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PROJECT COMPLETION REPORT

INDIA - IFFCO FERTILIZER PROJECT  
(LOAN 1079-IN)

June 15, 1983

Industry Department

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PROJECT COMPLETION REPORT  
INDIA - IFFCO FERTILIZER PROJECT  
(LOAN 1079-IN)

PREFACE

1. This report covers the IFFCO fertilizer project in India supported by Loan 1079-IN. The loan for US\$109.0 million to IFFCO was approved in January 1975, became effective in April 1975 and was closed in May 1981, 2.2 years after the original closing date.
2. The Project Completion Report was prepared in the Industry Department of the World Bank on the basis of information and data supplied by IFFCO, information gathered by a Bank completion mission which visited India in March 1982, and discussions with IFFCO and the Government.
3. Comments of the Borrower have been incorporated in the PCR, and are shown in Annex 13.
4. The Project has not been subject to an audit by the Operations Evaluation Department.



PROJECT COMPLETION REPORT

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BASIC DATA SHEET

KEY PROJECT DATA

Item	Appraisal Estimate	Actual
Total Project Cost (US\$ million)	220.5	246.7
Overrun (%)	-	11.9
Loan Amount (US\$ million)	109.0	109.0
Disbursed	109.0	109.0
Cancelled	-	-
Project Zero Date	01/75	05/76
Project Mechanical Completion	08/78	03/80
Start of Operation	10/78	03/81
Economic Rate of Return	16	11
Financial Rate of Return (Pre-Tax)	14	12
Institutional Performance		Satisfactory

CUMULATIVE LOAN DISBURSEMENT

As of June 30	1975	1976	1977	1978	1979	1980	1981
(I) Planned	4.3	27.2	71.9	105.6	109.0	109.0	109.0
(II) Actual	-	2.8	21.6	49.3	84.9	100.2	109.0
(III) (II) as % of (I)	-	10.3	30.0	46.7	77.9	91.9	100.0

OTHER PROJECT DATA

Item	Original Plan	Actual	Variation
First Mention in Files		10/73	
Appraisal		04/74	
Negotiations		10/74	
Board Approval		01/07/75	
Loan Signing Date		01/24/75	
Loan Effective Date		05/08/75	
Closing Date	03/31/79	05/04/81	26 months
Borrower	IFFCO	IFFCO	
Executing Agency	IFFCO	IFFCO	
Fiscal Year of Borrower	07/01 to 06/30	07/01 to 06/30	

MISSION DATA

Item	Mo./Yr.	No. of Days	No. of Persons	Man-days	Report Date
Identification	10/73	15	2	30	
Appraisal	03/74	21	2	42	
Post Appraisal	08/74	2	1	2	
Supervision I	06/75	8	2	16	07/17/75
Supervision II	09/75	4	2	8	09/24/75
Supervision III	08/76	5	2	10	09/24/76
Supervision IV	10/77	8	1	8	10/12/77
Supervision V	02/78	4	1	4	05/30/78
Supervision VI	11/78	4	1	4	03/31/79
Supervision VII	11/79	1	1	1	11/20/79
Completion	03/82	7	1	7	06/29/82

COUNTRY EXCHANGE RATES

Name of currency:		Indian Ruppees (Rs)
Year: Appraisal year average - 1974	Exchange Rate:	US\$1 = Rs 7.5
Intervening years average - 1975/1981		US\$1 = Rs 9.0
Completion year average - 1981		US\$1 = Rs 9.0



PROJECT COMPLETION REPORT

INDIA - IFFCO FERTILIZER PROJECT  
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HIGHLIGHTS

1. The IFFCO Fertilizer Project consisted of a grass root 900 tpd/1500 tpd ammonia/urea complex to increase the supply of nitrogenous fertilizers for the northern part of India. It was decided to build this complex at Phulpur, near Allahabad, to benefit from good access to the railroad network. The plant was to be based on fuel oil, with a design closely resembling that of the already completed Nangal plant.
2. The start-up of the project implementation was delayed by 17 months because, soon after appraisal, the Government decided to switch the plant feedstock from fuel oil to naphtha (para 3.02). After this initial delay the Project was implemented expeditiously and was mechanically completed in March 1980, 18 months behind the appraisal schedule. Commissioning tests could however not be started before March 1981 because of the non-availability of feedstock which resulted from political disturbances in the oil-producing state of Assam (para 3.15). The plant was promptly put into commercial operation once naphtha became available (para 3.15), and over the first 10 months of operation, it ran at an average of 80% capacity utilization (para 4.02). These construction, start-up and initial production performances are excellent.
3. In spite of the delays, the Project's actual installed cost exceeded appraisal estimates only by 10%, basically because (i) the naphtha-based plant finally built is simpler and inherently cheaper than the fuel-oil-based one envisaged at appraisal (para 3.17); (ii) a large portion of the project cost was incurred in rupees which depreciated by 20% vis-a-vis the US\$ since project appraisal (para 3.17); and (iii) the overall performance of IFFCO consultants and suppliers was satisfactory (para 8.01). This, in turn, resulted from IFFCO's good organizational arrangements and close attention to the coordination, control and monitoring of project activities (para 8.01).
4. The Project economic rate of return is lower than envisaged at appraisal, because it is now based on expensive naphtha, whereas it was appraised on the basis of (relatively) cheap fuel oil. Since 1975 when the Indian Government decided to switch feedstock, the price differential between naphtha and fuel oil has more than quadrupled and is expected to remain at current levels for the foreseeable future (para 6.02). The project return is still appropriate at 11.3% since, due to transport costs, naphtha's opportunity value at Phulpur is relatively low whereas urea's is high (para 6.03). Also, with the coming on stream of the Mathura refinery, feedstock supplies for Phulpur are likely to be more secure for naphtha than for fuel oil (para 6.03).
5. The report concludes (para 8.03) that the Project's "very successful early operation indicates that it is mostly likely to meet its objectives and help India provide fertilizer to the farmers of its Northern Region at economically competitive prices. The experience with this project also proves that with adequate planning, training and management, as provided by IFFCO, India can quickly achieve and maintain high capacity utilization rates in modern, complex fertilizer plants."



## PROJECT COMPLETION REPORT

### INDIA - IFFCO FERTILIZER PROJECT (LOAN 1079-IN)

#### I. INTRODUCTION

1.01 The Government of India gives high priority to the development of the fertilizer sector to help increase local agricultural production. The Bank Group has been involved in the development of this sector since 1967 when IFC financed a urea project in Kanpur, which was implemented by Indian Explosives Ltd. (a subsidiary of Imperial Chemical Industries of the UK). Since then the Bank Group has financed a total of 11 projects in this sector, three by IFC, one by IBRD and seven by IDA. Annex 1 lists these projects. The most recent Bank Group operation has been an IDA Credit of \$400 million approved in March 1981 for the Hazira Fertilizer Complex based on India's West Coast offshore gas fields. The IFFCO project was the eighth project in the fertilizer sector financed by the Bank Group and up to now the only one by IBRD. The Bank support of this sector has resulted in significant economic benefits for India and has helped to bring about important policy and institutional changes as discussed below. The Bank expects to remain active in this sector and is currently discussing the possibility of financing a fertilizer distribution project. In addition, another large gas-based fertilizer project is under consideration for future Bank/IDA lending.

1.02 During the 15 years of Bank involvement in the sector, India has become the fourth largest fertilizer producer in the world after the USSR, the USA and China. Fertilizer consumption has also grown rapidly, however, and India must still rely on large fertilizer imports to meet its demand. The table below shows the growth of India's fertilizer production and consumption over the last 15 years.

India - Fertilizer Production and Consumption  
(in '000 nutrient tons)

	<u>1965/66</u>	<u>1980/81</u>	<u>Average Growth Rate (% p.a.)</u>
Production:			
Nitrogen	238	2,164	15.9
Phosphate	119	842	13.9
Consumption:			
Nitrogen	575	3,678	13.2
Phosphate	133	1,214	15.9

During this period, India followed the evolution of the industrialized countries' technology and it built fertilizer plants of increasing sizes. It also changed the product mix of the fertilizer it manufactures, with most new capacity now producing high nutrient fertilizers. It changed the feedstock pattern for ammonia production, and it now emphasizes using newly discovered West Coast natural gas. Also, and this shall be discussed later in this report, overall project management and implementation performance has improved significantly with local companies now playing a larger role in project engineering, equipment supply and implementation management.

1.03 Another major development in the industry has been the introduction of a price retention formula under which fertilizer prices are set at levels that provide a 12% after tax return on net worth at 80% capacity operation. This pricing policy has allowed the companies, as the Bank Group discussed with GOI, to generate sufficient funds to meet their financial obligations, meet a portion of their investment requirements and also earn a reasonable return at efficient operation. It also rewards high capacity utilization rates, which the industry has had perennial difficulties to achieve.

1.04 The last fifteen years also witnessed the emergence of the cooperative sector as a major fertilizer producer in India. The Indian Farmers Fertilizer Cooperative Ltd. (IFFCO) started its Kandla and Kalol plants in 1975. It started the Phulpur plant in 1981, and is now the largest single producer of fertilizers in India, contributing 11% of the country's total nitrogenous fertilizer production and 23% of total phosphate fertilizer production in 1980/81. IFFCO's ammonia/urea plants at Kalol and NPK plant at Kandla have consistently achieved high capacity utilization rates, reaching 93% and 125%, respectively, in 1980/81. With IFFCO's Phulpur plant now reaching full production, with KRIBHCO (IFFCO's sister cooperative society) currently implementing the IDA supported 4,400 tpd urea fertilizer complex at Hazira, and with more than 27,000 cooperative institutions having now contributed about Rs 360 million to IFFCO's equity, the cooperative system appears well endowed to continue to play an important role in India's fertilizer sector.

