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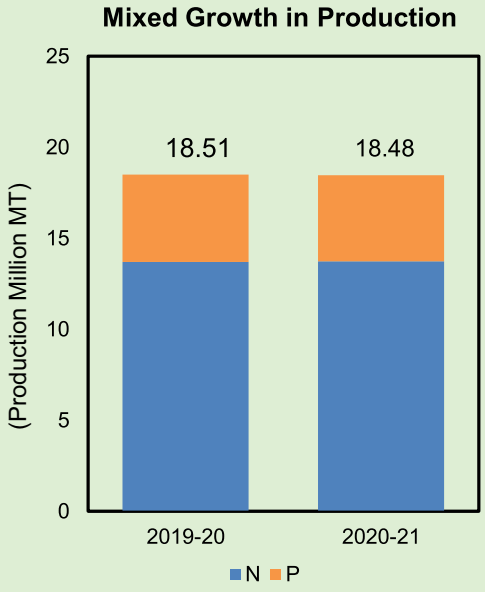
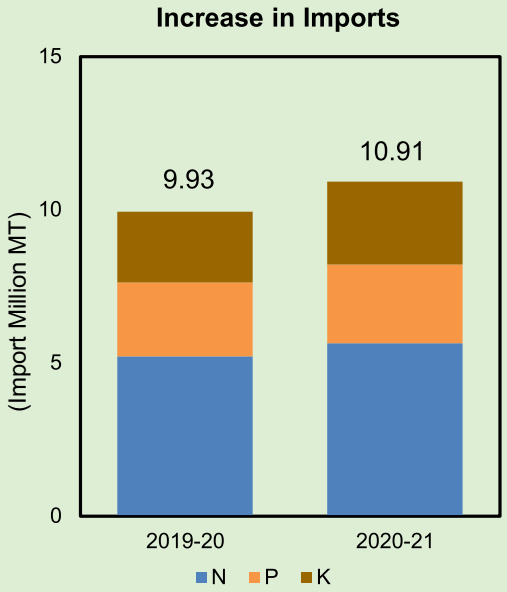
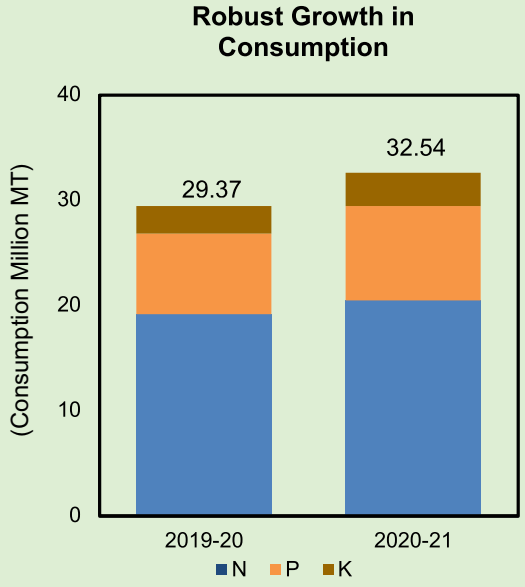
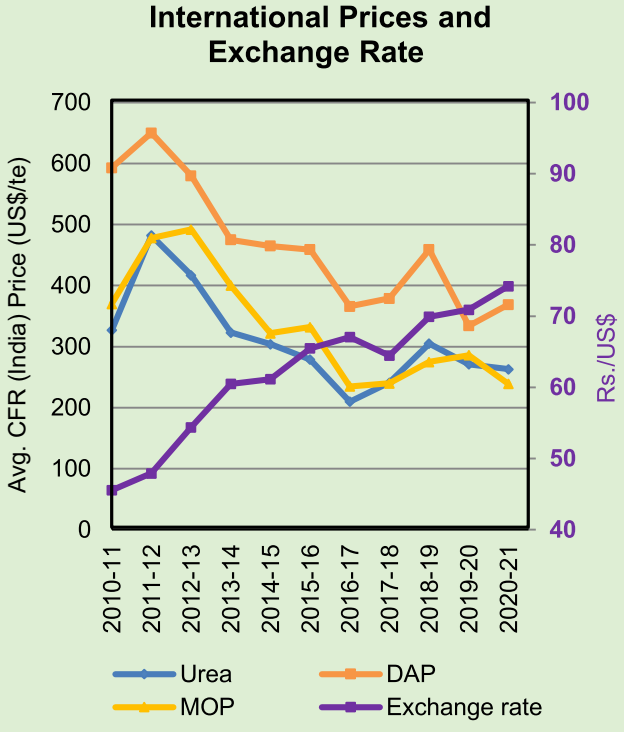
Marketing Special with Annual Review 2020-21









NPK use Ratio	7.3:2.9:1	6.5:2.8:1
Per hectare Use (Kg)	145.6	161.3
Food grains Production (Million MT)	297.5	308.7

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INDIAN JOURNAL OF FERTILISERS

Vol.17 No.9 September, 2021

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Marketing Special with Annual Review 2020-21

No. of Pages 164 (821-984)

Our Cover

Our cover depicts scenario of production, import and consumption of fertilizers in 2020-21 compared to 2019-20. It also shows trends in prices of fertilizers in international market and exchange rate.

Previous issue : Vol.17 No.8. pp.717-820

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Fertilizer Sector during 2020-21

Frank Notes

Satish Chander

The year 2020-21 witnessed an unprecedented worldwide public health crisis due to COVID-19. Economic, social and cultural activities were disturbed due to lockdown or partial restrictions imposed by the central, state or local administrations to prevent the spread of virus and minimize its impact. In spite of challenges due to COVID-19 pandemic, activities in agriculture and fertilizer sectors were least affected. This was possible due to exemption of these sectors from lockdown restrictions and help extended by central and state governments. Fertilizer Industry on its part ensured continuous production and dispatch of fertilizers by adopting all safety measures as per the guidelines of the Governments issued from time to time even at extra cost. As a result of these measures, fertilizer was the only sector among eight core industries registering positive growth while remaining seven sectors recorded negative growth in 2020-21. Major developments in fertilizer sector during 2020-21 are presented in the following paragraphs.

To begin with weather, Southwest monsoon 2020 arrived in Kerala on time, *i.e.,* 1st June, 2020. Overall rainfall from 1st June to 30th September, 2020 was 109% of long period average (LPA). Out of 36 meteorological sub-divisions, 31 sub-divisions received normal to excess rains and remaining 5 sub-divisions received deficient rains during the period. Water storage position in major reservoirs was comfortable in 2020. Live storage in 123 reservoirs at the end of *kharif* 2020 was 148.25 billion cubic meter (BCM) as against 151.07 BCM during the corresponding period in the previous year. This was 98% of the last year and 114% of the normal storage. Overall good rains facilitated higher coverage of area under various crops. Food grains production touched a record level of 308.7 million MT in 2020-21 as against 297.5 million MT in the previous year. Except cotton and jute & mesta, all other crops showed increase in production.

Total consumption of fertilizer products increased from 60.60 million MT during 2019-20 to 67.61 million MT in 2020-21 representing an increase of 11.6%. Consumption of urea at 35.04 million MT, DAP at 11.91 million MT, MOP at 3.42 million MT, NP/NPK complex fertilizers at 11.81 million MT and SSP at 4.49 million MT during 2020-21 recorded increase of 4.5%, 18.1%, 19.5%, 22.4% and 20.3%, respectively, over 2019-20. In terms of nutrients, consumption of total fertilizer nutrients at 32.54 million MT recorded a robust growth of 10.8% in 2020-21 over 2019-20. Per hectare use of total nutrients increased from 145.6 kg in 2019-20 to 161.3 kg in 2020-21.

Availability of fertilizers from opening inventory, indigenous production and imports was adequate to meet the surge in demand for fertilizers in 2020-21. Total indigenous production of all fertilizers at 43.49 million MT during 2020-21 registered an increase of about 2% over 2019-20. Production of urea at 24.60 million MT, NP/NPK complex fertilizers at 9.33 million MT and SSP at 4.92 million MT during 2020-21 marked increase of 0.6%, 7.6% and 15.8%, respectively, over 2019-20. However, production of DAP at 3.77 million MT witnessed a sharp decline of 17.1% during 2020-21. In terms of fertilizer nutrients, total production at 18.48 million MT during 2020-21 witnessed a marginal decline of 0.2% over 2019-20. While production of nitrogen (N) increased marginally by 0.2% to 13.75 million MT, phosphate (P_2O_5) declined by 1.1% to 4.74 million MT in 2020-21 compared to 2019-20.

Urea production could have been higher in 2020-21 but several factors limited the production. There was a cap on production of urea for naphtha based plants under policy. The viability of production beyond reassessed capacity was also affected under policy parameters. Two urea plants suffered loss of production mainly due to constraints in availability of working capital. A few plants encountered equipment related problems. Capacity utilization of phosphatic and complex fertilizer plants continued to remain low. This sector faces problems due to unfavorable taxation regime. There is same level of import duty on major inputs like ammonia and phosphoric acid and finished products like DAP. Also, the level of subsidy is same on domestically produced and imported fertilizers. Thus domestic industry is denied level playing field.

Supply of domestic gas to fertilizer plants has dwindled gradually over the years. This has made fertilizer plants more and more dependent on imported and more expansive LNG. Supply of domestic gas declined further from 12.8 million metric standard cubic meter per day (MMSCMD) in 2019-20 to 10.2 MMSCMD in 2020-21. Domestic gas constituted only 23.7% of total gas consumed during the year. The balance requirement of gas was met by imported LNG.

Imports of finished fertilizers remained high during the year. Import of urea at 9.83 million MT, DAP at 4.88 million MT, MOP at 4.23 million MT and NP/NPK complex fertilizers at 1.39 million MT during 2020-21 recorded increase of 7.7%, 0.2%, 15.2% and 86.3%, respectively, over 2019-20.

FAI continuously impressed upon the government, the need for additional allocation of funds for fertilizer subsidy in order to clear the arrears carried over from one financial year to other. In an unprecedented move, government announced additional allocation of Rs. 65,000 crore under Atmanirbhar Bharat 3.0 for 2020-21. This helped to clear most subsidy arrears of the fertilizer industry. As a result, Indian fertilizer industry was able to come out of the perennial liquidity crunch.

Government implemented the Modified NPS-III policy 2014 by issue of notification dated 30th March, 2020. The

Additional allocation of Rs. 14,775 crores to cover the increase in subsidy on P&K fertilizers will take fertilizer subsidy budget to Rs. 94,304.68 crores for the current year. However, there will be still higher requirement of funds for 2021-22.

payment of increased fixed cost for production upto reassessed capacity were made. But differential fixed cost for production above reassessed capacity is yet to be paid. Further, provision of minimum fixed cost under modified NPS-III policy 2014 is yet to be approved by the Government. This is under consideration of the Government. Giving relief to urea units using coal in urea production is also under consideration of the Government. Government tightened the energy norms for remaining 14 gas based urea units *w.e.f.* 1st October, 2020 as prescribed under NUP 2015.

NBS rates for N, P, K and S were marginally reduced for 2020-21 compared to 2019-20. The NBS rates for N, P, K and S had been fixed at Rs.18.789, Rs.14.888, Rs.10.116 and Rs.2.374 per kg, respectively for 2020-21 *w.e.f* 1st April, 2020. A new grade of fertilizer 14-28-0-0 was included in the notification of NBS scheme for 2020-21.

Issue of equitable treatment of taxes like GST in cost and realization in determination of reasonableness of profit/ MRP for P&K fertilizers under NBS remains under consideration of the Government. Customs duty on raw materials and intermediate products continued to impact competitiveness of domestic manufacturing of P&K fertilizers. The issue of delay in refund of accumulated input tax credit arising from inverted GST structure on inputs, non-refund of ITC on account of input services and IGST on ocean freight on imports on CIF basis remain to be addressed.

Having reviewed the performance and development of fertilizer sector during 2020-21, let us examine the prospects of the fertilizer sector for 2021-22. As regards weather, the Southwest monsoon made onset over Kerala coast on 3rd June 2021 with a delay of two days. Actual rainfall during June 2021 was 10% above LPA but in July it was 7% below LPA. IMD predicted normal (94 to 106% of LPA) rainfall during August 2021. Overall rainfall performance from 1st June to 31st July, 2021 was 1% below LPA. Out of 36 meteorological sub-divisions, 29 sub-divisions received normal to excess rains and remaining 7 sub-divisions received deficient rains during the period. Out of 694 reported districts, 72% districts received normal to excess rains during the period. Total live storage in 130 reservoirs was 85.36 BCM as on 29th July, 2021 as against 70.77 BCM on the same date in the previous year. Current year's storage is 121% of the last year storage.

As per the available information, total area sown under all *kharif* crops was 84.82 million hectares (million ha) as on 30th July, 2021 compared to 89.00 million ha during the corresponding period in the previous year. This was 4.7% lower than the corresponding period in the previous year.

Indigenous production of urea at 7.89 million MT and DAP at 1.11 million MT during April-July 2021 declined by 3.9% and 12.3%, respectively, over April-July 2020. However, production of NP/NPKs at 2.92 million MT and SSP at 1.71 million MT witnessed increase of 12.7% and 2.1%, respectively, during the period. Import of DAP and NP/ NPKs increased by 1.6% and 2.0%, respectively, during April-July 2021 over April-July 2020. However, import of urea and MOP declined by 6.7% and 41.8%, respectively, during the period.

Delayed and deficient monsoon rains and decline in sown area affected fertilizer demand during April-July 2021 over April/July 2020. Sale of urea at 10.19 million MT, DAP at 2.72 million MT, NP/NPKs at 3.69 million MT and MOP (for direct application) at 0.91 million MT during April-July 2021 witnessed decline of 11.4%, 26.6%, 4.6% and 7.9%, respectively, over April-July 2020. However, sale of SSP at 1.90 million MT registered an increase of 5.8% during the period.

Keeping in view that overall Southwest monsoon (June-September) 2021 is anticipated to be normal, deficit in cropped area during *kharif* 2021 is likely to be reduced. Normal Southwest monsoon is likely to leave good moisture contents in the soil for ensuing *rabi* crop season. Water availability in the reservoirs at the end of *kharif* season is also likely to be comfortable. International prices are not cooling and continuing to increase which remains a cause of concern. The total consumption of fertilizers during 2021-22 is likely to remain at the level of 2020-21.

Budget allocation for 2021-22 is Rs. 79,529.68 crores comprising Rs. 58,767.68 crores for urea and Rs. 20,762.00 crores for P&K fertilizers. Budget allocation for P&K fertilizers as per BE for 2021-22 has been reduced compared to BE of Rs. 23,504.00 crores in 2020-21.

In view of significant increase in international prices of finished fertilizers, raw materials and the intermediates used for manufacture of P & K fertilizers compared to the prices in 2020-21, Department of Fertilizers revised the NBS rates of P from Rs.14.888 per kg to Rs. 45.323 per kg *w.e.f.* 20th May, 2021. Increase in subsidy rates of P is applicable only upto 31st October, 2021. However, NBS rates per kg for N, K and S remained unchanged at the previous year's level. Accordingly, NBS rate per tonne of DAP and SSP increased from Rs. 10231 and Rs.2643 for 2020-21 to Rs. 24231 and Rs. 7513 per tonne for 2021-22, respectively. NBS rates for NP/NPK grades of fertilizers are now in the range of Rs. 11134 per tonne to Rs. 19910 per tonne. However, NBS rates for MOP and ammonium sulphate remained unchanged at Rs. 6070 and Rs. 4398 per tonne, respectively, for 2021-22.

Government has announced additional allocation of Rs. 14,775 crores to cover the increase in subsidy on P&K fertilizers due to increase in rate of subsidy notified on 20th May, 2021. This has taken fertilizer subsidy budget to Rs. 94,304.68 crores. But in view of continuing increase in international prices of fertilizers and raw materials, there will be still higher requirement of funds for 2021-22.

The performance of fertilizer sector in 2020-21 and prospects for 2021-22 are given in detail in the *Annual Review of Fertiliser Production and Consumption 2020-21* which is being published in the current issue of Indian Journal of Fertilisers. ■

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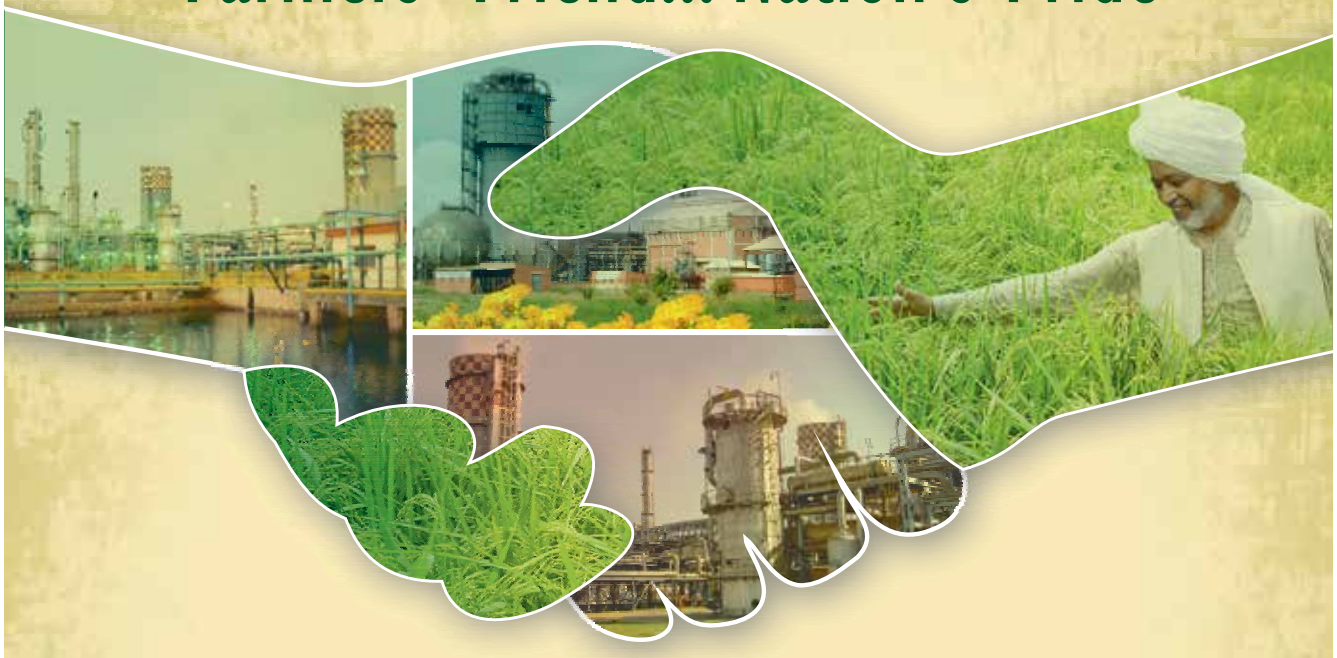

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Demand Supply Management for Ensuring Availability of Fertilizers

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Abstract

Fertilizer availability is influenced by many factors like demand-supply balance in domestic market, favourable government policies, easy access to raw material/feed stock, international prices & supply demand balance, future market prospects, preference for fertilizer grades by farmers, etc. Demand of fertilizer will continue to increase with increasing demand of food. Supply of fertilizers cannot be increased very quickly under short-term; it requires long-term planning and capacity addition based on requirement levels in the country. Import is aiding in supply of fertilizers but international market is not very stable especially in terms of prices. Prices of fertilizers in international market are very volatile which poses serious issues in timely import and availability of fertilizers. Fertilizer being bulky material need advance planning and arrangement of logistics for regular dispatches and movement across the country. Improved logistic arrangement would ensure better availability of fertilizers. Forecasting techniques can help in arriving at requirement of fertilizers for different areas and crops more accurately. Advance stocking scheme should be implemented throughout the country. Policy initiatives to bring urea under NBS, incentives for high use efficiency fertilizers will rationalize demand whereas systematic capacity addition will ease pressure on supply of fertilizers in the country.

Key words: Fertilizer market, drivers, consumption, production, gap, international prices, management

An Overview of Fertilizer Market

The Indian fertilizer industry has played a pivotal support role in the Indian agricultural industry. The growth in the use of chemical fertilizers has been the secret of nation's green revolution in the late nineteen sixties. Today, India is the third largest producer and second largest consumer of fertilizers in the world. The industry comprised of three major sectors *i.e.* private, public and cooperative. The Government of India subsidizes fertilizers to ensure that fertilizers are easily available to farmers and the county remains self-sufficient in food production. Agriculture is livelihood to about 58% of India's population. Indian agriculture is dependent on monsoon to a great extent. Monsoon affects crop sown area, fertilizer consumption as well as agriculture production. Fertilizers have important role to play in country's overall well-being and it can be looked upon from various aspects.

