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SYMPOSIUM ON 'FERTILIZERS : ISSUES AND POLICIES'

Chairman : DR. GUNWANT M. DESAI,
I.F.P.R.I., Washington, D, C., U.S.A.

Convenors : 1. SHRI P. N. BHARGAVA,
Principal Scientist, IASRI, New Delhi

2. DR. R. T. DANGARWALA,
Sr. Soil Scientist, G.A.U., Anand

The symposium on 'Fertilizers—Issues and Policies' was organised during the 44th Annual Conference of the ISAS on 3rd Dec., 1990 at G.A.U., Anand Campus, Anand. Prof. Prem Narain welcomed the Chairman and participants who were representing research organisations, agricultural universities and fertilizer industries and state governments. Prof. Narain stated in his introductory remarks that growth in agriculture production is mainly contributed due to the fertilizer use. The trend of fertilizer consumption and food production over years is more or less the same. As the total food production has increased over years, similar is the increase in fertilizer consumption. By 2,000 A.D., the requirements of food to feed the teaming millions of the country is likely to be around 240 million tonnes. To achieve this targetted requirement, the requirement of fertilizer is also estimated to be around 20 million tonnes. To produce and handle this large amount of fertilizers for its distribution to the countryside and make it available timely, it will involve a number of policy issues which need to be sorted out at this stage. Therefore, keeping in view the importance of the role that this fertilizer has to play in the total food production, the ISAS thought of organising this symposium so as to provide a forum for discussion of various issues and suggest policies in order to maintain the continuous growth of fertilizer production and consumption in the country.

Chairman, in his opening remarks, enumerated some of the price and

non-price issues on the fertilizer growth and briefly remarked on the current fertilizer responses and their behaviour for important crops in the country and desired that the statistics on fertilizer use and responses be developed for smaller areas which could ultimately form a recommendation for the farmers.

The convenor of the symposium, Sh. P. N. Bhargava informed that to cover the various aspects of fertilizers, the topic was divided into 5 subtopics. The speakers representing fertilizer industries, F.A.I. and agricultural universities were requested to submit the lead papers on the subtopics identified. There were 8 contributed papers, of which, 6 were presented by the scientists themselves and the summary of two papers was presented by the convenor. The detailed summaries of the papers presented are as follows.

1. FERTILISER PRICING AND SUBSIDY POLICIES IN INDIA—AN APPRAISAL

UTTAM GUPTA
Fertilizer Association of India, New Delhi

Rapid and sustained increase in foodgrains production to meet the requirements of growing population and maintaining their nutritional standards at reasonable level has been the basic objectives of Indian agricultural policy. Towards its fulfilment, coordinated efforts to increase cultivated area under high yielding varieties, irrigation and increasing fertilizer use have paid rich dividend in terms of increase in agricultural productivity and consequently production. Nearly 50 per cent of the increase in foodgrains production between 1966-67 to 1988-89 can be attributed to fertilisers.

While fertiliser consumption in India increased phenomenally from a meagre 70,000 tonnes (all nutrients) in 1951-52 to about 11.6 million tonnes in 1989-90, being a key to the success of 'Green Revolution', the underlying forces which contributed to this, are not so well appreciated. The paper deals with the role of fertiliser pricing and subsidy policy, an important pre-requisite for the development of fertiliser use.

Fertiliser pricing cannot be divorced from pricing of foodgrains. The policy with regard to the latter rests on the basic premise of *adequately* feeding the people living below the poverty line at *affordable* prices. The Government, therefore, administers food subsidy.

The convass of agricultural pricing/subsidy policy was extended to cover the agricultural inputs particularly fertilisers, which is the costliest

amongst all the purchased inputs. The Government has all along adopted a policy of keeping fertiliser price to the farmer at a "stable" and "reasonable" level. It enables production of low cost food thus keeping the burden of food subsidy or inflationary impact under check and induces increasing fertiliser consumption even by small and marginal farmers. The paper discusses the fertiliser pricing system in India which has evolved during the last 3 decades or so, within the framework of these fundamentals.

The prime focus is on the Retention Pricing Scheme (RPS) which was implemented in November 1977 for nitrogenous fertilisers (February 1979 for phosphatics) with two fold objectives of (a) sustaining an affordable price to the farmer despite inflation to induce increasing fertiliser use for enhancing agricultural production (b) protecting viability of domestic units in the face of control on consumer price at a low level to ensure the health and growth of the industry.