## II. PROJECT BACKGROUND

### A. Project Preparation and Appraisal, Loan Approval and Effectiveness

2.01 In 1973, IFFCO and the Government of India decided to build a grass root ammonia/urea complex to increase the supply of nitrogenous fertilizers for the northern part of the country, particularly for the state of Uttar Pradesh which had 25% of IFFCO's cooperative shareholding. It was decided that, to benefit from excellent access to the railroad network, this complex would be located at Phulpur, near Allahabad, on the southern side of a major broad-gauge railroad and only 15 km north of the Allahabad/Vanarasi meter gauge railroad and Grand Trunk Road. It was also

decided that the complex would use heavy fuel oil for feedstock, and that its design would closely resemble that of the already decided upon fuel oil based Nangal plant. This heavy fuel oil was to be brought to Phulpur from the Barauni refinery (some 200 km away) or from the then-planned Mathura refinery (some 500 km away).

2.02 The Government of India requested Bank Group assistance to finance this project, and an identification mission visited India in October 1973. As there were no major issues outstanding neither with the project scope and location, nor with IFFCO's implementation capabilities (it was in the final stages of the successful implementation of the Kalol and Kandla projects), the Phulpur project was appraised in March/April 1974. A post appraisal mission followed in August 1974. The major issue that concerned the Bank during negotiations was that IFFCO's assets at Kalol and Kandla had been mortgaged to secure the loan received by IFFCO from the Indian financing institutions, and that liens were also to be created on IFFCO's properties at Phulpur to obtain further loans from them. This issue was promptly resolved when the financial institutions agreed to accept Government guarantees in place of the liens, and the liens, if any, were to be limited to what IFFCO may provide the Government, to obtain the guarantees.

2.03 On January 7, 1975, the Board approved an IBRD loan of US\$109 million to IFFCO. This loan had a maturity of 15 years, including 4 years of grace, at an interest rate of 8% plus a 2.25% fee to the Government. The loan became effective on April 8, 1975.

#### B. Project Description and Objectives

2.04 The Project consisted of a 900 tpd partial oxidation fuel oil based ammonia plant to feed a 1,500 tpd urea plant. Steam and power were to be generated from coal. The Project included all necessary offsites such as railroad sidings, fuel oil and coal storage and handling facilities, water and effluent treatment plants, cooling towers, product storage and shipping facilities, maintenance shops, and offices and personnel facilities. The main raw materials to be used by the Project were (a) 250,000 tpa of fuel oil, and (b) 400,000 tpa of coal. A small amount of power (5 MW) was to be drawn from the state power grid.

### III. PROJECT IMPLEMENTATION AND MANAGEMENT

#### A. Achievement of Project Objectives

3.01 The IFFCO Phulpur fertilizer project was mechanically completed in March 1980, 18 months behind schedule. The delay was mainly due to the Government's decision to change the project feedstock from heavy fuel oil to naphtha, which postponed the project zero date by about 17 months. Because of feedstock unavailability, the plant's start-up was further

delayed by 10 months. It was put in commercial operation on March 28, 1981. Since then it has run remarkably well, achieving an average of 80% capacity utilization for the first 10 months of operation, and producing 329,632 tons of urea by January 1982. This high capacity utilization exceeds appraisal estimates (50% utilization in the first year, and 80% in the second year of operation) and partly offsets the economic penalty of delays in project completion. This is an excellent result for a naphtha-based urea plant in any developing country, and it reflects favorably on IFFCO's ability to achieve rapidly design production levels; it also proves that given adequate planning, training and management, India can indeed overcome a major remaining weakness in its otherwise impressive performance in the fertilizer sector, e.g. difficulties in quickly achieving and maintaining high capacity utilization rates. Between April 1981 and February 1982, IFFCO marketed 356,420 tons of Phulpur's urea in the northern states of India.

## B. Project Scope

3.02 As described above, there has been a major change from the original project scope with regard to the main process unit: In 1975, the feedstock for the ammonia plant was changed from fuel oil to naphtha. This necessitated adopting the steam reforming process and profoundly changing the design of the ammonia plant. The capacities of the steam generation plant and of other offsite facilities were consequently modified. Also, the capacity of the urea plant was increased from the original 1,500 tpd to 1,550 tpd. Finally, an additional effluent treatment plant was built to help the plant meet regulations concerning disposal of chromate containing water.

3.03 The Government's 1975 decision to switch feedstock from fuel oil to naphtha was a shift from its then prevailing policy of allocating fuel oil or coal for fertilizer production. This decision was based on the projected petroleum products supply/demand balances for the northern part of the country. Forecasts then indicated that, with the commissioning of the 6 million tpa Mathura refinery in Uttar Pradesh and with the continued operation of the Barauni refinery, there would be a surplus of naphtha of about 630 thousand tpa in the region while fuel oil would continue to be in deficit and would have to be imported. In the Government's view, the fact that surplus naphtha was locally available while fuel oil would need to be imported over long distances more than compensated for the price differentials that favored using fuel oil. At the time, the Bank conducted economic analyses of the two alternatives. It concluded that, although a naphtha-based plant would cost about 15% less than a fuel-oil-based one, a fuel-oil-based plant would be slightly more attractive economically because long-term forecasts placed fuel oil economic price about US\$30 per ton below naphtha price. As the expected difference in rate of returns was only 2 percentage points (22% vs. 20%), the Bank concluded then that the deciding factor was feedstock availability and it accepted that the feedstock be changed to naphtha.

3.04 This switch in feedstock has had major impacts on all aspects of project implementation. Schedule, capital cost, economic return and project operating performance have all been affected. The different impacts are discussed in the following paragraphs.

### C. Project Management

3.05 The project was primarily executed by consultants specializing in ammonia plant, urea plant, power plant and other offsites implementation. The project execution was under the overall responsibility of the general project manager, who reported to IFFCO's managing director. The general project manager, an IFFCO senior executive, was fully responsible for the project budget and implementation schedule. He was assisted by project engineers who had the responsibility of day-to-day coordination for different aspects of project execution. Annex 2 describes the organization of this Project Unit.

3.06 M. W. Kellogg (USA) was entrusted the design of the ammonia plant, and Snamprogetti (Italy) that of the urea plant. Development Consultant Private Ltd. (India) was selected to execute the detailed engineering for the power plant and offsites. Engineers India Ltd. carried out part of the ammonia and urea plants detailed engineering, and Fertilizer (Planning and Development) India Ltd. provided some field supervisory engineers to support Kellogg and Snamprogetti construction engineers.

3.07 Although IFFCO did not provide for sufficient corporate and project staff during the early stages of project implementation (it was starting up the Kandla and the Kalol plants, and admittedly work was at a standstill since the Government had not decided yet on which feedstock the project would be based), the overall performances of IFFCO's Project Unit and of the consultants have been excellent. This has been the major reason for the project's rapid execution, with mechanical completion occurring only 46 months after the effective zero date (compared to the appraisal estimate of 45 months). This was due both to the fact that IFFCO's managing director, the general project manager and engineers of the project units were well qualified and experienced, and to the fact that IFFCO set up appropriate relationships with the consultants for its staff to monitor closely project implementation and take on-the-spot decisions when required. These relationships placed great emphasis on close communications between IFFCO staff and their counterpart. For instance in the initial stages of project implementation, IFFCO assigned some staff to the consultants offices to monitor design and procurement activities. During the construction period its project engineers were also in close direct contact with the consultants resident construction managers. IFFCO also involved actively at a sufficiently early stage its operating and maintenance supervisory personnel for inspection checks, for site construction, follow-up with site contractors and precommissioning activities. This resulted in (i) IFFCO's active involvement and control of the project execution; (ii) freeing the managing director of day-to-day detailed project monitoring; and (iii) on-the-job training for IFFCO's middle management and junior staff who were to run the plant. Annex 2 also describes these relationships.

3.08 This sound organizational structure and the active involvement of IFFCO staff in project execution undoubtedly helped the company quickly to diagnose and solve equipment problems during pre-commissioning test runs. This allowed for a speedy plant commissioning and commercial operation start-up, once naphtha became available.

D. Employment and Training

3.09 To implement the Project, IFFCO took advantage of its pool of managers, supervisors and senior operators from its Kalol and Kandla plants. For junior operators and technicians, it recruited 228 young engineers, science graduates and qualified craftsmen, who underwent a comprehensive two-year specialized training program, at IFFCO's Kalol plant using elaborate training materials prepared by senior supervisory personnel. These trainees were in particular given on-the-job training in the Kalol plant. In all, the Project now employs 1090 permanent staff, about 320 more than was envisaged at appraisal. For training, as described above (para 3.07), IFFCO gave considerable attention to involving its staff with the engineering firms' work. Also, as a large ongoing industrial company, IFFCO has well established training policies and personnel development programs. It offers training assistance to other companies.

E. Use and Performance of Consultants

3.10 The Project did experience some delays in engineering carried out by all consultants, which delayed procurement of bulk materials. Also, some materials procured to inadequate specifications, required replacement after it had already been applied, which delayed the mechanical completion by about 2 months. Finally, IFFCO staff feel that the expediting carried out by the consultants was not satisfactory and that some of the delays experienced at the suppliers shops could have been avoided. There were also deficiencies in ordering bulk material for piping and insulation, which resulted in issue of large numbers of purchase orders at a late stage of project construction. IFFCO had to depute two of its personnel to expedite these critical items for project completion and to arrange for their air freighting.

