CHAPTER II

Industrial Policy of India and Evolution of Fertiliser Industry
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Industrialisation is the sine-qua-non of economic development. Industrialisation is a mean to achieve economic development and the former is essentially a process of capital formation which involves creation of savings, mobilization of savings and investment of savings. And the growth of savings depends largely on industrial factors apart from income. The institutional factors can be made conducive to the growth envisaged in economic planning.

Despite industrialisation and occupying an important place among the industrialised countries in the world, India is by and large an agricultural country with a vast segment of her population engaged in agriculture and allied pursuits.¹

The Industrial policy of the Government of India had a long history even before Independence. Its origin can be traced back to 1609 when the East India Company commenced its trading activity. Primarily interested in trade, the policy of the company was to encourage Indian handicrafts which formed the basis of the British trade regime.
The recommendation of Famine Commission of 1880, emphasised the need for setting of modern industries. By 1890, the Madras Government was the first to make some serious efforts in the direction of surveying industrial potentialities, assisting private industrial enterprise and even starting some pioneering industrial units in the Province of Madras.3

The Swadeshi Movement and subsequent events gave an impact to industrialisation. This was an indication of a change in Government's attitude in the establishment of a separate Department of Industry and Commerce of the then Government of India in 1905. The report of the Industrial Commission of 1918 stressed the importance of active Government assistance in furthering growth of Indian industries.4

The concept of Industrial policy is comprehensive and it covers all those procedures, principles, policies, rules and regulations which control the industrial undertaking of a country and shape the pattern of industrialisation.

**Meaning and Importance**

'Industrial policy' is meant all those objectives, principles, rules, regulations, and procedures concerning the pattern of industrial
development, rates of growth of industries, ownership pattern of industries, location and functioning of industrial establishment in the country.

**Industrial Policy Resolution of 1948**

The Industrial Policy Resolution of 1948 was adopted by the Parliament on April 6, 1948. It was the first official resolution on Industrial policy after Independence.

The Resolution emphasised the need for the State to play a progressively more active role in the development of industries. The most striking part of the resolution was its decision that India should have a divided economy with some industries reserved only for public sector investment and production while others would be open to the private sector.  

The resolution was classified into four categories. The first included strategic industries like Arms and Ammunitions, Atomic Energy, River Valley Projects and Railways. These were declared as State monopolies. The second category included Coal, Iron and Steel, Aircraft and Ship Building, Communication equipment and Mineral oils. The third category included 18 industries like, fertilisers, chemical, road transport and machine tools. The above said three categories were the responsibility of the State, the rest of industries were left to the private enterprises.
The Industrial Policy Resolution of 1956

The Industrial Policy of 1956 was the one of the most important policy documents related to Indian Industry.

The Resolution specially emphasised the following objectives:

(i). to accelerate the rate of economic growth and to speed up industrialisation,

(ii). to develop heavy industries and machine making industries,

(iii). to expand the public sector,

(iv). to build up a large and growing co-operative sector,

(v). to reduce disparities in income and wealth, and

(vi). to prevent private monopolies and the concentration of economic power in different fields in the hands of small number of individuals.\(^6\)

The Resolution classified industries into three categories:

In the first category 17 industries were included and listed in “Schedule-A”\(^7\), which were to be the exclusive responsibility of the State.
In 'Schedule-B', twelve industries were listed and in these industries, the State would increasingly establish new units and increase its participation but would not deny the private sector opportunities to set up new units or expand existing units.9

Those industries left out in the 'Schedule-A' and 'Schedule-B', which were for the private sector as 'Schedule-C'. The main role of the State in this category was to provide facilities to the private sector to develop itself.

The Industrial Policy of 1956, which aimed to develop basic and heavy industries, to give priority to the capital intensive industries in the public sector and to bring about speedy industrialization of the economy.

**The Industrial Policy Resolution of 1977**

The Government of India announced its third Industrial Policy, on 23rd December 1977. The old industrial policy resolution of 1956 continued to guide the basic structure of industries in the country.10

It provided for a closer interaction between the agricultural and industrial sectors, accorded the highest priority to the generation and transmission of power and an exhaustive analysis of industrial
products was made to identify products which were capable of being produced in the small scale sector.

**Industrial Policy Statement of 1980**


The policy redefined the small scale units to suit the hike in the prices of capital goods and plants and to encourage the development of small scale units.

**The New Industrial Policy of 1991**

The New Industrial Policy was tabled in Parliament on 24 July 1991. This policy related to industrial licencing, foreign investment, foreign technology agreement, public sector policy and the monopolies and restrictive trade practices etc.

The new industrial policy statement can be regarded as a realistic economic constitution governing the growth of industrial sector. The policy made efforts to deregulate and debureaucratise the sector with a view to remove all fetters on its growth potential by reposing greater faith in small and young entrepreneurs.
History and Growth of Industrial Policy measures in Tamil Nadu with reference to Fertilisers

India has opted for a federal constitutional framework. Every State has to formulate its industrial programme and schemes in conformity with the Industrial Policy of the Government of India. Based on the canvas of the industrial policy, the Government of Tamilnadu formulated various programmes, schemes, incentives and subsidies to boost the industrialisation process of the State.

