CHAPTER-5

CLASSIFICATION AND EXAMINATION OF FACTORS AFFECTING PROFITABILITY.

5.1 CLASSIFICATION.

5.1.1. Factors that can affect performance and profitability may be operational limitations, managerial inefficiency, lack of concern and controls, Government's interference unwilling employee, trade union activities, excess controls, unproductive approaches etc.

In this chapter, an attempt has been made to list out all possible factors tangible or nontangible, social, economic or political, controllable and uncontrollable which directly or indirectly affect the production, profits, productivity and profitability of the identified enterprises.

The factors which can be controlled by the Chief Executive of the identified enterprises are classified as endogenous (internal) and factors which are beyond the control of Chief Executive are classified as exogenous (external). They are further subclassified as primary, secondary and tertiary. Primary factors are those which are directly identified for having impact on productivity and profitability and can be mostly quantified, while secondary factors are those which are indirectly responsible for primary factors and are generally endogenous and relate to management and men, but cannot be precisely and quantitatively expressed. However, there cannot be a sharp line of demarcation between the nature of factors. Tertiary factors, quite important, are mostly exogenous. The classification of the factors is presented below.

F A C T O R	BROAD TYPE*	BROAD NATURE*
1. Investment decision	Ex	P
2. Location	Ex	S
3. Technology	Ex	P
4. Source of financing imports	Ex	P
5. Product pattern & non-flexibility	Ex	S
6. Power shortage	Ex	P
7. Project implementation & time/ cost over-runs of project, equipment	Ex/En	P
8. Utilization of capacity	En	P
9. High cost of inputs	Ex	P
10. Equipment break down	En	S
11. Neglected maintenance	En	S
12. High interest burden	En	P
13. High inventories of finished good	En	PS
14. Excessive inventory of raw materials, stores and spares	En	P
15. High overheads and non-productive expenses	En	P
16. Loss of Mondays due to strikes, go-slow tactics etc.	En	PS
17. Loss of Mondays due to un-planned shutdown	En	S
18. Shortage of raw materials, controlled inputs and imported spares	En/Ex	PS

En = Endogenous P = Primary Ex = Exogenous

S = Secondary T = Tertiary

19.	Transport limitations	En	S
20.	Market demand & pricing policy	Ex	PS
21.	Limitation on sale price due to non-capacity of consumers	Ex	T
22.	Personnel & administrative policies	En	ST
23.	Pay scales	Ex	PT
24.	Employment mix (high wage ratio)	En	S
25.	Social overheads	En	S
26.	Managerial inefficiency (faulty policies and faulty planning)	En	S
27.	Lack of cost consciousness amongst managers	En	S
28.	Industrial relations	En	S
29.	Non-cooperation & indifference of work force.	En	S
30.	Lack of team spirit	En	S
31.	Environment and lack of proper balancing facilities	En/Ex	S
32.	Government interference in day to day activity	Ex	T
33.	Lack of autonomy to Chief Executive	Ex	T
34.	Political interference	Ex	T
35.	Social obligation	Ex	T
36.	Management policies and practices	En	S
37.	Union	Ex/En.	T
38	Government as owner.	Ex	T
39	Parliament	Ex	T
40	Accountability matrix	Ex/En.	T

5.1.2 EARC'S CLASSIFIED HEADS.

EARC in the report number 7 on profitability,* had classified losses in the public sector under following heads:

(i) Over capitalisation due to cost and time-overruns.

(ii) Those attributable to Government policies (wrong investment decisions, uneconomic pricing, technology selection, source of financing, relation between Government and public sector, tenure of Chief Executive.

(iii) Those attributable to adverse conditions (power failure, draught, etc.).

(iv) Those attributable to management weakness.

5.1.3 STUDY SCHEME.

In study scheme, all primary factors correspond to operating parameters. Secondary factors relate to management practices and man. While tertiary factors are attributable to the Government and concerned agencies. There is an interdependence of all factors.

In the following sections, analysis is attempted to establish co-relation between profitability and the following primary factors which are vital and can be quantified:

1. Project implementation - mode of execution over capitalisation, cost and time over-runs, source of financing imports.
2. Technology, consumption norms, power failure, equipment break downs.

---

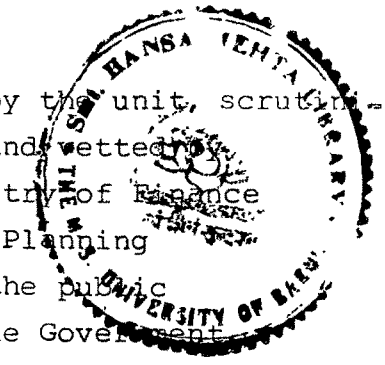
* EARC Report No. 7.

3. Capacity utilisation.
4. Inventory.
5. High cost of inputs.
6. Pattern of employment emoluments and social overheads.
7. Marketing, pricing policy, and promotional activities.

5.1.4 In Chapter-6 effect of management practices, personnel and financial management, exogenous factors like Government and Parliament control, autonomy, union, location, shall be discussed and examined.

5.2 PROJECT IMPLEMENTATION.

5.2.1 INVESTMENT DECISIONS.



Investment proposals are prepared by the unit, scrutinised by the controlling Ministry, and vetted by bureau of public enterprises, Ministry of Finance and Project appraisal committee of Planning Commission and finally cleared by the public investment board and approved by the Government. Guide lines for preparing project feasibility have been issued by the Project appraisal division from time to time to incorporate technical, social, economic and financial analysis for correct appraisal and investment decisions. . . In spite of this, sometimes wrong investment decision could be taken due to political and other considerations.

Jha Commission in its report No. 7 had mentioned wrong investment decisions as one of the possible causes for the poor performance and low profitability in the Public Sector. Investment decisions are taken by the Government considering economic viability, social needs and raw materials limitations. In case of Fertilizer Sector, investment decisions were taken as fertilizer input is a major requirement to increase food production. Location and Technology were selected to suit the availability of feed stock and source of financing imports. In early seventies when scarcity of Naphtha and fuel oil was apprehended technology based on direct gasification of coal was selected and investment decision to set up two coal based Fertilizer Units at Ramagundam and Talcher (FCI) was taken. Thus, by and far investment decisions to set up Fertilizer Plants were not wrong to meet the National objective. Only wrong decision taken was to install Sulphuric Acid Plant under Rationalisation Scheme at Sindri which had

to be subsequently scrapped. 'In case of Ramagundam and Talcher Projects, which were pioneering ventures with emphasis on indigenisation and self reliance, heavy price has been paid by way of time and cost over runs and continued operational problems'.[1] Decisions on mode of financing of imports had no doubt its impact on over-capitalisation of Projects and its smooth operation.

5.2.2 MODE OF EXECUTION - TIME AND COST OVERRUNS.

Project is a time bound activity with definite cost and time schedule. Mode of execution and source of financing imports coupled with proper management from concept to commissioning are prerequisites for successful implementation of the Project. In this para corelation between mode of execution and source of financing of imports of projects of identified enterprises and cost and time over runs are studied.

The schedule and completion time, as well as implementation scheme of the selected plants of the identified enterprises, are presented in Table-16 below.

---

1 BARC-II Report No. 7 pg. 73.

Table-16 SCHEDULE & COMPLETION TIME OF FERTILISERS PLANTS

Sr. No.	Projects	Zero date	Completion Schedule months	Date of Mech. completion	Time taken Month	Date of production.	Total time Month	Over run mon.	Implementation scheme
1	FCI Sindri Modernisation	Apr. 1975	36	Nov.78	43	Oct.79	54	18	DEP PDIL execution site.
2	HFC Durgapur	Dec. 1966	48	Sep.71	52	Oct.74	94	46	DEP by FEDO & PDIL execution site
3	HFC Barauni	Mar. 1968	42	Jul.75	88	Nov.76	104	62	"
4	NFL Nangal Expa.	Mar. 1973	39	Jul.77	52	Jan.78	58	19	DEP PDIL execution site
5	Panipat Bhatinda	Nov. 1975	36	Sep.78	34	Sep.79	46 42	10	Turnkey by Toyo execution EIL
6	RCF Trombay V	Jan. 1977	42	Apr.81	51	Jul.82	66	24	DEP by PDIL execut site
7	NFL	Jul. 1967	42	Jul.71	47	Nov.71	52	10	Turnkey Chemic

It would be observed that plants implemented under Turnkey responsibilities have been executed earlier as compared to execution under split responsibilities. In case of joint sector MFL, the plant had been completed under Turnkey responsibility with comparatively less time-overrun. Time-overrun as a corollary also leads to cost over-run.

* Split up execution.

5.2.3 COST-OVERRUN - OVER CAPITALISATION.

Table-17 presents estimated costs and actual costs as available of the selected plants of the identified units. In addition to the time overrun presented in Table-16 there is a significant cost overrun in case of all the plants of the enterprises under study. This adversely affects profitability due to over capitalisation.

Table-17 COST OVERRUN OF THE PLANT OF IDENTIFIED ENTERPRISES.

(Rs. in Lacs)

Company	Estimated cost of Project	Actual cost	Cost overrun	Source of financing
1. FCI.				
1.1 Sindri Modernisation	8,891	18,394	9,503	WB, FFE
1.2 Gorakhpur Expansion	-	1,840	-	FFE, WB.
1.3 Ramagundam	7,118	18,250	11,132	Assorted
1.4 Talcher.	7,049	20,000	12,951	Assorted
2. HFC.				
2.1 Durgapur	-	8,861	-	SC
2.2 Barauni	-	9,232	-	SC
2.3 Namrup Exp.II	-	7,490	-	SC
2.4 Haldia	8,803	42,210	33,407	Assorted.
3. RCF.				
3.1 Trombay-V	-	17,000	NA	FFE,SC.
4. NFL.				
4.1 Nangal Expn.	7,570	-	NA	WB
4.2 Bhatinda	-	18,770		Yen credit
4.3 Panipat	-	18,200		Yen credit
5. MFL.	6,500	7,100	600	FFE.

* Various reports.

* It is unfortunate that figures on estimates and actual costs are not fully available.

All the projects have registered cost overrun but the extent of over capitalisation in case of FCI, Ramagundam and Talcher and HFC Haldia are more than 150% of the cost estimates, which to a significant extent, can be attributable to assorted sources of foreign exchange. These projects had 36-40 licences to operate for imports. Over capitalisation has led to recurring operating losses. Let us look at source of financing imports.

5.2.4 SOURCES OF FINANCING IMPORTS.

Sources of financing imports and conditions applicable for utilising such sources, have impact on cost and time schedule of the project besides the limitations imposed on selection of Technology and choice of equipment. Number of import licences obtained for each project is presented in Table-18 which would reflect the source and frequency of sanctioning foreign exchange as a separate licence is issued for each sanction.

Table-18 NUMBER OF IMPORT LICENCES & SOURCES OF FOREIGN EXCHANGE.

Unit	Project	No.of Licences	Sources of Exchange.
FCI	Sindri Modernisation	10	World Bank Japan W. Germany FFE
	Sindri Rationalisation	29	Assorted credit, FFE
	Gorakhpur	9	Japanese, FFE
	Gorakhpur Exp.	5	World Bank and FFE
	Ramagundam	40	French credit Italian credit W.Germany credit. Indo-Czech.Trade Plan Indo-Swiss credit UK India loan STC-Sukab deal (Tied up credits)
	Talcher	24 +16 for raw materials common with Ramagundam	
HFC	Durgapur	18	Tied up Italian credit UK, W. Germany, FFE, STC-Sukab deal.
	Namrup Exp.II	9	-do-
	Barauni	19	-do-
	Haldia	36	Assorted Tied up credit French, West Germany, Czech, Polish, Dutch, Italian credits, STC-Sukab deal, UK Indian Loan.
NFL	Nangal	3	W.B. & FFE
	Bhatinda	1	Japanese credit
	Panipat	1	
RCF	Trombay V	3	FFE, Italian supplier credit
MFL	MFL	3	FFE.

Note: Obtained from PDIL.

It will be noted from Table that:

(a) Projects (Durgapur, Barauni, Namrup expansion, FACT Cochin) executed under tied up credits took 94-105 against 45 to 65 months taken by other plants for completion (Table-16).

(b) Projects like FCI Sindri Modernisation and Nangal expansion executed under World Bank loan took 36/44 months for completion and commissioning (Table-16). Sindri (SMP) was repeat for NFL Nangal Exp.

(c) Wherever plants were repeated, time taken was less. NFL Panipat was repeat of NFL Bhatinda - time taken is 34 months, against 44 months time taken by NFL Bhatinda (Table-16).

(d) Plant costs for identical capacity was higher for projects executed under tied up credits as compared to projects executed under free foreign exchange, HFC Durgapur compared to MFL, (Table-17).