F. Performance of Contractors and Suppliers

3.11 Workmanship. The overall quality of service rendered by the various contractors and suppliers, both indigenous and foreign, was satisfactory. IFFCO feels that the main reason for this has been the judicious selection of vendors based strictly on successful previous execution of similar job elsewhere. IFFCO did, however, face some construction delays due to problems in vendors supplies. In particular, (i) the superheater coil for the primary reformer convection zone in the ammonia plant was wrongly shaped; (ii) the separators of the air compressor in the ammonia plant were wrongly sized; (iii) the CO<sub>2</sub> compressor inlet passage was too small and the compressor could not deliver the specified gas pressure and flow; and (iv) the ammonia vaporizer of the inert gas plant was improperly designed. Although most of the necessary design and equipment changes were performed expeditiously, IFFCO lost about 3 months to modify the superheater coil.

3.12 Schedule of Delivery. Most of the major equipment ordered outside India were supplied within 2 or 3 months of their promised delivery. However, the bulk piping and instrument materials ordered outside India were late, at times by as much as 6 months. Most of the major equipment ordered in India were delayed by 6 to 12 months from contractual delivery dates. These items were not the sole contributors to further delays. IFFCO had major problems in this respect with the structural steel contractor who completed the structural steel work 17 months behind commitment because of lack of manpower, inadequate shop quality control and deficient planning. IFFCO also encountered delivery problems for vessels ordered in India because of strikes at the suppliers shop. In total, late deliveries of equipment and material delayed project contractual mechanical completion by about 7 months, including a one-month delay due to congestion at Bombay port and 2 months, due to structural steel contractor's delays.

#### G. Procurement

3.13 At project appraisal, it was anticipated that of a total estimated cost of about US\$130 million for equipment and materials, US\$55 million would be purchased under local procurement procedures (and not be financed with the proceeds of the Bank loan), while for the remaining US\$75 million which was to be financed by the Bank it was expected that about US\$55 million would be imported and about US\$20 million would be won through international competitive bidding by local suppliers. In total, the equipment procured under ICB was expected to total US\$65 million, proprietary equipment were to total US\$8 million and small items directly procured were to total US\$2 million. The actual cost of the equipment was US\$114.8 million--7% higher than the appraisal estimates, with US\$32.1 million in direct import and US\$82.7 million purchased locally. The indirect foreign exchange component of the equipment purchased locally represented about US\$29 million, bringing the total foreign exchange cost of the equipment to US\$61 million. The actual share of Bank-financed equipment and supplies was only 64% against the 75% estimated at appraisal. Only about 60% of the Bank-financed items were procured from suppliers outside India (Annex 3). As a result, about 72% of the project equipment and supplies were procured from India suppliers. As explained above, this large share of local suppliers did delay project mechanical completion by about 7 months, when measured against contractual arrangements.

#### H. Implementation Schedule

3.14 As shown in Annex 4, the Project was mechanically completed in March 1980, 18 months behind the appraisal schedule. As mentioned, this was mainly due to the 17 months delay in project zero date which is attributable to the feedstock switch to naphtha (paras 3.01 and 3.03). The contracts IFFCO entered into with the engineering firms after that switch called for the project to be mechanically completed in March 1979, 34 months after zero date. This appears to have been an over-optimistic schedule--it allowed for 11 months less than the corresponding appraisal estimate. The Project was in fact, mechanically completed 46 months after zero date, only one month more than estimated at appraisal. As explained above, 5 of these 12 months of contractual delays are due to slow plant

erection because of faulty material and equipment<sup>1/</sup> (paras 3.10 and 3.11) and 7 are due to late delivery of vessels and material purchased from Indian/foreign suppliers (para 3.13).

3.15 Although the plant was mechanically completed in March 1980, commissioning tests could not be started before March 1981 because of the non-availability of feedstock, which resulted from political disturbances in the oil-producing state of Assam. IFFCO managed to secure enough naphtha for intermittent pre-commissioning tests during July-October 1980. These tests revealed some equipment and material deficiencies which IFFCO promptly corrected. When naphtha became finally available in March 1981, commissioning tests were completed without major difficulties and the plant was declared in commercial production on March 28, 1981, after 25 days of continuous operations. This is perhaps the best start-up performance of any major fertilizer plants in India in recent years.

#### I. Capital Costs, Financing and Disbursements

3.16 Annex 5 presents (i) the capital costs estimates at the time of project appraisal; (ii) the revised estimates after the feedstock was switched to naphtha and the contracts were signed with the consultants; and (iii) the actual costs. A summary table is presented on the following page:

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<sup>1/</sup> Two months for the faulty refractory insulation and three months for the wrongly shaped superheater coil.

Summary of Project Costs  
(US\$ million)

	Appraisal			Direct Imports	Actual		% Change
	Estimates				Local		
	Direct Imports	Local Purchase	Total		Purchase	Total	
Ammonia Plant	31.3	34.0	65.3	19.7	18.5	38.2	-42
Urea Plant	9.2	11.3	20.5	7.3	9.5	16.8	-18
Steam Plant	8.0	12.8	20.8	-	20.2	20.2	-3
Power Plant	1.7	7.9	9.6	0.7	7.3	8.0	-17
Other Offsites/Shares	<u>5.4</u>	<u>9.7</u>	<u>15.1</u>	<u>4.4</u>	<u>27.2</u>	<u>31.6</u>	+109
Total Equipment	55.6	75.7	131.3	32.1	82.7	114.8	-13
Land and Civil Works	-	16.1	16.1	-	28.0	28.0	+74
Engineering and Other Services	14.4	5.3	19.7	12.3	12.2	24.5	+24
Erection	3.8	7.0	10.8	5.4	9.4	14.8	+37
Pre-operating Exp.	<u>-</u>	<u>3.3</u>	<u>3.3</u>	<u>-</u>	<u>18.1</u>	<u>18.1</u>	+448
Total Installed Cost	<u>73.8</u>	<u>107.4</u>	<u>181.2</u>	<u>49.8</u>	<u>150.4</u>	<u>200.2</u>	+10
Working Capital	-	13.0	13.0	-	13.7	13.7	+5
Int. Dur. Const.	<u>16.6</u>	<u>9.7</u>	<u>26.3</u>	<u>20.7</u>	<u>12.1</u>	<u>32.8</u>	+25
Total Financing Required	<u>90.4</u>	<u>130.1<sup>a/</sup></u>	<u>220.5</u>	<u>70.5</u>	<u>176.2<sup>b/</sup></u>	<u>246.7</u>	+12

a/ Includes about US\$17 million in indirect foreign exchange costs.

b/ Includes about US\$31 million in indirect foreign exchange costs.

3.17 In spite of the 30 months delay in start-up of commercial operations, the Project cost increased by only 12% in current US\$. This is mainly due to the fact that (i) naphtha-based ammonia plants are inherently simpler and cheaper than fuel-oil-based ones; and (ii) a significantly larger proportion of the project total cost was incurred in rupees than was estimated at appraisal (71% vs. 59%) and the rupee depreciated by 20%

vis-a-vis the dollar since project appraisal (as shown in Annex 5, the cost overrun expressed in current Rupees reaches 34%). The following table summarizes the variations in project cost by different causes.

Causes of Cost Variations

	<u>Amount</u> <u>(US\$ million)</u>	<u>%</u>
<u>Decrease:</u>		
Depreciation of the Rupee vis a vis the US\$	(49.4)	(189)
Decrease in Ammonia Plant Cost	(19.5)	(74)
<u>Increase:</u>		
Urea/Steam/Power plants	3.0	11
Other Offsites/Spares	22.8	87
Civil Works/Erection	24.5	95
Working Capital	3.4	13
Delays in Commissioning <u>a/</u>	<u>41.2</u>	<u>157</u>
Total	<u>26.2</u>	<u>100</u>

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a/ These delays increased interest during construction charges, project management fees and preoperating expenses.

3.18 When compared with the original cost estimates revised after the feedstock was changed, the Project shows a cost overrun of 32%. This is mainly due to overruns in (i) civil works (46%); (ii) project management and preoperating expenses and interest during construction (130%--resulting from the delays in plant commissioning); and (iii) working capital (260%--working capital requirements in the revised estimate were grossly underestimated). Compared with the original revised estimate, cost overruns in equipment, licenses and engineering, and erection only totalled 5%.

3.19 The total project cost of US\$246.6 million includes about US\$101 million in foreign exchange (US\$70 million in direct import and US\$31 million in foreign exchange costs). This cost has been financed with equity provided by the Government (US\$34.7 million), the cooperatives (US\$25.9 million) and IFFCO's own resources (US\$41.0 million), and with loans provided by the Bank (US\$109.0 million) and by Indian Financing Institutions (US\$36.1 million). The increase in project cost has been

financed through internal cash generation and additional borrowings from Indian financing institutions. It must be noted that, due to the rupee/US\$ exchange rate fluctuations since appraisal, the Government equity contribution to the project expressed in rupees is only 13% below appraisal estimate (vs. 28% below when expressed in US\$). Also, actual cooperatives contributions expressed in rupees exceed the appraisal estimate (Rs 233 millions vs. Rs 219 million). Finally the project debt:equity ratio of 59:41 is more favorable than the 65:35 estimated at appraisal.

3.20 IFFCO experienced problems with the Bank disbursement procedures. Since it could not directly obtain foreign exchange to pay the suppliers and since the suppliers were unwilling to ship equipment without a payment guarantee, IFFCO relied heavily on procedures V and VI (opening of Letters of Credit with commercial banks in the supplier's country) for paying foreign suppliers of Bank-financed equipment. Not only did IFFCO find that it took a substantial time to open Letters of Credit (sometimes up to 5 months), but it found these Letters of Credits very difficult to amend, even for minor reasons. IFFCO found these difficulties particularly bothersome during the last phase of the project construction period, as it sometimes had to wait 12 weeks for urgently needed material to be shipped when it knew such material was ready for dispatch on the day of order. To overcome this inconvenience, IFFCO suggested that, for borrowers who cannot directly obtain foreign exchange for payments overseas, the Bank should establish a small revolving fund amounting to 2 or 3% of the loan amount for small direct payments to material or small-equipment suppliers at the end of the construction period.