The growth and influence of regional economic blocks compelled the country to its fiscal, trade and industrial policies. Therefore one of the important tasks of the Government initiated when it assumed charge was to formulate most innovation policies for rapid industrial development in the State based on its own strength and resources.11

Policy measures during the plan period:

The Government of Tamilnadu concentrated on the provision for the basic infrastructural facilities for the development of industries and building up of institution for channelising financial and other forms of assistance to private entrepreneurs during the plan periods.
The first plan aimed at creating the base for rapid economic and industrial advancement. The main emphasis in the second plan was on widening and strengthening of the industrial base of the State though power development and increasing the food production to attain self-sufficiency. During this plan period various measures taken to promote industrialisation, establishment of Industrial Estates at Guindy and Virudhunagar and also small scale industries received much encouragement by K. Kamaraj, the then Chief Minister of Tamil Nadu.

Between 1963-1966, the industrial policy of the Government was to study the gaps in the production pattern in Tamil Nadu, sponsor schemes, select and encourage private entrepreneurs to implement those schemes by assisting them in securing licenses, institutional finance and basic necessities like land, water, power, technical, personnel and advice. The State had been instrumental in setting up production units either in the Public or in the Co-operative sector. During the third plan, M. Bhakthavatchalam, the then Chief Minister of Tamil Nadu, gave impetus to the large and small scale industries and also to private and public sectors. During the fourth plan, the Government had given a lead in fostering the concept of a joint sector and the State Government through 'Tamil Nadu Industrial
Development Corporation' (TIDCO) had participated in the performance.\textsuperscript{14}

Increase in employment opportunities, use of local resources, exploration of new sectors and development of backward areas are the main objectives of the Industrial policy by the Government of the Tamil Nadu, during the Sixth Five Year Plan.\textsuperscript{15}

The Industrial policy introduced by the Government of Tamil Nadu during 1986-87, stressed its main objectives in the field of small scale and rural industries to be two fold: (i) the industrial growth in the rural areas, and (ii). creation of more employment opportunities in the rural areas.

**New Industrial Policy of Tamil Nadu (1992)**

The New Industrial Policy was announced in January, 1992 by the Government of Tamil Nadu. The new industrial policy has been framed keeping in view the tiny units for which new technologies are required, new markets are created and new strategies evolved to tap their potential of employment generation.\textsuperscript{16} As part of the policy an attractive package of incentives for new industries and expansion of existing industries has been given. Steps have also been
taken to ensure that a conductive atmosphere is created for the setting up of new industries in the State of Tamil Nadu.

The State policy of Government of Tamil Nadu provides for the development of village and small scale industries in order to generate employment and to step up the production of consumer goods.

The pace of industrial development in Tamil Nadu has gathered considerable momentum and the State occupies a prominent place in the industrial map of India.

**Evolution of Fertiliser Industry**

**Manures and Fertilisers**

Manures and fertilisers play the same part in relation to the soil as food in relation to the body.

**(i) Manures:**

Manures may be classified into two categories: (a) Organic manures, and (b) Inorganic manures. Organic manures may further be sub-divided into (i) Bulky organic manures, (ii) Concentrated organic manures. Bulky organic manures include farmyard manure, compost
manure, night soil and green manure, while concentrated manures are oil cakes, bone meal, dried blood, horns and hoofs etc. The addition of bulky organic manures like farmyard manure which is by product in farming by bullocks, helps the soil by increasing its water holding capacity, improving soil aeration and by changing the plant nutrient through slow decomposition into forms readily available plants.\textsuperscript{17}

Farmyard or cattle manure, consisting of the excreta of animals mixed with litter and refuse farms one of the most efficient and generally available.\textsuperscript{18}

Green manuring can be defined as a practice of ploughing or turning into the soil undecomposed green plant tissues for the purpose of improving physical structure as well as fertility of the soil.\textsuperscript{19} The green manures commonly used are Sunhemp, Diancha, Kolingi, Vempati or Wild Indigo, Pillipesara, Karnga Leaves and Flowers, etc. If ploughed in while green, they supply the organic matter needed for conserving the soil, enrich it in the matter of Nitrogen and gives back the Phosphatic Acid and Potash they had taken from it in an easily assimilable condition.\textsuperscript{20}
The inorganic or synthetic fertilisers the most important nitrogenous ones are Ammonium Sulphate, Ammonium Nitrate, Calcium Nitrate, Ammonium Phosphate and Urea.

(ii) Chemical fertiliser:

A fertiliser\(^{21}\) is artificial manure made from chemicals. Fertilisers are accepted as the surest and quickest means of increasing agricultural yields. They bear such highly complementary relationship to other yield increasing practices that the amount of fertilisers used per acre of land can be used as a fairly good index of progress in adoption of yielding increasing technologies.\(^{22}\)

Definitions:

Fertiliser can be defined as follows:

(i) “Mined or manufactured material containing one or more essential plant nutrients in immediately or potentially available forms in commercially valuable amounts”.\(^{23}\)

(ii) “Any material, organic or inorganic, natural or synthetic, which supplies one or more of the chemical elements required for the plant growth”.\(^{24}\)
(iii) "Natural or artificial substance containing the chemical elements that improve growth and productiveness of plants".25

(iv) "Fertiliser means a fertiliser of the soil included in the first column of the first schedule and any mixture containing any one or more of the fertilisers of the soil".26

Fertilisers can be divided into two main classes:

(a) Straight fertilisers, and (b) Complex fertilisers.

A fertiliser is said to be 'straight' when it contains only one of the primary nutrients, i.e., any one of Nitrogen(N), Phosphate(P) and Potash(K) and a fertiliser with more than one of the above primary nutrients is 'complex fertilisers'. Urea, Ammonium Nitrate, Ammonium Chloride, Ammonium Sulphate are belonged to straight fertiliser group, whereas, Di-Ammonium Phosphate and NPK fertilisers are belonged to complex fertilisers.