Drivers for Fertilizer Consumption in India

Fertilizer demand is subject to a number of factors like agro-climatic conditions, rainfall, irrigation facilities, use of high yielding varieties (HYV), credit availability, crop sown area, cropping pattern and its intensity, fertilizer response ratios, farmers' knowledge of crop production methods, prices of fertilizers and agro-output infrastructure. In view of the low share of irrigated areas in the arable land of the nation, rainfall and its distribution pattern over time and regions are the basic determinants of fertilizer consumption. Even when all factors are favourable, failure of seasonal rains adversely affects fertilizer demand. In the past few years, erratic monsoons have exposed vulnerability of farmers. Regardless of this, it is important to understand other factors influencing fertilizer consumption and fertilizer use behaviour to arrive at an outlook.

Increasing Food Requirement for Increasing Population

Indian population is growing at 1.0% per annum. More than 1.3 crore people are added every year. Increasing population has increased demand for food and other materials. The food grain production increased from 244.5 million MT during 2010-11 to 308.7 million MT during 2020-21(**Table 1**). Added population puts more pressure on limited agriculture land and almost fixed cropping season. Fertilizer has great role to feed this population by augmenting food production. Fertilizer has 40-50% contribution in increasing crop productivity. So demand of fertilizer is expected to increase in future to meet increased demand of food. Global food production would be insufficient without fertilizers. To feed the growing population, there will be a need to produce ever increasing quantity of food grains. The increased production will be through improved productivity and increased supply of plant nutrients.

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Table 1. Progress of food grains production (Source: FAI, 2020, 2021)

(Million MT)

Year	Cereals			Pulses	Total food grains
	Rice	Wheat	Coarse Cereals		
2010-11	96.0	86.9	43.4	18.2	244.5
2011-12	105.3	94.9	42.0	17.1	259.3
2012-13	105.3	93.5	40.0	18.3	257.1
2013-14	106.6	95.9	43.3	19.3	265.1
2014-15	105.5	86.5	42.9	17.1	252.0
2015-16	104.4	92.3	38.5	16.3	251.5
2016-17	109.7	98.5	43.8	23.1	275.1
2017-18	112.7	99.9	47.0	25.4	285.0
2018-19	116.5	103.6	43.0	22.1	285.2
2019-20	118.9	107.9	47.8	23.0	297.5
2020-21 (4^{th} advance estimate)	122.3	109.5	51.2	25.7	308.7

The increase in production of rice and wheat is steeper compared to other crops. Since consumption of fertilizers in these crops is higher compared to other crops and contribute to increased demand of fertilizers more.

Increasing Areas under High Fertilizer Consuming Crops

The cultivation pattern has been shifting towards high fertilizer consuming crops due to better market for output and economic returns (**Table 2**). Increase in area under these crops will increase demand for fertilizers.

Agricultural Credit

Agricultural credit is also an important component in purchase behaviour of the farmers for any kind of agri-input. The Government of India is laying lot of emphasis in ensuring credit to the farmers through National Agriculture Rural Bank. The flow of institutional credit to agriculture sector has shown an increase from Rs. 468291 crore in 2010-11 to Rs. 1048475 crore in 2021-21 showing an increase of 123.9%. The rising trend augurs well for fertilizer consumption. Timely availability of agricultural credit, particularly through cooperative system has shown positive correlation in productive use of credit by way of increased use of agro-inputs and has also significant impact on reducing the rural indebtedness besides being an important factor in higher demand of fertilizers.

Cultivation of High Yielding Varieties

Increased demand for food has led to technological advancement in the field of agriculture. High Yielding Variety (HYV) is one of those technological breakthroughs. High yielding varieties have made it possible to grow more from the available arable area which cannot be increased beyond a limit. HYV has higher crop yield per hectare, improved response to fertilizers and high reliance on irrigation and fertilizers. If these requirements are met, these significantly outperform traditional varieties. Fertilizers not only assist in increasing yields and promoting healthy growth of plants but also in their

Table 2. High fertilizer consuming crops and area under cultivation in million ha (Source: FAI, 2020; Rao, 2011)

Crop	NPK consumption in kg ha^{-1} in 2011-12	2000-01	2005-06	2016-17	2017-18	2018-19
Sugarcane	319.5	4.3	4.2	4.4	4.7	5.1
Cotton	153.4	8.5	8.7	10.8	12.6	12.6
Potato	275.1	1.2	1.4	2.2	2.1	2.2
Fruits	177.9	3.8	5.3	6.4	6.5	6.7
Vegetables	197.7	6.8	7.2	10.2	10.3	10.1

Table 3. Increase in cropping intensity (%) with time (Source: FAI, 2020)

Year	Area sown (000 ha)		Cropping intensity
	Gross	Net	
1990-91	185742	142999	129.9
2000-01	185340	141366	131.0
2005-06	192737	141162	136.5
2010-11	197683	141563	139.6
2015-16	197054	139506	141.3
2016-17	199204	139659	142.6
2017-18	199281	139168	143.2

development. Modern day agriculture has adopted HYV in many crops and to sustain the production and productivity of such crops fertilizers use is inevitable. With increasing trend of HYV area under cultivation, fertilizer demand will continue to increase.

Crop Intensity

Fertilizer consumption improves with increased crop intensity. The crop intensity has improved from 129.89% during the year 1990-91 to 143.2% during 2017-18 (**Table 3**). Further, with development of irrigation facilities, use of HYV, improvement in seed replacement ratio and access to credit facility is likely to improve further thereby increasing the fertilizer usage.

Increase in Area under Irrigation

A critical input promoting fertilizer use and crop response to fertilizer is water. India receives 120 cm average annual rainfall, which is unevenly distributed geographically and is seasonal in character. This warrants development of irrigation facilities. Investment in irrigation infrastructure and various developmental schemes in the country are yielding results. A considerable increase in percentage of gross irrigated area to gross sown area is also noticed since 1990-91 (**Table 4**).

Table 4. Increase in share of gross sown area and gross irrigated area (Source: FAI, 2020)

Year	Area (000 ha)		% of irrigated area to gross sown area
	Gross sown area	Gross irrigated area	
1990-91	185742	63204	34.0
2000-01	185340	76187	41.1
2005-06	192737	84279	43.7
2010-11	197683	88940	45.0
2015-16	197054	96622	49.0
2016-17	199204	98335	49.4
2017-18	199281	99377	49.9

Soil Fertility and Mining of Nutrients

Agriculture is a perpetual activity and is continued since beginning of civilization. Continuous mining of nutrients from soils do not get replenished by natural process. Crop production levels not only need to be sustained but increased every year. Frequent cropping on fields has depleted soils all over the world for different nutrients. Plant nutrients are required in different quantity but their deficiency or absence hampers the performance of other nutrients even though they are available in plenty. Fertilizers help in quick replenishment of deficient nutrients. Balance fertilization helps in supplying various nutrients required by soils thus enhancing soil fertility. Soil fertility has reached alarming levels of deficiency in many areas and crop production may not be sustained without use of fertilizers.

Gap in Consumption and Production of Fertilizer Nutrients

Consumption of nitrogen (N) has reached at 20.40 million MT in 2020-21 from 16.56 million MT in 2010. On the other hand, production of N has increased from 12.18 million MT in 2010-11 to 13.75 in 2020-21 (**Table 5**). It can be inferred that there is gap in consumption and production of N has shown an increase of 52.0% during the period in the country. This gap is filled by import of urea and the increasing import is leading to alarming situations. Increased import level not only impact the national exchequer but also the prices of urea in international market which creates a vicious cycle to churn out more funds and adversely affecting fertilizer availability in the country.

Consumption of P in terms of P_2O_5 declined to 7.66 million MT in 2020-21 from 8.05 million MT in 2010. However, it showed an increase of 17.2% in 2020-21 over 2019-20. Production of P_2O_5 showed an increase of 9.6% in 2020-21 over 2010-11. Consumption of P_2O_5 remained less in all these years compared to 2010-11 except 2020-21. Reduced consumption of P_2O_5 is not desirable as increased consumption of N has already distorted the N:P:K ratio in the country. It can be further observed that there had been gap in consumption and production of P_2O_5 from 2010-11 to 2020-21. The gap was 4.24 million MT in 2020-21.

Consumption of K in terms of K_2O declined from 3.5 million MT in 2010-11 to 3.15 million MT in 2020-21. The demand of this nutrient is met through import in the form of muriate of potash (MOP) as there is no source of indigenous production. Consumption of K_2O remained less in all these years compared to 2010-11. Reduced consumption of K_2O is not desirable as increased consumption of N has already distorted the N:P:K use ratio in the country.

Table 5. Consumption, production and gap in fertilizer nutrients in India (Source: FAI, 2020; 2021)

(000 MT)

Year	Consumption of nutrient			Production of nutrient		Gap	
	N	P_2O_5	K_2O	N	P_2O_5	N	P_2O_5
2010-11	16558.2	8049.7	3514.3	12178.6	4371.2	4379.6	3678.5
2011-12	17300.3	7914.3	2575.5	12288.3	4363.7	5012.0	3550.6
2012-13	16820.9	6653.4	2061.8	12237.3	3826.0	4583.6	2827.4
2013-14	16750.1	5633.5	2098.9	12408.6	3972.0	4341.5	1661.5
2014-15	16949.6	6098.9	2532.9	12433.7	4118.9	4515.9	1980.0
2015-16	17372.3	6978.8	2401.5	13475.9	4425.8	3896.4	2553.0
2016-17	16735.9	6705.5	2508.5	13376.8	4552.7	3359.1	2152.8
2017-18	16959.3	6854.4	2779.7	13422.6	4724.4	3536.7	2130.0
2018-19	17637.8	6910.2	2680.3	13336.8	4590.5	4301.0	2319.7
2019-20	19101.3	7662.0	2607.0	13722.2	4790.7	5379.1	2871.3
2020-21	20404.0	8977.9	3153.7	13745.4	4737.3	6658.6	4240.6

Consumption, Production, Gap and Import of Urea

Consumption of urea has shown an increase of 24.6% from 2010-11 to 2020-21. It increased from 28.1 million MT to 35.0 million MT during the period. On the other hand, production has increased by 12.5% from 21.9 million MT in 2010-11 to 24.6 million MT in 2020-21 (**Table 6**). The gap between consumption and production has been widening and it showed an increase of 57.5% from 2010-11 to 2020-21. This gap is filled by import. The import volume of urea is leading to alarming situations. Increased import not only impact the national exchequer but also the prices of urea in international market which creates a vicious cycle to churn out more funds and adversely affecting fertilizer availability in the country.

Consumption of urea is increasing at higher rate than increase in production. This increase in consumption is translating in increased imports.

Factors Responsible for Increased Consumption of Urea: As discussed, consumption of urea is increasing and the trend is expected to continue in the near future. Some of the factors responsible for increase in urea consumption are as follows:-

Agronomical Reasons: There is preference for application of urea among farmers because it gives better crop response on application. Sudden increase in greenery in crop fields gives psychological satisfaction to farmers. Urea can be applied in most of crops at many times during the crop cycle. Multiple application of urea in the crops is practiced widely leading to its excessive use.

Easy availability: Urea is available in most parts of the country throughout the year. Easy availability of urea sometime leads to its overuse by farmers. In some areas, farmers try to compensate application of other fertilizers through its use.

Price of Urea: Price of urea is at a very low level. Statutory price for selling of urea is Rs. 5360 MT^{-1}. Price revision of urea has not taken place since 1st April, 2010 except marginal increase from 1st October, 2012

Table 6. Consumption, production, gap and import of urea in India (Source: FAI, 2020; 2021)

(000 MT)

Year	Consumption	Production	Gap	Import
2010-11	28112.5	21872.5	6240.0	6610.0
2011-12	29565.3	21992.3	7573.0	7834.0
2012-13	30002.2	22586.6	7415.6	8044.0
2013-14	30600.5	22718.7	7881.8	7088.0
2014-15	30610.0	22592.9	8017.1	8749.0
2015-16	30634.8	24461.3	6173.5	8474.0
2016-17	29613.6	24200.8	5412.8	5481.0
2017-18	29894.4	24026.0	5868.4	5975.0
2018-19	31418.1	23899.2	7518.9	7481.0
2019-20	33540.7	24455.2	9085.5	9123.0
2020-21	35042.5	24602.8	9828.0	9829.0

of Rs. 50 MT^{-1} to Rs. 5360 MT^{-1}. Low price of urea as compared to other fertilizers is the single most prominent factor leading to its overuse and imbalanced fertilization of crops.

iv). *Government Policies:* Many policies of Government of India (GOI) are favourable for urea. There is 100 % reimbursement of cost of production. Imports are made by GOI to fulfill the demand irrespective of cost of imports. Transportation subsidy is also provided by GOI on urea to make its easy availability throughout the country. Scheme for assistance for advance stocking of fertilizers are tilted towards urea. Pooling of gas is made through GOI intervention to create level playing field for all urea manufacturers. These policy initiatives give sufficient impetus to urea industry to maximize urea production and marketing. These policies, though help in increasing food grain production, but also lead to imbalanced use of nutrients.

Consumption, Production, Gap and Import of DAP

Consumption of DAP has shown an increase of 9.6% from 2010-11 to 2020-21. However, there had been less consumption up to 2019-20 compared to 2010-11 and year-wise is given in **Table 7**. Production of DAP was maximum at 4.65 million MT in 2017-18. In 2020-21, production was down by 17.1% compared to 2019-20. The gap between consumption and production is met import of DAP. More than 50% demand of DAP is met by import. High dependency on import makes availability of DAP a challenging task and is highly variable. Changes in international market scenario determines the import volume and availability of DAP in the country.

Consumption of DAP needs to be sustained to improve N:P:K use ratio. Reduction in consumption of DAP can be attributed to its higher prices. High price of DAP also lead to increased consumption of low priced urea resulting in nutrient imbalance.

Consumption, Production, Gap and Import of NP/NPKs (complex other than DAP/MAP)

NP/NPK complexes include fertilizer grades such as 16-20-0-13 (APS), 20-20-0-13 (APS), 20-20-0 (ANP), 15-15-15, 14-35-14, 24-24-0, 24-24-0-8, 28-28-0, 14-28-14, 19-19-19, 17-17-17, 13-33-0-6(S), 16-16-16, 12-32-16 and 10-26-26, etc. Consumption of NP/NPKs increased by about 21% from 2010-11 to 2020-21 (**Table 8**). However, there had been reduction in consumption from 2012-13 to 2019-20 compared to 2011-12 but was not uniform over the years. Consumption has been increasing continuously from 2013-14 onwards and reached a maximum level of 11.8 million MT in 2020-21. On the hand, production of the complexes showed an increase of 6.4% in 2020-21compared to 2010-11. There had been year-wise variations in production as shown in the **Table** under reference. In 2011-12. The import reached a level of 3.67 million Mt to bridge the gap between consumption and production. In 2020-21, import was about 1.4 million MT. Import dependency for NP/NPK complexes is less. About 90% of NP/NPK consumption is met through indigenous production.

Many grades of NP/NPKs consumed in the country. Multiplicity of grades sometime poses challenges in balancing demand-supply levels but NP/NPKs have the potential to meet and replace demand of urea, DAP and MOP. Higher consumption of NP/NPKs would also improve nutrient use efficiency and N:P:K use ratio in the country.

Consumption and Import of MOP

Consumption of MOP declined by about 12.9% in 2020-21 compared to 2010-11(**Table 9**). However, reduction was not uniform over the years and varies from year to year. There is no indigenous production of MOP in India. Country is 100% dependent on import to meet

Table 7. Consumption, production, gap and import of DAP (Source: FAI, 2020; 2021)

(000 MT)

Year	Consumption	Production	Gap	Import
2010-11	10869.9	3541.2	7328.7	7411.0
2011-12	10191.2	3951.3	6239.9	6905.2
2012-13	9154.1	3646.8	5507.3	5702.3
2013-14	7357.4	3628.2	3729.2	3261.1
2014-15	7625.6	3445.4	4180.2	3853.0
2015-16	9107.2	3821.8	5285.4	6008.0
2016-17	8963.5	4333.4	4630.1	4385.0
2017-18	9294.1	4654.0	4640.1	4217.0
2018-19	9211.1	3898.6	5312.5	6602.0
2019-20	10089.7	4549.5	5540.2	4870.0
2020-21	11911.5	3773.8	8137.7	4882.0

Table 8. Consumption, production, gap and import of NP/NPKs (other than DAP/MAP) (Source: FAI, 2020; 2021)

(000 MT)

Year	Consumption	Production	Gap	Import
2010-11	9764.13	8760.20	1003.93	980.60
2011-12	10394.70	7802.00	2592.70	3674.50
2012-13	7527.18	6208.40	1318.78	404.60
2013-14	7263.52	6946.00	317.52	361.60
2014-15	8277.51	7829.30	448.21	291.00
2015-16	8821.05	8379.20	441.85	629.00
2016-17	8414.31	7923.70	490.61	522.00
2017-18	8596.43	8238.90	357.53	499.00
2018-19	9028.22	8979.30	48.92	546.00
2019-20	9647.10	8664.50	982.60	746.00
2020-21	11810.00	9325.00	2485.00	1390.0

its demand of MOP. Availability of MOP remains unpredictable and highly variable due to total dependence on import.

Table 9. Consumption and import of MOP (Source: FAI, 2020; 2021)

(000 MT)

Year	Consumption	Import
2010-11	3931.6	6,357.0
2011-12	3028.9	3,984.6
2012-13	2211.0	2,496.1
2013-14	2280.4	3,180.0
2014-15	2853.4	4,197.0
2015-16	2466.9	3,243.0
2016-17	2863.2	3,736.0
2017-18	3158.2	4,736.0
2018-19	2956.6	4214.0
2019-20	2866.6	3670.0
2020-21	3424.9	4227.0

MOP is the main source of K for crops. Some requirement of K is met through usage of NPK fertilizers.

Consumption, Production and Gap in SSP

Consumption of SSP is more or less stagnant (less than 4 million MT) except 2011-12, 2012-13, 2015-16 and 2020-21(**Table 10**). Continuous addition in capacity of production for SSP has made India self-sufficient in supply of SSP. Consumption of SSP needs to be sustained to improve N:P:K use ratio.

Following measures can help in ensuring better management of demand-supply scenario of fertilizers in India.

Demand Management

i). Rationalization of Demand of Fertilizers: Fertilizer consumption will continue to increase to satiate the additional requirement of food production. Realistic assessment of demand of all fertilizers should be made on annual basis through a scientific model. There is also a need to review the agricultural practices being followed by farmers to rationalize the demand of fertilizers. Improvement in method of application of fertilizers such as seed-cum fertilizer drill for application near root zone, increased frequency of application of urea will increase nutrient use efficiency. This will make the demand of fertilizers moderate and realistic. Better management practices like maintaining of adequate soil moisture during fertilizer use. Greater awareness among farming community for proper usage of fertilizers will help in reducing the rate of increase in fertilizer consumption.

ii). Advancement in Technology: Use of improved technology like Nano fertilizers for increasing nutrient use efficiency of fertilizers will help in arresting

Table 10. Consumption, Production and Gap in SSP (Source: FAI, 2020; 2021)

(000 MT)

Year	Consumption	Production	Gap
2010-11	3825.2	3712.8	112.4
2011-12	4746.0	4324.0	422.0
2012-13	4030.4	4434.9	-404.5
2013-14	3879.3	4211.5	-332.2
2014-15	3989.3	4229.6	-240.3
2015-16	4252.7	4329.6	-76.9
2016-17	3756.8	4296.8	-540.0
2017-18	3439.4	3910.2	-470.8
2018-19	3578.9	4076.3	-497.4
2019-20	3730.6	4246.7	-516.1
2020-21	4490.0	4916.0	-426.0

increase in demand of fertilizers.

iii). Equitable Distribution of Fertilizers: Equitable distribution of fertilizers can be ensured through iFMS to manage equitable distribution of fertilizers.

Supply Management

i) New plants for production of fertilizers should be encouraged.

ii) Production of indigenous fertilizers should be incentivized through long- term policy measures.

iii) Long-term policy should be made for increase in phosphate mining in the country on systematic basis.

iv) Import of various fertilizers should be left to the general public based on the policy environment.

Other Measures

i). Fertilizer Types and Grades: There are many types and grades of fertilizer available in the market. The type and grades of fertilizers should be left to be decided by market forces. Increased use of water soluble fertilizers (WSF), customized fertilizers and liquid fertilizers will increase nutrient use efficiency. Higher use of WSF will reduce subsidy outgo on fertilizers.

ii). Stock Management: Buffer stocking scheme should be implemented in all states. Some states like Uttar Pradesh have implemented this scheme quite efficiently. Many states need to improve their advance stocking scheme. Anomalies in advance stocking scheme should be removed.

iii) Policy Interventions: The current policy environment is tilted towards urea. Price of Urea should be increased to create balance with other fertilizers. In fact like other fertilizers, urea should also be brought under Nutrient Based Subsidy scheme to create a level playing field and to arrest ever- increasing demand of urea. This will also help in balanced use of nutrients.

Conclusion

Fertilizer has played and will continue to play a vital role in increasing agricultural production in the country. Fertilizers are made available to farmers from indigenous production and import. India is import dependent to a great extent to meet its demand either in the form of finished fertilizers or raw materials. Therefore, meticulous planning is required to bridge the gap between demand and supply by proper management for ensuring availability of fertilizers across the country. Towards this, forecasting of demand and supply of fertilizers before outset of *kharif* and *rabi* seasons by marketing experts is of vital importance. Further, accurate forecasting can reduce the chances of stock out situation, and over stocking can also be minimized which indirectly affects working capital requirement of the measures.