3.21 All of the US\$109 million Bank loan have been utilized. The table below summarizes the Bank funds category-wise allocation envisaged at appraisal and the actual utilization:

<u>Allocation of Bank Funds</u> (US\$ millions)		
	<u>Appraisal Estimate</u>	<u>Actual</u>
Equipment and Material	<u>73.0</u>	<u>73.7</u>
Technical and Consultants' Services	18.0	14.6
Interest During Construction	<u>18.0</u>	<u>20.7</u>
Total	<u>109.0</u>	<u>109.0</u>

As shown in Annex 6, the loan disbursement pattern assumed at appraisal proved to be optimistic. It was expected that disbursements would begin during the first quarter of 1975, whereas, because the project zero date slipped 17 months, they actually began in the second quarter of 1976. Also, they proceeded at a rate slower than that assumed at appraisal: the loan was fully disbursed in 21 quarters (5.25 years) as compared with the appraisal estimate of 15 quarters (3.75 years). The loan was fully disbursed by May 4, 1981.

#### IV. OPERATING PERFORMANCE

##### A. Commissioning and Start-up

4.01 As described above (para 3.15), project commercial start-up was delayed because naphtha was unavailable until March 1981, 12 months after mechanical completion. Between July and September 1980, IFFCO managed to secure some naphtha and began test runs. These revealed some equipment and material problems with both the ammonia and urea plants, which IFFCO quickly solved. The plants were started up immediately after receipt of naphtha, and the guarantee test runs were performed without difficulties. The plant was declared in commercial production on March 28, 1981.

##### B. Buildup of Production

4.02 Annex 7 details the buildup of production at Phulpur through January 1982. It shows that, over the first 10 months of operation, the plant ran at an average capacity utilization of 80%. This is a remarkable achievement. IFFCO has already identified some equipment design modifications it intends to implement during the next scheduled maintenance stops. It believes that these first modifications will allow the plant to run at 90% average capacity utilization. Given its already mentioned excellent record with the Kalol and Kandla plants, IFFCO thus appears likely to achieve design production levels without difficulties.

##### C. Market Growth

4.03 Up to the end of February 1982, IFFCO has marketed 356,420 tons of the urea produced at Phulpur. Annex 8 presents the statewide distribution of this urea. As discussed above (para 2.01), Uttar Pradesh's village cooperatives, the state where the project is located, own a large proportion of IFFCO cooperative shareholdings, and as planned, the majority of the project output is marketed in that state. Given the large demand for urea in the states surrounding the plant, IFFCO does not anticipate any difficulties in marketing the project output.

## V. FINANCIAL PERFORMANCE

### A. Financial Rate of Return

5.01 The financial rate of return for the Project is estimated at 12.3%, as compared to the appraisal estimate of 13.9%. The Project thus shows an acceptable financial rate of return, in spite of the fact that (i) capital costs have increased in rupees by more than 30% over appraisal estimates; and (ii) the Project is using expensive naphtha (costing Rs 1978 per ton) whereas it was appraised on fuel oil (then estimated to cost Rs 288 per ton in 1978 terms). The major reason for this is that the Government now sets ex-factory fertilizer prices with a retention price formula which guarantees the fertilizer plants a 28.4%<sup>2/</sup> before tax return on net worth at 80% capacity utilization. Accordingly, increases in capital costs and raw material prices are compensated for by higher ex-factory prices. Annex 9 presents the project operating costs at 90% capacity utilization, and Annex 10 the yearly financial costs and revenue streams.

### B. Financial Results

5.02 As part of the project agreement, IFFCO was to (i) maintain a debt:equity ratio at less than 60:40; (ii) maintain a current ratio of at least 1.1 during project implementation and 1.5 after project completion; and (iii) not incur additional debt if its debt service ratio were to fall below 1.4. All these covenants have been complied with.

5.03 Annex 11 summarizes IFFCO corporate financial results. They show that since 1975, when the Kalol and Kandla plants started commercial operations, IFFCO has had good financial performances. In 1980/81, its assets totalled Rs 4,481 million (US\$498 million). Its net profits stood at Rs 185 million (US\$20 million), which represented 7% of sales and 9% of total equity. In that year also, IFFCO long-term debt:equity ratio stood at a comfortable 45:55 and thus shows an overall good financial health.

## VI. ECONOMIC PERFORMANCE

### A. Economic Rate of Return

6.01 The economic rate of return is estimated at 11.3%, 4.9 points below the appraisal estimate of 16.2%. Annex 12 details all input/output price assumptions on which this new return is based. The economic value of all traded items has been based on forecasts of international prices, after

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<sup>2/</sup> This guaranteed return has recently been changed to 27.5%. This does not substantially change the analysis and conclusions presented in this report.

allowing for transportation and handling costs. All non-tradeable items have been priced at their financial prices after adjusting for duties and taxes.

6.02 The major reason for this lower economic rate of return is that the project is now based on expensive naphtha, whereas it was appraised on the basis of (relatively) cheap fuel oil. In 1975 when the Indian Government decided to switch feedstock, the price differential between naphtha and fuel oil was expected to stay at the US\$30-35 per ton level which had been experienced up to that point. Based on this forecast, the Bank economic analysis showed that, were naphtha to be used instead of fuel oil, the return would drop only by about 2%. Since naphtha was more likely to be available than fuel oil (naphtha was projected in surplus while fuel oil was forecast to be imported) the Bank did not object to this feedstock switch. International prices of naphtha are now about US\$125/ton higher than those of fuel oil, and this price differential is expected to remain at this level for the foreseeable future.

6.03 With the coming on stream of the Mathura refinery, naphtha will indeed be in surplus in India's Northern Region, while fuel oil will be in deficit. Because of the long distance between the Mathura refinery and the Kandla port from which this naphtha would need to be exported, and because only small vessels can use that port, the rail transport and shipping costs to export naphtha from Mathura would be high. The opportunity value of naphtha at Phulpur is therefore relatively low (US\$262/ton as shown in Annex 12). Conversely, and also because of high transport costs, urea has a high opportunity value in the project market areas. These two factors explain why this naphtha-based urea project shows a still acceptable 11.3% economic rate of return.

#### B. Environmental Aspects

6.04 The Project has been constructed in conformity with the environmental norms agreed at appraisal. As mentioned above (para 3.02), IFFCO has built an additional treatment plant for the project to meet regulations for disposal of chromate containing water. IFFCO continuously monitors the plant's effluents to ensure that all environmental regulations are met.

#### C. Transfer of Technology

6.05 The project has been implemented with substantial involvement of Indian industrial companies. Indian engineering firms carried out part of the detailed engineering for the ammonia and urea plants. Offsites design and erection was also performed by an Indian firm. A large portion of the project equipment was procured from Indian suppliers. Also, IFFCO's

engineers effectively absorbed the technology transferred to them and they are now to help KRIBHCO--IFFCO's sister cooperative society--implement the IDA supported Hazira urea complex.

#### VII. BANK ROLE

7.01 During the various phases of the project, the Bank has worked closely with the Government and with IFFCO. The Bank's relationship with IFFCO throughout project preparation and implementation was excellent. IFFCO greatly facilitated this by providing an adequate team of competent professionals who quickly learned Bank procedures for procurement and disbursement. During appraisal, the Bank helped IFFCO to formulate the organizational arrangements for project implementation and urged it to staff adequately senior corporate positions which were vacant at the time. The Bank has also worked closely with the Government to ensure that IFFCO's highly competent Managing Director would not retire before project completion. Finally, the Bank ICB procedures helped IFFCO obtain equipment at competitive prices, which lowered the project cost.

#### VIII. CONCLUSIONS AND LESSONS FOR SIMILAR PROJECTS

8.01 Except for the 17-month zero date delay due to the Government's decision to switch feedstock and for the 12-month delay in commissioning due to unavailability of feedstock, the Project was executed promptly and successfully; it was mechanically completed 46 months after the revised zero date (project construction thus took only one month more than estimated at appraisal) and it ran at an average of 80% capacity utilization for the first ten months of operation (30 percentage points more than estimated at appraisal). The Project's actual installed cost did surpass appraisal estimates by 10%, while overruns in total financing required reached 12% because the 30-month delay in start of commercial production increased interest charges during construction. This relatively good capital cost performance is mainly due to the fact that (i) the naphtha-based plant finally built is simpler and inherently cheaper than the fuel-oil-based one envisaged at appraisal; (ii) a large portion of the project cost was incurred in rupees which depreciated by 20% vis-a-vis the US\$ since project appraisal; and (iii) the overall performance of IFFCO's consultants and suppliers was adequate. This in turn resulted from IFFCO's close attention to the coordination, control and monitoring of the project activities. The project was also implemented successfully because IFFCO staff were well experienced and competent and because IFFCO's senior management set up appropriate organizational arrangements under which

IFFCO's project unit controlled and was actively involved in all aspects of project execution.

8.02 In spite of the initial 17 months delay, the Bank involvement in this Project was not premature. There were no indications at appraisal that the project feedstock would be changed. Also, the early Bank participation facilitated the setting up of good implementation arrangements. The decision of the Bank not to object to the change in feedstock appears to have been appropriate as (i) feedstock supplies are likely to be more secure for naphtha than for fuel oil (it is indeed in surplus in the Northern Region of India while fuel oil is in deficit); and (ii) the project economic rate of return is still appropriate at 11.3% since, due to transport costs, naphtha's opportunity value at Phulpur is relatively low while urea's is high. This Project has shown that procedures V and VI (opening of Letters of Credit) for withdrawal of Bank funds can be cumbersome and that, for borrowers who cannot directly obtain foreign exchange, the Bank should consider allocating 2-3% of its loan in a revolving fund for small direct payments for materials and small equipment urgently required at the end of the project construction period.