Sixteen elements27 are identified as essential elements for plant growth of which their first 9 are regained in macro quantities. Oxygen and Hydrogen are supplied by air and water and therefore, as treated
as nutrients by fertilisers industry. The main aim of the industry is to provide the primary and secondary nutrients which are required in macro quantities.

Primary nutrients are normally supplied through chemical fertiliser. They are chemical compounds containing one or more of the primary nutrients and are generally produced by chemical reactions.

The purpose of using fertilisers to add to the soil those nutrients in which the soil is deficient and is not capable of supplying to the plants the required quantities for their optimum growth.  

The performed usage of NPK (Nitrogen(N), Phosphorous (P), Potassium (K)) is 4:2:1. Urea, Di-Ammonium Phosphate (DAP) and Single Super Phosphate (SSP) are the widely used fertilisers in India.

(iii) Bio-fertilisers:

Products of biological origin, can be advantageously blended to replace a part of the energy-intensive market purchased input. Bio-fertilisers can provide to the small and marginal farmers an economically viable level for realising the ultimate goal of increasing
productivity. Bio-fertilisers are used widely such as, Rhizobium, Asotabactor, Blu-green Algae, Azolla and Asospirillum, etc.

**Origin of Chemical Fertiliser**

The use of chemical fertilisers is still a comparatively recent phenomenon in the long history of agriculture. Until Chilean Nitrate and Peruvian Guano were first introduced into European agriculture in the 1830s, the limited use of artificial fertilisers were confined to such substances as soot, bones, hoofs and horns, saltpetre and lime. The main reliance for the maintenance and restoration of soil fertility was on such practices as shifting cultivation, following crop rotation, catch-cropping (especially with nitrogen fixing legumes) and the recycling of crop and animal residues.

In 1840, Justus Von Liebug of Germany proved that treatment with strong acid in bones, increased the availability of nutrients to plants. Later, innovations proved that birds droppings contained Nitrogen, Phosphorous and Potassium which acted as good nutrients to the crop. Subsequently, a process was the developed for get the Atmospheric Nitrogen in the forms of Ammonia by burning it with gas.
In USA, the discovery of deposits of Rock Phosphate in South Carolina in 1867, and in Florida in 1887 developed into Superphosphate fertiliser industry in the heart of the South Eastern United States. From the late 1880 research accelerated on the essential elements of fertiliser, on the best time, rate and method of application on fertiliser formula. An examination of experiment station records of the early 20th century shows that Superphosphate (acid phosphate) was being adopted as the main ingredient of cotton fertilisers throughout the South Eastern United States.31

With the abundant supply of chemical fertilisers possessing the advantages of concentration and portability and of adoptability to different soil conditions and to the requirements of different crops and animal residues to return fertility to the soil. In many developing countries especially where there was no tradition of mixed crop and livestock farming, crop and animal residues had never been much used for fertilisation but had been burned as non-commercial fuel. In these countries the modernisation of agriculture has sometimes gone straight to the stage of using energy-intensive chemical fertilisers. After that only the chemical fertiliser production is started in many countries like USSR, China, Chile and India, etc.
Beginning of Fertiliser Industry in India

Famines have been a regular feature of Indian History since earliest times. Whenever the famines took place the rulers of the country took necessary measures to provide relief to the people to reduce their sufferings. During the British period initially no regular Famine Policy was evolved. During the first Famine of 1769-70, the company failed to take relief measures. However, in 1792 when a famine visited Madras the Company under took relief work. Again in 1803 a famine spread in the North. The English failed to provide sufficient relief as they were busy with conquests and annexations.

It was in 1837, when a terrible famine visited the upper regions of Ganges and Yamuna that the authorities adopted various relief measures. In short, during the Company’s rule no attempt was made to formulate any general policy of famine relief.\(^{32}\)

After the assempion power by Crown in 1858, serious attention was paid to the problem of famine. An attempt was made to evolve a systematic policy, a number of Famine Commissions were appointed to examine the problem and to suggest measures for meeting the master of Famine. In the First Commission of Enquiry Report the Government made no effort to formulate any general principle.
During the 1866-67, a famine took place and the government appointed a Committee under the Chairmanship of Sir George Campbel to look into the matter.33

The most serious famine of the 19th Century broke out in 1876-78 affected the areas of Madras, Bombay, Utter Pradesh and Punjab. The famine was so severe. A Famine Commission under General Sir Richard Strachey was appointed in 1880 to recommend measures to avoid misery to the people.

The Commission recommended that improved agriculture should be the main object for obtaining security against disastrous failure in food supply. In the light of the recommendations of the Commission, a Famine Code was formulated in 1883 as a guide for the formulation of similar Codes.

*John Augustus Voelcker*, consulting chemist of the Royal Agricultural Society of England came to India on 10, December 1889 and left early in 1891. The record of his journeys all over India and impressions in contained in his report 'Improvement of Indian Agriculture'.34
Voelcker suggested that "it is desirable to ascertain whether the transference of the practice of the one part may be beneficially made to another part viz., embankment of land, green manuring, hedging and enclosure of fields, sheep folding, the use of leaves, the growing of fodder crops, the ploughing in the rice field after harvest, the use of castor oil and other oil seed refuse as manure, the utilization of night soil and tour sweepings, the planting of sugarcane in furrows and extended growing of sugarcane, potatoes and other crops".\textsuperscript{35}

Appropriate farm tools like the seed-cum fertiliser drill which is drawn by bullock and also by manual labour, an integrated tool bar, a paddy drier, a husk - fired farmance and a manure spreader had been developed. Adequate emphasis had been laid on the lining of irrigation canals, for efficient water management, fertiliser use efficiency, pesticides from indigenous sources and transfer of technology to farmers.\textsuperscript{36} Greater attention was paid to step up the use of key inputs like fertilisers and manures judiciously and efficiently for increasing production per hectare of land.