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FMS, mFMS, iFMS and DBT on Fertilizers

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Abstract

Fertilizer monitoring system (FMS) was introduced with the objective to monitor the import, production and movement of various subsidized fertilizers in 2007. The procedure for release of fertilizer subsidy was amended in November 2012 with introduction of mobile fertilizer monitoring system (mFMS). The balance payment of subsidy to the fertilizer companies *i.e.* 5% in case of urea and 10/15% in case of P&K fertilizers was linked to acknowledgement of receipt of fertilizers by the retailers. Further, for direct benefit transfer (DBT) of subsidy, an integrated fertilizer management system (iFMS), a more comprehensive system, was developed integrating both FMS and mFMS to enhance the features of system. It was introduced in 2016. The current iFMS provides a platform for DBT on fertilizers where subsidy is paid to producers/importers based on sales of fertilizers by the retailers through POS devices to farmers installed at retail points across the country. The system is working well and the software system can be extended to implement payment of subsidy directly in the bank account of the farmers.

Key words: FMS, mFMS, iFMS, dashboard, POS machine, DBT, R.O. module, issues, suggestions

History

History of fertilizer monitoring system (FMS) can be traced way back to 2007. The inauguration ceremony of the FMS was held on 13th January 2007; and FMS was formally launched by Hon'ble Minister of Chemicals and Fertilizers and Secretary, Department of Fertilizers on 22nd January 2007. It was a path breaking IT initiative undertaken by Department of Fertilizers (DOF). Availability and movement of fertilizers till district level used to be tracked on real time basis through the system. Subsidy payment including freight subsidy was processed with the help of this system.

The Then Hon'ble Finance Minister, in his budget speech of 2009-10 stated that in due course of time, the Government intends to move to a regime of direct transfer of subsidy to the farmers. Subsequently, in his Budget Speech of 2011-12 referred to constitution of a Task Force in order to work out the modalities for the proposed system of direct transfer of subsidy. The Task Force was constituted under the chairmanship of Chairman, Unique Identification Authority of India, Mr. Nandan Nilekani in February 2011. The Task Force recommended that beneficiaries of all social safety net programs (MGNREGS, SSP, JSY, IAY, Scholarships, etc.) and recipients of direct subsidy transfer payments (LPG, fertilizers, kerosene, etc.) can greatly benefit the stakeholders by electronically transferring the payments directly into their bank accounts or post office accounts.

In another press note issued in November 2012 titled as "Procedure for Release of Fertilizer Subsidy to Farmers", the Government amended the procedure for release of fertilizer subsidy. For this, the DOF developed mobile fertilizer monitoring system (mFMS) through National Informatics Centre (NIC). The mFMS aimed to provide end to end information on the movement of fertilizers up to the last mile delivery and subsidies to the manufacturers/ importers.

In June 2014, it was decided by DOF to develop a more comprehensive by integrating the FMS and mFMS to enhance the features of both the earlier systems and integrated fertilizer management system (iFMS) was developed by NIC. The system tried in the two pilot districts of Andhra Pradesh from 1st October, 2016. Subsequently, more districts of other states were included. These were under direct benefit transfer (DBT) system as a precursor to fertilizer subsidy. DBT scheme was rolled out in all states from 1st September 2017 to March, 2018. The scheme is not DBT in true sense. Subsidy payment is made to the industry on the basis of sale of fertilizers to farmers through point of sale (POS) machines.

Need for FMS, mFMS and iFMS

The mandate of the DOF is to make available fertilizers to the farmers at affordable prices. The "affordable prices" part of the mandate gets translated into subsidized fertilizers. The subsidy portion of fertilizers which ranges from 30% to 75% of the cost of the fertilizers is reimbursed to the companies, so as to make available fertilizers for the farmers at subsidized MRP. The requirement of fertilizers is projected by the state governments to the Department of Agriculture, Cooperation and Farmers Welfare, Government of India,

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which in turn, coordinates with DOF for finalizing the requirement of fertilizers for the seasons (*kharif and rabi*) in the country. Department of Fertilizers prepares state-wise supply plan, issue movement order to manufacturers/importers. State Governments prepare district-wise supply plan and issue quantity and quality certificates. With the objective to monitor the import, production and movement of various subsidized fertilizers and processing subsidy claims and for ultimate aim of introduction of DBT scheme on fertilizers, different software systems were introduced by DOF over the last decade *viz.* FMS in 2007, mFMS in 2012 and iFMS in 2016.

Fertilizer Monitoring System

The Fertilizer Monitoring System **(www.urvark.co.in)** was launched in May 2007 to capture dispatch of fertilizers from plants/ports to district warehouse of companies. It had web interface for entry/access of information and used for payment of subsidy. It provided login IDs to companies, state agencies and DOF for enter/view/process information. Companies used to provide information about production, consumption of raw materials, dispatches, receipts and first point sales of fertilizers to wholesalers/ retailers. Company-wise availability of fertilizers in a district was available in the public domain. It helped the DOF in planning import and ensuring equitable distribution of fertilizers across the country. It was initiated for the first time in the fertilizer sector and proved to be a well-established and credible source of information to all stakeholders *i.e.* industry, policy makers at Central government, State governments and the public at large. The subsidy used to be reimbursed to companies after receipt of fertilizers in the districts of the states. FMS was in the organized sector and therefore implementation and post implementation response was good.

Mobile Fertilizer Monitoring System

To achieve more visibility and transparency in the fertilizer supply chain from plants/ports to receipt at the last point sale (retail point), a mFMS was introduced in the year 2012 by the DOF through NIC as a developer of the system (www.mFMS.nic.in). It facilitated the retailer to acknowledge the receipt of fertilizers through mobile as well as web. The mFMS was also implemented for all subsidized fertilizers in the country. The subsidized fertilizers namely urea, ammonium sulphate and 20 grades of phosphatic and potassic (P&K) fertilizers were covered under the mFMS in 2012 (DOF, 2020). A portion of the subsidy *i.e.* 5% in case of urea and 10/15% in case of P&K fertilizers used to be reimbursed to manufacturers/importers after acknowledgment of receipt of fertilizers by the retailers in system pertained to wholesalers and retailers who were not so equipped to handle the new system. Therefore, implementation of the system was a challenge. Concerted efforts of the DOF and the industry prompted the retailers for acknowledgement of receipt of fertilizers by organizing need based training to them.

Integrated Fertilizer Monitoring System

In June 2014, it was decided by DOF to develop a more comprehensive, all-inclusive system which integrates, incorporates and enhances the features of both the earlier systems *i.e.* FMS and mFMS (DOF, 2020). Accordingly, the software programme integrated fertilizer management system (iFMS) was developed by NIC. It was developed in consultation with the industry and other stakeholders. The software was on parallel run from June 2016 and became fully operational *w.e.f.* 1st October 2016 in certain districts as pilot project. The system was rolled out in all states from 1st September 2017 to March, 2018. The system provides single-window interface for tracking movement of fertilizers from plants/ports to buyers. It has web and mobile and Point of Sale (POS) interface for entry/access of information and uses e-sign, biometric authentication, e-KYC for security/ authenticity of information. System is used for subsidy payment. Presently all fertilizer manufacturers/importers, 30,000 wholesalers and 0.25 million retailers are registered in iFMS. More than 10.45 crore farmers are making purchase of fertilizers. Payment of subsidy and freight is made to the industry after sale of fertilizers which are under subsidy scheme by the retailers through POS machines to farmers. The products being not under subsidy scheme are also monitored through the system. It was really an uphill task to implement this system as the retailers to sell fertilizers to farmers through POS machines and farmers to get themselves authenticated by Addaar cards. Therefore lot of efforts went in for educating them about the operation of the new system by again organizing various programmes across the country by the fertilizer companies. There were challenges in the operation of the system itself. Industry remained in constant touch with the NIC and DOF for solving the glitches of the system. The Fertilizer Association of India also helped the industry in taking up the issues with the DOF on sustainable basis. Now the system has more or less stabilized but certain problems still persist which are narrated in the later part of this paper. The system also monitors raw materials, production, import, energy consumption norms, revision in urea concession rates, natural gas projections/requirement (demand/supply) and distribution and movement information system-ECA, supply plan *vs.* actual movement.

Advantages of Integrated Fertilizer Management System

- System monitors the production, dispatches,

receipts and sales of subsidized fertilizers.

- It is used to track the actual supplies against the planned supplies.
- The State Governments use the system to monitor the availability of fertilizers at the districts.
- Fertilizer subsidy disbursement process moved towards greater transparency and uniformity.
- The diversion of fertilizers to non-agriculture use and its black marketing, etc. is reduced.
- The subsidy is disbursed to fertilizer producers and importers based on sale of fertilizers to farmers through POS devices and farmers Aadhaar card which is linked to UIDAI and iFMS system.
- The subsidy can be disbursed directly to the farmers Aadhaar linked bank accounts as when actual DBT is introduced.

Key Stakeholders in Fertilizer Sector

- Department of Fertilizers, Ministry of Chemicals & Fertilizers,
- National Informatics Centre,
- Ministry of Agriculture and Farmers Welfare,
- Ministry of Finance,
- State Governments and District Administration,
- Fertilizer importers, manufacturing companies/ units/plants covering public, private as well as cooperative sectors,
- Fertilizer Association of India (FAI), a representative body of fertilizer companies,
- Fertilizer dealers namely wholesalers, retailers, marketing federations, societies, agro-industry business centers, company's own retail outlets, etc. and
- Farmers – the ultimate users of fertilizers

The success of scheme depends on close coordination among all stakeholders robust monitoring and evaluation mechanism

Functionalities in iFMS

Integrated Fertilizer Monitoring System is a path breaking IT initiative undertaken by the DOF to improve the functioning of the Department in not only monitoring the movement and managing supplies of fertilizers but also processing of the subsidy claims. Various functionalities of system are:

- ***Transactions/Modules:*** Following transactional details are captured on the system. These are entered by the companies on a daily basis and thus system always provides latest information to the Department of Fertilizers and state governments at all points of time:
  - Import of raw materials/finished goods
  - Customs clearances
  - Receipts of raw materials bulk including natural gas in the plant
  - Production of subsidized fertilizers, including installed capacity data
  - Supply plan
  - Dispatches from plants and ports and returns
  - Receipts in the districts
  - District warehouse details, losses/ adjustments.
  - Wholesaler details
  - Capturing retail sales with farmers data
  - Tracking and capturing sales till retailer level
  - Product and freight subsidy claim generation module
  - Bills processing
  - MIS report generation

The above transactions in the system capture information in detail and facilitate the department in monitoring the movement of fertilizers and settlement of claims.

- ***Requirement & Supply Plan:*** The distribution of fertilizers in the country is linked to the requirement given by states for every season. The states also facilitate the fine-tuning of the supply plan for a month, in consultation with the lead fertilizer supplier (LFS) and the department. Thus the state governments provide and view the information about fertilizer distribution online. Payment of freight subsidy is limited to supply plan. Any deviation in supply plan has to be regularized by the competent authority of the DOF and in absence of the same, freight subsidy payment is not released.
- ***Subsidy Claims & Freight Subsidy:*** The weekly product subsidy claims are generated automatically based on the data entered in the system throughout the month. The claims once generated on the system as per the guidelines and format prescribed by the Department of Fertilizers are approved at different levels within the department according to the set norms. The freight claims are generated as per the uniform freight subsidy policy and also approved on the system.
- ***Certification of the States:*** Provision has been made for the State Departments of Agriculture to enter the following information:
  - Product-wise material received in the state
  - Certification of short or substandard quantity and uploading of Proforma B1 directly on the system
  - Provision has also been made to upload quality certificate (Proforma B2)

- ***Processing Claims within the Department:*** The entire process of approval of claims (both controlled and decontrolled) within the department has been mapped in the iFMS. Provision has been made for the following:
  - Tracking of budgets both for P&K and urea (cash, bond, special banking arrangement)
  - Generation of noting and sanction advice in the prescribed formats
  - Provision to split claims and generate supplementary claims
  - Provision to split the sanction advice depending on the amount being actually disbursed
  - Provision to link the companies bank guarantee and the amounts already utilized and available
  - Provision for linking the registration certificate given by the state for the sale of fertilizers to prevent processing of claims if the same has not been submitted to the department
- ***Generation of MIS Report in iFMS:*** The MIS report provided on iFMS gives up to date information about the fertilizers. Some of the indicative reports are:
  - State-wise/district-wise/product-wise - dispatch report
  - State-wise/district-wise/product-wise - sales report
  - District-wise-distribution-wise - sales report
  - Supply plan *vs.* actual receipts
  - Requirement *vs*. supply plan
  - Subsidy settlement

DBT System and Subsidy Payment

The POS device plays an important role in implementation of the DBT project. The sale of fertilizers by retailers to farmers is done through POS devices only. Software version is updated from time to time. Presently the software version 3.1 is in use throughout the country.

The POS software provides for a one-time registration of retailers in the system. Retailer can register and authenticate himself by entering his user ID of iFMS and Aadhaar card number. Once one-time registration is done and the retailer is having more than one machine, in such cases there can be 4 shop users with the same ID and can sell fertilizers to the farmers through the additional machines. The POS software has provision of sale of fertilizers to the farmers or buyers whose identity is verified through Aadhaar based biometric authentication or Voter ID Card or Kisan Credit Card. Each successful sale transaction will generate two sale receipts, one for buyer and other for retailer for record purpose. The generated bill also automatically informs the buyer the exact amount of subsidy that has been paid by the Government of India on behalf of the farmers to the manufacturer or importer for such purchase. Online sale transactions through POS machines by retailers to famers are tracked company-wise, plant-wise, product-wise in the iFMS, on real time, which enables DOF to process the weekly subsidy bills raised by the manufacturing units. The 100% subsidy claims are being remitted to the company's bank account through electronic mode but not paid in 7 days after sale is made. Further Aadhaar based biometric authentication is linked to Soil Health Card of the farmer. This would enable recommendation of appropriate mix of fertilizers compatible to the soil health profile of the agricultural land held by the beneficiary. However, the recommendation is not binding on the beneficiary and the sale of fertilizers is initially on a "no denial mode".

Reports Generated in POS Software

- *Fertilizer stock report:* A retailer may click this module to generate fertilizer stocks available as on date at his end.
- *Fertilizer sale report for a week*: It provides record of sale of fertilizers on weekly basis.
- *Fertilizer receipt report*: It is used to generate report on fertilizers received at the retailer. This report shows the company name, receiving date and quantity of fertilizers received.
- *Print bill in duplicate:* Its use is to print a duplicate bill in case of any requirement.

Release Order Module (R.O. Module)

Release Order Module/Vehicle Challan Module was incorporated in the iFMS on 17th May 2017. The objective of this module is to track the movement of fertilizers across the country on a real time basis. This module enables companies, wholesalers and retailers to generate vehicle challans in the iFMS application itself. It is now mandatory to generate vehicle challans whenever there is a movement by road and only those transactions for which vehicle challan is generated, will be available to the receiver for acknowledgment.

Details Captured in the R.O. Module

- The information of truck carrying the fertilizer consignment
- Movement of fertilizers from plant/port to rake point
- Movement of fertilizer from plant/port to district warehouse

- Movement of fertilizer from rake point to district warehouse or directly to wholesale or retailer
- Movement of fertilizer from district warehouse to wholesaler/retailer
- Movement of fertilizers from wholesaler to wholesaler/retailer

The POS user module is further divided into the following sub-modules

- Sale of fertilizers
- Receipt acknowledgement
- Initial stock reporting
- Bill receipts
- Reports

New initiatives of DBT

Software Version

Keeping in view the various operational challenges *viz.* limited POS vendors, rush of sales due to peak season, etc., Department of Fertilizers, through NIC being the developer of iFMS, launched DBT 2.0 on 10th July, 2019 *i.e.* an advanced multi-lingual desktop version of POS software as an alternative or added facility of POS devices. Retailers having computers or laptops are using this for sale of fertilizers. The Desktop software is more robust and secure. The original version in the POS machines was in English only. Now the software is in many regional languages. Further the new software version 3.0 was also multi-lingual having facility of Aadhaar virtual ID option and fertilizer recommendation based on soil health card. Now the POS 3.1 software version is in place. The details of sale through POS device are illustrated in **Figure 1**.

DBT Dashboards

In order to provide accurate information about the position of supply/availability/requirement of various fertilizers at National, State and District levels, the DOF had developed various dashboards (https://fert.nic.in). These dashboards can be accessed by general public by clicking the e-urvarak website of DOF (www.urvarak.nic.in). There are dashboards for the stakeholders as given below:

i. DOF Dashboard
ii. State Dashboard
iii. District Dashboard
iv. Fertilizer Company Dashboard
v. Markfed Dashboard
vi. Kisan Corner

These dashboards provide various reports such as:

i. Fertilizer stock positions at plants, ports, states and district levels
ii. Proportionate requirement for the season and availability of stocks at various levels
iii. Top buyers' list

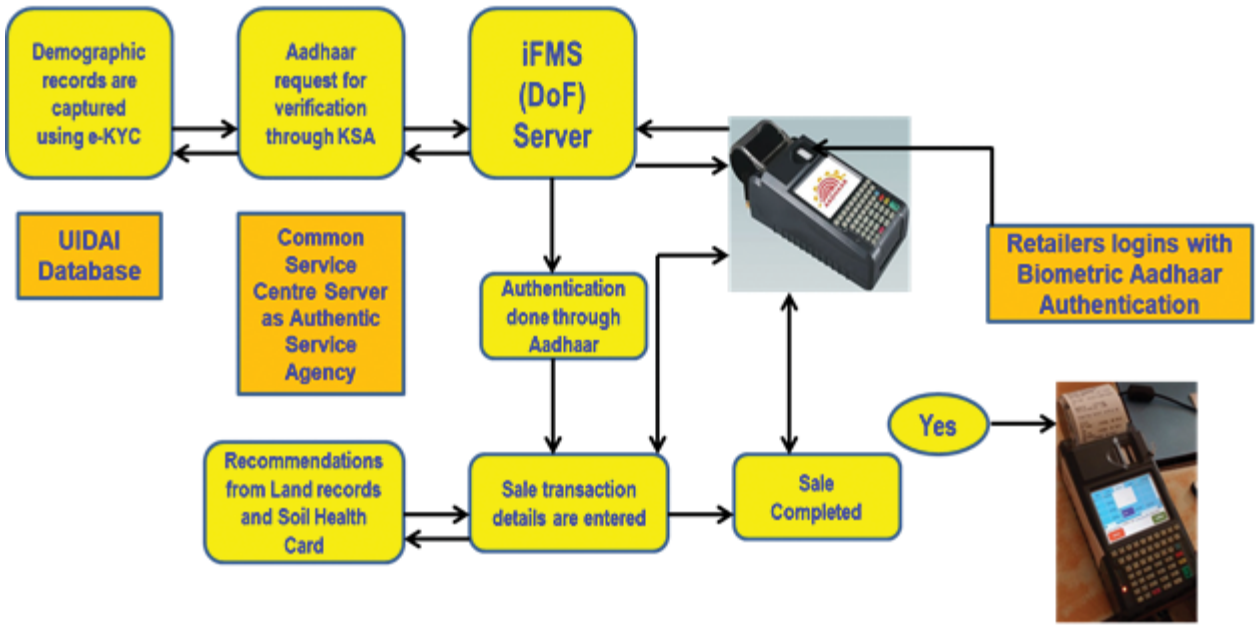

Figure 1. Mechanism of sale of fertilizers through POS machine

iv. Most frequent buyers

v. Retailers not selling fertilizers

In kisan corner, a farmer can know about the retail outlets in the district in his nearby village and availability of fertilizers at the nearest retail outlets. The DOF/movement division can monitor the product-wise availability of fertilizers on day to day basis at ports/plants and also in various states and districts, stock in the country, requirement *vs.* availability, bill tracking module, payment status and can also do the analysis of import *vs.* indigenous production and of subsidy expenditure. The state dashboard helps the state governments to understand about gap between requirement and supply on day-to-day basis, retail sale and top buyers of fertilizers. District dashboard is helpful to the district administration fertilizer requirement, sales and stock, material in transit, numbers of active wholesalers/ retailers, expiry of letter of authorization, of dealers, top buyers, frequency of purchase by beneficiaries and further analysis. The companies can know about production and inventory at various levels and bill generation and its status of payment. Fertilizer availability at their retail outlets and stock acknowledgement report can be accessed by marketing federations with the Markfed dashboard. In reality, generation of voluminous data can be used by stakeholders for understanding of market dynamics/response and farmers' behaviour as the same can be of great help for analysis to all concerned. A screenshot of the same is given in **Figure 2**.