Under the RPS, a reasonable ex-factory price is fixed for the manufactured product of any unit which covers its cost of production besides providing for reasonable margin of profit (currently 12 per cent post-tax on networth) subject to prescribed efficiency norms with regard to capacity utilisation and consumption of raw materials and utilities.

The pricing scheme has been in operation for more than a decade now. It has produced excellent results in terms of increase in investment/installed capacity and production. The installed capacity of N and P_2O_5 increased from 5.2 million tonnes during 1980-81 to 10.9 million tonnes as of now. The increase in production has been even more as the capacity utilisation of the industry improved substantially from 50 per cent N and 65 per cent P_2O_5 in 1980-81 to 85 per cent *N* and 87 per cent P_2O_5 during 1988-89. These and other parameters indicating the beneficial impact of pricing scheme are discussed in details in the paper.

In recent years, various changes in the parameters of pricing particularly the norm for capacity utilisation and depreciation as also arbitrary/ad-hoc implementation of the RPS, have adversely affected the financial results of the industry. The paper highlights various examples of the setbacks under the pricing scheme which is pushing the industry towards sickness despite consistent improvement in its operational efficiency.

Much of this appears to have been the result of an incorrect appreciation of the increasing fertiliser subsidy. The subsidy has increased because, on the one hand, the consumer price now continues to be what it was in the beginning of the decade of 80s and, on the other, the prices of inputs to the industry have increased manifold. Besides, fertiliser production by itself has increased steeply (6 million tonnes *N* and P_2O_5 between 1980-81 and 1988-89) and much of which has come from newly commis-

sioned units entailing higher capital cost under the impact of inflation, taxes and duties and rupee depreciation, etc. The paper discusses these factors in details, in particular, highlighting the fact that bulk of inrecase in fertiliser subsidy is only an "intra-economy" transfer.

Despite various measures, the subsidy burden continues to increase which on domestic fertilisers alone is likely to cross Rs. 4000 crores during the year 1990 91. The paper pleads for an objective assessment of the fertiliser subsidy issue which, as yet, does not seem to be forthcoming.

The paper also deals with the perception in certain quarters that fertiliser could be imported cheap and substantial subsidy incurred on domestic production thus saved. The notion of cheap import is a 'myth' and the paper brings out cost comparison on a 'like to like' basis to establish this point. Above all, it addresses three basic imponderables which are conveniently forgotten by those who argue for imports. First, whether the required quantity of fertiliser material will be available in the international market? Second, if so, at what price? and third, even if the answer to these two is 'yes', which is clearly not the case, then, shall we have the required 'foreign exchange' to pay for it?

The paper concludes by suggesting a package of policy/administrative measures which need to be implemented urgently to restore an attractive price policy environment. The stress is (a) to restore *status quo ante* in pricing norms mainly in respect of depreciation and capacity utilisation and (b) to deal with the question of fertiliser subsidy within the framework of its basic causes particularly the administered prices of inputs to the industry and the consumer price.

Efforts may be needed to prevent increase in fertiliser subsidy at an alarming pace. However, any orthodox view merely based on text book interpretation can give wrong policy signals and thus compromise on continued health and growth of the industry, This has happened in the past and must not be allowed to repeat lest our basic goals of continued self-reliance in agriculture and food security will be jeopardised.

2. SOME ECONOMIC ISSUES OF FERTILISER USE IN AGRICULTURAL PREDUCTION IN INDIA

C. C. MAJI and SUSRESH PAL*

The paper attempts to : (i) examine the pace and pattern of fertiliser

*Indian Council of Agril. Research Krishi Bhavan, New Delhi.
**Indian Agricultural Research Institute, New Delhi,

use, (ii) determine the factors influencing fertiliser consumption, and (iii) suggest research and policy issues including long-term integrated fertility management in Indian agriculture.

Pace and Pattern of Fertiliser Use

Consumption of fertiliser in India reached 11.0 million tonnes in 1988-89 from only 2.6 million tonnes in 1971-72 showing an annual compound growth rate of 8.85 per cent. Fertiliser use per ha also went up by nearly five times during the last two decades i.e. from 13.7 kg in 1970-71 to 62.2 kg in 1988-89.