The use of chemical fertiliser began in India on tea plantations during the year 1896, when Nitrate was imported from Chile. By
he beginning of the 20th Century, Calcium Nitrate, Calcium Cyanide, Ammonium Sulphate, Superphosphate and Potassium Sulphate were also imported for similar purpose.

The organised chemical industry started in a modest way in India in 1889 with the commissioning of a unit for the manufacture of soap in Merut. This was followed by a small paint manufacturing private firm in 1902, and in 1904 the defence department put up a plant for the concentration of Nitric Acid.

The first fertiliser factory in India came into existence in 1906 when Parry and Co., established their Single Super Phosphate factory with a capacity of 6400 tonnes Phosphate (P₂O₅) per annum at Ranipet, in Tamil Nadu. The factory also manufactures fertiliser mixers, insecticides and fungicides.

The recognition of the role of fertilisers in agricultural production was emphasised in the report of the Royal Commission on Agriculture in 1928, and was re-emphasised in a report prepared by the then Agricultural Commissioner to the Government, Dr. W. Burns in 1938. After a long period i.e., in 1938, the first Ammonium Sulphate production was begun at Tata Steel Plant, Belagula in Mysore. This plant had however only a small capacity of 6600 tonnes per annum.38
Large scale production of chemical fertiliser was started in India in 1947 by Fertiliser and Chemicals Travancore Ltd. (FACT) at Alwaye in Kerala as a private sector industry, later on it became a public sector undertaking in 1960. It has a running unit at Udyogamandal in Kerala with a production capacity of 70,000 tonnes of Nitrogen and 35,000 tonnes of Phosphate (P$_2$O$_5$) per annum.

During the Second World War (1939-1945), worldwide shortages developed and the available material had to be rationed under an International Emergency Scheme to provide fertiliser needy allied countries to maximise the food production for meeting the war needs. The Grow More Food Campaign was initiated in 1942 as a part of which it was decided to popularise the use of fertilisers. And, two important incidents i.e., the Great Bengal Famine in 1943 and the severe food imbalance in the wake of Partition, drove home the need for growing more food on a planned systematic basis and consequently recognition of the importance of fertilisers.

The Foodgrains Policy Committees in 1943 and 1947 recommended to the Government of India for the need for large scale manufacture of Nitrogenous fertilisers in India for stepping up the food production. It was decided in 1951 to commission a Government industry at Sindri in Bihar for manufacturing 70,000 tonnes of Nitrogenous fertilisers. The Fertiliser Corporation of India (FCI) produces Ammonium Sulphates, Double Salt and Urea. This
unit is not only the biggest public sector undertaking in India, but also the largest and most modern in Asia.

**Impetus to Fertiliser**

The First Five Year Plan (1951-1956) laid emphasis on the various measures required to stimulate agriculture production. Agriculture was given a high priority with about 32 percent of the plan expand items. Nevertheless, the real impetus to development of fertiliser industry came in 1960's with agriculture getting top priority in the Third Plan. While a number of plants such as, National Fertilisers Ltd. (NFL) - Nangal in 1961, E.I.D. Parry - Madras in 1963 and Rashtriya Chemicals and Fertilisers Ltd. (RCFL) - Trombay in 1965 etc., were commissioned.

(i) **Green Revolution:**

Since the mid 1960's India had been using a very advanced technology in certain areas for certain crops. As a result there had been some increase in production and productivity.

Inadequate production accompanied by growing needs of an increasing production, heavy dependence on food imports and scarcity of foreign exchange and drought condition prevailed during 1965-67. These were also the years when the Seeds of High Yielding
Variety became available. Without loss of time the Government enunciated the 'New Agricultural Strategy'.

The basic approach of Green Revolution (1967-1978) had been to tackle the entire agricultural problems in totality and to find out the ways and means to bring about significant improvement in the agricultural productivity.\(^4\)

The term 'Green Revolution' was coined by Dr. William Gaud of the V.S. Agency for International Development in 1968 to draw attention to the quantum jump achieved by India and Pakistan in improving wheat yield.\(^5\)

The reasons for the term 'Green Revolution' given were: (i) It was confined only to the technological field, and was therefore at best a technological revolution in agriculture, (ii) Even as it was, its production potential had been worn off in very recent years with growth rate of output not rising very fast, (iii) The worst was that in the field of its impact on distribution of grains and even on employment important for a country like India, this was a gray revolution and not green.\(^6\)
According to Dr. M. S. Swaminathan, "The Green Revolution in our country had to long lost ended the diverse between intellectual and labour in the cultivation of food crops had generated a climate of considence in our agriculture capabilities". Since High Yielding Varities (HYV) of seeds had been introduced along with chemical fertilisers, pesticides, adequate irrigation and machines, the package could also be termed as 'Biological-Mechanical Revolution'.

It implies a well-marked improvement in agricultural production in a short period as well as a substenance of a higher level of agricultural production over a fairly long-period of time. The chemical fertilisers has been playing a dominant role and the strategy has been recommended a definite massive quantity of prescribed fertilisers for each crop.