SMS to Buyers

The Department of Fertilizers has implementation short message services (SMS) to farmers for the sale of fertilizers to farmers in the DBT system. Buyer receives a receipt on his mobile through SMS on every purchase of fertilizers. Department of Fertilizers has made this facility available with POS 3.1 version.

i. The SMS contains the details viz. invoice no., name of retailer, quantity purchased, total amount to be paid, subsidy borne by the Government of India. etc.

ii. SMS module is used to send periodic SMS to farmer about availability of fertilizer at retail outlet from where he purchased fertilizer last.

iii. Farmer can get information about availability of fertilizer at any retail outlet by sending SMS to +917738299899 with sending retailer id of the concerned outlet he is interested in.

Current Issues in iFMS/POS Machines/DBT

- Dealers are closing their fertilizer business without informing to companies/ State Departments of Agriculture. Non-clearing of such stocks, which is lying in the POS machines, results in blockage of subsidy of the industry.

Figure 2. Screenshot of urvarak.nic.in

- Retailers are not updating their mobile numbers (especially societies where CEO term ends after certain tenure period) and unable to approach such retailers over telephone. Towards this, a mechanism for confirmation of retailer mobile number may kindly be developed during login in POS on quarterly basis with OTP authentication.
- Due to COVID-19, few cases have come up where dealers expired. The Aadhaar was registered in the name of the concerned proprietor in POS machine, and other persons cannot login the machine. There is a need to have a mechanism for addressing such issues immediately so that farmers are not deprived of fertilizers in the peak seasons. Companies/LFS/State Departments of Agriculture may be allowed for updation of Aadhaar names from their respective iFMS logins with proper documentation upload. Post verification of uploaded documents can be kindly be done by DBT Cell at New Delhi.
- A farmer can purchase only 50 bags in a month of all fertilizers put together as per the guidelines issued by the DOF on 21st January, 2021. Farmers, having more land and raising high fertilizer consuming crops, are facing lot of challenges in complying with the requirements of the crops during the peak seasons. A limit of 50 bags is insignificant for such farmers. The limit should be enhanced to 100 bags per month per farmer. Further the district administrations in some states direct the retailers to sell 3-10 bags to a farmer at a time. This is creating difficulties for the farmers and the retailers. Clear guidelines from the DoF will go a long way to sort out such issues.
- Automatic logout is happening in 15-20 minutes after login of POS devices by the dealers. The expiry of login session may be increased to 1 hour for ease of operation of POS devices by dealers.
- In case of damaged stock due to floods/any other reason, dealers are claiming the insurance as per the MRP but the stock held up in their retailer POS/iFMS is lying in the system, for such cases companies could not claim subsidy. A way out has to be there.

Direct Cash Transfer to Farmers

Direct Cash Transfer (DCT) to farmers has been under discussion at various forum such as PMO, Cabinet Secretariat and Niti Aayog. A Committee of Secretaries (COS) headed by Cabinet Secretary was setup to develop the broad contours of the DCT framework under which DCT to farmers can be implemented. The meeting was held on 16th January, 2020. The COS *inter alia* had recommended to constitute a Nodal Committee to be co-chaired by Secretaries of Department of Fertilizers and Department of Agriculture, Cooperation & Farmers Welfare to formulate and implement DCT in fertilizers. Accordingly, a Nodal Committee was constituted by DOF on 1st June, 2020 to formulate policy relating to implementation of DCT fertilizer subsidy to farmers.

On 4th June, 2020, DOF constituted five high level Working Groups for *Chintan Shivir* headed by Union Ministers/MOS of concerned Ministries to deliberate on challenges facing the fertilizer sector and to prepare knowledge report for five years' roadmap. The Working Group on Direct Benefit Transfer to farmer (Direct fertilizer subsidy to farmers account instead of an industry) was headed by Hon'ble Minister for Chemicals and Fertilizers (fert.nic.in/dbt). Two meetings of the Group were held in 18th May and 13th July, 2021.Five members from fertilizer companies and DG, FAI were part of the Group. There seems to be consensus amongst the members on implementation of nutrient based subsidy (NBS) scheme for urea and gradually shifting to a system of DBT where subsidy is transferred directly to the bank accounts of farmers.

Way Forward

Over the one and half decades, FMS has gone into transformation in mFMS and iFMS and fulfilling the purpose of introduction and implementation of the software system. The transformation into iFMS was with ultimate objective of introduction of DBT on fertilizers. The current iFMS caters the purpose of hybrid DBT, where the subsidy is paid to fertilizer producers and importers on the basis of sales of subsidized fertilizers by the retailers to farmers through POS devices, which is captured in iFMS. The system is working well and now the time is to extend and implement the software system for the real DBT *i.e.*, payment of subsidy directly in the bank accounts of the farmers.

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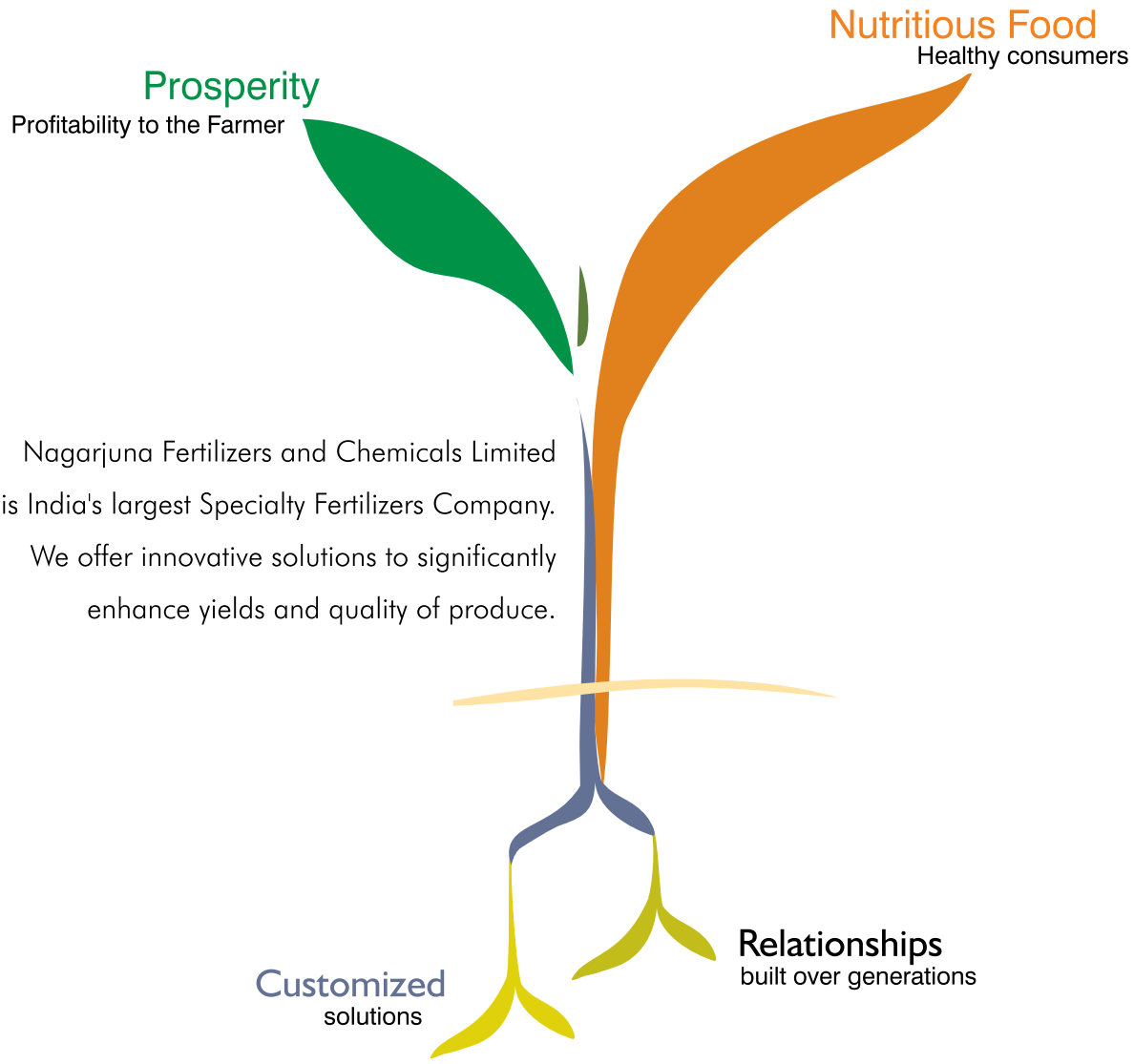

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Freight Policy for Movement of Fertilizers from Plants/ Ports and Ocean Freight - Issues and Suggestive Measures

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Abstract

In any business involving goods, logistics forms a critical part of supply chain and a substantial time and effort is expended to bring in efficiency and keeping costs at minimum levels. Fertilizer logistics is no such exception. Considering the geography of India and further import dependence of P&K nutrients which have to be largely imported, fertilizer logistics is vital to make fertilizers available to farmers across the country. Fertilizer logistics can be divided into inbound logistics *i.e.* movement and transportation of imports of fertilizers/fertilizer inputs to port/ plant and outbound logistics *i.e.* further transportation from port/plant to districts. Overall such logistics costs particularly freight constitutes to about 6-12% of the cost of sales to fertilizer companies in India and thus the management of the same is of paramount importance. There is a freight policy of the Government of India for movement of fertilizers and the same for governing compensation towards freight expenses are deliberated in this paper. Subsequently, ocean freight is also discussed.

Key words: Freight policies for movement from plants/ports, ocean freight, Baltic dry index, GST, IGST, issues, remedial measures

Evolution of Fertilizer Policy in India

The oil crisis in the nineteen seventies exposed India's weakness in being import dependent which also impacted the prices of vital NPK nutrients which are largely imported. As food security was of paramount importance, combating rising production/import costs became a challenge to maintain farm gate prices of fertilizers at affordable levels to the farmers. In order to boost domestic production, upon recommendations of the Marathe Committee Report, Government of India announced a pricing policy scheme for fertilizers in the year 1977. Government of India also announced uniform freight subsidy policy in 2008 to compensate freight expenditure of the companies for movement of fertilizers from plants/ports.

Prior to introduction of uniform freight policy effective from 1st April 2008, freight subsidy was paid largely on normative basis without any relevance to actual costs incurred. Thus the fertilizer industry faced huge under-recoveries resulting in tendency to sell fertilizers in areas close to their production/import facilities to keep their freight expenditure within the fixed freight element available and this defeated the objective of Government to make fertilizers available at all locations. To overcome the shortcoming of the above policy, uniform freight policy was introduced for subsidized fertilizers and is currently in vogue except change in freight for primary movement by road linking to railway freight slabs up to 500 km for P&K fertilizers and no secondary freight on such movement from rake points on these fertilizers.

Indian Agriculture Sector

Currently agriculture contributes to about 17-18% of GDP of the country. **Figure 1** shows the year on

Figure 1. Growth in agriculture sector (Source : PIB, New Delhi, 29th January, 2021)

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year growth in agriculture sector from 2017-18 to 2020-21.

It is certainly beyond doubt that sustained Government policies have ensured availability and use of chemical fertilizers which has contributed to growth in production of food grain and other crops.

Uniform Freight Policy

The said policy is effective since 1st April 2008 and is applicable to subsidized fertilizers including imported urea subject to contractual obligations, if any (DOF, 2008). The salient features of the policy were as under:-

i) The rail freight expenditure for transportation of fertilizers will be paid as per the actual expenditure based on actual lead.

ii) The road freight towards transportation of fertilizers from nearest rake point to block or from manufacturing unit/port directly to the block consist of two elements. Lead distance and per km rate and element of subsidy will be paid on the basis of lead distance for each block in the district based on the average district lead (average of leads from nearest rake point to block headquarters). Further, per km road freight will be paid on the basis of average of existing per km rate of each state in the country, being adopted by FICC for reimbursement of freight subsidy for indigenous urea, under NPS-III.

iii) The State Governments will be responsible for confirming the receipts as indicated in the movement plan in fertilizer monitoring system (FMS).

iv) The normative per km rate will be annually escalated/de-escalated based on a composite road freight index (weighted average of the WPIs of HSD oil, motor tyres, truck chassis and all commodities) as already being done under NPS-III for urea.

The freight policy became applicable to all fertilizers uniformly and continues to be even applicable to urea even today in its original form. The said policy stands modified in respect of P&K fertilizers consequent to introduction of Nutrient Based Subsidy Scheme in 2010.

Classification of Freight

- *Primary Freight:* Movement of material from plant/port to the rake point/district by rail or road is called as primary movement.
- *Primary Rail Freight:* Rail freight for the movement from plant/port to the rake point by rail is paid as per the actual expenditure based on actual lead distance indicated in Railway Receipt (RR).
- *Primary Road Freight:* Road freight for direct movement from plant/port to the district by road is paid on normative basis which consists of two elements as under:
  - Lead distance in km from plant/port as approved by Department of Fertilizers, Government of India (maximum limit of 500 km).
  - Normative rate per km MT^{-1} of the state as adopted by Department of Fertilizers.
- *Secondary Freight:* Movement of material from rake point to the district by road is called as secondary movement.
- Secondary freight for movement from rake point to the district by road is paid on normative basis which consists of lead distance of district derived by working out simple average of lead distance between nearest rake point to each block headquarter and normative rate per km MT^{-1}.

The freight policy after implementation of NBS on P&K fertilizers is given in **Table 1**.

The guidelines cover fertilizer transportation directly through rail and road from plants/ports. Special compensation for freight for secondary movement to difficult areas such as Andaman &

Table 1. Freight policy on P&K fertilizers in NBS regime

Period	Rail freight	Road fromrake-point to district	Road from plant/port
1st April to 31st December, 2010	Actual as per RR	Nil (an amount of Rs. 300 per MT was included in subsidy under NBS)	Lower of actual or equivalent rail freight across 5 distance slabs.
1st January, 2011 to 31st March, 2011	Actual as per RR	As per uniform freight policy for urea	Lower of actual or equivalent rail freight across 5 distance slabs.
1st April, 2012 onwards	Actual as per RR	Nil (except North-eastern & hilly states)	Lower of actual or equivalent rail freight across 5 distance slabs.

Nicobar, Uttarakhand, Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland is also allowed *w.e.f.* 1st April, 2012 but the same needs revision.

To encourage movement of fertilizers through coastal shipping/inland waterways, guidelines for claiming such freight subsidy were issued by Department of Fertilizers.

Salient Features of Freight Subsidy for Coastal Shipping

i) Only the movement of subsidized indigenous fertilizers (urea and NPK fertilizers) through coastal shipping/inland waterways will be eligible for payment of freight subsidy (DOF, 2019).

ii) In case of single mode or multimodal transportation of fertilizers which includes coastal shipping also, the freight subsidy for movement of fertilizers will be restricted to the railway charges or actual freight whichever is less.

Further it was clarified by the Department (DOF, 2019) as under:

i In case, the manufacturer is moving fertilizers through multi-modal transportation which includes coastal shipping/inland waterways and further movement from the discharge port to the destination district by road - then the entire multi-modal transport would be considered as primary movement. In such cases, there is no secondary freight/subsidy. Freight subsidy under primary movement is to be reimbursed on the basis of lower of actual freight incurred or railway charges.

ii) In case the manufacturer is moving fertilizers through multi-modal transportation which includes coastal shipping/inland waterways, further movement from the discharge port to the nearest rake point and then by road, the movement is considered as:

a) Multi-modal transport up to rake point is taken as primary movement.

b) Transportation of the material beyond rake point by road comes under the category of secondary movement.

Freight subsidy under primary movement is paid as lower of actual freight incurred or railway charges. Freight subsidy under secondary movement is applicable only for urea as per extant policy as there is no secondary freight for movement for NPK fertilizers.

Freight Claim Generation: Subsequent to generation of subsidy claim, freight claim can be generated. Such claims are generated based on receipted dispatch quantity. Process for generation of freight claims is illustrated in **Figure 2**. Certifications required in generation of freight claims are given in **Table 2.**

Issues Relating to Fertilizer Transportation and Freight Subsidy

i. There are mainly two modes for transportation of fertilizers from plants/ports *i.e.* rail and road. Coastal movement of fertilizers is still in its infancy. More than 80% of fertilizers are moved by railway net-work and the remaining by road.

ii. Under the uniform freight policy effective from 1st April, 2008, rail freight for movement of fertilizers from plants/ports up to rake points is reimbursed to fertilizer companies on railway receipt basis as per the actual expenditure incurred. However, the same is allowed for reimbursement only for movement upto 1400 kilometers.

iii. Freight subsidy for direct movement by road is restricted only upto 500 km in case of P&K fertilizers and further the same is reimbursed at lower of actuals or rail freight slab. Further no secondary freight is paid.

iv. Railways generally do not provide rakes for two point or three-point discharge. Many rake points are not adequately equipped to handle BCNHL rakes. This leads to multiple handling and storage costs leading to increased expenditure.

v. Availability of rakes from railways itself is a challenge and in some situations, companies are exposed to risk of higher storage costs at ports.

vi. In extreme situations, where the ports are clogged owing to above and also on account of traffic/diversions of vessels, etc., one is exposed to demurrage either by vessel owners or by railways.

vii. Any delay in unloading, etc. at rake points, fertilizer companies may be subjected to demurrage by railways.

viii. Despite, road freight being expected to be periodically revised, there has been substantial delays. This has resulted in fertilizer companies incurring huge expenditure on road freight due to under-recoveries owing to non-revision in rates in a timely manner.

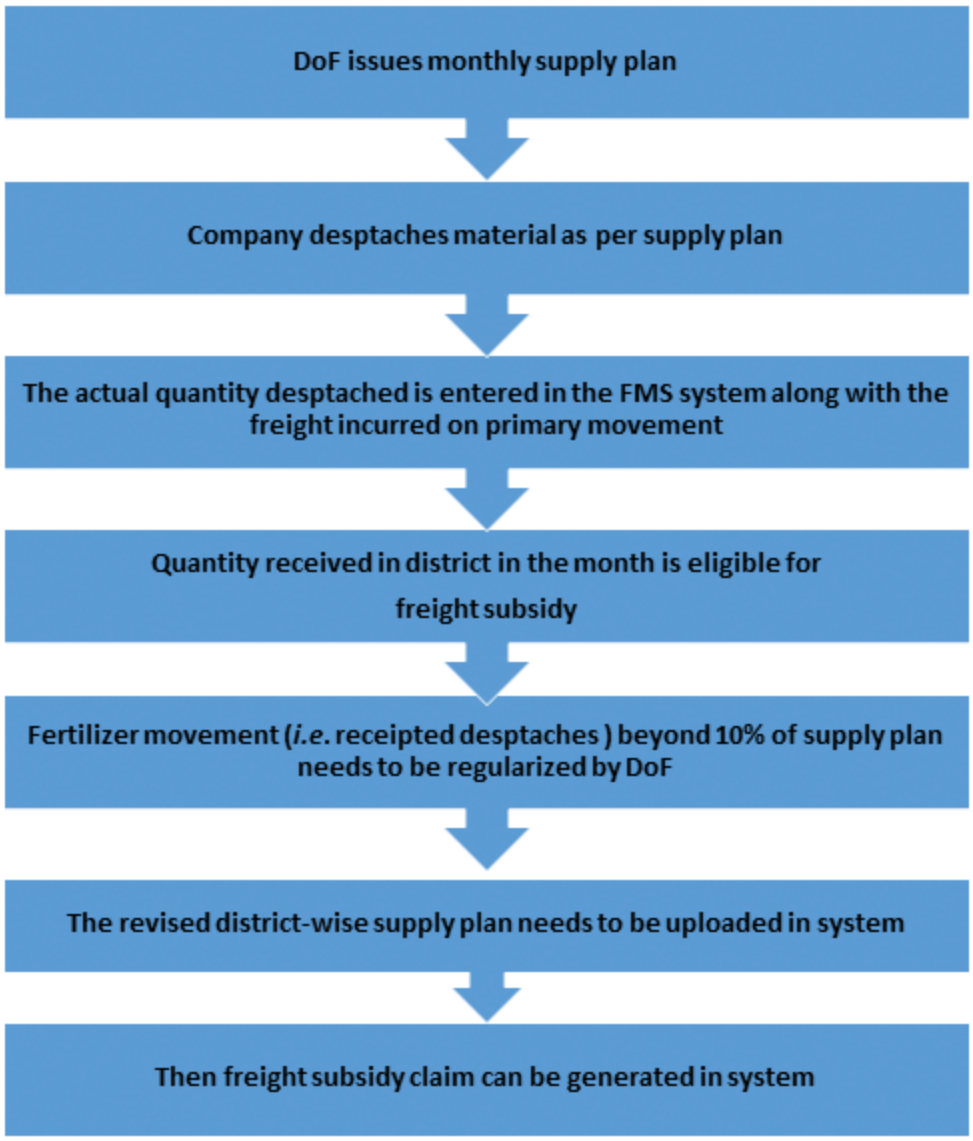

Figure 2. Process for generation of claim for freight subsidy

ix. Rates from the year 2008-09 were notified in phases and latest for 2016-17 was announced in March 2018 for urea. Even after notification of final rates, companies could not claim differential freight subsidy as the rates were not uploaded in web based Fertilizer Management system (FMS/iFMS). These rates were uploaded later in 2018, enabling the companies to generate differential freight claims up to 2016-17.

x. Moreover, the entire process of generation of claims requiring certification of such claims along with actual expenditure incurred for the past several years from statutory auditors was tedious and contributed to further delays.

xi. Final road freight rates for urea from 2017-18 to 2021-22 are yet to be notified.