8.03 In summary, although it was started 17 months behind schedule and although it could not be commissioned for 12 months after mechanical completion, the IFFCO Fertilizer Project has been well implemented. Its very successful early operation indicates that it is mostly likely to meet its objectives and help India provide fertilizer to the farmers of its Northern Region at an economically competitive price. The experience with this Project also proves that with adequate planning, training and management, as provided by IFFCO, India can indeed quickly achieve and maintain high capacity utilization rates in modern, complex fertilizer plants.

INDIA - IFFCO FERTILIZER PROJECT

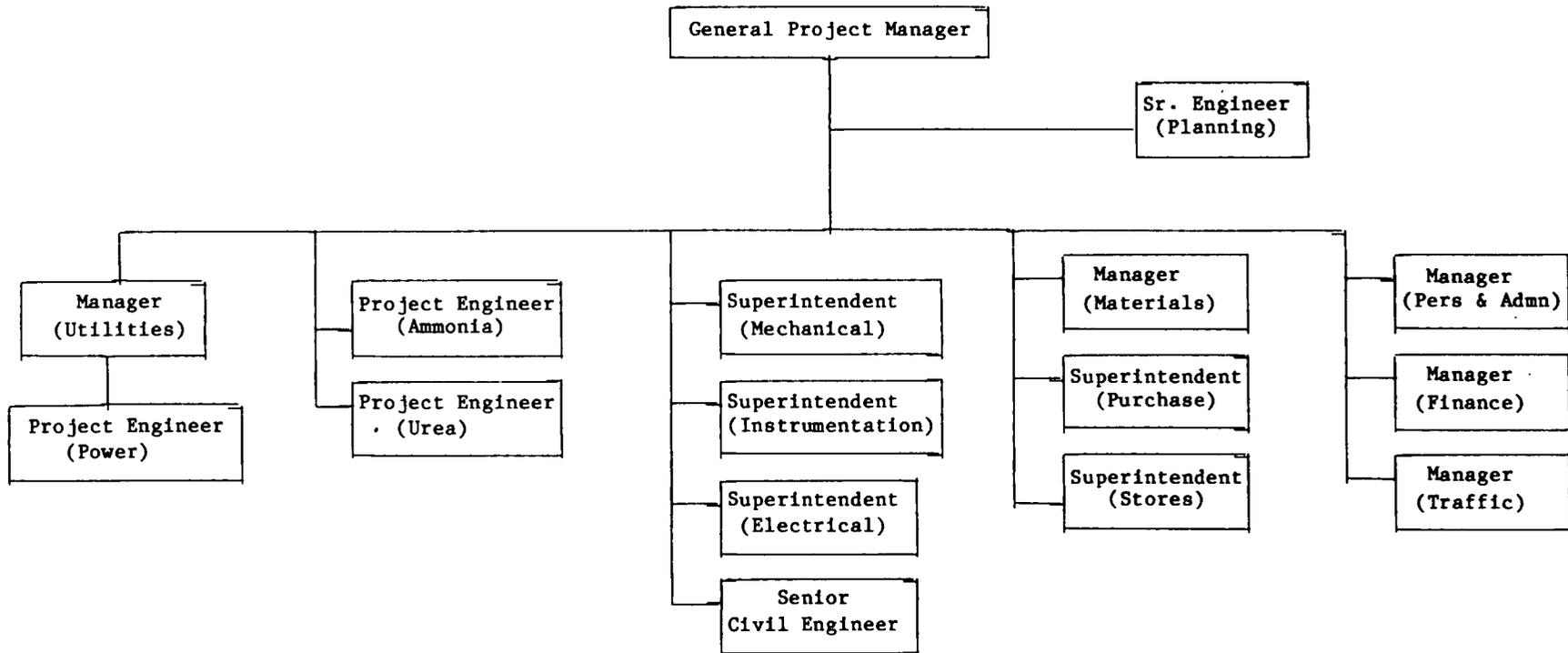
INDIAN FERTILIZER PROJECTS FINANCED BY THE BANK GROUP

<u>Project</u>	<u>Date of Signing</u>	<u>Amount of Financing (US\$ million)</u>
<u>I. International Finance Corporation</u>		
1. IEL Kanpur	Apr. 1967	11.5
2. Zuari - Goa	Mar. 1969	18.9
3. DFPC - Deepak	Jan. 1980	8.54
<u>II. International Development Association</u>		
1. FACT - Cochin II	July 1971	20.0
2. FCI - Gorakhpur	Jan. 1972	10.0
3. FCI - Nangal	Feb. 1973	58.0
4. FCI - Trombay IV and POIP	May 1974	50.0
5. FCI - Sindri	Nov. 1974	91.0
6. Fertilizer Industry Credit	Dec. 1975	105.0
7. KRIBHCO - Hazira	Oct. 1981	400.0
<u>III. International Bank for Reconstruction and Development</u>		
1. IFFCO - Phulpur	Jan. 1975	109.0

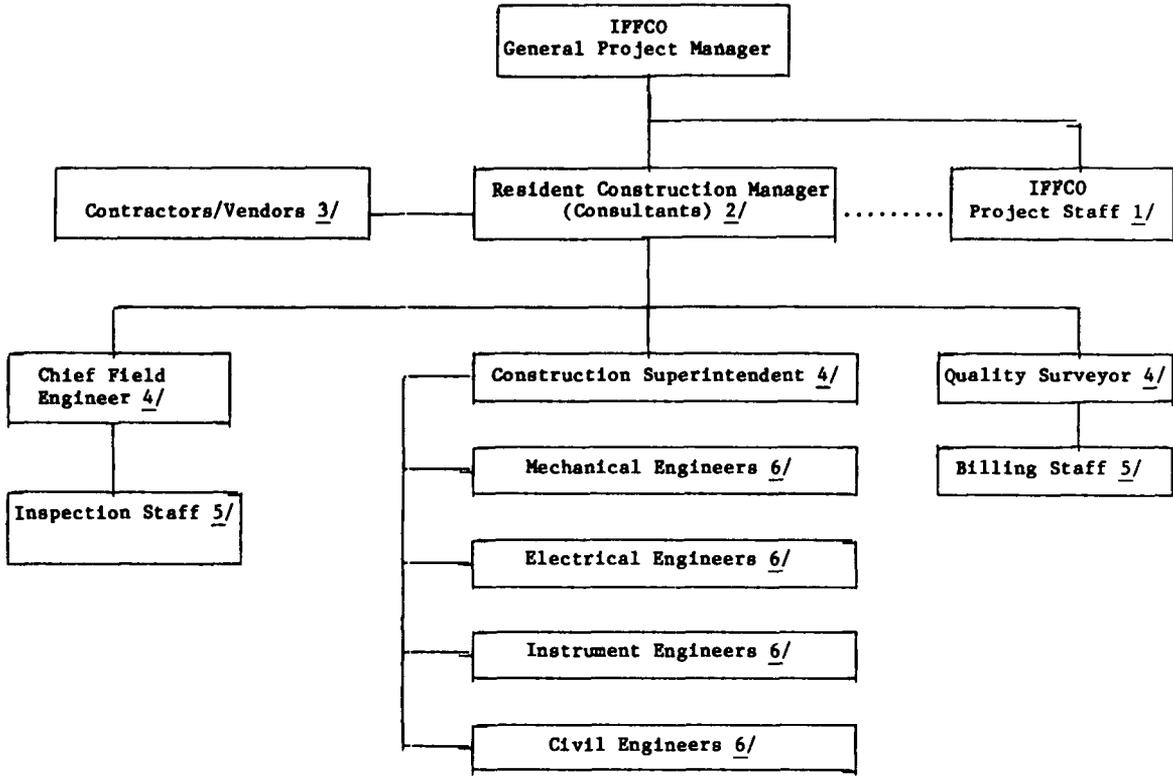
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INDIA - IFFCO FERTILIZER PROJECT  
ORGANIZATION CHART FOR PROJECT IMPLEMENTATION

IFFCO PROJECT UNIT



INDIA -IFFCO FERTILIZER PROJECT  
ORGANIZATION CHART FOR PROJECT IMPLEMENTATION  
IFFCO/CONSULTANTS/SUPPLIERS RELATIONSHIPS DURING CONSTRUCTION



- 1/ IFFCO Project Engineers.
- 2/ Kellogg, Snamprogetti and DCPL staff, fully responsible for plant construction.
- 3/ Indian companies.
- 4/ Kellogg, Snamprogetti and DCPL staff.
- 5/ IFFCO, FPDIL or Indian consultant staff.
- 6/ Senior staff from Kellogg, Snamprogetti and DCPL, with junior staff from IFFCO.