The Green Revolution gave added urgency to the need for rapid growth of fertiliser capacity within the country. In the 1970's and 1980's marked the beginning of a new phase as the industry not only witnessed further acceleration by way of addition to fertiliser capacity and production but also underwent significant structural changes giving in the complexion of a truly dynamic industry. The latter is clearly reflected in setting up of most modern, large size plants incorporating essential ingredients of best available technology based on better feed back i.e., natural gas.
<table>
<thead>
<tr>
<th>Year</th>
<th>Fertiliser Material Manufactured</th>
<th>Factory Which First Manufactured</th>
<th>Total No. of Manufacturing Units as on 1-10-1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Single superphosphate</td>
<td>EID-Parry (India) Ltd., Ranipet</td>
<td>78</td>
</tr>
<tr>
<td>96</td>
<td>Fertiliser mixtures</td>
<td></td>
<td>#</td>
</tr>
<tr>
<td></td>
<td>Ammonium sulphate</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>93</td>
<td>(a) As a by-product of steel</td>
<td>(a) Tata Iron &amp; Steel Co. Ltd., Jamshedpur</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>(b) Using sulphuric acid</td>
<td>(b) Mysore Chemicals &amp; Fertilisers Ltd., Bellagola*</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>(c) Using gypsum as raw material</td>
<td>(c) FACT, Alwaye</td>
<td>2</td>
</tr>
<tr>
<td>1974</td>
<td>(d) As a by-product of Polymer/caproacetamide</td>
<td>GSFC, Baroda</td>
<td>4</td>
</tr>
<tr>
<td>99</td>
<td>Ammonium sulphate nitrate</td>
<td>FCI Ltd., Sindi</td>
<td>1**</td>
</tr>
<tr>
<td></td>
<td>Urea</td>
<td>FCI Ltd., Sindi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ammonium chloride (Agriculture)</td>
<td>New Central Jute Mills Co. Ltd., Varanasi*</td>
<td>2</td>
</tr>
<tr>
<td>1960</td>
<td>Ammonium phosphate</td>
<td>FACT, Alwaye</td>
<td>20</td>
</tr>
<tr>
<td>91</td>
<td>Calcium ammonium nitrate</td>
<td>NFL, Nagal</td>
<td>3</td>
</tr>
<tr>
<td>1965</td>
<td>Nitrophosphate</td>
<td>RCFL, Trombay</td>
<td>3</td>
</tr>
<tr>
<td>1967</td>
<td>Diammonium phosphate</td>
<td>Gujaratal State Fertilizers &amp; Chemicals Ltd., Baroda</td>
<td>10</td>
</tr>
<tr>
<td>1968</td>
<td>Triple superphosphate</td>
<td>Dharamai Moranj Chemical Co. Ltd., Ambernath</td>
<td>1**</td>
</tr>
<tr>
<td></td>
<td>Urea ammonium phosphate</td>
<td>Coromandel Fertilisers Ltd., Vizag</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>NPK complex fertilisers</td>
<td>RCFL, Trombay</td>
<td>4</td>
</tr>
<tr>
<td>1973</td>
<td>Pelokes</td>
<td>Orissa Fertilisers and Chemicals, Rourkela</td>
<td>1**</td>
</tr>
</tbody>
</table>

*ow not in operation.  **Includes 3 urea plants of RCF, Thal and 2 of KIRBHCO, Hazira.
*ow not manufactured.  @ During 1995-96, 7 plants manufactured Ammonium Phosphate Sulphate (20-

exact number is not available.

Fertiliser plants with multiple products have been counted more than once under respective product categories.

Source: Fertiliser Association of India, New Delhi.
Presently, there are (Table-1) 69 Nitrogenous plants which includes 41 Urea plants belonging to 22 organisation and located in 33 sites, 17 complex plants belonging to 15 organisations and located in 17 sites, 11 Ammonium Sulphate plants belonging to 3 organisation located in 3 sites and 78 Single Super Phosphate plants belonging to 78 organisations and located in 78 sites. Gujarat State Fertilisers and Chemicals Ltd., Baroda was manufactured Di-Ammonium Phosphate (DAP) at first in 1967. There are 10 fertiliser industries producing DAP in India. The total installed capacity was 11.068 and 3.747 million tonnes of Nitrogen (N) and Phosphate (P2O5) respectively (as on 1999).44

Table-2

Forms in which fertilisers are produced and their contribution to Total Nutrient Production (1997-98)

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Nutrient Content</th>
<th>Production ('000 tonnes materials)</th>
<th>Percentage share of total N</th>
<th>P2O5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Straight Nitrogenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Ammonium Sulphate</td>
<td>20.6</td>
<td>562(551)</td>
<td>1.15</td>
<td>-</td>
</tr>
<tr>
<td>(b) Urea</td>
<td>46.0</td>
<td>18595(19292)</td>
<td>84.73</td>
<td>-</td>
</tr>
<tr>
<td>(c) Calcium Amm.Nitrate</td>
<td>25.0</td>
<td>438(466)</td>
<td>1.09</td>
<td>-</td>
</tr>
<tr>
<td>(d) Ammonium Chloride</td>
<td>25.0</td>
<td>110(63)</td>
<td>0.28</td>
<td>-</td>
</tr>
<tr>
<td>2. Straight Phosphatic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Single Superphosphate</td>
<td>16.0</td>
<td>3721(3625)</td>
<td>-</td>
<td>19.38</td>
</tr>
</tbody>
</table>

(contd...)
<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Nutrient Content</th>
<th>Production ('000 tonnes materials)</th>
<th>Percentage share of total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>(b) Single Superphosphate</td>
<td>14.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. NP/NPK Fertilisers