Table 2. Types of freight claims and certification

S. No.	Fertilizers	Authority	CompanySignatory	Certified by	Frequency
i	Urea	FICC	CEO/CFO/director	Statutory auditor	Monthly
ii	NP/NPKs	DOF	Authorized signatory	Statutory auditor	Monthly

xii. As regards, NPK fertilizers, there is no revision in primary road freight since April 2012, despite there has been an increase in railway freight over the years.

xiii. For movement of fertilizers by road, distances provided by the State Governments are compared with Google distances. Google provides lead distances for four wheelers but there are many roads where trucks and other vehicles are either prohibited or too narrow for trucks to ply or pass through cities which may lead to longer distances for actual movement of fertilizers. State Governments, in collaboration with lead fertilizer suppliers, should finalize lead for realistic distances for movement by road.

xiv. Coastal shipping is still nascent and consider the multi-mode of transportation, it may be costlier than rail transportation as most units have railway sidings and can directly move fertilizers from plants to districts.

Freight Expenditure and Taxes

Prior to introduction of Goods and Service Tax (GST), transportation of fertilizers was exempted from service tax. Even though, no expenditure towards service tax was incurred on transportation, the same was applicable on handling which was not bundled with transportation. With fertilizers being subject to 1% excise duty without any cenvat credit, the service tax incurred on the various services consumed in the business was cost to company primarily relating to handling, etc. which is quite substantial.

Under the GST regime, fertilizers are subject to 5% tax, consequently becoming eligible for availment of input tax credits. Even though, there is no exemption of GST on transportation of fertilizers, availability of input tax credits on various services incurred upto final sale of fertilizers would certainly contribute to overall cost reduction. However, with freight being categorized as supply of service, often many fertilizer companies who import NPK fertilizers would be left with huge unutilized input tax credit in such states wherein they are not in a position to set off against output GST liability which is lower or claim refund as the same does not fall under the inverted duty structure framework.

Inbound Logistics-Ocean Freight

As discussed above, India being deficient in P&K nutrients has to import, and considering the volumes handled, understanding ocean freight and management of such costs is important.

Ocean freight is a method of transporting large quantities of goods through the sea. In comparison to air freight, ocean freight is a cheaper for any shipment above 200 kg. Calculating the ocean freight rates is a complicated exercise because there are so many variables and most of them keep changing at different times of the year. In the global fertilizer trade, fertilizer transportation is largely characterized by transportation through bulk carriers. Bulk carriers are a type of ship which transports cargoes in bulk quantities. The cargo transported in such ships is loose form *i.e.* without any specific packaging to it and generally contains items like food grains, ores and coals and even cement. Since their inception towards the mid-19th century, bulk vessels have been revolutionized and streamlined in order to facilitate greater ease for their owners and operators, presently.

In terms of capacitances, bulk vessels can carry a maximum cargo of about 4,00,000 DWT. The vessels are further sub-divided into six major classes based on their cargo carrying capacitance and the important marine channels through which they can easily pass. The various classes of bulk cargo vessels in the descending order of cargo capacitance can be elaborated as under:

- Very Large Carriers
- Capesize & handymax
- Panamax
- Handysize
- Small sized

Further the location of destination ports and its ability to handle all-round the year is critical with reference to fertilizer imports. Considering the same, DAP and complex fertilizer plants are largely set up near port locations in India.

Location of Major NPK Plants in India

Location of major NP/NPK plants is illustrated in **Figure 3** and major ports are given in **Figure 4.**

Understanding of global fertilizer trade is of vital importance for import of different fertilizer products and raw materials in order to take precise decision. A glimpse of global fertilizer trade for 2018 is illustrated in **Figure 5**.

Determination of Ocean Freight

There are four major factors affecting ocean freight rates:

- ***Fuel:*** This is the most crucial factor to determine the freight charges for any type of shipping. Prices of oil keep changing and these are associated with the cost of bunker fuel. Carriers are also affected by these changes thereby affect the ocean freight rates.
- ***Currency:*** Currency rates have a significant

Figure 3. Location of NP/NPK plants (Source: FAI, 2020)

Figure 4. Major ports for import of fertilizers in India (Source: FAI, 2020)

effect on ocean freight rates. Though U.S. Dollar is the most used currency in the international transactions, the daily fluctuations of other money markets affect the stand point of freight rates.

- ***Season*:** Changing seasonal demands of goods also affect ocean freight rates. Fluctuations in supply and demand make some commodities more expensive to ship during certain seasons.
- ***Capacity:*** Ocean freight can be considered to be a commodity and like steel, natural gas or oil, the value rises when the demand is higher than the supply.

The above four factors influencing ocean freight is reflected in an index which also factors the size of the vessels of bulk cargo

Baltic Dry Index

The baltic dry index (BDI) is reported daily by the baltic exchange in London. The BDI is an index of average prices paid for the transport of dry bulk materials across more than 20 routes. The index is a composite of three sub-indices that measure different sizes of dry bulk carrier. Capesize, which typically transport iron ore or coal cargoes of about 150,000 MTs; Panamax, which usually carry coal or grain cargoes of about 60,000 to 70,000 MTs; and Supramax, with a carrying capacity between 48,000 and 60,000 MTs. The BDI takes into account 23 different shipping routes carrying coal, iron ore, grains and many other commodities. The BDI is often viewed as a leading indicator of economic activity because changes in the index reflect supply and demand for important materials used in manufacturing. This has a relationship with prevalent freight rates. Baltic dry Index from September 2017 to May 2021 is given in **Figure 6** for understanding of the readers.

Owing to the Covid-19 pandemic, there was a huge fall around May 2020. However the same has substantially risen, wherein crude prices also have peaked to 2 year highs.

Issues of Ocean Freight

Ocean freight constitutes about 5-20% of the total cost of the material imported which would vary based on the commodity handled, its price, the distance of or route of transport and the coast in India where it is imported. Off-late, India has been witnessing huge surge in commodity prices wherein an increase in ocean freight of such commodities is also experienced.

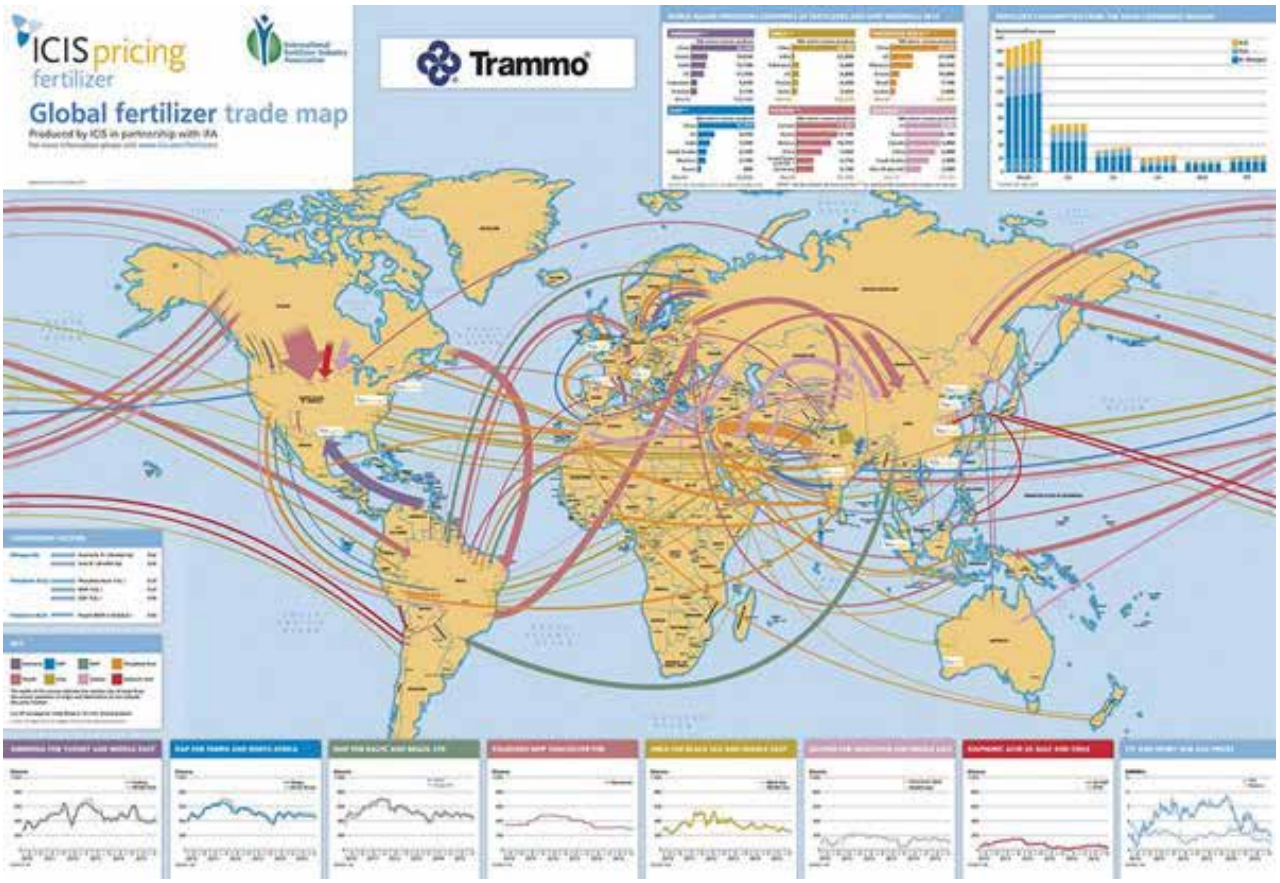

Figure 5. Global fertilizer trade (Source: www.icis.com)

GST on Ocean Freight

i. With respect to services supplied by a person located in non-taxable territory by way of transportation of goods by a vessel from a place outside India up to the customs station of clearance in India, the liability to discharge GST under reverse charge would be on the importer, located in the taxable territory. Thus the service by way of transportation of goods by vessel from a place outside India up to the customs station of clearance in India is covered under reverse charge mechanism wherein the importer is liable to pay GST.

   The value of ocean freight would be deemed as 10% of the CIF value (sum of cost, insurance and freight) of imported goods when the freight amount is not known.

ii. GST should not be made applicable on ocean freight as it further adds to the cost of imports and specifically for P&K fertilizers and leads to accumulation of such input tax credit since the tax incidence on imports is higher owing to higher assessable values.

Conclusions

Management of freight costs is critical to the fertilizer Industry. Despite sales being seasonal to ensure continuous production, adequate quantity has to be imported also keeping a watch on ocean freight rates. Further in case of imported DAP/MOP, etc. which are directly bagged at ports and desptached to districts for sale to farmers, sound planning is required considering the seasonality of Indian agricultural demand, the world market scenario, the prevalent ocean freight rates, the port of discharge and the infrastructure available thereon, to optimize logistics costs.

As regards freight expenditure incurred from plants/ ports to districts, companies try to optimize costs by effecting sales from rake points, thus saving on additional storage, handling and transportation costs. However, its success is dependent upon execution of material transfer with precision and

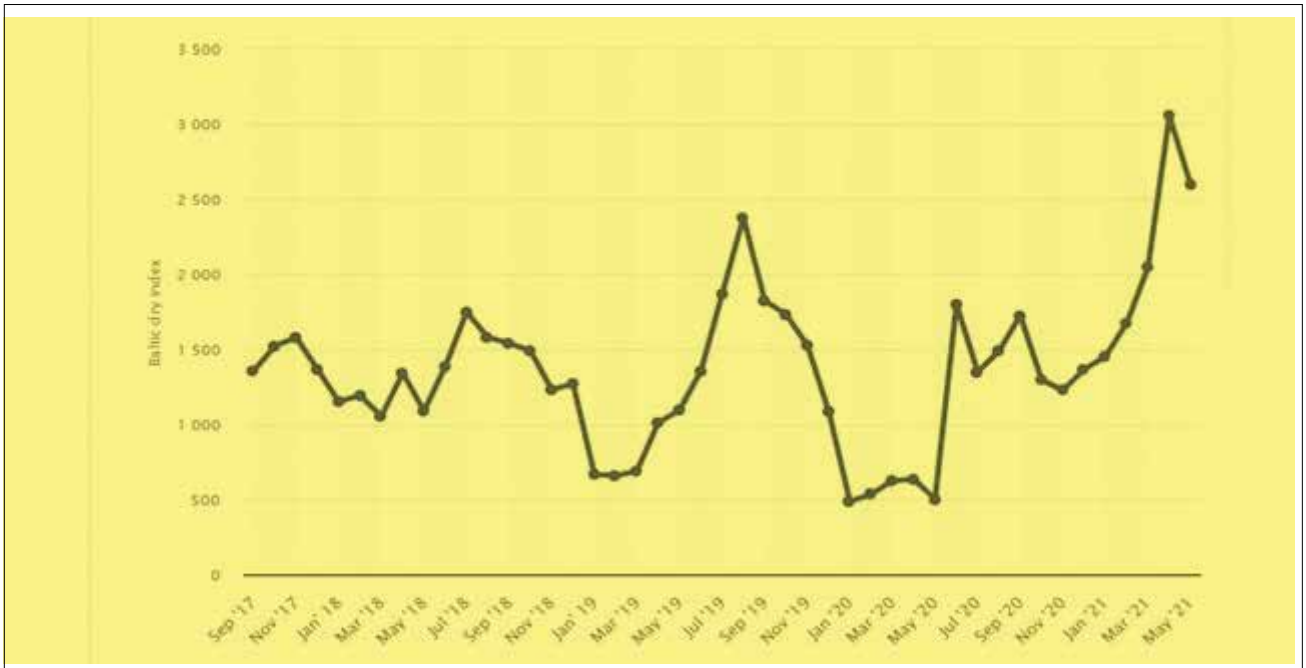

Figure 6. Baltic dry Index from September 2017 to May 2021 (www.statista.com)

timing and requires onboarding and support of all agencies involved. Any delay may result in payment of demurrage and wharfage charges to railways.

Despite Government of India policies allowing reimbursement of freight expenditure to ensure equitable distribution and availability of fertilizers throughout the year, there are certain issues which need to be addressed. Settlement of freight subsidy claims on priority is necessary for working capital requirement. Final secondary freight rates for urea from 2017-18 to 2021-22 need to be notified. The procedure for claim freight subsidy is more cumbersome. Unlike DBT claims which are certified by any Chartered Accountant, freight subsidy claims are to be certified by statutory auditors and involves voluminous data to be reported and uploaded in iFMS system. P&K fertilizers are entitled for freight subsidy only for primary movement. As the retail prices are decontrolled, the secondary freight is not compensated. Possibility of merging primary freight with price subsidy will save time and effort in compliance to be explored. Freight is an important component of cost in the supply chain. Policies related to reimbursement of primary and secondary freight should be streamlined so that there is no under-recovery in freight.

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Role of Agro-service Centers in Supply Chain Management

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Abstract

India lives in villages and agriculture is the backbone of the Indian economy. Since time immemorial agriculture directly or indirectly has employed majority of Indian population. As per World Bank data of 2019, agriculture still provides employment to around 43% of population. Country such as India, with its ever growing population, requires huge agriculture production to feeds its population and its agro-based industries. Farmers have started demanding for new technologies and products. Towards this, supply chain is one of the vital links which can address the evolving scenario. With overall stagnation in arable land, crop productivity and ever increasing market of agriculture inputs, agro-service centers can play a vital role in addressing issues of farmers and act as a medium of propagating information between farmer and agro- input companies.

Key words: Agriculture, population, industry, information, supply chain, agro-service centers

Introduction

In an agrarian based economy like India, agriculture is the dominant sector and it occupies an important place in the economic development. With all efforts at rapid industrialization, agriculture continues to be the pivotal of the Indian economy. The country is amongst the top three world producers of rice, wheat, milk, poultry products, vegetables, coconut, tea, spices, marine and fresh water products including shrimp and fish. As per economic survey of 2020-21, 20 per cent of the country's GDP is derived from agriculture and allied activities. It employs nearly 43% of its work force in India. The development of agriculture holds the key to the progress of our economy as a whole. Therefore, it is necessary that it should be given due importance in terms of marketing of agricultural inputs, increased investment, infrastructure development, providing quality inputs in time to agriculture sector. Among the inputs, seed and fertilizers are important which boost up the agriculture sector as a whole. During 2020-21 cropping season, record sowing of 1801 lakh hectares of major crops was observed which was 7% above normal sowing and 4% higher than 2019-20 (**Table 1**).

It can be seen that among the major crops which are sown, rice and wheat accounts for more than 40% of total area of major crops. This has created a threat to sustainable and profitable agriculture (Bhatt et al., 2016). The Government is laying lot of emphasis on importance of crop diversification for sustainable agriculture. However, farmers of Indo-Gangetic Plains are still adhering to rice-wheat cropping system. India is one of the largest importers of oilseeds and pulses. Therefore, more concerted efforts by all concerned are required to

Table 1. Sown area under major crops in last 5 years in lakh hectares (Source: https://eands.dacnet.nic.in)

Crop	Normal sown area	2016-17	2017-18	2018-19	2019-20	2020-21
Rice	439	398	417	412	416	442
Wheat	303	311	300	299	336	346
Coarse cereals	242	246	240	225	236	235
Pulses	274	303	306	288	297	307
Oilseeds	251	272	254	260	260	281
Sugarcane	48	46	50	56	52	53
Cotton	122	103	122	121	128	130
Jute & Mesta	8	8	7	7	7	7
Total	**1688**	**1687**	**1696**	**1668**	**1732**	**1801**

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Table 2. Production of major crops in last 5 years in million MT (Source: https://eands.dacnet.nic.in)

Crop	2016-17	2017-18	2018-19	2019-20	2020-21	
					Target	4th advance estimate
Rice	110	113	116	119	120	122.3
Wheat	99	100	104	108	108	109.5
Coarse/nutri-cereals	44	47	43	48	48	51.2
Total pulses	23	25	22	23	26	25.7
Total food grains	275	285	285	298	301	308.7
Oilseeds	31	31	32	33	37	36.1
Sugarcane	306	380	405	371	390	3993.5
Cotton*	326	328	280	361	360	353.8
Jute & Mesta**	110	100	98	99	105	95.6

* Lakh bales of 170 kg each**Lakh bales of 180 kg each

convince the farmers to adopt the practice of crop diversification and minimize the area under wheat and rice and grow other nutritive crops so that nutritional security is also secured in in line with food security. As depicted in **Table 2**, production of pulses, coarse/nutri-cereals and oilseeds is still low in the country to meet the growing demand of the growing population.

Further adoption of same cropping system over the years has led to imbalance in soil nutrients and deterioration of soil health, depletion of water levels, increased greenhouse emissions and over-flowing stocks at Food Corporation of India creating burden on exchequer. This imbalance in sowing and production of crops needs to be properly addressed by coordinated efforts of all stakeholders. The last delivery point of agri-input companies is the retailers from where the farmers make purchase of agri-inputs for raising their crops. The retailers are considered as guide and philosopher for the farmers as they seek advice from them related to crops and use of agri-inputs inclusive of fertilizers. The retailer of agro-inputs is located in almost every town/village and plays a vital role in persuading/convincing a farmer to adopt new technologies, new products for his farm. Retailers are important constituents of supply chain between the farmers and the industry. Many companies have their own retail-outlets and the experts are providing value added services to the farmers of the area where they are located.

Supply Chain Management

Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain with the process to satisfy customer requirements as efficiently as possible. Supply chain management spans all movement and storage of raw materials, work-in-process inventory and finished goods from point of origin to point of consumption. The term supply chain management was coined by a consultant Keith Oliver of strategy consulting firm Booz Allen Hamilton in 1982 (Manjunath, 2014).

The term "Supply Chain" was originally associated with classical multinational enterprises that were vertically integrated. But, now supply chain management has become relevant in situation where in there are more than one autonomous players. Supply chain management involves an organizational or institutional perspective involving collaboration, business environment, power and trust; a performance perspective involving performance measurements and consumer behaviour; and a process perspective involving performance measurement issues such as costing, organizing supply chain, targets and decision making.

A supply chain refers to different actors being linked from farm to fork to achieve more effective and market oriented flow of products. The supply chain may include growers, pickers, packers, processors, storage and transport facilitators, marketers, exporters, importers, distributors, wholesalers and retailers. The development of supply chain requires knowledge and expertise about the chains and within the chains. The knowledge about chains is about chain strategy, chain formulation, chain organization, chain design, chain management and partnership. On the other hand, knowledge within chains is about chain marketing, chain logistics, quality assurance, information flows, added value, technology and interaction. Managing supply chain requires an integral approach in which chain partners jointly plan and control the flow of good, information technology and capital from

farm to fork and vice versa. Various innovations in supply chain management include efficient customer response, information and communication technology (ICT) and new generation co-operatives (NGCs), besides strategic partnering and vertical alliances, which create more sustainable partnership in supply chain. The development of supply chain requires knowledge and expertise about the functioning of the complete chain including strategic aspects *i.e.* farming strategies pertaining to chain design, chain formulation, chain organization, chain management and partnership. The functioning aspects *i.e.* chain marketing, chain logistics, quality assurance, material flow, information flow, value addition, technology and interaction. Supply chain management is concerned with the efficient integration of the entities involved so that merchandise is produced and distributed in the right quantity to the right location and the right time.