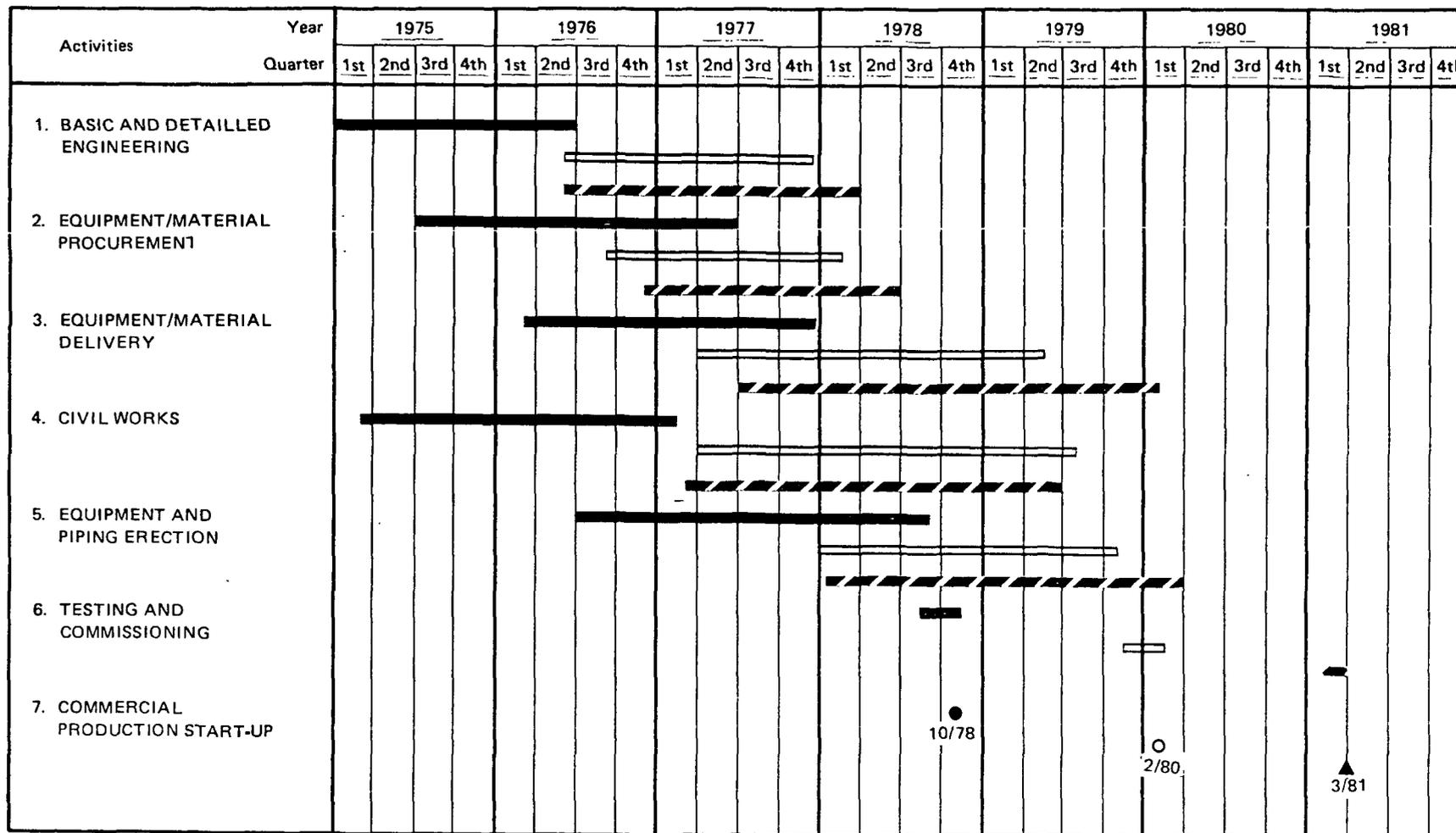
INDIA - IFFCO FERTILIZER PROJECT

COUNTRIES OF ORIGIN OF BANK FINANCED EQUIPMENT

<u>Countries</u>	<u>Amount</u> <u>(in thousand of US\$)</u>	<u>Percentage</u> <u>(%)</u>
India	43,290	39.7
USA	29,450	27.1
Japan	9,201	8.4
Italy	9,168	8.4
Germany	8,429	7.8
Switzerland	4,922	4.5
United Kingdom	2,181	2.0
Canada	566	0.5
Sweden	258	0.2
Austria	249	0.2
Belgium	248	0.2
France	212	0.2
Mexico	106	0.1
Others	<u>720</u>	<u>0.7</u>
Total	<u>109,000</u>	<u>100.0</u>

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**INDIA**  
**IFFCO FERTILIZER PROJECT**  
**Implementation Schedule**



- [Solid Bar] Appraisal Estimate (Fuel Oil Based)
- [Hollow Bar] Original Revised Estimate (Naphta Based)
- ▲ [Hatched Bar] Actual

INDIA - IFFCO FERTILIZER PROJECT

PROJECT COST SUMMARY  
(in million Rupees)

	----- Appraisal Estimates -----			----- Original Revised 1/ -----			----- Actual -----				Change in			
	Fuel Oil Based			Naphtha Based			Naphtha Based				Vs. Appraisal	Vs. Revised		
	Foreign 2/	4/	Local 3/	Total	Foreign 2/	5/	Local 3/	Total	Foreign 2/	5/	Local 3/	Total	(%)	(%)
Equipment														
Ammonia Plant	235.1		254.9	490.0	174.1		190.2	364.3	177.4		167.0	344.4	-29.7	-5.5
Urea Plant	68.6		85.1	153.7	63.2		77.1	140.3	66.1		85.3	151.4	-1.5	+7.9
Steam Plant	59.6		96.1	155.7	-		184.8	184.8	-		181.5	181.5	+16.6	-1.8
Power Plant	12.8		58.9	71.7	5.8		50.8	56.6	6.1		65.4	71.5	-0.3	+26.3
Other Offsites	6.4		29.4	35.8	9.8		94.0	103.8	1.6		135.0	136.6	+281.6	+31.6
Construction Equipment	9.8		12.7	22.5	13.9		19.2	33.1	1.2		15.3	16.5	-26.7	-50.2
Spare Parts	24.5		30.7	55.2	31.1		48.3	79.4	36.6		94.6	131.2	+137.7	+65.2
Sub-total	416.8		567.8	984.6	297.9		664.4	962.3	289.0		744.1	1,033.1	+4.9	+7.4
Land	-		4.9	4.9	-		3.9	3.9	-		3.8	3.8	-22.4	-2.6
Site Development & Township	-		31.2	31.2	-		81.6	81.6	-		130.5	130.5	+318.3	+59.9
Licenses & Engineering	93.3		15.3	108.6	108.3		9.6	117.9	110.1		10.6	120.7	+11.1	+2.4
Civil Works	-		85.0	85.0	-		87.4	87.4	-		117.7	117.7	+38.5	+34.7
Erection & Supervision	28.4		52.7	81.1	36.3		108.6	144.9	49.0		85.0	134.0	+65.2	-7.5
Project Management	14.7		24.4	39.1	8.6		43.4	52.0	-		98.9	98.9	+152.9	90.2
Preoperating Expenses	-		24.5	24.5	-		19.4	19.4	-		163.0	163.0	+565.3	+740.2
Total Installed Costs	553.2		805.8	1,359.0	451.1		1,018.3	1,469.4	448.1		1,353.6	1,801.7	+32.6	+22.6
Working Capital	-		97.5	97.5	-		34.0	34.0	-		122.9	122.9	+26.1	+261.5
Interest During Construction	124.5		72.8	197.3	133.3		41.0	174.3	186.2		108.8	295.0	+49.5	+69.2
Total Financing Required	677.7		976.1	1,653.8	583.4		1,094.3	1,677.7	634.3		1,585.3	2,219.6	+34.2	+32.3

1/ Original Control Estimate, dated January 1977, after signing of engineering contracts.

2/ Direct Foreign Exchange only.

3/ Including Indirect Foreign Exchange.

4/ At US\$1.0 = Rs 7.5.

5/ At US\$1.0 = Rs 9.0.

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INDIA - IFFCO FERTILIZER PROJECT

IBRD LOAN DISBURSEMENT SCHEDULE

(in US\$ million)

Calendar Year and Quarter	Appraisal Estimate		Actual		
	Quarterly	Cumulative	Quarterly	Cumulative	
1975 - I	2.1	2.1	2	-	-
II	2.2	4.3	4	-	-
III	3.3	7.6	7	-	-
IV	3.3	10.9	10	-	-
1976 - I	7.6	18.5	17	-	-
II	8.7	27.2	25	2.8	2.8
III	10.9	38.1	35	5.7	8.5
IV	10.9	49.0	45	6.1	14.6
1977 - I	12.0	61.0	56	4.1	18.7
II	10.9	71.9	66	2.9	21.6
III	10.9	82.8	76	3.7	26.3
IV	9.8	92.6	85	7.7	33.0
1978 - I	7.6	100.2	92	9.8	42.8
II	5.4	105.6	97	6.5	49.3
III	3.4	109.0	100	9.4	58.7
IV	-	-	-	9.9	68.6
1979 - I	-	-	-	12.0	80.6
II	-	-	-	4.3	84.9
III	-	-	-	6.4	91.3
IV	-	-	-	2.3	93.6
1980 - I	-	-	-	5.3	98.9
II	-	-	-	1.3	100.2
III	-	-	-	5.0	105.2
IV	-	-	-	1.4	106.6
1981 - I	-	-	-	2.2	108.8
II	-	-	-	0.2	109.0

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INDIA - IFFCO FERTILIZER PROJECT

PRODUCTION BUILD-UP  
(in tons)

<u>Month</u>	<u>Ammonia</u>	<u>Urea</u>	<u>Average Cap. Utilization (%)</u>
1981 - April	14,529	18,728	45.4
May	13,296	26,214	63.5
June	23,392	41,584	100.8
July	18,726	25,888	62.8
August	22,140	37,826	91.7
September	17,458	34,287	83.1
October	21,272	35,042	85.0
November	17,878	32,215	78.1
December	25,143	42,669	103.4
1982 - January	<u>20,917</u>	<u>35,179</u>	<u>85.3</u>
Total	<u>194,751</u>	<u>329,632</u>	<u>80.0</u>

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INDIA - IFFCO FERTILIZER PROJECT

STATEWISE DISTRIBUTION OF THE PROJECT UREA OUTPUT  
(April 1981 - February 1982 Period)

<u>State</u>	<u>Quantity</u> <u>('000 tons)</u>	<u>Percentage</u> <u>(%)</u>
Uttar Pradesh	252.10	70.7
Bihar	26.79	7.5
West Bengal	30.23	8.5
Madhya Pradesh	28.45	8.0
Punjab	<u>18.85</u>	<u>5.3</u>
Total	<u>356.42</u>	<u>100.0</u>