(e) Plants executed with split up responsibilities took more time for completion than plants under tied up credit. HFC Durgapur wherever compared to MFL (Table-16).

5.2.5 INVESTMENT COST PER TONNE.

Mode of execution and source of financing affect cost and time overruns. This is further concluded by the investment cost per tonne of comparable plants of HFC Durgapur and MFL executed under same period:

HFC Durgapur - Rs. 5819 per MT* of 'N'
MFL - Rs. 4034 per MT* of 'N'

---

* PE Survey 1984-85. Vol. II Sept.'85.

5.2.6 TURNOVER OF PROJECT MANAGER AND SPAN OF PROJECT.

The person incharge of the project should continue with the project so that he feels responsibility of cost and time overruns from the beginning till the project is erected and commissioned. The table presents the status on turnover of project managers, total span of the project, time schedule and source of financing imports.

Table-18 TURNOVER OF PROJECT/GENERAL MANAGER OF PROJECT.*

Unit		Span of project month	Number of PM/GM	Source of finance.
1.	FCI.			
1.1	Sindri Modernisation	60	1	WB
1.2	Gorakhpur Expansion	48	1	WB
1.3	Ramagundam	100	4	FFE, Supplier's Credit.
1.4	Talcher	100	4	-do-
2.	HFC.			
2.1	Durgapur	82	4	Supplier's credit.
2.2	Barauni	94	3	-do-
2.3	Namrup Exp.II	100	2	-do-
2.4	Haldia	100	4	-do-
3.	RCF.			
3.1	Trombay-V	6	1	WB
4.	NFL.			
4.1	Nangal Exp.	6	1	WB
4.2	Bhatinda	42	2	FFE
4.3	Panipat	42	2	FFE
5.	MFL	52	1	FFE

* Collected from various units.

As would be observed FCI and HFC projects had maximum number of changes and their time of completion is also maximum. Nangal expansion and Sindri Modernisation executed under World Bank had a Project Manager all through and they were executed comparatively with reasonable time overrun, MFL had same person as incharge all through. Considering this as a vital factor in project implementation, World Bank while alloting finance impose a condition to receiving company that Project Manager/General Manager designated as incharge of project should not be disturbed during life of the Project. Transfer, promotion or change of the project manager or general manager as revealed by above data is due to the Management style which in turn affect the continuity of management of the project and have repurcussions on the time and cost schedule.

5.2.7 EARC REPORT.

EARC in its report No. 7 of Profitability of Public Enterprises says "We now turn to losses attributable to over capitalisation arising from substantial time and cost overruns. Even after mechanical completion of certain projects there have been prolonged commissioning delays, failing to reach reasonable level of capacity utilisation for years. These problems arise from a variety of reasons, such as deficiencies in project designs; the putting together of plant and equipment from a multiple sources, because of allocation of foreign exchange from different sources, the lack of unified responsibility for project management and a heavy emphasis on the use of indigenous capabilities". * All these has resulted in large delays in the implementation of project, HFC's Haldia, Durgapur and Barauni projects have been plagued by the problems of sources of foreign exchange and mode of execution as examined earlier (Table-16 and 17).

---

* EARC Report No. 7 pg. 72.

But many do not agree to Jha Commission's reference to indigenous capabilities which is a step towards self reliance and was a learning curve, and at the same time it didn't contribute to the cost overrun. Mode of execution, which was a split responsibility within FCI fold at that time, reflects the inefficiency and lack of vision of the Management and Government Control.

EARC Report No. 7 further records "Where the emphasis was essentially on timely completion and quick commissioning and all arrangements and procedures were aimed at the objective, the projects have done very well e.g. the Kalol/Kandla project of IFFCO and Madras Fertilizers". Similarly the special arrangements made in case of Kundermukh Iron Ore Project enabled the management to complete the project within the sanctioned time and cost.

5.2.8 SUM-UP.

The study reveals that the manner in which project is conceived, financed and implemented have a co-relation with:

(a) Cost and time schedules.
(b) Impact on the plant performance.
(c) Operational profitability.

Tie-up credits had positive impact on investment costs and also time and cost over-runs. Split up mode of execution had resulted in more time over-run as compared to plants commissioned under turnkey responsibility. Tie-up credits had limited choice of technology and selection of proven equipment which had impact on plant performance. FCI Ramagundam and Talcher, HFC Durgapur, Barauni and Haldia are victims of tied-up credits which had a major share in contribution to their recurring losses.

5.3 TECHNOLOGY.

5.3.1 In this para, an attempt is made to briefly refer to the technologies adopted for plants of the identified units as it has impact on the economics of Fertilizer production and plant performance. Urea is basically produced by chemical reaction between Ammonia (NH3) and Carbon Dioxide (CO_2) under certain set of conditions.

The reaction is $2NH_3 + CO_2 = Co\langle^{NH_2}_{NH_2} + H_2O$

2 Ammonia + Carbon dioxide = Urea + Water.

These processes are patented and offered by different process licensors (know how consultants) and the most commonly used Urea Process in India and abroad, are:

1. Stamicarbon Bv Geleen, Netherlands.
2. Mitsui-Toatsu Chemicals Inc., Tokyo, Japan.
3. MontedisonSpA, Milano, Italy (Technimont).
4. Snam Progetti SpA, Milano, Italy.
5. Chemico, New York, USA.
6. Vulcan Cincinnati Inc. Ohio, USA.

For the production of Ammonia, the basic input for production of Urea, there are separate Process Licensors (know-how consultants) from various feed stocks viz., Coal, coke, Naphtha, Fuel Oil and Associated and Natural Gas. These feed stocks are processed and their constituents broken-up under catalytic conditions and Nitrogen and Hydrogen are separated to finally give a mixture in the ratio of 1:3. This mixture reacts to form Ammonia in the presence of Ammonia catalyst under certain set of conditions of temperature and pressure. The reaction is:

$2N + 3H_2 = 2NH_3$ (Exothermic)

Nitrogen + Hydrogen Ammonia.

Process Licensors for Ammonia are:

1. Haberbosch Process, West Germany.
2. C.F. Brown Process, U.S.A.
3. Kellog Process, U.S.A.
4. Chemico, U.S.A.
5. Haldor Topsoe Process, Netherland.
6. I.C.I. Process, U.K.
7. Koppers process for coal gasification, West Germany.
8. Uhde.

All these licensors have patended their know how for processing and reforming the feed stock with different type of catalysts under different set of conditions.

The efficient recovery of energy in Ammonia Plants and use of such energy for the process contibutes to the reduction in operating cost of the plant. Complete Ammonia Production Plant is a very complicated one comprising of compressors, heat exchangers, reformers, ammonia converters, etc. and purification units for various gases to finally obtain a pure mix of Nitrogen, Hydrogen in the ratio of 1:3. The process flow sheet for Urea and Ammonia are given at Appendix-XV and XVI with photographs of individual plants.

The gorwth of modern fertilizer industry in India over the last three and a half decades can be traced to 3 or 4 prestigeous technology phases. The first phase starting from Sindri lasted till about 1965 and covered Nangal, Trombay, Namrup, Gorakhpur, Kota, Baroda (GSFC), Coromandal and in a sense Kanpur. They were conceived and built before some of the major breakthrough in the process technology, plant design and engineering of Nitrogenous Fertilizer plants made their full impact. The advancement in the technology all over the world became necessary in view of the rising cost of fertilizer plants (fertilizer plants being capital intensive) and need to reduce the cost of production so that fertilizers can be supplied at a cheaper rate to the farmer to maintain a closer relationship between the crop price and fertilizer price.

Except Sindri, which was based on coal/coke gasification as a source of Nitrogen and Hydrogen all other plants were based on Naphtha which was by then abundantly available.

The SECOND PHASE broadly represents the assimilation of the new technology based on the steam driven centrifugal compressors having higher capacity and in single stream with energy saving scheme. Durgapur and Cochin were the first public sector plant conceived in India on the basis of this technology adopting Tecnimont Process. A series of plants at Barauni, Namrup Expansion-II, Madras Fertilizers, Zuari Agrochemicals, Goa, Mangalore Fertilizers then followed. These plants have a capacity of 600 to 750 TPD Ammonia. As the additions of the sizes became increasingly evident the world over, the plant sizes in India were increased further in the case of Kalol and notably Tuticorin with a capacity in single stream crossing 1000 to 1100 TPD Ammonia.

The THIRD PHASE began with the second generation of plants based on partial oxidation process of petroleum heavy stock and the new coal based plants. These plants adopted high pressure technology using centrifugal compressors in single stream with an Ammonia capacity of 900 TPD and above.

"This development also became necessary because of the scarcity of Naphtha as the feed stock and to develop the coal as raw material for production of fertilizer as a step towards self reliant economy. This venture of direct coal gasification adopted at Ramagundam and Talcher did not turn out to be a big suggess and remained a pioneering venture".[1]

The FOURTH PHASE has its genesis in the discovery of sizeable resources ofnatural and associated gas particularly in the Bombay Offshore structurals.

---

1. EARC Report No. 7 pg. 73.

Thus new plants were based on the natural gas and two twin stream plants were conceived in 1978, one at Thal, District Alibag, Maharashtra with RCF and other at Hazira, Dist. Surat with KRIBHCO. The plants have a capacity of 1350 TPD Ammonia for each stream and correspondingly 2200 Tonnes of Urea for each stream. The total capacity is 2750 Tonnes Ammonia per day and 4400 Tonnes of Urea per day. The efforts in the recent years were directed towards adoption of low energy process to keep the cost of production as low as possible.

The economy of fertilizer production with different feed stocks is presented in nutshell in Table-19 below for a typical 900 TPD Ammonia and 1500 TPD Urea complex operating at 90 per cent capacity utilization.

Table-19 ECONOMICS OF FERTILIZER PRODUCTION USING* DIFFERENT FEED STOCK.

Particulars	Natural gas	Naphtha	Fuel oil	Coal
1. Investment Rs. Crores	413	420	565	730
2. Cost of production of Urea Rs./Tonne.	2627	2714	3045	3040

* Source: FAI Seminar 1984 on Productivity, Cost reduction & Subsidy in Fertilizer Industry.

5.3.2 Technology adopted for plants of identified units is given below.

Plant	Feed stock	TECHNOLOGY AMMONIA			
		Reformer	Purifi-cation	Synthesis	Urea *
1. FCI.					
Sindri	Fuel Oil	Shell	Rectisol	Uhde	Technimon
Gorakh-pur.	Naphtha	-	-	-	-
Ramagun-dam.	Coal	Kopper's gasifi-cation	-	-	Technimon
Talcher	Coal	-	-	-	Technimon
2. HFC.					
Durgapur	Naphtha	Power gas	Vetro-coke	Monte-catini	Technimon
Barauni	Naphtha	-do-	-do-	-do-	-do-
Namrup Exp.II	Gas	-do-	-do-	-do-	-do-
Haldia	Naphtha	-	-	-	-
3. NFL.					
Nangal Exp.	Fuel oil	Shell	Rectisol	Uhde	Montecati
Panipat	Fuel oil	Shell	Rectisol	Topsoe	Mitsui Toatsu
Bhatinda	Fuel oil	-do-	-do-	-do-	-dp-
4. RCF.					
Trombay-V	Gas	Topsoe	Bene-field	Topsoe	Snam-Progetti
5. MFL.	Fuel oil	Topsoe	Cat.Carb.	Chemico	-

* R.K. Bansal and A.K. Karankar - Process TechnologyEngineering Construction of Urea Plants in India - Chemical Age of India Vol. 29, No.12A - 1978.

The vintage of MFL, HFC Durgapur plants is same, therefore, the performance comparison ofthe two plants as detailed below amply shows that the selection of Technology had important bearing on the plant performance and profitability.

Plant.	Year of commiss-ioning.	CAPACITY UTILIZATION 81-82	82-83	83-84	84-85
Durgapur	Oct.1974	42.68	27.45	50.75	
		39.45	25.83	46.97	
MFL	Nov.1971	92.14	82.82	53.67*	

5.3.3 Choice of technology and reliability of critical equipment have a lasting effect on the plant performance and operational profitability.

* Capacity low due to closure of Plant for 5 months.

5.4 CONSUMPTION NORMS - INPUTS AND ENERGY.

5.4.1 Fertilizer production is essentially conversion of the hydrocarbons feed stock into urea through a series of operations. Flow sheet is given at Appendix-XVI & XVII Consumption of inputs and energy required in the process compared to norms are therefor important indices in operational efficiency which determine the extent of profitability.