Supply chain management is the oversight of materials, information, and finances as these move in a process from supplier to manufacturer to wholesaler to retailer and ultimately to consumer. Supply chain management involves coordinating and integrating these flows both within and among companies.

Supply chain management plays an integral role in keeping business costs at a minimum and better profitability. There are many factors involved in supply chain management. Flow is the foremost element, the foundation for all aspects of the process. There are three main flows, such as the product flow, the information flow and the finance flow. The product flow includes the movement of goods from a supplier to a customer, as well as any customer returns or service needs. The information flow involves transmitting orders and updating the status of delivery. The financial flow consists of credit terms, payment schedules, etc. to ensure the prompt, efficient and accurate monetary transactions. Within these categories, various other elements falls, which include the sourcing of raw material, coordinating, manufacturing and assembly of products, maintaining accurate warehousing and inventory accounts, researching supply and demand and much more. The challenges for supply chain management are to maintain all three flows and all three unique in an efficient manner, resulting in optimal results for the company.

Broad Components of Supply Chain Management

Production: Focuses on which suppliers to use, how much to produce, when to produce, where to produce (in source *vs.* outsource, quantities, time, location).

Inventory: Decides where to store their produce and how much to store (make to order *vs.* make to stock, consolidated *vs.* break bulk, location).

Distribution/Logistics: Addresses issues about how the products should be moved and stored (logistics methods own fleet *vs.* 3PL).

Payments: Looks for the best ways to pay suppliers and get gain to customers (pricing policies, promotion and discounts).

Advantages of Supply Chain Management

- Reduction in product losses in transportation and storage
- Increase in sales volume
- Sharing of technology, techniques, capital and knowledge among channel
- Better information about the flow of products, markets and technologies
- Product traceability in the entire chain
- Control of product safety and quality
- Capital investment risks are shared among partners in the chain
- Increasing process efficiencies and
- Customer satisfaction.

Hence, supply chain management is defined as management of physical, managerial and financial systems needed to transfer goods and services from point of production or import to point of consumption in an efficient and effective manner. The entire supply chain management process is a value chain where bottlenecks, value adding factors and liability factors are identified and addressed, thus enabling the retail organization to have an efficient supply chain. The supply is the part of retail operations that ensures the right product in the right place, at a right time and at the right cost.

Supply Chain Management in Indian Agro-input Sectors

A marketing channel is a set of practices or activities necessary to transfer the ownership of goods and to move goods from the point production/imported material from port to the point of consumption, as such; it consists of all the institutions and all the marketing activities in the marketing process. In the traditional marketing of agro-inputs, mainly three marketing channels are present. The existing marketing channels are shown in **Figure 1**.

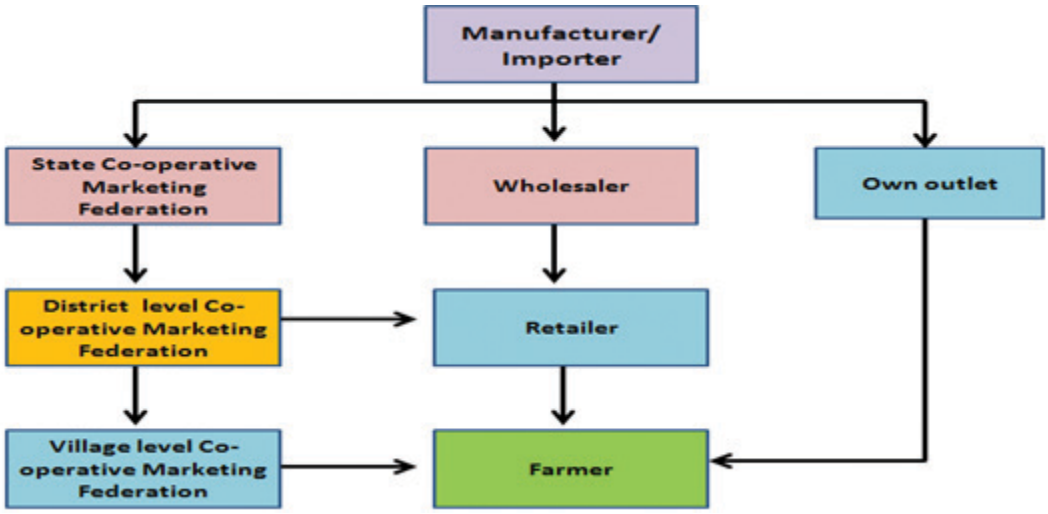

Figure 1. Supply chain for agro-inputs

A retailer or a village level co-operative society or company' owns sale points commonly known as agro-service centers play a vital role towards point of contact in Indian agriculture. A retailer acts as a point of dissemination of information of products between industry, Government and farmers. A retail point acts as a medium for sharing information regarding new products, new schemes/ plans of the central or state governments for farmers' welfare and feedback on current products. Retailer also acts as point of sales of fertilizers, seeds, crop protection chemicals and farm implements.

Agro-service Centers

Post liberalization, privatization and globalization in year 1991, Indian agro-input industry received a thrust and exposure for new agro-chemicals, seeds and fertilizer grades. In early days of Green Revolution the agriculture sector, Indian agriculture market was largely untapped to realize its full potential due to traditional usage of inputs and services being provided. The traditional retailing had several drawbacks. Farmers used to spend more money and time on unnecessary and low-quality products advised by retailers in towns. There was poor management of supply, storage and distribution of agro-inputs. Even there was un-even pricing of fertilizers from retailer to retailer. A farmer had to move from retailer to retailer for purchasing of different inputs required. Farmers were largely dependent on Krishi Vigyan Kendras for farm advisory services and the same were far off.

In the recent era, the agro-inputs market is not only limited to certain traditional category of products, but now coupled with new age technology products, irrigation, advisory services, etc. Agro-input industry still faced with a dilemma that despite of new age technologies available which have new avenues for growth, there is a disinterest among the retailers in adopting new technologies and services. Industry saw this as an opportunity and an idea of agro-service centers was conceived. The concept agro-services center is not new to Indian agriculture. Such concept existed earlier to liberalization, privatization and globalization era, but was limited to certain agro-input industry through their depots. The agro-service centers in addition to traditional work of retailing products also provides additional services such as soil testing, farm advisory, crop finance, insurance, farm machineries on rent basis, animal feed. Inclusion of the services component along with traditional retailing in form of agro-service center has given farmer the benefit of "all inputs under one roof". The basic products and services being offered in an agro-service center are shown in **Figure 2**.

In fertilizer marketing, agro-service center (ASC) plays a very important role. Some features of ASC *i.e.* model retail shops are following:

- **Farm Inputs**
  - Traditional fertilizers/secondary nutrients/ micronutrients//bio-fertilizers
  - Seeds
  - Organic Manures
  - Water soluble fertilizers (solution grade, fertigation grades for drip irrigation)
  - Agro-chemicals
  - Animal feed (cattle feed, fish feed, prawn feed)
  - Farm implements (sprayers, drip and others)
  - Insurance

Figure 2. Products and services in place at agro-service center

- **Farm Advisory Services**
  - ♦ Soil testing through static laboratories or mobile vans
  - ♦ Field visits by crop experts and remain in constant touch with the farmers
  - ♦ Crop seminars for the farmers
  - ♦ Farmers' meetings
  - ♦ Visits of farmers to Agricultural Universities/ krishi mela/ fertilizer plants
  - ♦ Slide shows on recent advances in agriculture
  - ♦ Touch screen kiosks
  - ♦ Monthly newsletters for the farmers
  - ♦ Free advisory service through call centers
- **Farm Mechanization Services**
  - ♦ Nursery operation
  - ♦ Land preparation
  - ♦ Transplanting
  - ♦ Spraying services
  - ♦ Rental services for tractors and farm implements

Agro-service centers or Model retail shops for agro-inputs are run by several prominent fertilizer companies of India. Coromandel International Limited successfully runs more than 800 model retail outlets in states of Andhra Pradesh, Telangana, Karnataka and Maharashtra. Similarly, GSFC has 284 model retail outlets in Gujarat and Rajasthan states since more than 30 years. Cooperatives such as IFFCO also run such modern retail shops in states of Uttar Pradesh, Punjab and Haryana, etc. GNFC has also such centers in Gujarat.

Governments in various states have also taken note of importance of Model retail shops. It is worth mentioning that the State Government of Andhra Pradesh (Reddy, 2020) has implemented one stop solution for farmers in form of *Rythu Bharosa Kendra (RBK)*. The centers offer services like delivery of inputs to farmers within 24-48 hours of order through kiosks, custom hiring of machinery, technical advisories and this is an attempt to bring the agriculture extension system more closely to the farmers. The state government has planned to setup 10,641 RBKs in state. The list of inputs and services provided by them is listed below:

- ♦ Agri-input shop
- ♦ Farmer knowledge centers
- ♦ Custom hiring centers
- ♦ Delivery of inputs at farmer's home within 48 hours
- ♦ Crop insurance and finance
- ♦ Extension services
- ♦ Veterinary services
- ♦ Interaction with knowledge experts

A snapshot of a Kendra, knowledge kiosk and farmer training is shown in **Photo 1**.

a. Rythu Bharosa Kendra
b. Knowledge Kiosk
c. Farmer Training

Realizing the potential of ASC, few private as well as cooperative wholesalers in Karnataka have combined their business synergy to form a well-oiled wholesaler-retailer network which is offering such services.

Agro-service Center: A case of Fertilizer Industry in Gujarat State

Gujarat state is located in the western part of

Photo 1. Snapshot of the Rythu Bharosa Kendra, knowledge kiosk and farmer training

India. It has 4 urea plants of IFFCO, KRIBHCO, GSFC & GNFC and 4 phosphatic plants of IFFCO, GSFC, GNFC and HINDALCO in addition to SSP and mixture manufacturers. Gujarat having the largest coastline in India is host to many ports where many fertilizer companies import their raw materials and finished fertilizer products. It has a geographical advantage in terms of manufacturing units and ports set up throughout state. In Gujarat, total consumption of fertilizers in terms of products is around 4.0 million MT.

The fertilizer supply chain and retailing in Gujarat is largely a 3 tier system which is followed by both private and cooperative sector. There are around 9,000 active fertilizer retailers in Gujarat. Gujarat has played a major role in establishing cooperative movement in India. It is home to one of India's largest apex cooperative marketing federations in fertilizer industry and commands major share of 59% of total fertilizer retail outlets in Gujarat. Private retailers constitute only 25% share. Agro-service centers *i.e.* model fertilizer retail outlets of GSFC, GNFC and GAIC constitute only 16% of the total retail outlets (**Table 3)**.

In Gujarat, even though the share of ASC or model retail outlets of GSFC, GNFC and GAIC is only 16% of total retailers, ASC model has been quite successful in the state. ASC of GAIC, GSFC & GNFC play a very important role in retailing of fertilizers. The presence of such outlets has developed faith among the farmers and also there is price stabilization in the state and cases of over-charging are bare minimum. The material by and large is sold at MRP during any season. This has helped in creating trust in mind of farmers for quality and price. Due to uniformity in price and quality at ASC, farmers prefer purchasing fertilizers from these outlets.

An example of GSFC is worth to cite for explaining the importance of ASC in the state. In addition to own agro-service center, company sells fertilizers to Gujcomasol *i.e.* cooperative network, private dealer, GNFC and GAIC. The major quantity is through Gujcomasol and some quantity is sold in the private trade. Total material sold of GSFC through point of sale (POS) machines to farmers was 1.154 million MT in 2020-21. Out of which material sold by agro-service centers of GAIC, GSFC and GNFC was around 0.4 million MT which is around 34% of total sales of fertilizers through POS devices of GSFC as shown in **Table 4**. This cements the fact that even though the number of ASC is only 16% of total retailers, the material sold through them is of higher quantity. Farmers prefer a one stop shop location which has uniformity in prices, assurance of quality, availability of multiple agro-inputs, farm advisory, etc.

In fertilizer industry with commencement of DBT regime, ASC not only provides stock management and proper documentation but also guarantee of faster POS realization. Retail points of ASC have

Table 3. Retail outlets in Gujarat

Retailer type	Nos.	% Share
Private	2,265	25.2
Cooperatives	5,300	58.9
GSFC	272	3.0
GNFC	55	0.6
GAIC	1,100	12.2
Total	8,992	100.0

Table 4. Sale of fertilizers of GSFC through ASC of GSFC, GNFC and GAIC

Retailers	Quantity (MT)	%Share
GSFC material through own ASC	234,935	20.4
GSFC material by GNFC through ASC	4,303	0.4
GSFC material by GAIC through ASC	161,545	14.0
Others	753,480	65.3
Total sale through POS machines	**11,54,263**	**100.0**

adequate storage facilities. In fertilizer industry, during off-seasons, fertilizer retail points serve as additional storage points. Companies during off-season offer attractive schemes or notional storage charges to retailers. This indirectly helped companies reduce their warehousing, additional transportation and material loss during handling and storage. ASC have played a major role in implementation of State government schemes. Earlier every year Government of Gujarat had launched several schemes for benefit of farming community such as Vanbandhu Kalyan Yojna under tribal development department, fertilizer input kit scheme under Agri-diversification project, scheme for promotion of water soluble fertilizers. Lack of interest from retailer and nodal agencies limited the outreach of the project to its ultimate beneficiaries. At times, farmers had to visit multiple retailers in order to avail benefits. Since 2017-18, GSFC has taken up the tasks for implementation of these projects through its retail arm. GSFC offers its services as a one stop shop location in form of individual kit and distributes them. This has created a win-win situation for the farmers and Government. GSFC has facilitated for efficient dispersion of scheme to its beneficiaries and it has resulted in increase in participation among tribal farmers.

Conclusion

Agro-service centers of the fertilizer companies and State Agro-industries have helped and will continue to help the farmers to make various need based agro-inputs available to the farmers. Also the services provided by such centers have been assisting them for their overall development and improving socio-economic conditions of the rural mass. With ever-changing scenario in Indian agriculture and dire need of reforms, it is now high time that instead of "traditional retailing", all stakeholders including Government of India should mandate, facilitate and promote setting up of ASCs. Agro-service centers can be a game changer for the Government to broadcast its schemes and announcements made from time to time for betterment of the farming community.

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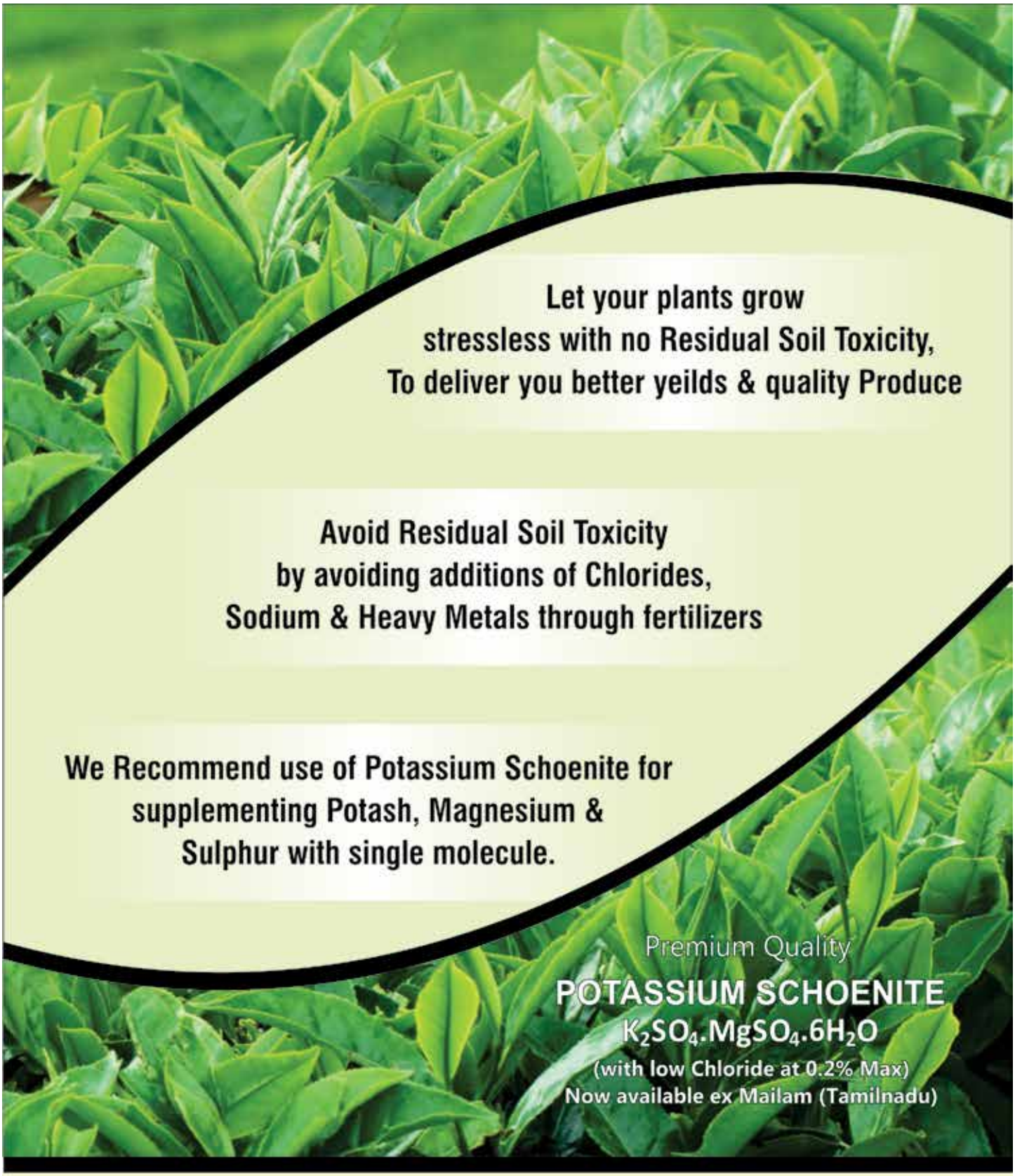

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Marketing of Innovative Fertilizer Products

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Abstract

Innovative fertilizers refer to plant nutrient products with varied functional properties, comprising products used for precision nutrient management, post-harvest keeping quality and managing soil health. Growing requirement of high-quality crop and thrust on improved nutrient use efficiency has driven the growth of these fertilizers world over. Fertilizer companies have been adopting innovative marketing strategies to serve Indian farmers. Government policies need to support industry efforts, such as the general specifications for water soluble fertilizers. This approach needs to be extended to the entire fertilizer range of products and general specifications of fertilizers (primary-, secondary- and micro-nutrients). The right policies and right marketing strategies will definitely help India to become a leading player in the global market.

Key words: Water soluble fertilizers, strategy, market access, general specifications, grade approval, micro-irrigation, policy

Crises of Food and Nutrition Security – Global Scenario

The sustainable development goals (SDG) aimed at reducing poverty; ensuring healthy environment and prosperity for humankind were adopted by the United Nations in 2015. For the world to achieve the goals of SDG 2030, efficiency in agriculture is a must. We will have to improve our food system. The population of undernourished humans has risen to 690 million in 2019 and this number is expected to rise to around 840 million humans by 2030. The world is not on track to achieve zero hunger, even without the negative effects that COVID-19 will likely have on hunger. Two billion people, or 25.9 per cent of the global population, experienced hunger or did not have regular access to nutritious and sufficient food in 2019. This situation could deteriorate if we do not act immediately and boldly.

Future of the planet is that the young children are possibly even worse affected. These trends in food insecurity contribute to increasing the risk of child malnutrition being painful but true in 2019, 21.3 per cent (144.0 million) of children under 5 years of age were estimated to be stunted, 6.9 per cent (47.0 million) wasted and 5.6 per cent (38.3 million) overweight, while at least 340 million children suffered from micronutrient deficiencies. Projections for 2030, even without considering a potential global recession in the aftermath of Covid-19, serve as an added warning that the current level of effort is not anywhere near enough to end malnutrition in the next decade. We simply do not have the luxury of time anymore – the time to act is now.

Crises of Food and Nutrition Security – Indian Scenario

The situation for India is alarming as we have ranked 94 among 107 nations in the Global Hunger Index 2020 according to the report issued by FAO. As per this report, 14 per cent of India's population is under nourished and almost 18 crore Indians are suffering from malnutrition. Worryingly, 37% of our children under the age of five are showing signs of stunting as shown in **Photo 1**. Today's children are tomorrow's workforce and if we are unable to provide a healthy childhood, the foundation of an efficient workforce gets shaken to the detriment of the future growth of the economy.