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INDIA - IFFCO FERTILIZER PROJECT

PROJECT OPERATING COSTS AT 90% CAPACITY UTILIZATION  
(in million of 1981 Rs)

	<u>Unit</u>	<u>Unit Cost (Rs)</u>	<u>Annual Consumption</u>	<u>Annual Cost</u>	<u>Percentage (%)</u>
<u>I. VARIABLE COSTS</u>					
Naphtha	MT	1978.1	252.9x10 <sup>3</sup>	500.3	64.1
Purchased Power	Kwh	0.453	64.9x10 <sup>6</sup>	29.4	3.8
Coal	MT	254.2	361.4x10 <sup>3</sup>	91.9	11.8
Fuel Oil	KL	1436.0	15.4x10 <sup>3</sup>	22.1	2.9
Water	-	-	-	0.2	-
Chemicals	-	-	-	1.3	0.2
Bags	-	4.8	9.0x10 <sup>6</sup>	43.2	5.5
Sub-Total				688.4	88.3
<u>II. FIXED COSTS</u>					
Labor				16.4	2.1
Maintenance				10.1	1.3
Administration & Overhead				47.2	6.1
Selling				17.3	2.2
Sub-Total				91.0	11.7
<u>III. TOTAL OPERATING COSTS</u>				<u>779.4</u>	<u>100.0</u>

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INDIA - IFFCO FERTILIZER PROJECT

PRE-TAX FINANCIAL RATE OF RETURN

(in million of 1981 Rs)

<u>Fiscal Year</u>	<u>Capital Costs</u>	<u>Working Capital</u>	<u>Fixed Costs</u>	<u>Variable Costs</u>	<u>Revenues</u>	<u>Net Cash Flow</u>
1975/76	63.4					(63.4)
1976/77	248.6					(248.6)
1977/78	626.9					(626.9)
1978/79	603.3					(603.3)
1979/80	380.6					(380.6)
1980/81	411.1	74.4	24.9	127.5	294.2	(343.7)
1981/82		47.8	91.0	650.1	1,349.5	560.6
1982/83		6.8	91.0	688.4	1,379.5	684.3
1983/84			91.0	688.4	1,337.2	557.8
1984/85			91.0	688.4	1,280.4	501.0
1985/86			91.0	688.4	1,248.2	468.8
1986/87			91.0	688.4	1,223.1	443.7
1987/88			91.0	688.4	1,176.1	396.7
1988/89			91.0	688.4	1,167.0	387.6
1989/90			91.0	688.4	1,127.8	348.4
1990/91			91.0	688.4	1,080.7	301.3
1991/92			91.0	688.4	1,065.8	286.4
1992/93	(209.7)	(122.9)	91.0	688.4	1,050.1	270.7

Financial Rate of Return = 12.3%

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INDIA - IFFCO FERTILIZER PROJECT

IFFCO FINANCIAL STATEMENTS  
(in Rs million)

<u>(Year ending June 30)</u>	<u>1976/77</u>	<u>1977/78</u>	<u>1978/79</u>	<u>1979/80</u>	<u>1980/81</u>
<u>Income Statements</u>					
Total Revenues	1,181.5	1,666.7	1,864.4	1,862.0	2,657.4
Cost of Goods Sold (Excl. Depr.)	805.9	1,185.3	1,393.4	1,536.3	2,287.9
Interest Charges	68.8	54.2	50.6	43.9	85.1
Depreciation	61.0	61.7	63.3	67.2	107.4
Profit After Taxes	245.8	365.5	357.1	191.0	185.0
Internal Cash Generation	306.8	427.2	420.4	258.2	292.4
<u>Balance Sheets</u>					
Current Assets	903.5	1,212.3	1,317.1	1,131.0	1,638.3
Net Fixed Assets	871.0	1,247.6	1,737.2	2,419.2	2,704.7
Other Assets	39.9	95.7	196.5	5.4	137.9
Current Liabilities	112.6	225.2	261.9	426.9	631.0
Long-Term Debt	890.3	1,069.8	1,292.9	1,244.1	1,811.6
Equity & Retained Earnings	811.5	1,260.6	1,696.0	1,884.6	2,038.3
Total Assets	1,814.4	2,555.6	3,250.8	3,555.6	4,480.9
<u>Ratios</u>					
Current Ratio	8.0	5.4	5.3	2.6	2.6
Long-Term Debt to Equity	52:48	46:54	44:56	40:60	45:55

Industry Department  
May 1982

INDIA - IFFCO FERTILIZER PROJECT

ECONOMIC ANALYSIS

I. ASSUMPTIONS

A. Economic Value of Naphtha at Phulpur

1. IFFCO's phulpur ammonia/urea plant is to obtain its naphtha from the Mathura refinery. With this refinery coming on stream in late 1982, India's Northern Region will have a surplus of naphtha for the foreseeable future. Surplus naphtha from Mathura must be exported from the Kandla port, and the economic value of naphtha at Phulpur is to be derived from corresponding export receipts as shown below:

Naphtha Economic Value at Phulpur  
(in 1981 US\$/ton)

	<u>1982</u>	<u>1985</u>	<u>1990</u>
Crude Price (US\$/bbl)	34.0	34.0	38.5
Equivalent to (US\$/ton) <u>1/</u>	243	243	275
Naphtha export value <u>2/</u>	304	304	344
(-) Penalty for export on small vessels <u>3/</u>	20	20	23
(-) Kandla/Mathura freight and handling <u>4/</u>	50	50	55
(+) Mathura/Phulpur freight and handling <u>4/</u>	<u>28</u>	<u>28</u>	<u>31</u>
Total	<u>262</u>	<u>262</u>	<u>297</u>

1/ Crude density 0.88 kg/l.

2/ Naptha/Crude oil price ratio of 1.25 for exports from Bombay, as per the India Refineries Rationalization Project SAR (Report No. 3645-IN, dated March 1, 1982).

3/ Kandla is a shallow water port which can only accomodate small general purpose vessels (17,000 tons carrying capacity). Also, it is a very crowded port with long waiting times and high demurrage charges.

4/ Rail transport costs as per railways tariffs.

B. Project Operating Economic Costs

2. Economic costs for the project inputs are summarized below in 1981 US\$. Except for naphtha, they were derived from financial costs after deducting local taxes.

<u>Operating Economic Costs</u> (in 1981 US\$)					Annual Operating Economic Cost (US\$ million)
	<u>Unit</u>	<u>Annual Consumption</u>	<u>Financial Unit Cost</u>	<u>Economic Unit Cost</u>	
Naphtha	MT	252.9 x 10 <sup>3</sup>	219.8	262.0	66.2
Coal	MT	361.4 x 10 <sup>3</sup>	28.2	25.4	9.2
Purchased Power	Kwh	64.9 x 10 <sup>6</sup>	.05	.045	2.9
Fuel Oil	KL	15.4 x 10 <sup>3</sup>	159.6	143.6	2.2
Bags and Chemicals	-	9.0 x 10 <sup>6</sup>	.5	.5	4.5
Sub-total					<u>85.0</u>
Labor					1.8
Maintenance					1.1
Adm. and Overhead					5.2
Selling					<u>1.3</u>
Sub-total					<u>10.0</u>
Total					<u><u>95.0</u></u>

C. Economic Value of Urea at Phulpur

3. The project's urea is sold primarily in the northern regions of India surrounding the plant. Its economic value is thus derived from import costs by adding domestic economic distribution freight to Phulpur, as shown below:

<u>Urea Economic Value at Phulpur</u> (in 1981 US\$/ton)			
	<u>1982</u>	<u>1985</u>	<u>1990</u>
1980 US\$	175 <u>a/</u>	268 <u>b/</u>	282 <u>b/</u>
1981 US\$	167 <u>a/</u>	256 <u>b/</u>	269 <u>b/</u>
Marine Freight to Bombay	45	50	60
Port Handling and Storage	6	6	6
CIF Landed Bombay	<u>218</u>	<u>312</u>	<u>335</u>
Bombay/Phulpur freight and handling	18 <u>c/</u>	19 <u>c/</u>	23 <u>c/</u>
Phulpur Ex-factory price	<u>236</u>	<u>331</u>	<u>358</u>

a/ Derived from international prices of US\$180/ton which prevailed in early 1982.

b/ As per EPD Commodities and export Projects Division December 1981 price forecasts.

c/ Rail transport costs as per railways tariffs.

II. COST AND BENEFIT STREAMS FOR ECONOMIC RATE OF RETURN  
(in 1981 US\$ million)

<u>IFFCO</u> <u>Fiscal Year</u>	<u>Capital</u> <u>Costs</u>	<u>Working</u> <u>Capital</u>	<u>Fixed</u> <u>Costs</u>	<u>Variable Costs</u>		<u>Revenues</u>	<u>Net Cash</u> <u>Flow</u>
				<u>Naphtha</u>	<u>Others</u>		
1975/76	5.5						(5.5)
1976/77	27.1						(27.1)
1977/78	64.5						(64.5)
1978/79	61.2						(61.2)
1979/80	40.4						(40.4)
1980/81	42.8	2.6	2.7	12.5	3.5	20.6	(43.5)
1981/82		2.0	10.0	62.6	17.8	102.6	10.2
1982/83		0.6	10.0	66.2	18.8	121.5	25.9
1983/84			10.0	66.2	18.8	136.3	41.3
1984/85			10.0	66.2	18.8	152.4	57.4
1985/86			10.0	67.9	18.8	154.8	58.1
1986/87			10.0	69.6	18.8	157.2	58.8
1987/88			10.0	71.4	18.8	159.7	59.5
1988/89			10.0	73.2	18.8	162.2	60.2
1989/90			10.0	75.1	18.8	164.8	60.9
1990/91			10.0	77.0	18.8	167.4	61.6
1991/92			10.0	79.0	18.8	170.1	62.3
1992/93	(24.2)	(5.2)	10.0	81.0	18.8	172.7	92.3

Economic Rate of Return = 11.3%

Industry Department  
May 1982



P. C. Dhir  
Under Secretary  
Tele. 373936.

भारत सरकार  
वित्त मंत्रालय  
आर्थिक कार्य विभाग  
Government of India (Bharat Sarkar)  
Ministry of Finance (Vitta Mantralaya)  
Department of Economic Affairs (Arthik Karya Vibhag)

नई दिल्ली/New Delhi, the 13 May, 1983.