(a) Ammonium Phosphate
- 16-20-0: 200(214) 0.32 1.30
- 20-20-0: 855(900) 1.69 5.57

(b) Diammonium Phosphate
- 18-46-0: 3666(3864) 6.54 55.05

(c) Urea Amm. Phosphate
- 28-28-0: 148(176) 0.41 1.34

(d) Nitrophosphate
- 20-20-0: 247(151) 0.49 1.60
- 23-23-0: 156(177) 0.36 1.17
- 20.7-20.7-0: 247(242) 0.51 1.66

4. NPK Fertilisers

1. Nitrophosphate With Potash
- 15-15-15: 332(355) 0.50 1.63

2. Others
- 17-17-17: 431(684) 0.50 1.63
- 19-19-19: 156(77) 0.30 0.98
- 10-26-26: 302(303) 0.30 2.57
- 12-32-16: 362(352) 0.43 3.78
- 14-28-14: 18(26) 0.03 0.70
- 14-35-14: 136(115) 0.19 1.56

|                  |                  |                                    | N | P2O5 |
|------------------|------------------|------------------------------------|   |      | 12.75 | 80.62 |

Figures within brackets denote production during 1998-99.

Source: The Fertiliser Association of India, New Delhi.
<table>
<thead>
<tr>
<th>Year</th>
<th>Nitrogen (N)</th>
<th>Phosphate ($P_2O_5$)</th>
<th>Complex (NPK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951-52</td>
<td>29</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>1955-56</td>
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<td>90</td>
</tr>
<tr>
<td>1956-57</td>
<td>79</td>
<td>18</td>
<td>96</td>
</tr>
<tr>
<td>1960-61</td>
<td>112</td>
<td>54</td>
<td>166</td>
</tr>
<tr>
<td>1961-62</td>
<td>154</td>
<td>65</td>
<td>220</td>
</tr>
<tr>
<td>1965-66</td>
<td>237</td>
<td>119</td>
<td>357</td>
</tr>
<tr>
<td>1966-67</td>
<td>309</td>
<td>146</td>
<td>455</td>
</tr>
<tr>
<td>1967-68</td>
<td>403</td>
<td>207</td>
<td>610</td>
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<tr>
<td>1968-69</td>
<td>563</td>
<td>213</td>
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<tr>
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<td>2562</td>
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<td>1992-93</td>
<td>7431</td>
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<td>1993-94</td>
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<td>1997-98</td>
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<td>13,141</td>
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<td>1998-99</td>
<td>10,477</td>
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<td>13,651</td>
</tr>
</tbody>
</table>

Source: The Fertiliser Association of India, New Delhi.
Table-4
Consumption of Fertilisers
1950-51 to 1998-99

('000 tonnes)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Nitrogen N</th>
<th>Phosphate P$_2$O$_5$</th>
<th>Potash K$_2$O</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>55</td>
<td>8.8</td>
<td>6.0</td>
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<tr>
<td>1951-52</td>
<td>59</td>
<td>7</td>
<td>-</td>
<td>66</td>
</tr>
<tr>
<td>1955-56</td>
<td>107.5</td>
<td>13</td>
<td>10.3</td>
<td>130.8</td>
</tr>
<tr>
<td>1956-57</td>
<td>123</td>
<td>16</td>
<td>15</td>
<td>154</td>
</tr>
<tr>
<td>1960-61</td>
<td>211.7</td>
<td>53.1</td>
<td>29</td>
<td>293.8</td>
</tr>
<tr>
<td>1961-62</td>
<td>250</td>
<td>60</td>
<td>28</td>
<td>338</td>
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<td>1965-66</td>
<td>574.8</td>
<td>132.5</td>
<td>77.3</td>
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<td>1966-67</td>
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<td>249</td>
<td>114</td>
<td>1101</td>
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<tr>
<td>1967-68</td>
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<td>335</td>
<td>169</td>
<td>1539</td>
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<tr>
<td>1968-69</td>
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<td>382</td>
<td>170</td>
<td>1761</td>
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<td>1969-70</td>
<td>1356</td>
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<td>1479.3</td>
<td>541</td>
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<td>1974-75</td>
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<td>1975-76</td>
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<td>1372</td>
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<tr>
<td>1998-99</td>
<td>11354</td>
<td>4112</td>
<td>1332</td>
<td>16798</td>
</tr>
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</table>

Source: The Fertiliser Association of India, New Delhi.
Urea constitutes 83.1 percent of the Nitrogen capacity in the country. Nitrogen (N), Phosphate (P) and Complex fertilisers (NPK) account for 71.8 percent of Phosphate capacity of which Di-Ammonium Phosphate (DAP) alone constitute nearly 46.0 percent. Forms in which fertilisers and produced and their contribution in terms of percentage share to the total Nitrogen and Phosphate production in the country are given in Table-2.

a) Fertiliser Production in India:

During 1951-52 the fertiliser production (Table-3) 0.27 lakh tonnes and 0.90 lakh tonnes in 1955-56 in India. During 1960-61 and 1965-66 production was 1.7 lakh tonnes and 3.6 lakh tonnes respectively. The total production in 1970-71 was 10.6 lakh tonnes due to improvement in the production performance of units already existing and to contribution from new units commissioned during this period. During the year 1975-76 the total production had raised to 18.2 lakh tonnes in India. In 1984-85 and 1985-86 the production was 30 lakh tonnes and 57.7 lakh tonnes respectively. The total production of Nitrogen (N) and Phosphate (P₂O₅) for the year 1989-90 was raised to 85.4 lakh tonnes and in 1990-91 the production 90.4 lakh tonnes. Production of Nitrogen(N) declined from 87.7 lakh tonnes in 1995-96 to 85.9 lakh
FIGURE - 1
FERTILISER PRODUCTION IN INDIA (1951-1998)
FIGURE - 1a
FERTILISER PRODUCTION IN INDIA (1951-1998)
FIGURE - 2a
FERTILISER CONSUMPTION IN INDIA (1951 - 1998)