Fertiliser use was highly uneven among the States, both in respect of total quantam and use per hectare. Paddy and wheat crops which have a larger proportion of their area under irrigation consumed more than 2/3rd of total NPK. The amount of fertilisers used by jowar, bajra and maize was about a half of that used in sugarcane alone. The per ha fertiliser use and the proportion of fertilised area to the gross cropped area on farms using fertiliser vary inversely with farm size. However, when all farms are considered the percentage of farmers using fertiliser and the proportion of gross cropped area fertilised increase with farm size. Since more than three fourths of the country's total farms are either marginal or small a higher intensity of fertiliser application on these farms has profound implications for fertiliser consumption, agricultural production and fertiliser subsidy policy. It is also important to note that the small and the marginal farmers together consume about one-third of the total NPK in the country.

Determinants of Fertiliser Use

The results of regression analysis in general show that fertiliser demand factors *viz.* area under irrigation and short-term credit are more important in determining the fertiliser use. The gross cropped area per sale point which is a proxy for fertiliser supply network also appears to influence fertiliser consumption. Since there is little variation in the fertiliser price across the States the estimated coefficient of this variable has not turned out significant.

There was a sharp rise in fertiliser subsidy in 1974-76 on the imported fertilisers on account of high international prices of fertiliser in the wake of oil crisis. Subsidy on domestic fertilisers which started in 1976-77 and was Rs. 60 crore rose by 78% in 1977-78 and shot up to Rs. 321 crore in 1979-80 due to a downward revision of fertiliser prices. With exception of 1980-81 and 1981-82, the fertiliser subsidy continued to increase over

the past decade and was as high as Rs.3250 crores in 1988-89. It is important to note that in the recent past subsidy on the domestic fertilisers has become several times larger than on the imported fertilisers.

Since per ha use of fertiliser is more on the small and the marginal farms than that on the larger farms benefit on account of fertiliser subsidy accrued to farmers per *unit of land* varies inversely with the size of operational holding. However, the semi-medium and medium farms which account for about 60% of the total NPK consumption in the country enjoy the maximum share of the fertiliser subsidy. The cropping pattern is a major factor responsible for regional disparity in the distribution of benefits from the subsidy on fertlisers.

Disparity in the distribution of fertiliser subsidy leads to a wider disparity In rural income among regions and farms of various sizes within the regions. Restricting the scope of subsidy to only the small and the marginal farmers may be ideologically sound and socially desirable but cannot be implemented as it will give rise to many corruptive practices. Furthermore, doubts have also been raised as to whether farmers are the net beneficiaries of the subsidy programme. Evidence showst hat only 47.69% of the total fertiliser subsidy was going to the farmers and the rest to the fertiliser industry or the distribution system during the eighties.

Except in 1974-75 consumption of fertilisers increased in spite of substantial increase in fertiliser prices. There may be two plausible reasons for such a phenomenon. First, the marginal value product of fertilisers has been empirically found to be much higher than the subsidised price of fertilisers in most of the crops and regions. Secondly, since an increase in fertiliser price results in a higher cost of production which is taken as a basis for fixation of procurement price of most of the crops using fertilisers the fertiliser-crop price ratio either remains unaltered or becomes more favourable to fertiliser use without any reduction in dosage and area.

Emerging Issues and Long-term Strategies

Chemical fertiliser is one of the most important inputs in bringing about a rapid increase in agricultural output. However, continuous application of fertilisers at an increased dose especially in a tropical climate like ours may lead to several undesirable long-run consequenees. Details on these aspects are discussed in the paper.

Bio-fertilisers are highly economical and can fix 20-30 kg of atmospheric nitrogen per ha. Commercial production and distribution of bio-fertilisers is not existent at present. Concerted efforts to encourage the use of bio-fertilisers through establishment of a strong production and distribution system should be made and the existing extension services should

be re-oriented and geared to that purpose.