For any given technology consumption norms for inputs and energy are specified by the process. Consumption norms are checked during guarantee test at the time of the plant commissioning. The norms established at the time of guarantee test runs normally serve as a guide for setting operational target on sustained production basis. Plants which are either continuously run or which run with minimal or no interruptions at 100% capacity utilisation are capable of achieving the consumption norm close to the guarantees, provided quality of feedstock, coal etc. also lie within the range envisaged.

Consumption of various inputs including energy, are basically governed by the process design parameters as well as the technical specification of the equipments. Vintage of the technology has a bearing on the consumption of inputs and the recent advances in the process and catalyst technologies have resulted in achieving better consumption norms. For example, consumption norms on Naphtha (Feed + Fuel) per tonne of ammonia used to be guaranteed by various designers of plants of 70s, vintage was 0.91-1.00 tonnes per tonne of ammonia which for the similar plants of 80s vintage has come down to 0.8-0.85 Tonne per tonne of Ammonia.* Similarly, in case of Ammonia/Tonne of Urea, the consumption has improved from 0.6 to 0.580 for the plants of the vintage of 70s and 80s respectively.*1

---

*1 Development of Fertilisers - FAI New Delhi - 1980.

5.4.2 INPUTS.

As a convention, consumption norms are expressed on per tonne of Ammonia/Urea basis. Increase in the total output has therefore an overall effect of reducing the inputs consumed per tonne of the product. Consumption norms are therefore better at high capacity utilisation levels.

Frequently stopping/starting of the plant due to any reason adversely affects the plant performance with regard to the consumption norms. The economics of the process Technology depend upon consumption norms viz. Naphtha consumption per tonne of Ammonia, Steam consumption per tonne of Ammonia.

HFC Durgapur, Barauni and MFL Madras which are old vintage plants have higher guaranteed Naphtha consumption per tonne of Ammonia.

HFC Durgapur	0.9270 T Naphtha/T. Ammonia.
HFC Barauni	0.9270 T
MFL Madras	*1.0098 T

"While at IFFCO Phulpur due to better Technology the same is 0.856 T. There is thus difference of 9 to 15% in Naphtha consumption due to vintage in technology. Similarly energy consumption per tonne of Ammonia for HFC, Durgapur, Barauni is 10.42 K. Cal. and for MFL 12.10 K. Cal. while at IFFCO the same is 10.25 K.Cal. only."[1]

The Sindri old Plant having a capacity of 270 TPD Ammonia and 1000 Tonnes of Ammonia Sulphate (21% N) conceived in 1945 and commissioned in 1951 with a total working force of about 8000 workers which subsequently increased to 10,000 while the modern plants having 600 to 900 Tonnes capacity are managed by 1500 to 1800 personnel. This difference is a good indicator as to the possible impact of the technology on theprofitability of the unit. The old generation plant at Sindri was scraped and in its place a modern expansion was planned and implemented in 1979 on Naphtha based feed stock, with a capacity of 600 TPD Ammonia corresponding to 3,30,000 MT Urea p.a.

---

* Inter firm comparison of Fertiliser Units - BPE.

Table-20 presents consumption norms and actual consumption of input of various plants of identified units.

Table-20 CONSUMPTION NORMS OF INPUTS OF* IDENTIFIED UNITS - 81-84 -

Plant	Guaranteed norm.	Actuals 81-82	82-83	83-84
FCI-Sindri Mod.				
LSHS/T.Ammonia	0.839	0.839	0.9531	0.9203
Ammonia/T.Urea	0.517	0.6088	0.6309	0.6278
HFC-Durgapur				
Naphtha/T Ammonia	0.927	1.4100	1.2380	1.2700
Ammonia/ T.Urea	0.600	0.6380	0.6200	0.6310
HFC-Barauni				
Naphtha/ T.Ammonia	0.950	1.2240	1.1800	1.3450
Ammonia/ T.Urea	0.600	0.6450	0.6500	0.6940
NFL-Nangal				
Naphtha/ T.Ammonia	0.844	0.8350	0.8680	0.8990
Ammonia/ T.Urea	0.580	0.5980	0.5910	0.5880
NFL Panipat				
Fuel Oil/T.Ammonia	0.850	1.2240	1.1800	1.3450
Ammonia/T.Urea	0.600	0.6200	0.6450	0.6500
MFL-Madras				
Fuel oil/T.Ammonia	1.0098	1.0140	1.0290	1.0000
Ammonia/T.Urea	0.605	0.6130	0.6090	0.6130
IFFCO-Phulpur				
Naphtha/ITe	0.856			
Ammonia/T.Urea	0.576			
FACT(Cochin)				
Naphtha/T.Ammonia	0.927	0.9940	1.0740	1.0980
Ammonia/T.Urea	0.600	0.6170	0.6310	0.6270

*Inter firm comparison of Fertilizer Plants -BPE 1985-Table

In case of HFC (Durgapur) extra consumption of Naphtha per tonne of Urea over specified norms and corresponding increase in cost per tonne Urea for three year 1981-84 are given in Table-21.

Table-21 INCREASE IN COST OF PRODUCTION OF UREA* DUE TO INCREASE IN CONSUMPTION OF NAPHTHA.

	81-82	82-83	83-84
1. Extra consumption of Naphtha per tonne of Urea-MT	0.2593	0.1866	0.1958
2. Increase in cost of production due to extra consumption of Naphtha	Rs.446	321	337

The increase in cost on account of increase in consumption of Naphtha over the guaranteed norms works out to 9.2% for 1981-82, 5.4% for 1982-83 and 7.22% for 1983-84.

* Basic cost of Naphtha taken as Rs. 1723.00 per MT.

5.4.3 ENERGY.

Table-22 present energy consumption performance of selected Ammonia plants of identified units.

Table-22 ENERGY CONSUMPTION 1981- TO 1984 *

Plant	Technology			Guaranteed Norm	Actual consumption Energy/T.NH_3		
	Reformer	Gas purification	Synthesis		81-82	82-83	83-84
FCI(SMP)	Shell	Rectisol	Uhde	12.75	-	18.80	17.47
HFC Durgapur	Power gas	Vetro coke	Motlcatin	10.42	17.260	14.54	15.08
Barauni		Vetro coke	Motlcatin	10.42	13.590	14.69	16.70
NFL							
Panipat	Shell	Rectisol	Uhde	13.53	16.463	16.87	16.93
RCF							
Trombay-V	Topsoe	Benefield	Topsoe	10.14	-	16.06	13.78
MFL Madras for comparison	Topsoe	Cat. Carb.	Chem. Co.	12.10	13.830	13.85	14.10
IFFCO Phulpur	Kellog	Benefield	Kellog	10.258	12.928	12.52	14.03
FACT Cochin	PGC	Vetro	Moti-Catni	10.6	12.498	13.613	12.756

From the above data it will be noticed that consumption of inputs and energy for Ammonia plant is higher than norm in all the plants and varies from plant to plant. The consumption of inputs for Urea Plants is in proximity to norm.

FCI Sindri Modernisation and NFL Nangal plants are comparable, based on same technology and having same feed stock, consumption of inputs and energy are more in case of FCI Sindri Modernisation Plant than for NFL Nangal Plant.

* Inter firm comparison of Fertilizer Plants Table-9 - BPE-1985.

HFC Durgapur and Barauni plants are based on same feed stock and technology and have different actual consumption figure. HFC Durgapur and MFL Madras were set up during same period. The guaranteed energy consumption for Durgapur was 10.4 against actual average consumption of 15.62 for 1981-84. In case of MFL guaranteed energy consumption was 12.1 (higher than Durgapur) but actual average consumption was 13.92 which is lower than Durgapur for these three years 1981-84. This reveals that the efficiency of operating the plant is better in case of MFL as compared to Durgapur.

HFC Durgapur and FACT Cochin plants are set up with same technology during same period. The average energy consumption forDurgapur is 15.62 M K Cal per tonne of Ammonia and for FACT Cochin 12.99 M.K. Cal per tonne of Ammonia. The study reveals that FACT Cochin plant is maintained and operated more efficiently than Durgapur. This can be attributed to location and skill of the operating technicians and managers.

5.4.4 SUM-UP

Consumption of inputs and energy depend upon efficiency of equipment, quality and consistency of raw materials, continuous supply of power and operating efficiency of the plant.

From discussions with various executives it is concluded that the reasons for short fall in operating efficiency and increase in consumption of inputs is mostly attributable to any or all of the following:

a) Power problem - frequent tripping of the plant due to power failure.
b) Equipment problem - frequent breakdown.
c) Design deficiency.
d) Operative problem - Mal operation & neglected operation.
e) Neglected preventive maintenance.
f) Frequent shut down of the plant.

Any of the above factors adversely affect consumption of inputs, as each start up consumes extra input of raw materials and increased losses of utilities, thereby increasing cost of production, reducing profits and profitability of the plant.

Continued operation of plants which show higher consumption of raw materials, energy and utilities is not in the over all interest of the company and should be subjected to energy audit to identify problems areas for revamping or retrofitting.

5.5 POWER LIMITATION.

5.5.1 Frequent power failures trips the equipment and restarting of the equipment and recommissioning the plant consumes extra inputs and energy. Table-23 presents the loss of production of Ammonia and Urea due to power problems.

Table-23 LOSS OF PRODUCTION DUE TO* POWER PROBLEMS - 81-84

Plant.	Ammonia loss MT			Urea Loss MT.		
	81-82	82-83	83-84	81-82	82-83	83-84
FCI SMP	213	4,483	6,955	127	1,329	4,104
HFC-Durgapur	5,040	-	3,830	-	-	-
Barauni	10,585	11,440	- 5,331	-	-	-
NFL Nangal	963	38	950	1,198	1,114	-
Panipat	-	20,184	9,936	-	37,655	15,395
RCF Trombay V	-	-	1,950	-	916	2,025
MFL Madras	-	18,700	-	-	35,150	-

From the data it will be revealed that loss of production in FCI SMP and RCF are minimum. This is due to Sindri having its own power plant and RCF having uninterrupted supply from Tatas. All other plants have suffered heavily from power failure. Power failures have adversely affected capacity utilization as well as increased consumption of inputs (5.4). Considering the nature of plant, need to protect critical equipment from damages during power failures, Government has agreed for installation of captive power plants for various fertilizer plants.

* Inter firm comparison of fertiliser plants BPE-1985.

5.6 EQUIPMENT PROBLEMS.

5.6.1 Equipment problems are faced on account of their poor performance and frequent breakdowns, which results in low capacity utilization and increased consumption of inputs due to recommissioning.(5.4) Equipment problems can be classified under sub group viz. Mechanical, Electrical, Instrument, operational and others. Breaksown analysis of equipment for various plants of identified units is presented in Table-24.

Table-24 BREAKDOWN ANALYSIS OF DIFFERENT PLANTS 81-84*

(As % of loss hrs.)

Sr. No.	Plant.	Ammonia Plant			Urea Plant.		
		A	B	C	A	B	C
1	FCI-Sindri Modern.						
	81-82	41.50	50.51	00.34	68.98	30.67	00.35
	82-83	4.97	88.94	6.09	53.11	43.23	3.66
	83-84	3.05	86.58	10.37	47.73	41.66	10.61
2	HFC Durgapur						
	81-82	-	95.00	00.50	-	-	-
	82-83	-	92.00	7.50	-	-	-
	83-84	9.00	87.00	40.00	-	-	-
3	HFL Barauni						
	81-82	12.40	74.00	9.50	-	-	-
	82-83	-	94.30	-	-	-	-
	83-84	-	62.90	13.30	-	-	-
4	NFL Panipat						
	81-82	12.00	24.00	6.00	-	-	-
	82-83	2.40	61.50	5.80	-	-	-
	83-84	1.80	83.30	2.00	-	-	-
5	NFL Nangal						
	81-82	38.54	46.24	11.17	-	-	-
	82-83	11.54	69.13	13.21	-	-	-
	83-84	47.27	40.88	14.95	-	-	-

* Source: Inter comparison of Fertilizer Plant Table-13 BPE - 1985.

Sr. No.	Plant	Ammonia Plant A	Ammonia Plant B	Ammonia Plant C	Urea Plant A	Urea Plant B	Urea Plant C
6.	RCF Trombay V	-	-				
	81-82	-	-	-	-	-	-
	82-83	10.00	86.00	22.00	4.56	40.00	-
	83-84	3.00	89.00	8.00	9.78	130.00	-
7.	MFL Madras						
	81-82	-	70.00	-	16.00	-	-
	82-83	-	11.00	-	9.00	-	-
	83-84	-	30.00	-	3.00	-	-

A = Operational problem.

B = Mechanical problem.

C = Instrument problem.