(Million tonnes)

Year


0.06 0.1 0.3 0.7 2.2 2.8 5.8 8.4 12.8 13.8 16.2
tonnes in 1996-97 i.e., a reduction of 180 thousand tonnes. This was primarily the result of disruption in supply of feedstock specially natural gas and infrastructural constraints in regard to handling and transportation besides technical problems faced by some of the plants. During 1997-98 (Figure-1a) the total production was steeply raised to 13.1 million tonnes in India.

b) Fertiliser Consumption in India:

The consumption of fertilisers has been rising steadily over a period though its use has become more popular since the 1960’s. It increase (Table-4) from 65600 tonnes in 1951-52 to 2.94 lakh tonnes 1960-61, to 22.57 lakh tonnes in 1970-71, 55.15 lakh tonnes in 1980-81 and 87.22 lakh tonnes in 1985-86. The breakthrough came after 1965-66, when consumption was only 7.8 lakh tonnes which nearly trebled to 22.6 lakh tonnes in 1970-71 and more than doubled to 55.2 lakh tonnes 1980-81. The up trend in consumption as in evidence in the 1980’s also, though unfavourable weather conditions in several regions in 1984-85 slowed down the off-take of nitrogenous and complex fertilisers. The use of these nutrients was more selective because of the adoption of better agricultural practices. Thus, the average rise in consumption between 1980 and 1986 was only 9.7% though it was as high as 21% in 1983-84.
Having witnessed record increase (Figure-2a) in consumption in 1989-90, the rise in 1990-91 was moderate 11.5 million tonnes and 12.8 million tonnes respectively. In 1995-96 the consumption raised to 13.8 million tonnes and in 1997-98 it was 16.2 million tonnes in India.

**Agricultural Education**

Scientific management of agricultural inputs with particular emphasis on fertiliser is essential to increase fertiliser use efficiency. Techniques of fertiliser application, therefore, is as important as the use of fertiliser itself. The promoters of the fertilisers must educate the farmers, farm women and young farmers about the proper use of the fertiliser on one hand as well as the techniques of application on the other.

Proper agronomic practices can increase remarkably fertiliser use efficiency, eg., mulching with crop residues and that created by tillage, continuous cropping and adequate fertilisation under sub-optimum tillage rather than with conventional tillage, deep tillage in problematic soil and sub-surface placement of nutrients, planting of wider spaced crops on ridges to facilitate localised application of fertiliser to check leaching losses, application of Anhydrous Ammonia
to increase Nitrogen use efficiency, Rock Phosphate to comb at the problem of Phosphorous fixation in acid soils, and use of amendments in acid soils to increase the efficiency of applied nutrients.

Similarly, deep placement of Urea foliar application, split application and slow release of fertiliser by application in the form of pellet (with mud or others) granules coated with suitable material, have shown good promise both on formulation of farms as well as farmer’s field. The farmers are yet to be educated of formulation of fertiliser doses based on fertility status, consideration of residual effects and inclusion of legumes in crop rotation.

Government’s Efforts:

Government of India have been taken much efforts to educate the farmers on using of fertilisers and methods of cultivation etc., through mass media like Doordarshan, All India Radio, Newspapers and Magazines. Doordarshan Kendra, Chennai, give much importance to agriculture by telecasting the programme ‘Vayalum Vaazhvum’ from the inception of the TV channel in 1975. This ‘Vayalum Vaazhvum’ programme is being telecasted on Monday to Friday in the evening with the specialization of interviews with agricultural officers, specialists, farmers and also field experiments,
methods of cultivation, etc. This programme is providing a clear picture of farming methods, new technologies, use of fertilisers, etc, to the farmers.

All India Radio is impart the education in agriculture by telecasting 'Veedum Vayalam' for more than fifty years. 'Pannai Cheithi' and interviews with farmers, specialists, agricultural officers are take part in this programme. Through the Radio programme much of the farmers benefiting in the agricultural production. News papers and Magazines are also educate the farmers through the advertisements, agricultural news and articles etc.

Government Agricultural Department conducts number of awareness programmes, seminars, visiting tours by their 'Field Officers' to educate the farmers in the field of use of fertilisers, methods of cultivation, harvesting, etc. 'Field Officers' used to go to the villages and meet the farmers and teach them in the farms itself by demonstration to use of fertilisers, farming methods, etc. The farmers also make clear themselves all their doubts on cultivation methods, use of fertilisers in proper way by the Field Officers. Number of the villages have been visited by the Field Officers and educated the farmers in proper way. Besides the field experiments and
demonstration classes, the agricultural department used to show demonstration short films on agricultural methods to the village farmers. These kinds of short films teach the farmers very clearly about the new agricultural methods and use of fertilisers, etc.