The country is faced with a dilemma. On the one hand, there is an imperative need for higher agricultural production particularly of foodgrains to feed its rapidly growing population. On the other, the modern technology involving hybrid seed varieties responsive to higher doses fertiliser, irrigation, plant protection measures may not be consistent with long-run sustainability of agriculture firstly because most of the components of the high-yielding technology are dependent on non-renewable resources and secondly continuation of 'chemical agriculture' for a longer time may have serious ecological and environmental problem. In view of the above, it is suggested that an Integrated Fertility Management Programme be developed for major crops for each season and agro-climatic region as an alternative source of plant nutrients. This necessitates suitable modifications both in the objectives and design of experiments and should be given top priority by fertiliser researchers and statisticians. Like long-term fertiliser experiment conducted on different locations and soils long-run experiments on Integrated Fertility Management be undertaken involving both the conventional and the non-conventional crops in the irrigated and the rainfed conditions. Finally, varieties/strains with a higher responsiveness to fertiliser application and an increased ability to utilise environmental energy in general and solar energy in particular through biotechnological research and photosynehetic manipulations should be evelved to meet the dual objective of higter production and long term sustainability of agriculture.

3. FEEDING SECOND INDIA—FOOD AND FERTILIZER PERSPCTIVE

HANSA MODI and MADHUKAR MAJMUDAR
Gujarat State Fertilizers Company Limited, Vadodara

Foodgrain production rose from 72 million tonnes in 1965-66 to 170 million tonnes during 1988-89. This big leap into self sufficiency in food production has been possible due to input intensification of Indian agriculture and particularly increasing fertilizer use ever since mid-sixties. Fertilizer consumption had increased from 294 thousand tonnes in 1960-61 to 2.2 million tonnes in 1970-71, 5.5 million tonnes in 1980-81, and about 11.5 million tonnes of nutrients in 1989-90.

Population in India has steadily grown from 361 million in 1951 to 685 million in 1981 and about 750 million in 1985. It will around 1 billion people by 2000 AD.

What would be the magnitude of foodgrain needs? What would be the

corresponding requirements of food producing inputs particularly fertilizers? As for the food requirements there are various approaches to the futurological study. One is the approach based on nutritional considerations and another one is an economist's perspective of "demand for food" reflecting the tastes and habits. Another and more practical one is to achieve "food security" and feed the population atleast at the present levels which we have achieved in early eighties. According to planning Commission, the country will need to produce 205 million tonnes of food by the end of Eighth Plan and 235 million tonnes by 2000 AD.

Demand for fertilizers does not depend on food production targets. Its course is determined by several other factors. Considering the average fertilizer crop response ratio of 1 : 10 in Indian agriculture it is estimated (by FAI) that fertilizer requirement would be 17.5 million by 2000 AD as compared to 11.5 million tonnes and in 1989.90. The Working Group on Fertilizer, Ministry of Agriculture however, projected the fertilizer demand to be 20.6 million tonnes by 2000 AD.

As regards the supply positions, prejection are made by the working group. The comparative picture of nutrientwise demand projections made by the working group and FAI are presented the paper.

The demand-supply gap which is worked out on the basis of these projections and production projections is also given in the paper. Production projections as worked out by the working group are based on likely production resulting from modernisation and stabilisation of existing plant capacities, improvements in productivity perfromance achieved in the past, implementation of the spill over gas-based projects on the HBJ pipeline. Production projections also take into account revamping of the existing units for capacity utilisation, projects, under implementation and projects under consideration. Based on the above, the estimated nitrogen production works out to 8.6 million tonnes and that of P_2O_5 to 3.2 million tonnes by 1994-95. As regard to nitrogenous fertilizers, there will be a gap of 1.45 to 1.50 million tonnes of N by the year 1994-95. This gap will widen to nearly 4 million tonnes by the end of the century. Similarly, there will be a deficit of 1.25 million tonnes of P_2O_5 by the end of eighth plan and this deficit is likely to be around 2.5 million tonnes by 2000 AD.

The demand-supply gap needs to be bridged over the period to provide much needed nutrients to the soil. The strategic decisions to be made relate to making the deficit through options of "Buy" or "Make". This gives rise to many questions. The paper discusses the merits and demerits of these two options.

If one visualises to make deficit through merely imports, even at the current (second half of 1990) prices of Urea, DAP and MOP, the import

bill is likely to be of US $ 1115 million for the year 1994-95. For making the likely deficit through imports, the same is likely to reach a staggering level of US $ 2348 million by 2000 AD.

Pure "make" decision will involve massive expansion of production facilities on the domestic front in a short time span. Though India has capabilities to develop such a wide production base, several factors need to be considered such as :

—timely decision-making on the locational front,
—attracting private-sector capital for financing such projects,
—containing fertilizer subsidies in view of the higher capital outlays required for new base compared to the old utilities,
—import of raw materials like Rockphosphates or Phos-Acid for manufacture of DAP.