From the table it is noticed that major loss of hours is due to breakdown of mechanical equipment and in second rank comes operational efficiency. The data reveals that mechanical equipment failures in case of HFC Durgapur are much higher than MFL Madras, executed at the same time. Operational efficiency of MFL plants is also better than HFC Durgapur. Equipment failures for NFL Nangal and Panipat are also comparatively less. NFL Nangal expansion and FCI-SMP were implemented during same period with same technology and feedstock, but mechanical problem in FCI-SMP are more than NFL Nangal/ expansion. This indicates towards the efficiency of operation of the individual plants and a pointer towards the inefficiency of operating and managerial staff of respective units.

Source: Inter comparison of Fertilizer Plant
Table-13 BPE Sept. 85.

5.6.2 SUM-UP

From the study of breakdown analysis, it is concluded that type of technology, selection of equipment, operational efficiency significantly contribute to equipment performance. And equipment performance directly affect profitability of the identified unit through higher consumption of inputs and utilities and lower capacity utilization.

This brings us back to the mode of implementation of the project, which determines selection of technology and equipment and location. HFC Durgapur and Barauni were financed by supplier's credit. Thereby choice of technology and equipment selection got limited. NFL plant was financed under World Bank loan and MFL under free foreign exchange which could ensure choice of technology and reliable equipment with proven performance. Equipment failure can also be due to inefficient operation and poor maintenance. This has genesis in the type and involvement of the people operating and managing the plant.

5.7 HIGH COST OF FEED STOCK.

5.7.1 Increase in cost of feed stock significantly affect the cost of production. Unless the manufactured item is of monopoly nature having constant demand, it is generally not possible to recover improportionate increase in input costs by adjusting sales price. Fertilizer however has a different status as it is for farmer who does not have paying capacity.

The cost of feed stock for fertilizer had a steep rise after oil crisis in 1973. The cost of Naphtha and Fuel oil for ten years from 1973 to 1983 is given in Table-25.

Table-25 PRICE OF NAPHTHA AND FURNACE OIL*

I-NAPHTHA. (Unit Rs./MT)

Year	Barauni Digboi Haldia	Koyali Bombay Hazira	Madras	Calcutta	Increase
Before 1-9-73	-	253.00	268.00	267.00	+ 60
1-6-74	-	478.05	502.48	501.36	+ 234
1-9-75	-	650.83	612.48	653.58	+ 110
1-1-77	677.36	650.83	612.48	653.58	NIL
8-6-80	1,086.36	1,071.31	1,087.48	1,128.00	+ 475
3-1-81	1,386.36	1,371.31	1,387.48	1,428.58	+ 300
11-7-81	1,738.36	1,723.31	1,739.48	1,780.58	+ 352
18-3-82	-	1,723.00	-	-	NIL
17-3-85	-	1,982.31	-	-	+ 259

Note: The price excludes custom duty and excise duty which was Rs. 6 per tonne for Fertilizer industry. Excise has been withdrawn.

* Fertilizer statistics 1985-86, FAI Table-2 - 170

II-FURNACE OIL.* (Unit Rs./KL.)

Period	Barauni Digboi Haldia	Koyali Bombay Hazira	Madras	Calcutta	Increase or decrease in price.
11-6-73	-	248.71	263.42	262.44	15.93
2-3-74	-	604.12	618.84	617.87	355.41
18-9-74	-	654.12	668.84	667.87	50.00
1-3-75	-	683.07	697.79	696.82	28.95
14-7-75	-	763.68	779.79	801.13	80.00
1-3-78	902.81	889.06	903.78	927.12	125.38
17-8-79	842.81	829.06	843.78	867.12	- 60.00
3-1-81	1,082.81	1,039.06	1,053.78	1,077.12	+ 210.00
11-7-81	1,077.81	1,064.00	1,078.78	1,102.12	25.00
18-3-83	1,287.81	1,274.06	1,288.78	1,312.12	210.00
1-9-83	-	1,148.06	-	-	- 126.00
17-3-85	-	1,320.06	-	-	172.00

Note: Excise duty on furnace oil was Rs. 113.00 per Tonne. For other than feed stock for fertilizer industry it is Rs. 63.46/KL.

* Fertilizer statistics 1985-86, FAI Table-2 - 170

The price of feed stock is statutory controlled by the Government, and sale price of Fertilizer is also controlled by the Government keeping in view national objectives. To compensate the producer or in other words to give relief to the farmer, Government operates a formula of retention price and gives subsidy to the units. The average FICC prices vis-a-vis cost of production is given in Table-26.

Table-26 AVERAGE FICC PRICES VIS-A-VIS COST OF* PRODUCTION OF SAMPLE PLANTS.

Unit		Cost of production Rs/Ton	FICC prices* Rs/Ton	Difference Rs/Ton	Capacity/ Utilization Actual %	Break* even%
FCI Sindri	81-82	2,973	3,030	117	72.4	51.00
	82-83	3,093	3,103	10	77.0	51.00
	83-84	3,356	3,236	(-)100	78.0	51.00
HFC Durga-pur	81-82	4,824	2,440	(-)2384	39.45	78.00
	82-83	5,879	2,919	(-)2960	25.85	77.00
	83-84	4,668	3,052	(-)1615.65	46.97	77.00
NFL Pani-pat	81-82	2,279	3,150	871	48.97	54.30
	82-83	2,745	3,425	677	70.63	54.30
	83-84	2,921	3,358	437	67.65	54.30
RCF Trombay	81-82					
	82-83	3,477	3,610	133	56.4	41.60
	83-84	2,920	3,615	695	92.5	41.60
MFL	81-82	2,182	2,120	(-) 63	92.0	83.00
	82-83	2,219	2,456	(+) 237	82.82	82.00
	83-84	2,453	2,513	(+) 78	53.67	82.00

* FICC Norms.

5.7.2 SUM-UP.

Higher cost of feed stock will increase cost of production and affect profitability. The impact of higher cost of inputs will be significant if the capacity utilization is not maintained at optimum level i.e. 90% and plants are not operated efficiently within guaranteed consumption norms(Table-21).

In case of FCI and HFC cost of feed stock has contributed to losses, as capacity utilization is low and operational efficiency measured in terms of guaranteed consumption is poor which has resulted in extra consumption of feed stock per tonne of Urea and higher cost of production.

5.8 CAPACITY UTILIZATION.

5.8.1 The cash flow analysis of the fertilizer projects is undertaken on the assumption of 330 days of working of the plants in a year. Balance 35 days has been earmarked for plant maintenance and overhauling. Thus unless the plant operates for 330 days in a year, it is difficult for any unit to show adequate projected profits.

Capacity utilisation performance of various identified plants is presented in Table-27 with capacity utilization of MFL and GSFC for comparison.

Table-27 CAPACITY UTILIZATION OF UREA PLANTS* OF IDENTIFIED UNITS FOR 1980-85 -

No.	Plant	Capacity utilization (in percent)				
		80-81	81-82	82-83	83-84	84-85
1	FCI/Gorakhpur	46.00	56.00	57.00	62.12	63.00
	Sindri Mod.	12.00	72.40	77.00	78.00	82.00
	Ramagundam	11.50	26.00	33.00	46.00	41.00
	Talcher	11.00	20.00	9.00	46.00	24.00
2	HFC Durgapur	-	39.45	25.83	46.97	-
	Barauni	-	48.84	49.94	38.71	-
	Namrup	9.4	55.00	51.00	47.00	38.00
3	NFL Nangal Ex.	47.00	80.90	78.70	58.33	90.00
	Panipat	29.00	70.40	69.00	66.78	67.00
	Bhatinda	42.40	57.00	66.00	61.00	61.00
4	RCF Trombay V	-	19.33 (trial)	56.00	92.00	82.00
5	MFL Madras	71.00	92.14	82.82	53.67*	87.50
6	GSFC Baroda	71.00	88.00	69.00	90.00	87.00

* Appendix-III

The average capacity utilization of each company for five years is presented in Table-28

Table-28 CAPACITY UTILIZATION OF FIVE YEARS (1980-85) OF IDENTIFIED UNITS*

Unit	CAPACITY UTILIZATION % - 1980-85					Average of five years
	80-81	81-82	82-83	83-84	84-85	
FCI	15.0	39.0	33.0	17.5	40.5	29.0
HFC	20.0	48.0	33.0	43.0	37.0	36.0
NFL	41.0	68.0	70.0	69.5	70.0	64.0
RCF	-	19.3 (trial)	56.0	92.0	82.0	77.0**
MFL	71.0	92.0	83.0	54.0***	87.5	77.4
GSFC	71.0	88.0	69.0	90.0	86.5	81.0

Note:
* Figures are rounded off for comparison purposes.
** Average for 3 years 1982-85, as actual production started from 1982.
*** Plant was shut down for 5 months for water and power shortage.

* Appendix-III

5.8.2 On perusal of the above Table-27 for capacity utilization following observations are pertinent:

a) The capacity utilization of public sector undertaking is very low and is even below the break even point.

b) The average capacity utilization of the public sector FCI, HFC in Eastern Region is very low 29% and 36% respectively.

c) The capacity utilization of the public sectors RCF, NFL units in Western and Northern region and MFL unit in Southern region is 64%, 77% and 77.4% respectively.

d) The capacity utilization of joint sector GSFC in Western Sector is high - 81%.

e) Capacity utilization of GSFC and MFL plant is consistent.

f) The capacity utilization of plants in Eastern region is lower than that in Western, Northern and Southern region.

In all the above plants, feed stock is Naphtha or fuel oil except in case of:

a) Ramagundam and Talcher of FCI where feed stock is coal and
b) In case of Namrup of HFC where feed stock is natural gas.

All are single stream plants. Thus capacity utilization is a very good and reliable physical norm for evaluation of the performance of the identified unit and their profitability. Comparison of profitability and capacity utilization of identified unit with MFL and GSFC for comparison is presented in Table-29.

Table-29 COMPARISON OF PROFITABILITY AND* CAPACITY UTILIZATION - 1980-85

	80-81		81-82		82-83		83-84		84-85	
	A	B	A	B	A	B	A	B	A	B
Company										
FCI	15	L	39	L	33	L	17.5	L	40.5	L
HFC	20	L	48	L	33	L	43.0	-	37.0	L
NFL	41	L	68	10.33	70	6.4	69.0	5.37	70.0	11.27
RCF Trombay-V	-	-	19 trial	-	56	-	92.0	-	82.0	5.34
MFL	71	88	92	6.7	83	12.36	54.0	9.17	97.5	7.99
GSFC	71	7.7	88	12.57	69	14.41	90.0	7.7	86.5	11.86

A - Capacity utilization.

B - Profitability.

L - Loss.

Note: 1. Capacity utilization of RCF is for Trombay-V.

2. Profitability figure of RCF and GSFC does not fully correspond to fertilizer as it manufacture and sells number of other industrial products.

* Computed from financial data. Appendix-IV

On corelation of the profits of the identified enterprises with the capacity utilization, it is derived that enterprises working below 50% utilization are incurring perennial losses. NFL was working at an average 39 percent of capacity in 1980-81 and incurred a loss of Rs. 923 Lacs (Gross) while it had capacity utilization of 68% in 1981-82 and it showed net profit of Rs. 5,975 Lacs which profit declined to Rs. 3,429 Lacs in 1982-83 as capacity utilization had fallen to 62.66 percent. From this analysis it is evident that capacity utilization has a direct bearing on profits and profitability.

This is further collaborated by the analysis of cost of production per MT vis-a-vis capacity utilization as presented in Table-30.

Table-30 COST OF PRODUCTION PER MT VIS-A-VIS* CAPACITY UTILIZATION OF SAMPLE SELECTED PLANTS -

(Unit-Rs./MT)

	80-81		81-82		82-83		83-84		84-85	
	A	B	A	B	A	B	A	B	A	B
FCI Sindri Modn.	4823	43.68	2973	42.4	3093	77	3356	78		
HFC Durgapur	-	-	4823.93	42.68	5879.48	27.45	4668	50.74		
Barauni	-	-	3426.25	43.00	3788.77	49.90	5450.60	38.00		
NFL										
Nangal Exp.	-	-	2368.86	80.00	2594.98	78.70	2597.00	88.33		
Panipat	-	-	2297.24	48.97	2745.26	70.63	2921.44	67.65		
RCF Trombay-V	-	-	-	-	3477.00	56.40	2920.00	92.50		
MFL	-	-	2183.00	92.00	2219.00	82.82	2435.00	53.67		

A Cost of production Rs. per MT of fertilizer Urea.

B Achieved capacity utilization %.

* Inter comparison of Fertiliser Plants - Table-16-BPE 1985.