Government Agricultural Departments and fertiliser industries have been conducted number of programmes to educate the farmers. The companies like, Madras Fertilisers Limited, SPIC, etc., are conducted many programmes to educate the farmers. MFL took a Long Term Agricultural Development Programme (LTADP) which had taken up 22 operational units covering a cultivated area of nearly 4.5 lakh acres. This programme was meant to provide supplies and services to such of those areas in the country where current levels of agricultural production where below the national average with a view to increase agricultural production by removing the constraints that farmers faced in increasing their production. SPIC Ltd conducted many seminars and group discussions involving farmers and several experts on relevant subjects were very enthusiastically received. To keep the farmers informed of the latest developments, SPIC in bringing out periodically a journal called ‘Pannai Cheithi Malar’, which is being published in English, Telugu and Kannada. These publications which are distributed to farmers free of cost, have
become very popular. Soil Testing, Seed Treatment Campaign, etc., and a number of special projects are among the popular programmes conducted regularly.

The fertiliser industry has a close liaison with agricultural universities, research stations to keep informed up-to-date agro technology. Institutions like, IFFCO have established the chairs of professors in agricultural universities of the country. Many other manufacturers have instituted fellowship for priority projects. Few organisations like, KRIBHCO, NFL are recognising the scientist of agriculture universities by giving them awards for their contribution in farm production. The industry is also collaborating with many international organisations like FAO, IRRI and IFDC in their programmes to increase the agricultural production with fertiliser use.

In the year 1985-86 China was third place in the world to consumption of Phosphate viz., 2764.5 thousand tonnes. By educating the farmers of China and teaching the techniques of utilizing fertilisers, the country came first place in the year 1991-1992, i.e., 7326.3 thousand tonnes and in the next place was the USSR i.e., 6594.6 thousand tonnes. India was the fourth place in the world to consumption of Phosphate in the year 1985-86 viz, 2068
thousand tonnes and in the year 1991-92, 3321.2 thousand tonnes. In the year 1996-97 India was in the third place i.e., 2976.8 thousand tonnes next to USA i.e., 4144.9 thousand tonnes of Phosphate consumption in the world.45

To increase the fertiliser use and production of food grains more, not only educating the farmers but also school level students have to be educated on agriculture and it will enable them to know more about agricultural methods, use of fertilisers to much the yield in the agricultural products.

**Education of farmers to use fertilisers is essential:**

The farmers needs some basic understanding about the place and value of fertilisers, how plant nutrients are replaceable, characteristics of the primary and to a lesser extent, the secondary and minor nutrients, problems of teaching and fixation, why balanced applications are essential, and some idea of fertiliser usage in other areas are parts of his basic education.

The farmers must have good, sound advice and guidance in applying fertiliser and other inputs to local conditions and on his own soils. Just as the farmers’ general education about fertilisers is
based on research, the advice he gets about applying modern technology, to his own soil and crop problems must come largely from research.

Understanding of the interactionary nature of fertilisers is important and in turn, the interactionary relationships of fertilisers with the other modern technological inputs and practice such as improved seeds, plant protection chemicals and practices, irrigation and drainage and improved cultural practices.

The producer needs analytical data showing probabilities of costs and physical and monetary returns resulting from his fertiliser and other inputs, application and information on the mechanics credit, fertiliser deliveries and marketing procedures.46

It will be also desirable to look into the need for agricultural chemicals, such as pesticides, herbicides, etc. These are also an important part of the whole agricultural picture and are often sold with fertilisers or through the same outlets.
REFERENCES


7. Schedule A of the Resolution includes the following industries:

   (1) arms and ammunitions, (2) atomic energy, (3) iron and steel, (4) heavy casting and forgings of iron and steel, (5) heavy plant and machinery, (6) heavy electrical plant, (7) coal and lignite, (8) mineral oil, (9) mining of iron ore, manganese ore, chrome ore, gypsum, sulphur, gold and diamond (10) mining and processing of copper, lead, zinc, tin etc., (11) minerals connected with production and use of atomic energy, (12) aircraft (13) air transport (14) railway transport (15) ship building (16) telephone cables, telegraph and wireless apparatus (excluding radio receiving sets) (17) generation and distribution of electricity.

8. Schedule B covers the following industries:

   (1) minerals except minor minerals as defined in section 3 of the Minerals Concession Rules of 1949, (2) aluminium and other non-ferrous metals not included in Schedule A, (3) machine tools, (4) ferro-alloys and too steels,
(5) **basic** and intermediate products required by chemical industries such as manufacture of drugs, dyestuffs and plastics, (6) anti-biotics and other essential drugs, (7) fertilisers, (8) synthetic rubber, (9) carbonization of coal, (10) **chemical** pulp, (11) road transport, and (11) sea transport.


17. First Five Year Plan, Planning Commission, New Delhi, 1952, p-255.


21. The term fertiliser is ordinarily applied to materials which are added to soil to increase the supply of plant nutrients and thereby enhance the fertility of the soil.


24. FAI, Handbook on Fertiliser Technology, New Delhi, p-1.


27. Sixteen Elements are Carbon, Oxygen, Hydrogen; Primary Nutrients-Nitrogen, Phosphorous, Potassium; Secondary Nutrients-Calcium, Magnesium, Sulphur; Micro Nutrients-Boron, Chlorine, Copper, Iron, Manganese, Molybdenum and Zinc.


33. Ibid., p-224.

35. Ibid., p-22.


37. Thomas Parry came to India in 1788 from England for the purpose of trade. In the beginning of 19th Century he established Parry & Co., to manufacture confectionary products. In the year 1906 the company established a factory at Ranipet to manufacture chemical fertilisers. The Ports of Madras and Cuddalore are near to Ranipet, the availability of raw materials and transportation, etc., are very convenience to the factory.