In view of these it is advisable to have a suitable mix of "buy" and "make" decision to bridge the gap between demand-supply.

4. SUSTAINING GROWTH IN FERTILISER CONSUMPTION IN 90's

S. N. PANDEY and L. K. VASWANI
KRIBHCO—New Delhi

The impressive growth in fertiliser consumption during 70's and 80's has been the key factor in raising agricultural production to its existing level. During this period significant increase has taken place in fertiliser use in terms of per unit area and coverage of various crops. Inspite of these changes disparities in fertiliser use across regions, crops, and size of holding continue to persist. The fertiliser consumption continue to be high in districts with well developed infrastructure and large areas under irrigation and HYV. The past and ongoing fertiliser promotion programme launched by the Government and fertiliser industry from time to time have not been able to narrow down these disparities to a desirable extent.

The future growth in fertiliser consumption will have to be attempted with better understanding of the dynamics of growth in fertiliser use. The process of growth mainly consists of transforming agronomic and economic potential into effective demand and has been elaborately covered in this paper. This in turn will require a new orientation through a set of promotional programmes, policies and a much more responsible fertili-

ser marketing system. Given these components influencing fertiliser growth process, the future fertiliser growth strategies should consist of i) increasing consumption in areas where existing levels are below national average, (ii) further raising profitability of fertiliser use by improving crop yield response function and (iii) the improving response of fertiliser marketing system.

Besides clear understanding of fertiliser growth process, role of support system like credit, extension etc. has also to be favourably influenced so as to reduce time-lag in achieving fertiliser use potential. In this context paper outlines specific action issues separately for low and high consumption areas for inclusion in the new fertiliser promotional approach. The paper also suggests steps to operationalise this new promotional approach by suitably integrating with recent initiatives already taken by the industry and the Government in this regard.

5. FERTILISERS—ISSUES & POLICIES

K. KAPOOR
Zuari Agro Chemicals Limited, Zuarinagar, Goa

The one bright spot in the Indian economy is the excellent progress in agriculture. The key inputs for the achievement have been increased irrigation and fertilisers. Thus fertiliser consumption in the last two decades have increased from 2.3 million tonnes of NPK in 1970-71 to 11.6 million tonnes in 1989-90.

However there are various problem areas :

(a) Per hectare NPK consumption is still low and compares unfavourably with other countries: Pakistan 82 kgs, Egypt 350 kgs, Japan 432 kgs with India at 65 kgs.

(b) Four crops—rice, wheat, sugarcane and cotton account for bulk of fertiliser consumption. Other crops either not fertilised or do not get optimum level.

(c) Skewed consumption pattern:

—Out of 412 districts, 67 districts account for 50% of fertiliser consumption.

—Uneveness in kharif and rabi consumption (45 : 55 whereas 64% area covered in kharif and 36% in rabi).

(d) Inadequate credit and marketing facilities

(e) Production-Consumption gap :

Indigenous production not keeping pace with demand.

(f) 'Fertiliser' subsidy

Retention Price Scheme (RPS) introduced in 1977 with twin objectives :

(i) To increase consumption by making fertiliser available to farmers at reasonable prices and
(ii) Attract investment to fertiliser industry by giving reasonable return

These objectives largely achieved.

However, subsidy has grown steeply from Rs. 321 crores in 1978–79 to Rs. 3600 crores in 1989-90: there is the false impression that fertiliser industry has benefitted. In reality, increase in fertiliser subsidy is due to :

—Sharp escalation of input costs,
—Increased per tonne cost of newly built plants,
—Substantial increase in fertiliser consumption (from 2.34 million tonnes of *N* in 1975 to 8.96 tonnes in 1988):
—Fertiliser prices to farmer same as 10 years ago.

To meet the challenges of the 2000 AD, when our population will be one billion, foodgrain production must increase to 240 million tonnes.

For this we need to orient our agronomic policies to serve composite communities instead of individual farmers i.e. watershed approach, community efforts to rehabilitate waste land etc.

Our low productivity levels need to be improved (i e. India 1493 kgs/ha of foodgrains v/s China 3798 kgs/ha). To achieve targetted foodgrain production our present fertiliser consumption of 65 kgs/ha needs to go upto 113 kgs/ha.