Photo 1. Signs of fatigue in children due to malnutrition

To emerge as a global economic force and put our demographic advantage to full use, India needs a productive and healthy workforce. This is possible only by ensuring that everyone can access not only food, but nutritious foods that make up a healthy diet.

India's population is expected to reach 1.64 billion by 2050 and to ensure food as well as nutritious security for this growing population; we must increase our agriculture production significantly. The huge yield gap is one of the reasons for low farm incomes. A study by Planning Commission estimated these yield gaps between 6 to 300 per cent in cereals, 5 to 185 per cent

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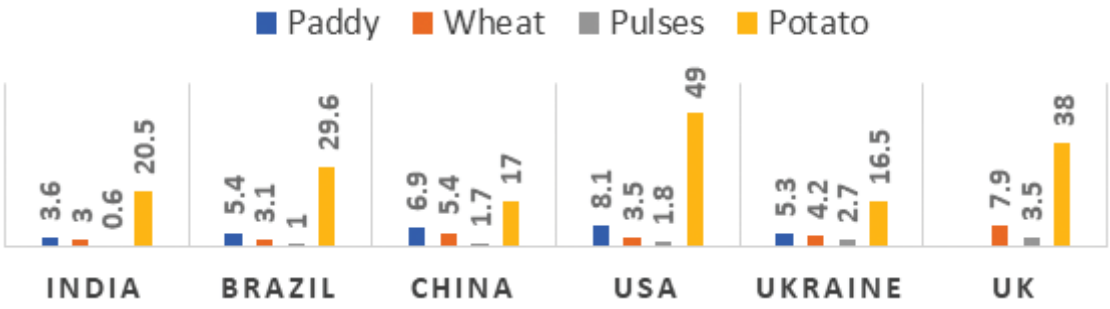

Figure 1. Comparison of average yields in 2016 (MT ha^{-1}) of four crops in India with other five countries

in oilseeds, and 16 to 167 per cent in sugarcane (Planning Commission, 2016). Average yields of crops in India in metric tonne per hectare (MT ha^{-1}) are considerably low compared to other countries (**Figure 1**).

Challenges Driving the Need for Innovative Fertilizers

Change is occurring at a rapid pace driving the urgent need for us to adapt in order to help the farmers to face these new challenges. Some of the key challenges are listed.

Climate Change

Changing climatic patterns are beginning to impact agricultural production throughout the world. In India, we are experiencing uncertain as well as uneven monsoons impacting our cropping pattern as well as yields. 25 per cent of the world's greenhouse gas emissions come from agriculture; hence reduction of greenhouse gas emissions is very important. The key solutions are agronomic knowledge that can help develop solutions responding to the changing growing environments and low-carbon neutral solutions for reducing emissions from farming.

Water Stress

Agriculture accounts for around 70 per cent of the freshwater usage. Lack of water in sufficient quantity as well as quality has a negative impact on crop yields. India is consuming almost twice the amount of water to produce one MT of cereal as compared to countries such as China and Brazil. There is an urgent need to expand area as well as crops under fertigation to reduce water consumption. We must adopt new technologies and to advance water use efficiency and offer solutions for water-scarce agriculture. If there is scarcity of water in the soil due to non-irrigation, particularly in heavy textured soil, cracks are developed (**Photo 2**).

Soil Degradation

Roughly one third of the world's soil is degraded due to a variety of factors, including soil erosion,

Photo 2. Cracks in soil due to water scarcity

biodiversity loss and pollution. Farming without adequate replenishment of nutrients adds to the problem and results in productivity losses. Best farming practices focus on soil health, carbon capture and regenerative agriculture. We need to promote deeper understanding of different farming environments and best practices for improving soil health. While balanced crop nutrition and application knowledge can contribute to soil health. Towards this, integrated nutrient management comprising of all available sources inclusive of vermi-compost (**Photo 3**) needs to be given more impetus.

Changing Consumer Demands

Climate and health conscious consumers, particularly in high income countries, are increasingly driving diets towards healthier and sustainable choices as well as plant-based nutrition. Changing dietary patterns impact agricultural demand and crop production regionally. We need to adapt to respond to changes in dietary patterns. Farmers now have to gear up to produce the crop and the quality the consumers demand and for this, they need knowledge as well as new innovative products to help them meet the

Photo 3. A snapshot of vermi-compost

Photo 4. A view of an innovative fertilizer

changed market requirements successfully.

The Indian agriculture sector, with more than 146 million farm holders, holds tremendous potential for contributing significantly higher than the current 17% to the Indian GDP. Agriculture continues to remain the only sector that has a direct combined impact on poverty, rural livelihoods, health and nutrition. India has one of the largest arable land resources in the world. With 20 agri-climatic regions, all 15 major climates in the world exist in India. The country also possesses 46 of the 60 soil types in the world and high proportion of agricultural land (157 million hectares). This presents a unique opportunity and we can produce almost everything in the country and supply to the global markets round the year. Farmers need to access Innovative solutions in order to meet the ever changing requirements of the consumers. Marketing of innovative fertilizers has become the necessity to the economic system of the country. It is of paramount importance to identify the need of the farmers and meet the same in cost-effective manner to produce quality produce of different crops as per demand of the consumers. In simple words, marketing can be defined as 'Find a need and fulfil it'. We need to focus on innovative approaches to reach remote rural farms.

Marketing Strategy for Innovative Fertilizers

The marketing strategy for the innovative fertilizers (**Photo 4**) should be such that the farmers are helped to overcome the challenges that have been discussed earlier. Sharing below some of the ideas that we have been using to help create awareness amongst the Indian farmers

- ***Crop-Clinic and Crop Demo***

  Organise crop clinic and crop demo to help and educate farmers for using proper Innovative fertilizer for their crop and demonstrate its impact.

- ***Mini Kits to the Small and Marginal Farmers***

  Distribution of Mini kits to the small and marginal farmers is also an important element of the promotional programme. The productivity of different crops at the small and marginal farmers' fields is so low that even a marginal increase in investment on the right type of inputs would give better results. Each mini kit contains a pack of fertilizers, improved seeds and plant protection chemicals, etc.

- ***Small Farmers Meetings***

  Meet the farmers in regular intervals. Sensitise them how Innovative fertilizers can increase their crop productivity (yield and quality). Highlight the salient features of specialty products and convince them to buy such fertilizers.

- ***Connect with Dealers and Retailers***

  Agronomists and sales executives need to get in touch with dealers and retailers selling agricultural products in and around locality. It is important to regularly sensitise about the benefits of innovative fertilizers and their impact on increasing yield, quality, and other related advantages. And also, product-wise business plan for dealers and retailers needs to be developed. Displaying promotional materials and brochures at dealers and retailers' outlets will also be useful for the visiting farmers to know about such products.

- ***Sponsor a Local Event***

  Sponsoring a local event helps in building a strong relationship with the local farming community. Display of products, distribution of leaflets as well as some live demonstrations (if possible) would also go a long way in helping farmers to understand the new products and their usefulness in agriculture.

- ***Participate in Agricultural Trade Shows***

  Participation in agricultural trade shows especially in the Agricultural Universities gives a

good opportunity to showcase innovative products to the scientific community as well as the farmers.

- ***Advertisements***

  Advertisements play an important role in creating awareness of the product as well as brand. Traditional media such as newspapers and now digital media are extremely useful in reaching out to large groups of farmers. Strategically placed hoardings help catching the attention of the farming community. Advertisement on TV is expensive but the impact is significant in raising the awareness among farmers.

- ***Crop Seminars and Webinars***

  Organizing seminars and webinars are important tools for sensitizing groups of farmers about innovative solutions. The seminars and webinars should focus not only on products and solutions but also best practices to be adopted.

- ***Model Plots***

  Creating of model plots to demonstrate the best agricultural practices and use of innovative products and solutions for any particular crop.

- ***Digital Tools***

  Digital technology enables us to address a key problem in smallholder markets, which is how to bring know-how to remote farms, and reach millions of farmers. Imagine a world where such farmers can arrive at an informed decision and we can unlock the tremendous potential it has. Technology, of course, is a part of a holistic system. Certainly, high quality physical inputs, optimized seeds, infrastructure, etc. need to be further optimized.

Consumption of Water Soluble Fertilizers and Related Areas

Among innovative fertilizer products, use of water soluble fertilizers is of vital importance. Consumption of such fertilizers has increased by a compound annual growth rate (CAGR) of 21.1 per cent in the country from 2005-06 to 2019-20 (**Figure 2**). The growth is driven in part by the applicability of water soluble fertilizers across all crop types; in particular, horticultural crops which not only are the biggest constituent of the market but also are the fastest growing. The growing population and thus, rising demand for fruits and vegetables is fuelling the growth of horticultural crops.

Water soluble fertilizers are applied in the crops by foliar and through drip irrigation. Use of such fertilizers through drip irrigation, generally known as fertigation, is considerably more than foliar application as per the data available for 2017 given in tonnes (**Figure 3**). Moreover, the increasing acceptance of micro-irrigation and precision irrigation techniques is a major driving factor for the fertigation application. Application of such fertilizers through drip irrigation results in enhancing fertilizer use efficiency considerably (**Table 1**).

Drip irrigation also increases water use efficiency to a great extent as water is applied in the root zone as per the demand of the crops. Realizing the importance, Government of India is giving lot of emphasis in

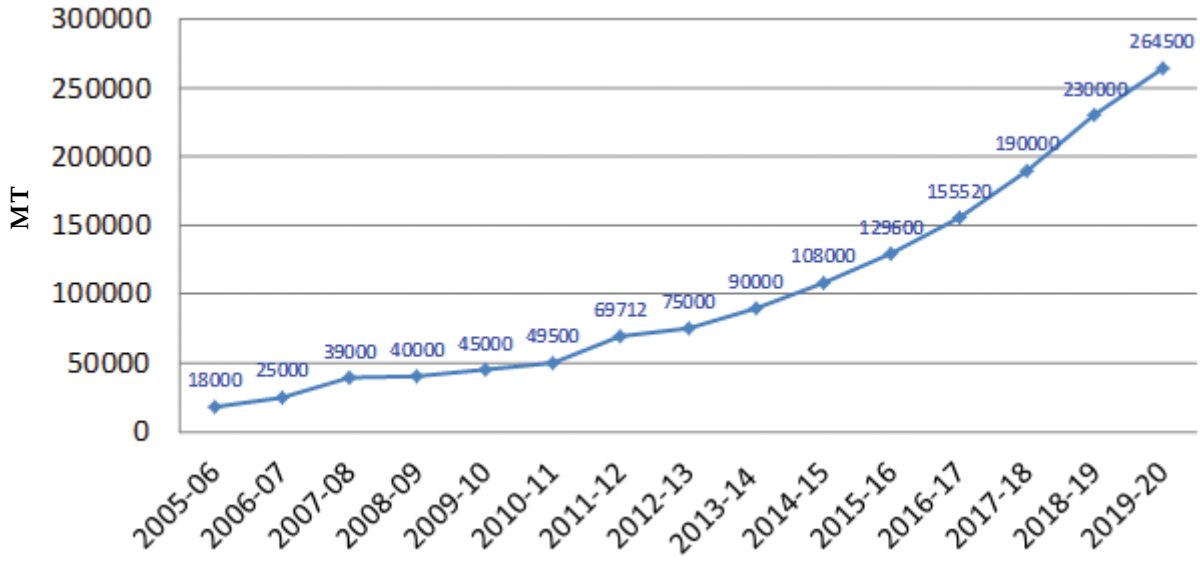

Figure 2. Estimated consumption of water soluble fertilizers in India (Source : FAI, 2020)

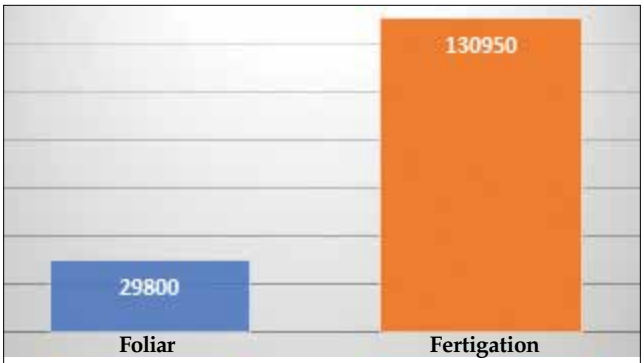

Figure 3. Use of water soluble fertilizers (MT) through foliar and drip irrigation (Source : E&Y, 2019)

Table 1. Fertilizer use efficiency (%)

Nutrient	Soil application	Fertigation
Nitrogen	30-50	95
Phosphorous	20	45
Potassium	50	80

promotion of micro-irrigation comprising of drip and sprinkler in the country. The area has increased from 3.1 million ha to 2005 to 11.4 million ha in 2019 showing a CAGR of 9.8%. Per Drop More Crop Scheme initiated in 2015 under Pradhan Mantri Krishi Sinchai Yojana and corpus of fund increased from Rs. 50 billion to Rs. 100 billion for the current year to expand the area under micro-irrigation. Government target is to cover additional 10 million ha in next 5 years. More than 85 per cent area under drip irrigation is in the states of Andhra Pradesh, Maharashtra, Gujarat, Tamil Nadu and Madhya Pradesh **(Table 2)**. For sprinkler irrigation, leading states are in the order of Rajasthan > Karnataka > Gujarat > Haryana > Maharashtra > Andhra Pradesh (FAI, 2020).

Case Studies on Impact of Innovative Fertilizers

Innovative fertilizer products certainly help in getting more yields with quality produce. In our country also, farmers have realized their importance. Snapshots of pomegranate and grapes produced from use of such products particularly 100% water soluble fertilizers (WSFs) are given in **Photo 5** and **Photo 6**.

Other Innovative Products

In addition to water soluble fertilizers, there are other innovative fertilizer products such as micronutrients, fortified fertilizers, customized fertilizers, nano fertilizer, organic fertilizers, etc. Micronutrients are needed by the plants in small proportion as compared to primary nutrients but are indispensable for the life cycle of a plant. Fortified fertilizers are multi-nutrient carriers and there are 30 zinc, boron, sulphur and

Table 2. State-wise area under micro-irrigation (lakh ha) as on 31st March, 2019 (Source : FAI, 2020)

State	Drip	Sprinkler	Total
Andhra Pradesh	12.95	4.90	17.85
Bihar	0.11	1.05	1.16
Chhattisgarh	0.25	2.91	3.16
Gujarat	7.23	6.99	14.22
Haryana	0.33	5.73	6.06
Jharkhand	0.21	0.16	0.37
Karnataka	6.58	8.63	15.21
Kerala	0.24	0.09	0.33
Madhya Pradesh	3.14	2.43	5.57
Maharashtra	12.00	5.05	17.05
Odisha	0.25	0.98	1.23
Punjab	0.36	0.13	0.49
Rajasthan	2.45	16.46	18.91
Tamil Nadu	4.88	1.88	6.76
Telangana	1.92	0.71	2.63
Uttar Pradesh	0.26	1.28	1.54
West Bengal	0.01	0.66	0.67
Others	0.35	0.55	0.90
Total	**53.55**	**60.58**	**114.13**

Photo 5. A fruit of pomegranate with use of water soluble fertilizers

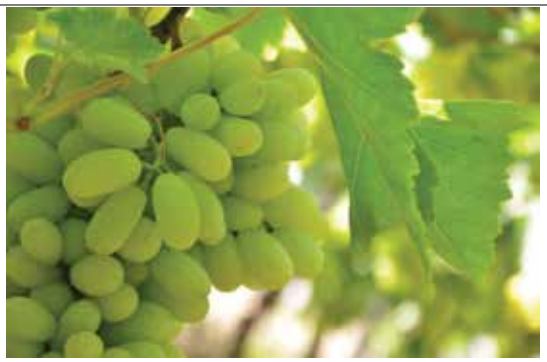

Photo 6. Quality grapes produced from innovative fertilizer products

magnesium based fortified fertilizers in FCO, 1985 but market is not expanding. Farmers' acceptance needs to be created on importance of value added fertilizers in agriculture. Production of zincated urea is not cost effective. Customized fertilizers are area and crop specific but production is not picking up. There are separate papers on nano fertilizer and organic fertilizers in this issue. The market size of the specialty fertilizers in the country is given in **Figure 4**.

The net result in use of innovative fertilizer products is improvement in quality of produce in addition to increase in yield. The import of agriculture commodities can further get impetus if crop quality is as per international standard. The country still lags behind other counties in export compared to other countries in spite of having largest arable land (**Figure 5**).

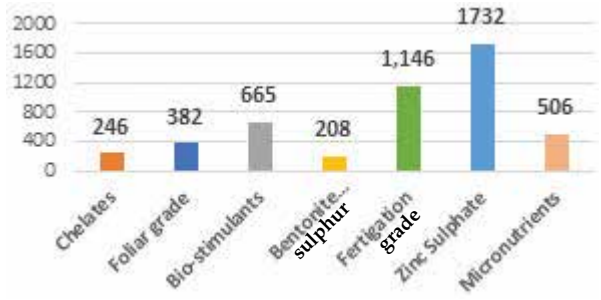

Figure 4. Category-wise market size (Rs.crores) of specialty fertilizers in India (Source: EY, 2019)

Facilitating Access to Innovative Fertilizer Products

While marketing strategies ensure easy warehouse-to-local market access to innovative fertilizers for farmers, the broader issue is encouraging companies to introduce innovative fertilizers into the Indian market. Given the critical role of innovative fertilizers play in ensuring our country's food and nutrition security, the government must create conducive policy environment to spur supply. In India, the fertilizer sector is heavily regulated, and all products must be registered under the Fertiliser Control Order (FCO), 1985 before introducing to the Indian farmers. India has a rather long-winded process for registering new fertilizer products in FCO as outlined in **Figure 6**.

In India, product sample of the new product either imported or produced is taken and trials are conducted by Indian Council of Agricultural Research (ICAR) or State Agricultural Universities (SAUs) for one season and then results of the same are communicated to Ministry of Agriculture & Farmers Welfare. There is a Central Fertilizer Committee (CFC) and the results are reviewed in the

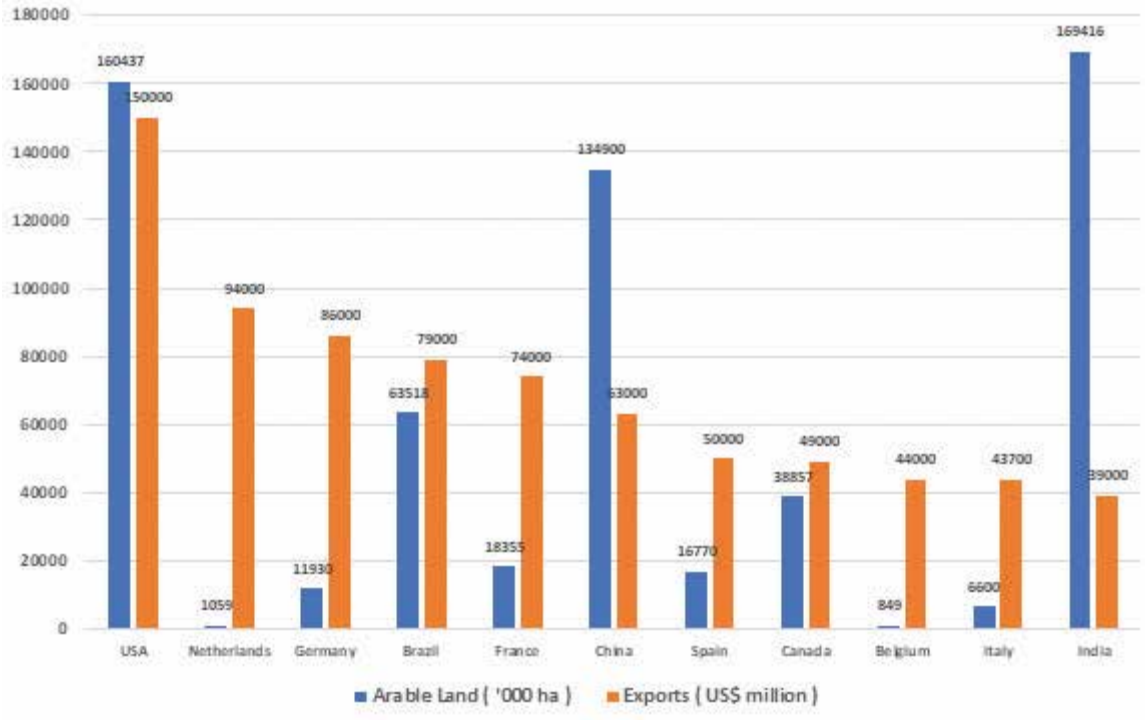

Figure 5. Comparison of India with other countries in relation to arable land and export of agricultural commodities (Source : https://humboldt.global/top-agricultural-exporters/)

Figure 6. Process of registration of new fertilizer under FCO, 1985

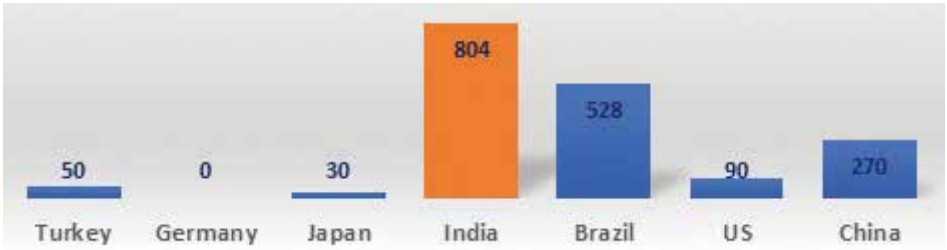

Figure 7. Time taken (days) in India compared to SAARC countries for approval of new grade (Source: World Bank Report, 2019)

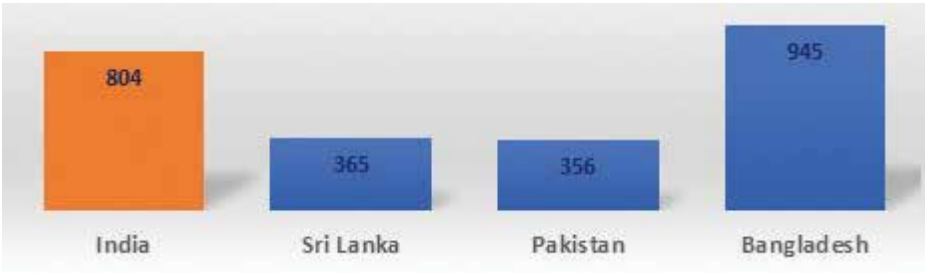

Figure 8. Time taken (days) for approval of a new grade in top agriculture producing countries (Source - World Bank, 2019).

meeting of CFC. After lot of deliberations if the committee feels that the product is good for Indian farmers, the same is approved and notified in Official Gazette for inclusion in FCO, 1985. The important point is that the entire process takes lot of time compared to other countries as illustrated in **Figure 7** and **Figure 8**.