It would be revealed that cost of production per MT has direct relation to capacity utilization. When capacity utilization is low, cost of production is high and vice-versa. Plants operate on higher capacity utilization will have higher profitability. Mathematically it can be expressed as:

$$P \quad f(cu) \quad \frac{1}{f(cp)}$$

Where P = Profitability
CU = Capacity utilization
CP = Cost of production

Let us analyse the factors that affect capacity utilization.

5.8.3 FACTORS AFFECTING CAPACITY UTILIZATION.

Likely factors which can affect capacity utilization individually and collectively are tabulated in the form of following chart.

	quantity & quality of feed stock	
Labour unrest (Industrial relations) Union activities		Interuption in power supply
Lack of Involvement & team spirit		Source of Financing Imports.
Location		Frequent Breakdown and Equipment problems
	Capacity utilization	
Technology		Operation problems
		Down time in maintenance.
Lack of Planning and decision		
Lack of timely assistance from Government		Stockout of replacement parts.
	inefficient management.	

Availability of proper quantity and quality of feedstock and regular uninterrupted power supply are essentially through another public enterprises. All other factors including breakdown and operational problem which may have a root in the selection of equipment at project implementation stage but are controllable by Chief Executive and have direct bearing on policies, planning techniques and efficiency of the management. Thus capacity utilization in this context is primary factor responsible for profitability and other factors are secondary and tertiary which are important to Primary.

5.8.4 These factors can be broadly grouped under technical and operational, managerial and behaviourial and Governmental. Some of the technical and operational aspects have been discussed in Section 5.2 to 5.5 of the study. Managerial behaviourial and Governmental aspects shall be discussed in Chapter-6 and 7. However, the views expressed by a senior manager of FCI Sindri would be of interest and narrated below:

"Whenever any Government assistance is sought from the controlling Ministry it does not come forthwith expeditiously and any proposal goes through same channel of red tapism viz. officer of controlling ministry writes to its counterpart in the other ministry who processes and after approvals writes back to the department or undertaking concerned. This consumes lot of time and finally real purpose is not achieved." Specially in case of emergency breakdowns and unscheduled maintenance. The assistance sought may be the approval of the proposal for release of foreign exchange for import of essential spares to carry out maintenance and recommissioning of the plant or grant of import licence for import of the equipment and spares or clearance of imported spares at port from Customs or supply of Naphtha from a sistern concern IOC or restoration of continuous supply of power from the local electricity boards.

Since all these vital factors/inputs are controlled by the Government and public enterprises, the Government, as owner, should intervene on priority to assist the Chief Executive to solve his problems whenever assistance is sought. The private sector can manage many of these limitations in their own way but the public sector cannot manage.

5.8.5 SUM-UP.

Considering the various phases of technology and the technological advances and limitation of the existing equipment in achieving optimum capacity utilization, there is a need to revamp and rehabilitate the old generation plants. "End to End survey" and "Energy Audit" are done to assess and decide upon the modifications, replacements and addition of the equipment that would be necessary to improve upon process conditions and equipment performance and eliminate wastages and excess consumption of utilities. Government had appointed committee to study problems of few individual plants viz.; In case of FCI Durgapur, committee was appointed (1974) to make 'End to End Survey' for suggestions, modifications to improve performance; Kulkarni Committee was appointed in 1979 to study the constraints in Gorakhpur in achieving higher production. Paul Pothen Committee was (1985) appointed to submit report on performance and proposal for revamping of plants of FCI and HFC Haldia. These reports are neither implemented quickly nor made public. Public Sector is public and these reports should be processed at working level on priority for viable and dedicated implementation, rather than processed at leisure.

There is a strong case for instituting 'task force' at plant level to continuously carryout 'energy audit' and equipment assessment to identify weaknesses and wastages and implement measures to improve operational efficiency and capacity utilisation. The revamping and retrofit techniques may involve (a) adding supplementary equipment/replacing old equipment (b) modifying and improving the process, (c) use of improved and new generation of catalyst (d) recovery of low level energy and (e) optimum manpower utilization.

5.9 INVENTORY MANAGEMENT.

5.9.1 INVENTORY.

In financial parlance, inventory is defined[1] as the sum of the values, of raw materials, fuels, and lubricants, spares-parts, maintenance consumables, semi-processed materials and finished goods stock at any given point of time. The operational definition would be, the amount of raw-materials, fuel and lubricants, spare-parts and semi-processed materials to be stocked for the smooth running of the plant.

Inventories are maintained basically for the operational smoothness which they can affect by uncoupling successive stages of production, whereas the monetary value of inventory serves as a guide to indicate the size of investment made to achieve the Operational convenience. The financial or material management guidelines should provide this operational convenience with a minimum possible investment in inventories. This can be achieved by exercising selevtive inventory control and application of inventory control techniques.

Inventory control has been attracting the attention of managers in India for a long time. With the credit squeeze measures adopted by Reserve Bank of India, from time to time and the consideration of 'Tandon Committee'* recommendation for inventories, top management got deeply concerned with developing suitable norms for inventory control. However, since 'Credit Squeeze' remotely affects Public Sector, inspite of various norms announced by Bureau of Public Enterprise the inventory levels in Public Sector goes on increasing. This has precisely happened with Fertilizer sector too. The inventory levels of identified units are presented in table below.

---

1 Materials Management, an integrated approach by P. Gopal Krishnan and M. Sundaresan - page - 199

* Tandon Committee recommendation 1975.

Total inventory comprises of raw materials, spares, stores finished goods stock. The inventory of identified units alongwith MFL & GSFC for comparison purposes for the period 1980 to 1985 is presented in the table below:

Table-31 TOTAL INVENTORIES. - 1980-85

(Rs. in Lacs)

Year	FCI	HFC	NFL	RCF	MFL	GSFC
1980-81	8,707	6,326	5,816	5,346	3,688	4,550
1981-82	12,886	10,048	8,182	8,632	5,939	4,667
1982-83	14,012	9,702	13,625	11,424	6,604	4,493
1983-84	11,653	8,720	10,647	8,900	5,181	4,143
1984-85	14,855	11,138	12,343	15,266	5,778	4,839

Out of the total inventories as given in Table-31 inventory of raw materials, spares and stores which has direct consumption relations with the production and sales is presented in Table-32.

Table-32 INVENTORY OF SPARES AND STORES (CONSUMABLE)*

(in Rs. Lacs)

	1980-81	1981-82	1982-83	1983-84	1984-85
FCI	7153	7989	8103	8087	8737
HFC	4941	5031	6195	6791	7543
NFL	4721	6690	7301	8003	8594
RCF	2964	4191	4700	5202	7913
MFL	2210	2655	1989	3033	3297
GSFC	2992	3189	3255	3473	3859

* Annual reports - Appendix-VI.

The increase in inventory of spares and stores from year to year with 1980-81 as base year is given below.

Table-33 PERCENTAGE INCREASE IN INVENTORY OVER 1980-81*

(in percent)

	1980-81	81-82	82-83	83-84	84-85
FCI	Base	11.68	13.28	13.05	22.14
HFC		18.20	35.33	39.44	52.66
NFL		41.70	54.64	69.51	82.03
RCF		41.30	58.50	75.50	166.00**
MFL		20.13	-10.00	39.20	49.18
GSFC		6.58	8.70	16.10	28.97

In absolute terms the inventory levels as seen from Tables 31 and 32 are very high and also showing an increasing trend. The inventory for the year 1982-83 for FCI was about 140 crores while that of HFC 97 crores, NFL 136 crores, RCF 114 crores. For a total production of about 320 crores in 1982-83 for FCI, the level of inventory of 140 crores by any measures is very high and this is one of the reasons of FCI being chronic loser. FCI and HFC are always showing losses while NFL and RCF did show some profit. But this profit could have been much higher, had there been efficient inventory management as the capital blocked in inventories could have been liberated by use in alternative investment, or repayment of loan and thereby reduce the interest burden and increase surpluses. In addition, inventory carries, carrying costs.

* Computed in Appendix-VI.

** Because of Trombay V & Thal surplus.

5.9.2 INVENTORY CARRYING COSTS.

To keep and maintain inventory, lot of costs, are involved called inventory carrying costs (ICC) which comprises of:[1]

1. Interest on capital.
2. Insurance and tax charges.
3. Storage costs - any labour, including handling of receipts of new orders - the costs of provisions of storage area and facilities like bins, racks etc.
4. Allowance for deterioration or spoilage.
5. Salaries of stores staff.
6. Obsolescence.
7. Depreciation.
8. Deterioration.

The ICC varies from 23-30 percent in Indian industry. In fertiliser industry it is 25%. A major portion of this is accounted for the interest on capital.

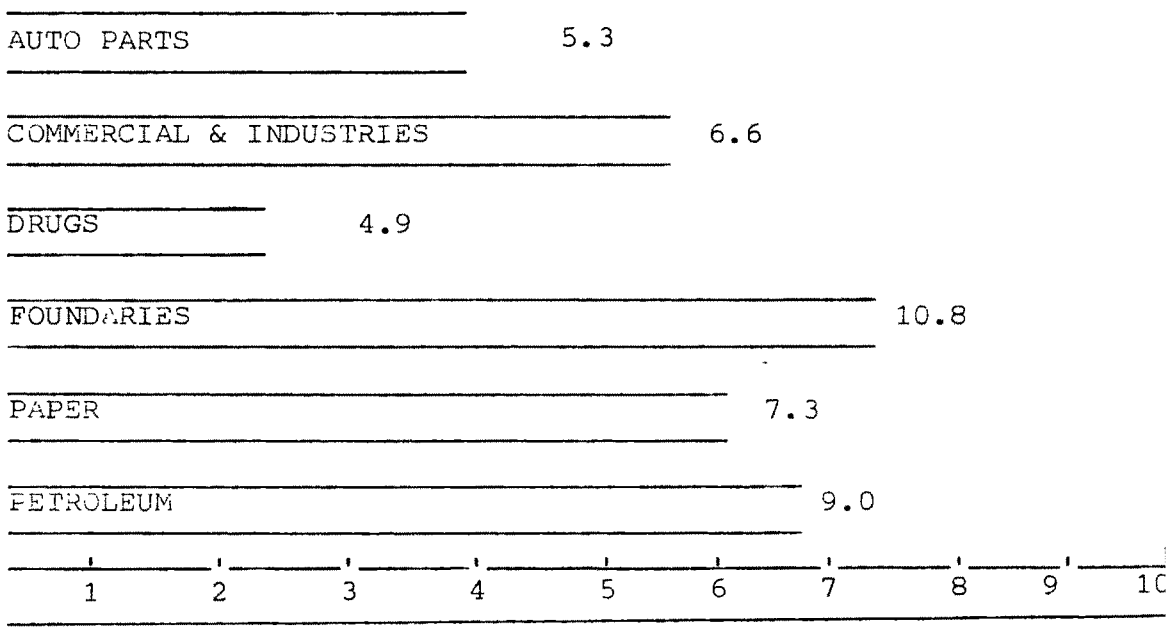
Thus inventory management is a power tool to manage working capital, reduce losses and increase profitability. Ratio technique is used to analyse efficiency of inventory management. ITR is one of the yard stick."

---

1 Materials Management - an integrated approach P. Gopal Krishnan & M. Sundarshan - Pg. 202.

5.9.3 INVENTORY TURNOVER RATIO.

The inventory turnover is calculated by dividing sales by closing inventory. This measures the extent of generating rupees of sales per rupee of inventory. Generally, a high inventory turnover is indicative of good inventory management. A low inventory turnover implies excessive inventory levels than warranted by production and sales activities, or a slow moving or obsolete inventory. A high level of sluggish inventory amounts to blocking of unnecessary funds, impairment of profit and increased costs. A relatively high inventory turnover should be carefully analysed. A too high inventory turnover may be the result of a very low level of inventory which results in frequent stock-outs. The turnover will also be high in the firm replenishes its inventory in too many small lot sizes. The situation of frequent stock-outs and too many small inventory replacements are costly for the firm. Thus, too high and too low inventory turnover ratios should be investigated further. The computation of inventory turnover for individual components of inventory may help to detect the imbalanced investments in the various inventory components. Industry having imported machinery and based on imported raw materials would comparatively have large inventory as lead time for for procurement is high. Inventory turnover of key industry drawn from Dum and Bradstreet comparative ratio 1957-1961* is given hereunder.



* Purchasing Man and his Job Victor-H Pooler Jr. -pg. 153

Fertilizer industry comes under chemical group Norm of inventory turn over as given in Table Bradstreets ratio is 6.6[1]. Some authors[2] consider 6 times to 8 times inventory turnover as the reasonable norm for the profitable industries. The table presents the sales to inventories ratio of the identified enterprises and of MFL & GSFC for comparison.