This can be achieved by :

(i) More effective farmer education and extension programmes particularly in dryland areas. Thus T&V programmes where the extension worker's responsibility is not diluted and is combined with regular follow-up have been effective.

(li) Farmer access to inputs like fertilisers, pesticides, seeds, micro-nutrients under one roof (single window concept) say within 5 km distance.

(iii) Increase area under irrigation.

(iv) Credit—both short and long term availability is inadequate. Even more than the farmer's need for additional credit perhaps is his need for elimination of redtape, paper work and delays: simpler, farmer-friendly procedures (i.e. 'pass book' system) required.

(v) Small packaging to suit tribal, hilly and coastal areas. Progress has been made in this direction by promoting 10 to 20 kg packaging.

(vi) Increase area under high yielding varieties; present area of 64 million hectares must go upto 105 million hectares by 2000. Increased HYV use will occur only when combined with a package of incentives since HYVs are costly in terms of inputs.

In addition, drylands need to be made more productive by special measures like integrated watersheds and water conservation. Improved infrastructure is also required in rural areas i.e. roads, mandis, banks so that farmer gets better return and spoilage of food stuff is prevented.

6. FERTILIZER MANAGEMENT FOR CROP PRODUCTION

S. N. SHARMA and K. N. SINGH
IARI, New Delhi-110012

Fertilizer use plays a vital role for increasing food grain production. The notable features of a fertilizer-use strategy which aims to sustain optimum production are discussed in the present paper. The optimum rates of fertilizer application should be worked out for a cropping system as a whole rather than for a crop in isolation. The conclusions drawn on the basis of results of various short and long term experiments are as follows :

—In cereal-cereal cropping systems, optimum rate of nitrogen should be applied to each crop and P to rabi crops only, while in legume-cereal cropping, kharif legume should receive major portion of P dose to be applied in a cropping system.

—Application of K in balanced proportion with N and K is important to sustain productivity of a cropping system.

—Organic manures give more benefits when these are applied during kharif season.
—Application of zinc, manganese, sulphur and iron increases the response to other nutrients.
—Residual as well as current *N* transfer for legumes should be taken into consideration while deciding the fertilizer schedule for a cropping system.

Balanced fertilization is must for sustaining optimum yields. The word "balanced" should mean a total plant nutrient system which is capable of taking care of all nutrient deficiencies which occur in an area.

Efficient fertilizer use is another strategy which country can not afford to ignore it. Agronomic practices such as choice of appropriate crop, timely sowing, maintaining optimum plant population, adopting proper time and method of fertilizer application, selection of proper fertilizer material adopting scientific water management and efficient weed, pest and disease control play an important role in increasing fertilizer use efficiency.

Integrated input-use strategy is last but very vital for sustaining crop yields. The usage of organic manures along with optimum rates of fertilizer application not only increase the response to fertilizers but also improves the physical, biological and physiochemical properties of the soil.

7. FERTILIZER MANAGEMENT FOR INCREASING CROP PRODUCTION

K. G. PILLAI
Directorate of Rice Research, Hyderabad (A.P.)

India is the fourth largest user of fertilizer in the world, using almost 11.3 million out of the world's total fertilizer consumption of nearly 140 million tonnes of NPK during the year 1987-88 and it may not be wrong to state that fertilizers have played a very significant role in the modernisation of Indian Agriculture and in making the country self sufficient in food grain production. It is estimated that almost 40-45 per cent of the total food grain output can be directly attributed to fertilizer use.

Although the current gains in our food front are quite impressive because of two successive record years in food production, Indian agriculture still faces some major challenges in the immediate future ahead, as well as over the long-term, mainly because of the narrow genetic base over which it has been built and due to large-scale use of one single

nutrient that is nitrogen, often ignoring the concept of balanced fertilizer use. Indian agriculture has already stepped into the era of multi-nutrient deficiencies, because of continuous cropping and soil depletion and because of imbalanced use of fertilizers. The estimated crop removal of NPK in 1985 in our country which was at 18.8 million tonnes is expected to go upto almost 26.2 million tonnes by 2000 A.D. and we shall be using around 18 million tonnes of plant nutrients by that time. The declining trend in grain yield response of a major crop like rice with increasing fertilizer consumption levels, during the last three decades as evident from recent reports, from 15 kg grain per kg nutrient in the sixties and seventies to 7-8 kg. grain per kg nutrient, would vividly explain the complexities of the problem further; emphasising the need to correct new and emerging problems of nutrient deficiencies and the need for balanced use for improving the fertilizer use efficiency.