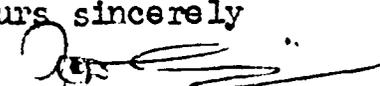
Dear

Kindly refer to my d.o. letter of even number dated 24th March, 1983 forwarding GOI's comments on the draft Project Completion Report (Loan 1079-IV) on IFFCO Fertilizer Project.

2. Based on the discussion IFFCO had with Shri Venkataraman of World Bank, slight modification has been made to the comments furnished Para 3.10 of the PCR. A complete set of the comments incorporating the modification is enclosed for transmission to the concerned Official in the Bank.

With kind regards,

Yours sincerely

  
(P. C. Dhir)

Dr. Y.V. Reddy,  
Adviser to ED(Bank),  
C/o Indianbassy,  
Washington D.C.

COMMENTS ON PROJECT COMPLETION REPORT ON INDIA  
IFFCO FERTILISER PROJECT (LOAN 1079-IN) THE WORLD BANK

PAGE 2 - PARA 1.04:

In the last sentence of this para, the figure relating to cooperative institutions be changed to 27,000 instead of 28,000 and the amount of IFFCO's equity of Rs. 145 million mentioned may be changed to Rs. 360 million without any change in the description. These changes could be incorporated into the report.

PAGE 3 - PARA 2.03:

The fee payable to Government of India on the loan over and above the interest of 8% may please be read as 2.25% and not 2.5% indicated in the report.

PAGE 3 - PARA 2.04:

In the last but one line, the quantities of raw materials to be used in the project are mentioned as tpd against fuel oil and coal which may please be changed to tpa.

PAGE 4 - PARA 3.02:

In the third line from the bottom, kindly delete the statement "a gain of 3% in process efficiency".

PAGE 5 - PARA 3.07:

The latter part of the para may be slightly elaborated as indicated below from 17th line.  
"During the construction.....Construction Managers" appearing in the 17th line of this paragraph.

"IFFCO also involved actively at a sufficiently early stage its operating and maintenance supervisory personnel for inspection checks for site construction, follow-up with the site contractors and all pre-commissioning activities".

PAGE 6 - PARA 3.09:

Slight elaboration of this para is suggested as mentioned below:

"For junior operators and technicians, it recruited 228 young engineers, science graduates and qualified craftsmen, whom they submitted to comprehensive two years specialised training programmes, at IFFCO's Kalol Plant using elaborate training materials prepared by senior supervisory personnel. These trainees, after completion of class room training were given on the job training in various sections of operations of the Kalol Unit and finally, they were also given the opportunity for independently operating the Urea Plant. In all, the Project....."

PAGE 6 - PARA 3.10:

It is suggested that this para may please be modified to read as under:-

"The Project did experience delay due to some delay in Engineering carried out by all consultants which delayed procurement of bulk materials. Also some materials procured through inadequate specifications required replacement after it had already been applied which delayed mechanical completion by about two months. Finally, IFFCO staff felt that the expediting carried out by the consultants was not satisfactory and that some of the delays experienced at the supplier's shops could have been avoided. There were also deficiencies in ordering of bulk materials for piping and insulation etc., resulting in issuing large number of purchase orders at a sufficiently late stage. IFFCO had to depute two of its personnel to USA for expediting these critical items for project completion and arranging for their air freightage".

PAGE 6 - PARA 3.11:

In seventh line from top, the word "connection" is to be corrected to "convection".

PAGE 7 - PARA 3.12:

The para has been modified and may please be read as under:

Most of the major equipment ordered outside India were supplied within 2 or 3 months of their promised delivery. However, the bulk piping and instrument materials ordered outside India were late, at times by as much as 6 months. Most of the major equipment ordered in India were delayed by 6 to 12 months from contractual delivery dates. As a result of the delays explained earlier (para 3.10 and 3.11), these items were not on the critical path contributing to further delays. IFFCO had major problems in this respect with the structural steel contractor who completed the structural steel work 17 months behind commitment because of lack of manpower, inadequate shop quality control and deficient planning. IFFCO also encountered delivery problems for vessels ordered in India because of strikes at the suppliers shop. In total, late deliveries of equipment and material particularly in bulk piping and fittings, etc., of foreign supplies delayed the project contractual, mechanical completion date by about seven months which also covers a delay of about a month due to congestion at Bombay Port and two months on account of delays by structural steel contractor.

PAGE 7 - PARA 3.13:

The last sentence at the end of para reading "as explained above, this large share of local supplies did delay project mechanical completion by about seven months when measured against contractual arrangements" is not relevant since the value of the equipment involved compared to the Indian fabrication capacity is not much. On the other hand, it brings out the fact that the Indian industry has successfully been able to procure orders for a significant value of the requirements of the fertiliser plant.

PAGE 7 & 8 - PARA 3.14:

The last sentence should be read as under with corrections:

"As explained above, 5 of these 12 months of contractual delays are due to slow plant erection because of faulty material and equipment (Para 3.10 and 3.11) and 7 are due to late delivery of vessels and material purchased from Indian/foreign suppliers (Para 3.12)

PAGE 9 - PARA 3.16:

The data presented is at variance with the project costs being used by IFFCO, presumably due to a difference in the system of presentation of the data on the project. We have separately commented on the same presented in more detail subsequently in Annexure 5. Any changes as a result of our comments therein would also call for incorporation in the table under this para as well.

PAGE 9 and 10 - PARAS 3.17, 3.18 and 3.19:

The figures appearing in the above paras may undergo a change if any modification is made in the project cost as a result of our comments.

PAGE 13 - PARA 5.01:

The return on net worth guaranteed by the Government before tax at present is 27.5%, which may vary depending on the tax on profits.

PAGE 15 - PARA 7.01:

The last but one sentence may be read as under:

"The Bank has also worked closely with the Government to ensure that IFFCO's highly competent Managing Director would not retire before Project Completion."

ANNEXURE - 2

In the organisation chart, kindly replace Purchase Manager by Superintendent Purchase and Stores Section by Superintendent Stores.

ANNEXURE - 5

As mentioned at para 3.16, the project cost adopted by IFFCO are as under:-

A C T U A L ------(NAPHTHA BASED)-----			
Equipment	<u>Foreign/2/5</u>	<u>Local/3</u>	<u>Total</u>
Ammonia Plant	246.8	97.6	344.4
Urea Plant	98.7	52.7	151.4
Steam Plant	169.1	12.3	181.4
Power Plant	24.0	47.6	71.6
Other Offsites	28.1	108.5	136.6
Construction Equipment	2.0	14.5	16.5
Spare Parts	<u>87.2</u>	<u>44.0</u>	<u>131.2</u>
SUB-TOTAL	655.9	377.2	1033.1
Land	-	3.8	3.8
Site Development & Township	-	130.6	130.6
Licence and Engineering	110.1	10.6	120.7
Civil Works	-	117.7	117.7
Erection and Supervision	49.1	114.4	163.5
Project Management charges including insurance	-	98.9	98.9
Pre-operating Expenses	-	54.5	54.5
TOTAL INSTALLED COST	<u>815.1</u>	<u>907.7</u>	<u>1722.8</u>
Working Capital	-	34.0	34.0
Interest during Construction	186.2	108.8	295.0
Total financing required	<u>1001.3</u>	<u>1050.5</u>	<u>2051.8</u>

The main differences are on account of the following

- i) Erection and supervision charges considered by IFFCO based on approved capital cost by the Government is Rs. 163.5 million as against a figure of Rs. 134.0 million shown in the completion report prepared by the World Bank.
- ii) We presume that Project Management charges considered by the World Bank includes Insurance charges amounting to Rs. 10.5 million.
- iii) Pre-operating cost as suggested above is worked out as under:

	<u>Rs million</u>
(a) Cost towards operating expenses	163.0
(b) Contingency and escalation	2.5
(c) Less for pre-operational production inventory and construction surplus	(-) 111.0
	<u>54.5</u>

- iv) In the approved capital cost of Phulpur Project the working capital has been shown as Rs. 34.0 million as against Rs. 122.9 million considered by the World Bank.

This may also please be noted that there is variance in Foreign and Local allocations shown by the World Bank and the Capital cost approved by the Government of India for most of the items, though the final figures itemwise remaining unchanged.

ANNEXURE II

- a) Total assets indicated have been correctly reported but the break up of the same calls for corrections as under:

<u>Particulars</u>	<u>(Rs in millions)</u>				
	<u>1976-77</u>	<u>1977-78</u>	<u>1978-79</u>	<u>1979-80</u>	<u>1980-81</u>
Current assets	903.5	1212.3	1317.1	1131.0	1638.3
Net fixed assets including development expenditure pending allocation	910.7	1343.1	1933.5	2419.2	2704.7
Investments	0.2	0.2	0.2	5.4	133.0
Deferred Revenue Expenditure	-	-	-	-	4.9
TOTAL	<u>1814.4</u>	<u>2555.6</u>	<u>3250.8</u>	<u>3555.6</u>	<u>4480.9</u>

- b) The long term debt and equity and retained earnings for the year 1977-78 may please be corrected as under:

Long term debt	1069.8
Equity and Retained earnings	1260.6