Table-34 SALES TO INVENTORY RATIO* (IN TIMES)

	80-81	81-82	82-83	83-84	84-85	Average for 5 yr.
FCI	1.12	1.41	1.82	2.86	2.26	1.894
HFC	2.26	1.33	1.40	2.06	1.91	1.792
NFL	2.69	4.19	2.30	3.96	3.10	3.248
RCF	4.14	2.89	2.25	4.59	2.92	3.368
MFL	4.24	2.69	2.85	3.37	2.66	3.162
GSFC	2.55	3.45	4.01	4.10	4.64	3.75

The sales to inventory ratio as worked out in table above is much below the norm generally acceptable and advocated for a profit oriented unit to ensure adequate generation of resources. It is also seen that enterprises which register a ratio of 2.5 or less are losing units and those working on a higher ratio manages some profits. Here too efforts have to be oriented towards increasing sales by increasing the production and reducing the inventory of raw materials, spares and stores and finished goods to optimise profits.

---

1 Purchasing man and his job 1 Victor M Pooler pg. 153.

2 Mohcin, M., Financial Planning & Control, Op.Cit.pg. 174 & Weston, J. Ered & Bringham, F.Engens, Managerial Finance Op. Cit, Pg. 66

* Computed from financial data Appendix IV.

5.9.4 INVENTORY TO CAPITAL EMPLOYED RATIO.

Inventory as a percentage of capital employed is a second measure of efficient inventory management which is frequently employed by finance executives.

Table-35 INVENTORY CAPITAL EMPLOYED RATIO--1980-85

(in percent)

	1980-81	1981-82	1982-83	1983-84	1984-85
FCI	14.60	21.30	24.30	24.55	36.57
HFC	40.40	86.57	13.30	-	-
NFL	11.12	14.60	25.72	24.27	28.02
RCF	36.70	49.30	38.79	32.22	19.85
MFL	47.80	86.00	114.00	89.66	114.00
GSFC	-	34.49	31.51	25.39	26.78

As would be observed inventory to capital employed ratio ranges from 11-114%, low ratio below 20% is due to meagre production and high ratio is due to large stocks of finished goods. The operable ratio in Indian context would be between 25-40%. Lower the ratio better would be profit potential.

Interest rates for cash credits were 11% till 1972-73. Thereafter it raised to 19.5% in 1982-83 and now fixed at 18%. Thus money is costly. If it is tied up in inventory it would automatically affect profits.

5.9.5 PROFIT ENHANCEMENT POTENTIAL.

If inventory level of raw materials, spares and stores and finished goods Table-31 in the identified enterprises could have been reduced by 20%, the Profit Enhancement Potential for 1980-85 would have been as under, taking 25% as average inventory carrying cost for fertilizer industry.

PEP = Inventory x IOC x Proposed reduction.[1]

Table-36A PROFIT ENHANCEMENT POTENTIAL*

(in Rs. Lacs)

	1980-81	1981-82	1982-83	1983-84	1984-85
FCI	435	644	700	582	742
HFC	316	502	485	436	557
NFL	291	409	681	532	617
RCF	267	431	571	490	713
MFL	184	292	330	257	289

If finished goods are excluded and profit PEP enhance potential is computed on the basis of reduction in inventory of raw materials, spares and stores (Table-32) the position is as under.

Table-36B PROFIT ENHANCEMENT POTENTIAL

(in Rs. Lacs)

	1980-81	1981-82	1982-83	1983-84	1984-85
FCI	357	399	405	404	437
HFC	247	251	309	339	377
NFL	256	335	365	400	429
RCF	148	209	235	260	395
MFL	110	133	99	151	164

In actual operations, the inventory level of raw materials stores could be reduced considerably increasing profit potentiality.

* Computed from Table-31 for total inventory.

1 Materials Management, Deans Ammer Mcgraw Hill Pub.

5.9.6 ECONOMY IN MATERIAL COSTS AND PROFITABILITY.

Increase in profitability, can also be effected by increasing sales, but reduction in materials cost will multiply profit. (The result of the efforts in reducing material cost by 5% is the same as the marketing efforts of increasing sales by 30% where profit margin is 10%). Dean Ammer, Materials Management expert had opined that the efforts for saving a rupee in material cost is almost equal to the efforts made for additional sale of Rs. 10.[1]

Materials form an important part of the current assets in any organisation. In Fertilizer Industry materials account for nearly 45% of the total expenditure. Thus, the importance of the materials management lies in the fact that any significant contribution made in reducing materials cost will go on a long way in improving the profitability and the rate of return on the investment.

The return on investment (ROI) depends to a great deal on the manner of utilisation of materials. The return is represented below:

$$ROI = \frac{PROFITS}{SALES} \times \frac{SALES}{FIXED\ ASSETS + CURRENT\ ASSETS}$$

Fixed assets constitute capital already spent and only scope for improving the profits lies in the efficient management of materials which constitute the bulk of the current assets and in other words cost of production.

Total material costs will constitute purchase cost of materials including ordering cost and inventory carrying cost which is about 25% of purchase cost. Any saving in material costs will in turn also reduce burden on ICC. Thus inventory management, flow of materials right from indenting stage to receipt and its issues play an important and direct role in attaining and improving the profitability of the operation.

---

1 Dean S. Ammer : Materials Management. Mcgraw Hill Pub.

5.9.7 REASONS ATTRIBUTABLE TO HIGH INVENTORY.

A probe into the higher inventory by way of discussions with the executive of identified units revealed that the inventory has continuously increased due to various reasons including but not limited to (a) Lack of financial control, (b)Diffused authority (c) Inefficient management (d) Improper guidelines (e) non-fixing of responsibility (f) usual lack of decision for disposal. (g) Huge surpluses left over/completion of the project. (h) Shortfall in targeted production.

One of the causes of high inventory in the identified enterprises is the leftover surplus stores after commissioning of the project. During project stage, lot of surplus pipes, fittings valves, commissioning and maintenance spares are ordered as a safeguard against shortage. This finally results in a very high inventory for the plant immediately after completion of the project. In case of Thal-Vaishat project completed in 1985, value of such inventory amounts to Rs. 400 Lakhs.* This is true for other fertilizer projects which carry high inventories of surplus immediately after commissioning of the plants. This inventory is carried forward from year to year. In spite of best efforts by the unit, these surplus items are not used by other projects. Thus major portion of these surpluses becomes a dead surplus in course of time and increase inventory carrying costs.

During operation of the plant production manager/ maintenance engineer manages to keep maximum inventory to avoid remotest possibility of shutdown of the plant due to stock out (nonavailability of raw materials and item of spare). Shut down of the plant is questionable and looked upon very seriously by the Government and all. In that process many items are added to inventory from year to year. Many times certain items are ordered for attending to maintenance jobs on adhoc basis in large quantities, but actually not used either because of delay in receipt or resorting to alternative arrangements or not actually required when machine is opened.

---

* Completion Report.

In the public sector it is not easy to dispose off even the dead surplus what has not been used for years. Many surplus items have neither specific utility nor demand and its sale value would be much less than the purchase cost. As per public sector norms and practices applicable to identified enterprises as a first step for sale, a committee has to declare the surplus as unusable and then book value is determined. Sales below book value are questionable hence not restored to. Chief Executive has limited powers to approve such sales. Approval of board of director is necessary. Thus procedure is time consuming, cumbersome and elaborate and is generally avoided. The managers, therefore, feel convinient to carry over inventory rather than initiate action for disposal which may bring to light many issues.

5.9.8 INVENTORY MANAGEMENT A TOOL.

From the above study it is established that materials Planning & Financial Control in managing proper inventory has vital role in enhancing profit potentiality of the enterprise. To make material management effective it is necessary that each plant should have integrated material management approach with proper financial consciousness and control and blessings of the top management and clear responsibility and authority. The concept of management by MBO[1] equally applies to this function.

High inventory is cancerous to industry, reflects poor material planning and financial control. It is therefore necessary to keep inventory at optimum level by having adequate financial and managerial control over indenting and procurement. Further instead of holding and carryover unusable and dead surplus from year to year, an easy procedure for its disposal should be considered and implemented to release the blocked finance. The report of the committee on public undertakings also mentions need for proper inventory control and necessity to adopt the scientific practice and techniques that have been developed in this regard.[2]

---

1 Reddin N.J. Effective Management by objectives - Mcgrawhill - Pg. 120.

2 Fortieth report on materials management on public undertakings Committee on public undertakings, Loksabha Secretariate Pg.1.

Available techniques include ABC analysis, VED analysis, Codification and standardisation, value analysis and engineering and adhering to five 'R' in practice for purchasing right quality of right quantity from right vendor in right time, at right price. Economics of purchase, make or buy analysis, ordering of economic order quantity (EOC) are additional techniques to minimise cost of purchasing and inventory carrying costs.

Alongwith applying modern techniques to maintain optimum inventory, a simplified procedure to dispose of surpluses periodically should be instituted. The analysis should be reviewed and updated from time to time to optimise results and develop future strategies.

A system of common spares and consumable especially for 'A' items for plants should be considered and implemented to reduce overall inventory of identified enterprises. Catalyst charge is one such item which is costly and required to be changed as per planned schedule and sometimes under emergency if efficiency of conversion is reduced due to maloperation or otherwise.

As a prelude to application of the techniques, institutions of system of procedures, proper material planning and budgeting, specifying norms of inventory level, periodical review of inventory, purchases and their utilisation is very necessary. Proper system and procedures and their compliance repeat compliance will lead to greater over all efficiency and higher profitability.

5.10 EMPLOYMENT, EMPLOYMENT-MIX AND EMOLUMENTS.

Man is an important factor of production alongwith materials, money and machines. Man-power costs constitutes about 7-9% of cost of production.* Efficient management of manpower would result in higher productivity and higher profitability. There is no norm for manpower efficiency as consumption norms for raw materials and inventory norms for spares and stores. Nevertheless concept like profitability per employee or sales per employee can be used to determine the impact of pattern of employment, emoluments on profitability.

5.10.1 PROFITABILITY PER EMPLOYEE.

Pattern of employment, qualification of the officers and workers, employment mix, nature of employees, emoluments and personnel policies persued, have direct bearing on the profitable operation of the industrial units. Profitability in terms of employment can be expressed in absolute terms of gross profit per employee. Table-37 presents gross profit per employee for the identified units with MFL for comparison purposes for the period 1980-85.

Table-37 GROSS PROFIT PER EMPLOYEE (1980-85)*

(Rs. in Lacs)

	1980-81	81-82	82-83	83-84	84-85	Average of 5 yr.
FCI	-0.460	-0.474	-0.164	-0.30	-0.05	L
HFC	-0.265	0.235	-0.361	-0.39	-0.39	L
NFL	-0.096	1.560	1.022	+0.69	1.20	1.11**
RCF	0.641	0.716	0.839	1.43	1.29	0.98
MFL	2.069	0.950	1.450	1.38	1.18	1.40

* Appendix-VII.

** Average of 4 years only.

From the above data it is revealed that the gross profit per employee (Profitability per employee) varies from year to year, even for profit making units under review. The highest profit per employee is Rs. 2.069 Lacs for MFL. There is no norm available for comparing profitability per employee. Therefore in the present study average profitability of five years of MFL which has shown profits consistently is taken as norm. Average profitability per employee works out to Rs. 1.4 Lacs. As compared to this RCF's average is 0.98 only and NFL's average is 1.11 (For four years only which showed profits) FCI & HFC have shown losses.

Thus there is either over employment or high manpower cost or high cost of production or less production and productivity which results in low profitability per employee as sales price is fixed.

5.10.2 AVERAGE EMOLUMENTS.

Table-38 presents the average employment, average emoluments for the 5 years (1980-85) for the identified enterprises.

Table-38 AVERAGE EMOLUMENTS FOR 1980-85.*

(Rs. in Lacs)

	Average Employment Number	Average Emolument Rs. Lacs.	Average Emoluments/ Employee Rs.	
FCI	13,667	2,669	19,530	
HFC	9,794	1,865	19,040	
NFL	5,701	1,157	20,110	
RCF	4,450	1,130	25,370	
MFL	1,243	490	39,420	For Comparison
GSFC	3,490	971.4	41,880	

From the data it is revealed that the total emoluments of FCI & HFC (Loss making companies) are higher, but average annual emoluments per employee are lower than other enterprises which are making profits. FCI has the highest employment of 13,667 employees. This may be due to higher employment in Sindri which was based on coal and gypsum process involving handling of solid raw materials while all

* Appendix-VII.

other plants are based on Naphtha /Fuel oil/gas except Ramagundam and Talcher which are based on gasification of coal. Average emoluments of MFL which had shown consistent profits is higher than other erstwhile FCI companies i.e. FCI, HFC, NFL, RCF. It could thus be concluded that in FCI and HFC, the proportion of lower category of employees is more than the higher skilled and qualified supervisory and managerial category.