The need of the hour is to move away from the "soil mining" agriculture to "soil building" agriculture or towards a regenerative agriculture. Commenting on new nutrient deficiencies and the changing emphasis towards high analysis fertilizers like DAP and urea; the superiority of low analysis traditional fertilizers like ammonium sulphate and super phosphate is now being brought out by many recent reports and the present consensus is to encourage the use of low analysis fertilizers, where possible, 'for specific crops and situations to increase the fertilizer use efficiency'.

An attempt is also made to briefly review the fertilizer management practices relating to major, secondary and micro-nutrients for major crops and cropping systems, as also in presenting a case for increased emphasis on fertilizer use in rainfed areas and under dryland agriculture. The response to major nutrients in major crops under diverse agro-climatic conditions are briefly reviewed based on data from Experiments on cultivators' fields and the yardsticks developed are presented.

It is to be remembered that efficient and cost-effective fertilizer technology alone would not make the desired impact in the absence of appropriate public policy and package of Governmental support, towards improving the input purchasing and risk taking capacity, as well as social status to derive the economic benefits from new technologies. More than by giving remunerative prices for the produce and subsidies on purchased inputs the farmers should also be given easy access to markets, as otherwise it can prove counter productive for increasing production.

8. FERTILIZER MAYKETING—POLICY ISSUES

R. C. GUPTA and B. L. NARAYANA
IFFCO, New Delhi

The role of chemical fertilizers in the growth of agriculture in the Indian economy occupies a prominent position. Increasing use of chemical fertilizers is unavoidable for enhancing productivity. As such, their marketing, distribution and logistics (transportation, storage, packaging etc.) acquire a great significance. Some of the important policy issues discussed in the paper are as follows :

Pricing :

Certain decisions were taken with regard to fertilizer pricing by introducing modifications in the capacity utilization and depreciation norms which proved detrimental to the healthy growth of fertilizer industry. The profitability was adversely affected, the main reason being the change in the retention price norms. Recently it has been agreed to revise the depreciation norms to a certain extent. The depreciation rate was changed from 5.3% to 11.1% w. e. f. April 1988 and now revised to 7.1%.

Product and Produtcion :

As a matter of policy, emphasis is given on production of urea as a source of N and DAP as that of P_2O_5. During 1989-90, urea and DAP accounted for 85% and 40% of the total N and P_2O_5 production in the country. Potassic fertilizers are imported as the country does not possess raw material for their production.

Distribution :

The distribution of fertilizers is determined by the Government, the guiding principle being rationalisation of transportation. Allocations are made in such a manner that the national transportation system is burdened the least, the transportation cost is minimised and there is no criss-cross movement in the identical product. The merits and demerits of the system are discussed in the paper and suggestions given to overcome difficulties.

Logistics :

By the end of Eighth Five Year Plan, 35 million tonnes of fertilizers

material is to be distributed throughout the country and by the turn of this century, the quantity would be more than 50 million tonnes. The main modes of transportation are rail and road, rail accounting for 70%. The paper discussed the problems faced in transportation including infrastructural facilities and cost involved.

Storage :

Warehousing is an essential element of fertilizer logistics management. The material need to be made available, to farmers at their door steps at the appropriate time. This is possible only when there is widespread network of field warehouses from where the retailers can draw their requirements. The paper discusses the existing facilities, the bottlenecks and possible remedies.

Retail Outlets :

There is need for widespread network of fertilizer retail outlets. Their number and location matters a lot in promoting fertilizer use. The paper discusses about the number of fertilizer sale points set up by co-operatives and private agencies, and mode of functioning of these retail outlets.

Packaging :

Fertilizer needs a special packaging material to protect it against environment particularly moisture. Under Fertilizer Control Order, the type, grade, composition quantity and the brand name has to be indicated on the bag. The advantages and disadvantages of using different packaging material like jute bags, High Density Polyethylene bags are discussed in the paper.

Promotion :

The achievement in the field of fertilizer consumption attained so far is limited to certain pockets in the country, the areas with assured irrigation system. In order to promote fertilizer use in the low consumption rainfed areas, it is planned to launch a national project in 182 districts during 8th Plan. Need-based educational and promotional programmes need to be evolved for promotion of fertilizer use.