political condition specific to Project			x		
10. Resolution of Bureaucratic problems			x		
11. Actual Dissemination of Project Benefits			x	x	
12. Receptiveness to Change		x	x	x	
13. Intent/Capacity to sustain and/or Expand Project Impact after U. S. inputs are terminated			x	x	

C. AID/W:

	<u>Not</u>	<u>As</u>	<u>Superior</u>
	<u>Applicable</u>	<u>Negation</u>	<u>Planned</u>
1. Provision of Personnel			x
2. Provision of Commodities	x		
3. Provision of Adequate AID/W Technical backstopping			x
4. Contract Negotiation	x		

D. USAID:

1. Responsibilities defined and assigned in USAID			x
2. Authorities defined and assigned to USAID			x
3. Effective Communication within USAID			x
4. Effective communication with other Action Agents			x
5. Mobilization of Mission Staff as Needed			
6. Coordination with Related Projects			x
7. USAID Performance per Terms of ProAg/Contract, etc.			x

\*Note: Marks in more than one column indicate variation over time and between the two activities of this sub-project.

E. Participant Training:

Pre-departure:

1. English language ability			x
2. Host country Funding			x
3. Orientation			x
4. Participant Availability			x
5. Trainee Selection			x

Post Training

1. Relevance of Training to Project			x
2. Recognition of Degree Equivalency	x		
3. Appropriate Facilities and Equipment for Returned Trainees			x
4. Employment appropriate to project			
5. Supervisor Receptiveness			x