5.10.3 SALE PER EMPLOYEE.

Extent of employment and productivity of an employee is further analysed by comparing the unit sale per employee for the 5 years 1980 to 1985.

Table-39 SALES PER EMPLOYEE.*

(Rs. in Lacs)

	1980-81	81-82	82-83	83-84	84-85
FCI	0.698	1.30	1.84	2.54	2.48
HFC	1.12	1.38	1.347	1.79	2.19
NFL	2.677	5.84	5.40	6.79	7.80
RCF	5.75	5.95	5.72	8.74	8.82
MFL	13.83	13.37	13.70	13.33	15.71

From the above data, it will be seen that MFL has highest sales per employee. RCF and NFL too have good turnover. GSFC's ratios are not very attractive though the company records sustained profitability. FCI & HFC have a poor sales per employee ratio and are showing recurring losses year by year.

Sales per employee ratio has direct relationship with profits. Low profitability is due to poor performance of the plant which has roots in 'manpower' as behind each social economic, operational and technological problem is 'Man' and his contribution.

* Computed. Appendix-IV.

5.10.4 EMPLOYMENT MIX.

Let us look at the pattern of employment in maintenance and production Departments of selected plants of identified enterprises as presented in Table-40.

Table-40 -
DISTRIBUTION OF MANPOWER ACCORDING TO THE QUALIFICATION IN MAINTENANCE AND PRODUCTION DEPARTMENTS.* (1983-84)

Sr. No.	Plant	Officers		Workers	
		Maintenance	Production	Maintenance	Production
		No. %	No. %	No. %	No. %
1	FCI Sindri				
	Engineer	31(52.54)	33(44.5)	-	-
	BSC/Dipl.	28(47.45)	41(55.4)	19(10.55)	49(13.3)
	Others	-	-	-	-
	Total	59	74	180	368
2	HFC Durgapur				
	Engineer	46(41.8)	46(61.3)	-	-
	BSC/Dipl.	46(41.8)	26(34.6)	47(12.5)	147(41.9)
	Others	18(16.4)	3(4.1)	329(87.50)	203(58.1)
	Total	110	75	376	350
3	HFC Barauni				
	Engineer	52(58.5)	38(43.18)	-	-
	BSC/Dipl.	42(39.2)	47(53.4)	24(11.1)	54(20.9)
	Others	13(12.3)	3(3.42)	192(88.9)	204(78.9)
	Total	107	88	216	258
4	NFL Panipat				
	Engineer	50	68(67.3)	-	-
	BSC/Dipl.	44	31(30.6)	33	91(24.46)
	Others	6	2(1.98)	213	281(51.3)
	Total	100	101	246	372(24.19)
5	RCF Trombay-V				
	Engineer	39	25(83.3)	-	-
	BSC/Dipl.	2	1(3.3)	20	50(61.72)
	Others	11	4(13.3)	87	31(22.22)
	Total	52	30	107	81(16.00)
6	MFL				
	Engineer	17(33.33)	33(33.3)	-	-
	BSC/Dipl.	27(52.94)	66(64.66)	126(75.44)	164(70.3)
	Others	7(13.72)		41(24.56)	69(29.70)
	Total	51	99	167	233(16.83)

* Inter Firm Comparison of Fertiliser plants Table-23 BPE

The profitability per employee (Table-37) and sales per employee (Table-39) are higher in case of MFL which has been showing consistent profits. From the pattern of employment in MFL it is noted that ratio of engineers to BSC and Diploma Holders in maintenance department is 1:1.6 and in production department it is 1:1.9. Further ratio of BSC Diploma workers to matriculates and others in MFL in maintenance department is 3:1 and in production department it is 2.4:1. There is a wide variation between these ratios and ratio in plants of identified enterprises as presented in Table-41.

Table-41 EMPLOYMENT MIX RATIO IN PLANTS OF I.E.(1983-84)

	Employment mix	FCI Sindri	HFC Durga-pur.	NFL Pani-pat	RCF Trombay V	MFL
1	Ratio of Engineers to B.Sc and Diploma Holders (1:)					
1.1	in maintenance	0.90	1.00	0.88	0.05	1.6
1.2	in production	1.20	0.56	0.45	0.04	1.9
2	Ratio of Diploma B.Sc Holders to Matriculates & other (1:)					
2.1	in maintenance	8.47	7.00	6.45	4.35	0.33
2.2	in production	4.46	1.38	3.08	0.62	0.40

Above ratios give a practical clue about employment mix which is very important for human resource development to keep vitality of the plant and optimise productivity. In HFC, FCI and NFL Plants in maintenance department ratio of engineers to diploma holders 1:1, 1:0.9 and 1:0.88 respectively which is not correct mix when compared with MFL. At operators level, B.Sc. and diploma qualified operators and technicians are less in proportion to other work force in all these plants. Such an employment mix affect the maintenance and operational efficiency of the plant as the work force which is not qualified to retain and develop experience cannot operate and maintain plant efficiently and meet the emergent situations.

5.10.5 EMOLUMENTS.

Salary revisions and pay rise for public sector employees including Fertiliser Sector has been regular. Wich each pay revision/commission for the Central Government Employees, there has been corresponding increase for Public Sector employees. From 1.1.1964 to date, there has been five revisions. In Fertilizer Sector wage structure as on 1.4.64 and 1.1.73 were according to 2nd and 3rd Pay Commission. Thereafter industrial structure of salary, after wage negotiations for Fertilizer workers were implemented with effect from 1.1.1976, 1.1.1979, 1.1.1983. Next revision was due on 1.1.1988. For officers revised scales were negotiated and implemented with effect from 1.9.77, 1.8.82 and next revision was due from 1.8.87. It was the intention to hold wage negotiations every five years. The categories of the employees and their salary structures as on 1.4.64 and subsequent revisions is given at Appendix- **X.**

Many undertakings did not opt for industrial structure and preferred to remain linked with Government Pay structure. (They had even gone to court for this status-quo) The 4th Pay Commission's recommendations were accepted by the Government and implemented for Government Servants with effect from 1.1.86.

These revisions were immediately considered for these Public Enterprises who continued to be guided by Government scales, with effect from 1.1.86 and adhoc payment released. This raised a uproar amongst employees of the identified enterprises and others who were guided by industrial structure. The government had to agree to consider revision with effect from 1.1.86 though as per agreement it was to be given effect from 1.8.87 for officers and 1.1.88 for unionised staff.

Government started working with concept of uniform pay structures for all public enterprises and in the meanwhile paid adhoc amount as increase in salary from 1.1.86. Arrears distributed on this account, for sample categories are given below.

CATEGORY.	GRADE Rs.	(Arrears for 16 Months)
Dy. GM	3000-37000	19,200
Project Engineer	2301-2500	10,560
Asstt. Engineer	2201-2300	8,640
Office Supdt.	1201-1300	5,760
Mazdoor	510-719	1,600

This was a windfall* for everybody rather unexpected and reduced profits or increased losses for the enterprises. With thefourth Pay Commission, the increase in salary structure for public enterprises has become quite lucrative. As on date salary structure of public enterprises are better than counterparts in private sector except for certain Senior Positions like Director or Vice-President levels. This is the result of demands raised by the Unions and the Associations from time to time, and comparing themselves with Government Servants. Every time increase in salary structure has taken place after a lot of delay and negotiations. Thus such increase hardly motivates employees or creat sense of belonging as Union feels "we have fought and got it". There is hardly any participative spirit, though often participative management is prescribed. Revised salary structures with effect from 1.1.86 have not been finalised till date and adhoc amount continues to be distributed. Delay in decisions by the Government bureaucrates and not adhering to any schedule for decisions creates working problems for executives.

---

* Higher emoluments are justified but its application with retrospective effect is unwarranted, unsocial and nonproductive as it effects other sections. Let Government as 'owner' rise to the occasion and take timely decisions.

Public Sector employees proportionately large number of people at various levels under the shade of social obligations. In FCI & HFC average emoluments is less but total emoluments are more as compared to other plants (Table-38). This is due to larger unionised category staff employed in plants situated in this region (Bihar and Bengal). This also creates a imbalance in employment mix (Table-41) and raises number of management problems. Once the employee enters the public sector he is fully secured and he too is sure that nobody can turn him out. At best promotion can be stopped. This too is often not possible specially at junior levels because of various policies and constraint of the management.

This employment and salary philosophy of public sector Fertilizer units has been explained in brief to focus following points.

a) Salary structures are revised on demand as a right even though enterprise may be chronic loser and thus affects profitability.

b) Salary increase hardly works as incentive to productivity as it is not earned with hard work.

c) Lot of time is wasted in wage negotiations on settlement which causes frustration and management problems.

d) Because of the typical grade structure, the increase in salary or promotion in many categories is nominal and even promotion does provide positive incentive (It only removes -ve effect)

It is true that public sector is ideal employer and should not exploit but it should not be exploited as well. The present situation is, it is being exploited. Organised sector specially the public sector employees is the greatest exploiting chunk.[1]

---

1 Centre for monitoring Indian Economy - July 83 pg. 10

whether decisions on pay revisions and the facilities cited above can be classified as meeting "Social Obligations" enjoined on Public Sector. Really it is not so. In plan frame and industrial policy resolution "Social obligations" of the Public sector refers to society at large - "Maximum benefit for maximum number of people" and not a narrow concept of raising standard of living of the employees of the public sector only or employing extra staff in the public sector.

5.10.6 SUM-UP

Employment mix and emoluments have direct and indirect impact on the performance and profitability of the enterprise. Though salary structures are controlled by the Government, employment and employment mix is fully under the perview of the public enterprise management. Judicious employment and proper job allocations can help to increase productivity and profitability.

5.11 SOCIAL OVERHEADS.

It has been often argued at different forums that social-overheads of the Public Sector Enterprises affects profitability. Jha Commission also in their Report No. 7 (1985) observed, "Another factor leading to over capitalisation of a number of public enterprises is the element of social overheads such as township, hospitals, schools and other civic amenities". It further says "Not only social overheads increase the capital cost of projects and consequently the costs of production, but they also set up recurring cost of high order[1]". Thisis too general a statement.

Public Sector projects, with a view to develop regions, are set up in green field sites. As a model employer and otherwise also township and other civic amenities are essential requirements for such sites to attract and retain qualified and experienced personnel for managing the plants. Thus, these so called "social overheads" are actually not "overheads" for that particular unit, but an essential feature or say one of the utilities. These social overheads expenditure are indirect payment to the employees as Bonus, HRA in addition to direct payments of salary and Dearness Allowances. Even Private Sector provides such facilities for their projects in greenfield sites.

Let us examine the cost of township and its maintenance and other staff welfare expenses of Fertilizer Sector Units and magnitude of its impact on loss or profits for the sample year 1980-81.

---

1 BARC Report No. 7 Pg. 72.

Social overheads in terms of expenditure on maintenance of township, and other staff benefits in year 1980-81 are given in Table-42.

Table-42 SOCIAL OVERHEAD COSTS - 1980-81

(Rs. in '000)

HEAD	FCI	HFC	NFL	RCF
1. RECURRING				
1.1 Maintenance of township.	21,876	11,723	5,983	10,290
1.2 Education	6,109	2,589	2,279	379
1.3 Medical	15,880	10,821	7,762	4,347
1.4 Canteen	3,191	2,556	1,731	3,259
1.5 Transport	1,275	1,400	960	271
1.6 Social & Cultural	1,425	819	582	16
1.7 Others	7,630	5,917	81	4,573 *
Total 1.1 to 1.7	57,387	35,465	19,378	23,115
2. Number of employees*	13,812	9,204	5,652	3,850
3. Overheads per employee	4.15	3.85	3.42	6.00
4. Annual emoluments per employee	17.81	15.35	13.87	19.40

From the above presentation, the indirect expenditure in the form of social overhead per employee per annum is Rs. 4,150 in FCI, Rs. 3,850 in HFC, Rs. 3,420 in NFL, Rs.6,00 in RCF which works out to 24% to 25% in FCI, HFC and NFL and 31% in RCF of the average annual emoluments for the year 1980-81.

The contribution of social overheads to cost of production, expressed as percentage comes to 4.8% for FCI, 2.8% for HFC, 1.6% for NFL and 1.25% for RCF for 1980-81.

* Balance sheet.

In absolute, terms, the total amount spent under "social overheads" is high and there should be scope for reduction of expenses. In case of FCI and HFC expenses are high because of large number of employees and ratio is low because of employment mix (Table-38) and low capacity utilization. Indirect effect of uneconomic, improportionate expenditure on these facilities would reflect the cause as inefficient management and faulty personnel policies and not the concept of "Social overheads".

It is essential expenditure towards collateral objectives which are necessary to carry out primary objectives. Management shouldjudiciously formulate policies and practices to have proper employment mix and provide these social benefits to the extent it acts as a catalyst - as an incentive, to work more, to produce more, as a motivating force to feel concerned, and belonging to the company, and as an instrument to inculcate team spirit.

There is no 'norm for comparing expenditure on social overheads as consumption norm in case of raw materials. Nevertheless based on past experiences in various undertakings and elim.nating superfluous expenditure, either norm in form of % of total emoluments or a fixed amount per head can be fixed. This is an area where participatative management of "Social overheads" within allocated budget can be implemented.

5.12 MARKETING, PRICING AND PROMOTION ACTIVITIES.

5.12.1 Marketing is defined as " the performance of business activities that direct the flow of goods and services from producer to consumer. Alternatively marketing is getting right goods and services to right people at the right place at the right time at the right price with right communication and promotions".[1] Fertilizer prices are controlled by the Government and Fertilizer consumers are farmers.

Farmer can neither bear the high cost of fertilizer nor has the paying capacity. Further any increase in fertilizer price will affect its usage, crop prices and food production. Therefore Fertilizer prices are kept as low as possible considering various facets of economy. Table-43 gives the trend in fertilizer price increase over last ten years 1973-83.

Table-43 PRICES OF FERTILIZER (UREA)*

Date & year.	Max.price of Urea (46% N) 50 kg Pkg. Rs./Tonne	Max.price of Neutrient (N) through Urea Rs/kg
30- 3-72	1,030	2.08
11-10-73	1,050	2.28
1- 6-74	2,000	4.35
18- 7-75	1,850	4.02
16- 3-76	1,750	3.86
8- 2-77	1,650	3.59
12-10-77	1,550	3.37
2- 2-79	1,550	3.37
10- 3-79	1,450	3.15
8- 6-80	2,000	4.35
2-7--80	2,000	4.35
11- 7-81	2,350	5.11
29- 6-83	2,150	4.67
84	2,150	4.67
19- 4-85	2,150	4.67
31- 1-86	2,350	5.11

NOTE A. Prices are statutory controlled, exclusive of sales-tax.

B. With effect from 1/2/1966, prices have been fixed on all India basis.

C. Prices effective 8.6.80 (and thereafter) exclude excise duty as it is withdrawn with effect from 7-6-80.

1. Marketing Management - Philips Kotler role of marketing in today's organisation - Pg. 4

* Fertilizer statistics published by FAI.

Pricing policy of PES in India differs from that of private enterprises, in that it has a Micro objective as well as a Macro objective".[1]

5.12.2 FERTILIZER PRICING POLICIES.

The history of fertiliser pricing policies and need thereof is briefly described in this para.

The question of fertilizer pricing, which impinges directly on the growth of the fertilizer sector, inevitably tends to become enmeshed with the sensitive issue of agricultural subsidy.

In India, Government control on fertiliser prices dates back to the Central Fertilizer Pool (1944):

A second world war which prescribed an uniform price for fertilizers throughout the country while undertaking the regulation of fertilizer distribution. Such regulation continued to be exercised through the ninteen-fifties and the Fertilizer Control Order of 1957 brought urea, As and CAN under the Essential Commodities Act.

Although the pricing policy of the Central Fertilizer Pool was to be based on a "Zero profit or loss" objective, the disparity between falling international prices of fertilisers and the steadier local "Pool" prices gave rise to substantial revenue earnings for the Pool till then middle sixties. Upto the end of 1965, the entire local production of nitrogenous fertilisers was acquired by the Pool and distributed by it. The Producers were given a retention price fixed on the basis of . Ministry ofFinance cost study. The Sivaraman Committee[2] On Fertilizers, the recommendations of which led to the far-reaching liberalization of the Government's policies towards the fertiliser industry, had commented adversely on this accretion to the Pool. In the revised fertiliser policy of end 1965, although manufacturers were to be permitted to set their own prices for a period of 7 years, in practice, this relaxation did not materialize for Urea, CAN and ammonium sulphate which accounted for the bulk of the total fertiliser production in the country.

---

1. Ramanathan VV Pricing & investment in Public Enterprises VBH - ND - 1979.

2. Sivaraman Committee 1964.

Over the period 1969 to 1972, world fertiliser prices were low but the Pool maintained its prices at a level which did not cause hardship to local producers. After 1972, when international prices firmed up, the Pool absorbed part of the inflation to retain price stability at the level of the farmer. However, a break in pattern occured in 1974 when, following the energy cirsis of 1973, World prices of petroleum products, and, inevitably of fertilisers, staged their steep ascent. Government raised fertiliser prices by nearly 100 percent and levied a Pool Equalization Charge on the industry to (a) mop up the surplus profit and (b) partially offset the losses on imports which were being made at still higher prices. Price escalation of this order put the brakes; on the growth of consumption which was consistently brisk; the offtake of nitrogen was stagnant in 1974-75 and those of phosphorus and potash marked a decline.

Against this background, the emphasis of policy was soon shifted towards reducing fertiliser prices in stages so that consumption could be stimulated. Indeed, by the Kharif season of 1977, the pace of consumption was reestablished indicating the restoration of the cost-benefit equation between the prices of fertiliser nutrients and those of agricultural products.

"It is perhaps correct to say that the compulsion of fostering growth of fertiliser consumption on one hand and the need to assure a reasonable return on the ever-increasing investment required in fertiliser manufacture on the other, have posed a strategic predicament for the determination of fertiliser price policies the world over. India is no exception to this and, indeed, the problem is compounded by the fact that the Indian fertiliser industry is characterized by the existence of a wide variety of plants of different vintages using different processes and feed stocks and one selling price.[1]"

---

1 Development ofFertilisers in India-FAI New Delhi -pg.223.

One way out of this conundrum, as prescribed by the Marathe Committee[1] and implemented by the Government from November, 1977, consists in working out a formula whereby each individual producer would be given a price assuring the unit's viable operation while a general pooling arrangement yields a single equated price at the selling point which is also remunerative to the farmer. Under this formula, the retention prices for nitrogen producers are based on a 12 per cent post-tax return on net worth, subject to a plant capacity utilisation factor of 80 per cent and prescribed consumption norms for each factory. The first order impact of the new pricing formula has been to ensure stability of return to fertiliser units, provided of course that their operating performance measures upto the norms which have been laid down for output and material efficiencies. In this respect, it has provided a framework within which new investment can be planned with relative confidence.

Any system of fertiliser prices is inextricably linked to the structure of farm output prices. As the Report of the Committee on Controls and Subsides[2] which was submitted in 1979 pointed out, "the issue is not only that of the benefit-cost ratio arising out of fertiliser application to the farmers but also the national imperative of quickly raising the level of agricultural production in the country. Thus, it is essential that a long-term parity is targeted for achievement between fertiliser prices and the general level of agricultural prices and rate on return or investment in Fertiliser Sector."

---

1 Marathe Committee.

2 Report on the Committee on control and subsidies.

As the sales prices is controlled, marketing efforts have to be promotional oriented to ensure maximum Fertilizer use, sales and minimum stocks of finished goods to maximise profits. In such a situation focus is on production, means in selling and promoting and end is profits through sale volume. Thus, marketing efficiency is revealed by the stock of finished goods, any company carries.

In quantitative terms marketing efficiency can be expressed as ratio of product stock to sales revenue. Higher rates would indicate proportionately large stocks and poor marketing strategy. Table-44 gives the product stock to sales revenue.

Table-44 PRODUCT STOCK TO SALES REVENUE RATIO*

(in percent)

Unit	80-81	81-82	82-83	83-84	84-85
FCI	19.31	26.93	23.11	10.75	18.22
HFC	9.60	37.64	25.96	10.77	16.91
NFL	6.98	4.36	20.11	6.20	9.80
RCF	10.72	17.86	26.19	9.05	16.50
MFL	8.79	20.22	25.93	12.90	20.60

The study of the data gives mixed impression, as HFC and NFL have shown losses in 1980-81 but the product stock to sales revenue ratio is low, MFL has been constantly showing profits but the ratio is high. GSFC has shown consistently low ratio and also profitability. Therefore direct corelation between marketing and profitability cannot be established as other factors play important part. But to the extent product stock is reduced, it will increase cash flow realisation, and eliminate blocking of working capital which in turn reduces interest burden and correspondingly increase profitability.

* Computed - Financial Data Appendix-IV.

5.12.3 PRODUCT INVENTORY.

PRODUCT inventory of some plants of identified enterprises, could be available, is presented below:

Table-45 PRODUCT INVENTORY (1981-84).*

(In terms of days of net sales)

Plant.	1981-82	1982-82	1983-84
FCI SMP	88 (72.00)	85 (77.00)	19 (53.00)
HFC Durgapur	184 (39.40)	140 (26.00)	43 (46.97)
HFC Barauni	144 (48.80)	108 (50.00)	20 (38.40)
NFL Nangal	28 (80.90)	62 (78.78)	21 (88.18)
NFL Panipat	18 (70.43)	84 (69.00)	24 (66.73)
RCF Trombay-V	- -	154 (56.00)	36 (92.27)
MFL Madras	72 (92.00)	88 (87.00)	45 (54.50)

Note: Figures in Bracket shows capacity utilization %.

The inventory levels in NFL Plants is the lowest while HFC Plants are the higher. If we take average of trend of two years (1981-82 and 1983-84) of NFL Plants, number of day inventory of product should not exceed 25 at any given period. Higher inventory carries higher cost and to that extent affect profitability. The intention of showing capacity utilization side by side is to indicate that in the year when capacity utilization is low and finished goods inventory is high, profitability will further decrease. In case of HFC plants, inventory level is high and capacity utilization is low which adversely contribute to profitability.

* Inter firm comparison of Fertiliser Plants Table-19 -BrE 198

5.12.4 FERTILISER PROMOTION.

In case of Fertiliser industry, fertiliser promotion has great significance in marketing strategy to increase sales volume.

Direct encouragement of fertiliser usage through Government effort goes back to the days of the Grow More Food Campaign of the middle ninteen-forties. The Community Development Projects launched in course of the First Five Year Plan provided the instrument for demonstration programmes on cultivators' field to highlight the benefits of fertiliser application. The process of national demonstration was continued and intensified through time, particularly as the work done at agricultural research institutes and universities were being brought to the farmer. The Sivaraman Committee[1] had emphasised the need for stepping up fertiliser consumption to achieve the targets of agricultural production. Fertiliser promotion received special attention under the liberalised policy of the mid-sixties. The entry of new manufacturers gave the necessary impetus. Keenness of members of the industry to project their image and establish firm footholds in their natural markets led to widespread efforts to develop markets and promote brands* during the period upto mid-seventies. With the stabilisation of marketing territories, the emphasis has been shifting towards intensive rather than extensive promotion.

---

1 Sivaraman Committee 1964.

* BRANDS: FCI - SWASTIK, NFL-KISAN, RCF-UJJAWALA HFL - X , GSFC-SARDAR, SRIRAMFERTILISER-SRIRAM ZUARIAGRO - JAI KISAN, RCF NPK MIXTURE-SUPHALA, INDIAN EXPLOSIVES - 'IEL', GNFC-NARMADA, KRISHAK BHARTI-KRIBHCO, IFFCO-IFFCO.

The success of most promotional schemes has depended upon the degree of coordination between Government and industry. "The Intensive District Development Programme started in 1976 is an example of such coordinated efforts leading to higher fertiliser usage by concentrating attention on a few selected districts with good irrigation".[1] Other examples of innovative promotional measures are micro-level planning for input distribution in Bihar block demonstrations in Karnataka and the minimum yield guarantee programme in Maharashtra, extensive demonstration farms adopted by IFFCO, KRIBHCO, NFL, HFC, Television advertising campaign by NFL, GSFC, GNFC, KRIBHCO, RCF. In the context of the steep rise in energy costs and fertiliser prices, increasing the effeciency of fertiliser use is now receiving increasing attention.

Fertilizer promotion Activities include but not limited to educating and training farmers, disseminating available information to the field level, setting up of demonstration farms & mobile testing laboratories, adopting model villages, projecting advantages of fertiliser usage through advertising media-press, handouts in regional languages, Radio-Television.

Coupled with Fertiliser promotion, is the need of adequate and timely credit arrangements for purchase of fertilisers, a seasonal commodity, by farmers. Co-operative arrangements for purchase, distribution and credit would be an ideal solution which require attention with verve, vim and vigour by the Government.

Proper marketing and promotional activities help in realising cash flow, reducing losses and/or increasing profitability.

---

1 Development of Fertilisers in India, FAI New Delhi pg. 273.