In a study done by World Bank on the time taken to register fertilizers, India came at 98th position out of some 101 countries surveyed (World Bank, 2019). The delay means that Indian farmer is deprived of accessing the latest developments in the global market in the field of crop nutrition. On the other hand, his counterparts in other countries producing the same crop are accessing as well as benefiting from the latest technological developments in crop nutrition. This delay is one of the reasons for the huge productivity gap that we see between India and the rest of the world.

As an illustration of the powerful outcomes that emerge consequent to an enabling policy environment which encourages the introduction of innovative fertilizers, consider the case of water-soluble fertilizers.

In a landmark reform the Ministry of Agriculture and Farmers Welfare, Government of India introduced general specifications of water-soluble fertilizers NPK (WSF NPK) in 2014 . The guidelines spelt out the minimum level of nutrients that have to be in the WSF NPK for sale of the fertilizer in India. This reform helped suppliers create and make available crop stage specific grades to the farmers without a time lag.

Water Soluble Fertilizers offer multiple benefits in the Indian context. Fertigation is an effective tool to control nutritional deficiency at the crop stage. It also helps improve fertility and increase productivity of

plants. For instance, use of WSF NPK has driven up the yield per hectare, for fruits and vegetables, by almost 10 per cent since 2014 (Ministry of Agriculture and Farmers Welfare, 2018). Horticulture production, as a whole, has gone up by 11% since 2014-15. This has had a cascading impact on quality of produce and thus realisations for the farmer. At a national level, aside from contributing to the government's ambition of doubling farmers' incomes, exports too have increased.

Take the case of grapes, exports have increased by nearly 25%, over a three-year period from 2017 to 2019, primarily due to better crop quality as result of using of innovative crop nutrition products (APEDA). Higher exports, in turn, imply better returns for the Indian farmer. Many similar stories, for other crops, such as apples, lychees, oranges and pomegranates have also been documented

Conclusion

Innovative fertilizers play an important role in enhancing farm productivity with quality produce. There is a sea change in behaviour of the consumers to go in for quality diet. The potential of agri-export is tremendous. In order to enable various market players to introduce more innovative products which help the farmers produce high quality crops and improve their farm incomes, it is essential that the Ministry of Agriculture and Farmer Welfare allow for label claim on all fertilizers (primary-, secondary- and micro -nutrients). This will go a long way in helping develop innovative products which will help the farmers meet the challenges of climate change, soil degradation as well as improve the nutrition content of the crop. It is important for farmers to access innovative products and solutions in order to ensure our country's food and nutritional security. Fertilizer companies have been adopting innovative marketing strategies to serve Indian farmers. Government policies need to support industry efforts, The right policies and right marketing strategies will definitely help India to become a leading player in the Global US$ 1500 billion market.

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Sales Promotion and Marketing Strategy of Nano Urea (liquid)

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Abstract

Nano Urea (liquid) is the fertilizer of the 21st century. Since long, nanotechnology based solutions have been commercially applied in areas of medicine, aerospace, defence, pollution control, electronics, sensor-based technologies, paints, etc. Nanotechnology has been breaking new barriers in many fields but its application in agriculture has been limited. IFFCO through its Nano Biotechnology Research Centre (NBRC) at Kalol has undertaken research and development of nano-fertilizers. Nano-fertilizers can lead to economy in application of nutrient fertilizers, better crop harvests with minimal environment footprint. For this, extensive field trials and lab testings have been conducted to ascertain efficacy- biosafety- bio toxicity of nano-fertilizer. Concentrated efforts by IFFCO since 2017-18 have resulted into introduction of world's 1st nano-fertilizer - Nano Urea (liquid) for the farmers. It had also been notified under Fertiliser Control Order (FCO) of Government of India. Real challenge for any novel product lies in its acceptability by the customer for which channel partners are also being sensitised. IFFCO enjoys support of primary agriculture cooperative societies (PACS) which form its robust channel partner network at grassroots level. Apart from PACS, alternative channels such as IFFCO bazar, IFFDC societies, farmers service centres (FSC), digital marketing platform are also being explored to disseminate the benefits of Nano Urea (liquid) in short time. To achieve this objective effectively, innovative sales promotion and marketing strategy is being employed. Nano Urea (liquid) fulfils the ideology of 'Make in India and Made for the World'. National and international tie ups/ MoUs/ JVs with cooperatives and dealers in India and abroad are steps in this direction. Paper summarises the publicity, promotional and extension efforts of IFFCO for Nano Urea (liquid) so that farmers can harness its benefits, improve their profitability and also benefit the environment during the process.

Key words: Nano urea liquid, nano technology, joint ventures, MoUs, promotion, publicity, marketing, way forward

Introduction

Agriculture remains the backbone of Indian economy, a fact that has been demonstrated well even during Covid-19 pandemic. Today, consumer is concerned about food traceability, environment friendly agri-inputs, soil and environment health and sustainable farm operations. This calls for novel and innovative solutions to address these challenges. Nitrogen (N) is one of the most essential and structural nutrient required for better crop growth and development. Though, it is abundantly available in atmosphere (78 %) but its unavailability in soils results in suboptimal or reduced yields. Low carbon status due to intensive crop cultivation practices and reduction in soil organic matter (SOM) have disturbed the C: N ratio of soils. Plant requirement for N is largely met by urea and this is the farmer's first choice which is now becoming a habit at the cost of balanced fertilizer application over the years. It's low cost, ease of application and visible responses have been some of the factors for its adoption. With nitrogen use efficiency (NUE) of 30 to 50%; urea losses are getting substantial over a period of time. Urea's ill effects due to excess application in terms of prevalence of pests and diseases, crop lodging, delayed maturity and soil- air- and water- pollution had been well documented.

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A Few Facts about Urea

In India, urea accounts for 80% of the nitrogenous fertilizers applied to crops by farmers. There has been commensurate increase in production, import and consumption of urea over the years. If we see the trend in urea consumption in India over the years, the compound annual growth rate from 1990-91 to 2020-21 works out to be 3.1 per cent. On the other side if we take into account the production of food grains and consumption of N (FAI, 2020; 2021) and assume that 40% increase in food grain production is on account of N application and considering that 65% N is going to food grain crops, the response ratio (kg grain kg N^{-1}) is showing a declining trend (**Figure 1).** It suggests that with commensurate increase in application of nitrogenous fertilizers such as urea, we may not be able to sustain higher food grain production in perpetuity. Therefore, contingent measures have to be taken for ensuring sustainability of our food grain production systems.

Application of urea though is essential for the food security of the country but its production and distribution is both energy and resource intensive. Out of the total demand of 35.04 million MT of urea in India, about 72% was met through indigenous production while 28% was from imported urea in 2020-21 (FAI, 2021). During 2020-21, out of the total

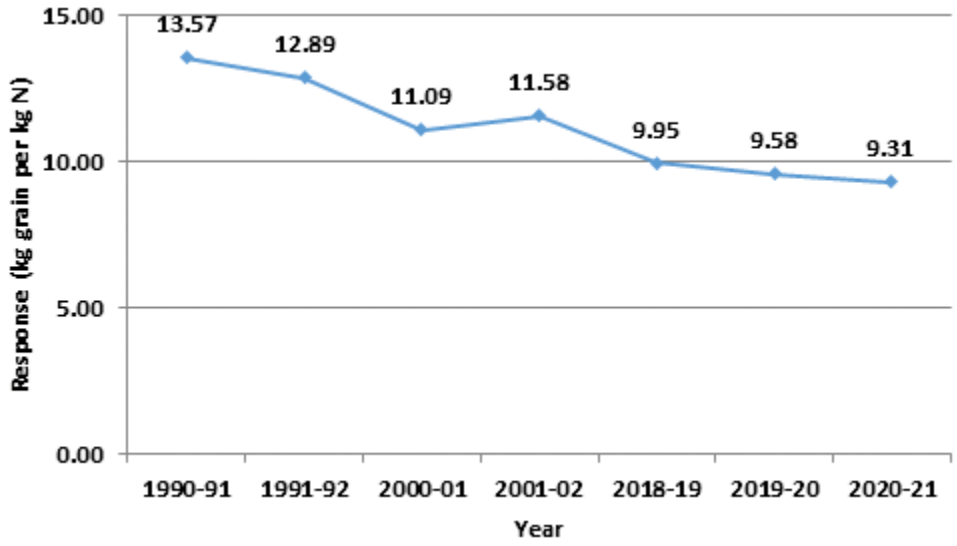

Figure 1. Response of food grains to applied N over the years

urea consumption of 35.04 million MT, production was 24.6 million MT while import was 9.83 million MT. Imported quantity of urea during 2020-21 was almost four times than the quantity imported during 2005-06. This shows increasing import dependency to meet the higher urea demand of farmers at higher economic cost for the country.

There has been inter- state, -district, -crop -area and –village variation in fertilizer consumption inclusive of urea consumption. The same should be properly addressed by all concerned. Balanced use of fertilizers is key to enhance farm productivity and for sustainable soil health. Fertilizer consumption in India is imbalanced and skewed in favour of urea-N. All India NPK consumption ratio has widened from 4:3.2:1 in 2009-10 to 6.5:2.8:1in 2020-21(FAI, 2020, 2021). The farmers are using more urea at the cost of P&K fertilizers. Nitrogen application has to be balanced in higher application states and to be increased in the lower application states. Urea consumption scenario, its dynamics across the country have to be understood for bringing effective corrective solutions. Incidentally, green revolution states having predominant rice–wheat cropping system have more consumption of urea.

Out of 35.0 million MT of urea consumed across India during 2020-21, Uttar Pradesh, Madhya Pradesh, Punjab, Gujarat, Maharashtra, Telangana, Andhra Pradesh, Rajasthan, Haryana, Karnataka, Bihar and West Bengal are the leading states while north east and hill states were lowest in consumption. If we analyse the urea consumption in terms of per unit gross cropped area; it is evident that states like Punjab, Haryana, Bihar, Telangana, Uttar Pradesh and Uttarakhand use urea more than 230 kg ha^{-1} (**Table 1**). First four states have consumptions more than 300 kg ha^{-1}. NPK ratio is highly skewed in states like Punjab, Haryana, Uttar Pradesh and Uttarakhand. Further, it is also distorted in Rajasthan (50.4:20.7:1), Jharkhand (25.2:10.2:1), Madhya Pradesh (12.4:7.3:1) and Gujarat (9.9:3.4:1). This disparity is more evident if district-wise and crop-wise scenario is analysed. It has wide implication in terms of soil health and environment pollution; gap in crop productivity and declining factor productivity in agriculture.

Ensuring healthy environment and soil-crop-atmospheric biodiversity in perpetuity is a common agenda for most of the nations. India too as a responsible nation is concerned about soil health, climate change and global warming issues. Urea is a major source of nitrogen pollution (NO_3^-, NH_3,

Table 1. State-wise scenario of urea consumption in India in 2020-21 (Source: FAI, 2021)

Urea consumption	Punjab	Haryana	Bihar	Telangana	Uttar Pradesh	Uttarakhand	All India
Million MT	2.94	2. 15	2.33	1.75	7.41	0.24	35.0
Per unit of gross cropped area (kg ha^{-1})	377.5	325.9	314.6	303.7	275.9	232.9	173.8
NPK use ratio	27.0 : 6.9: 1	28.2:8.1:1	7.7: 2.7 : 1	6.8 :2.7 : 1	16.6 : 6.0 : 1	14.4 : 3.5 : 1	6.5: 2.8 : 1

N_2O) and its application has to be rationalized. To address these concerns, Indian Council of Agricultural Research and fertilizer industry have also researched and introduced slow and controlled release fertilizers namely, *neem* coated urea, sulphur coated urea, granular urea, urea super granule. Various nitrification and urease inhibitors have also been experimented with but were not accepted because of price affordability or unease in application. Further, decision support systems based on soil test based fertilizer management, site specific nutrient management, integrated nutrient management, leaf colour chart, green seeker, etc. are also in operation for better nitrogen management. Nutrient efficient products and technology requires acceptability at farmer's level and demonstrated benefits to sustain their interest. Many European and Asian countries like China and Sri Lanka are also moving towards reduction in chemical fertilizer usage. Consumers are preferring organic or residue free agriculture with minimal environment footprints. This calls for continuous innovation in agriculture and novel measures on the ground that can lead to reduction in chemical fertilizer application.

Nanotechnology-based Nano Fertilizers for Agriculture

Nanotechnology is a promising field of research widely adopted by developed countries and resource poor countries for providing 'Out of Box' solutions to problems faced by humanity. Nano nutrients have small size (1–100 nm) which imparts unique characteristics and benefits. Their large surface area to volume ratio offers opportunity for better and effective interaction at target sites. Once inside the plant system, these trigger or signal nutrient pathways resulting into higher crop productivity even at reduced nutrient doses. Introduction of advance fertilizers like Nano Urea (liquid) and its sale through farmer's cooperative societies and retailers weans farmers away from conventional urea.

Nano Urea (liquid) - Worlds 1st Approved Nitrogenous Nano-fertilizer

Advent of smart fertilizers like nano-fertilizers has made 'Ever Green' revolution in agriculture a distinct possibility. Enhancing nutrient use efficiency has become critical for our food production systems. With the introduction of Worlds 1st nano-fertilizer as IFFCO Nano Urea (liquid) an era of high impact, low environment footprint fertilizers has dawned. It opens a new chapter in plant nutrition, crop management and farmers' awareness all over the world. Nano Urea (liquid) has benefit of precision and targeted application with an efficiency of more than 80% and promises to be a potential source of nitrogen nutrition to crops. Its production process is also environment friendly and has advantage in terms of logistics and warehousing too. Manufacturing plant of Nano Urea (liquid) can even be initiated in areas where earlier urea production was not possible because of energy or natural gas limitation.

A lot of work has been done globally, including India, on development of nano-products. However, safety issue remains the main bottleneck in their commercialization. In year 2020, IFFCO submitted a proposal for inclusion of its three products (Nano nitrogen, nano zinc, nano copper) in FCO. IFFCO nano nitrogen, nano zinc and nano copper have been evaluated and validated according to 'Guidelines for Evaluation of Nano-based agri-input and food products in India" released by the Department of Biotechnology, Government of India. Department of Biotechnology guidelines are harmonised in tune with international/OECD protocols. On-station and on-farm trials of Nano Urea (liquid) had demonstrated its field efficacy across 11,000 locations and 94 crops. Quality of harvested food produce had also been found to be better due to application of Nano Urea (liquid). Subsequently, Nano Nitrogen had been brought under Fertiliser (Inorganic, Organic, or Mixed) (Control) Order, 1985, in Schedule VII. General specifications of Nano Nitrogen under head Nano Fertilizer both in liquid and solid were notified vide S.O. 884 (E) dated 24th February, 2021. Further on the same date in pursuance of clause 20D of the Order, vide S.O. 885 (E), Department of Agriculture, Cooperation and Farmers Welfare notified the specifications of Nano Urea (liquid) to be manufactured by IFFCO for a period of 3 years.

With the introduction of nano-fertilizers like Nano Urea (liquid), effective nitrogen (N) management is possible in the crops. One 500 ml bottle of Nano Urea (liquid) can replace at least one bag of top dressed nitrogenous fertilizers like urea based on its performance and efficiency. It has been priced 10 % lower than the cost of one bag of urea. It can provide a viable and informed alternative for foliar application of N to crops rather than the soil without compromising on the yield.

With the introduction of digital technologies in agriculture and technology package in terms of spraying solutions through drones/UAVs/precision sprayers; liquid fertilizer like Nano Urea (liquid) will soon become integral part and parcel of our diverse crop production systems. It can replace a portion of excess urea applied in our crop fields and also where availability of conventional urea has been a limiting factor. Environment friendly Nano

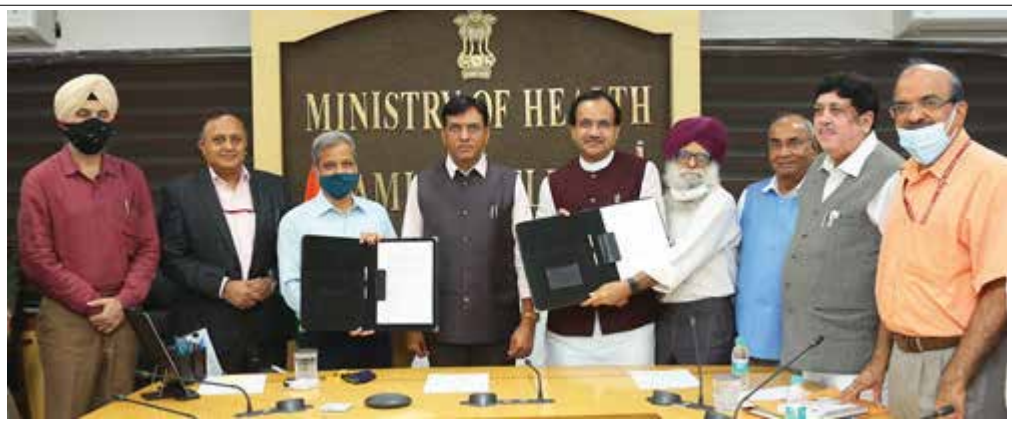

Photo 1. MoUs between IFFCO-NFL and IFFCO-RCFL for technology transfer of Nano Urea (liquid) production

Urea (liquid) can play an important role in ensuring food and nutritional security of the nation.

Sales Promotion and Marketing

Nano Urea (liquid) is a nano-fertilizer and a new product genre. It is for the first time in the world that commercial production of this fertilizer has started by effectively scaling the production process from lab to the plant stage.

IFFCO Nano Urea (liquid) Plant: IFFCO Nano Urea (liquid) plant at Kalol became operational on 1st June, 2021. Production capacity of the plant is 1.5 lakh bottles per day. In due course of time, 4 more plants would be constructed. For scaling up the production of Nano Urea (liquid), Ministry of Chemicals and Fertilizers had signed two MoUs for technology transfer of this product *i.e.* MoUs between IFFCO and National Fertilizers Limited (NFL), and between IFFCO and Rashtriya Chemicals and Fertilizers Limited (RCFL). A snapshot of the MoUs is shown in **Photo 1**. These MoUs will further scale up the production of Nano Urea (liquid) in the country. Besides, states of Assam, Telangana and Karnataka have also expressed willingness to set up plants of this new genre product.

MoU & JVs with Foreign countries: Nano Urea (liquid) is reaching out to other countries. MoUs had been signed between IFFCO and two cooperatives - INAES and Cooper of Argentina Organization and also between IFFCO and Brazilian Cooperatives, OCB (**Photo 2**). They will also be working together for setting up this fertilizer manufacturing plant in their countries *i.e.* Argentina and Brazil.

Reaching Newer Markets – Export of Nano Urea (liquid)

Nano Urea (liquid) is in demand by many countries. The Department of Fertilizers (DOF), Ministry of Chemicals and Fertilizers has accorded permission to IFFCO to export Nano Urea (liquid) fertilizer with conditions: (i) Total export will not exceed 20 per cent of the total production of Nano Urea (liquid) fertilizer in a year; (ii) No subsidized raw material (fertilizer/ urea) will be used for the production of Nano Urea

2a **2b**

Photo 2. Snapshots of MoUs beween IFFCO and two cooperatives - INAES and Cooper of Argentina Organization (2a) and IFFCO and OCB, Brazil (2b)

(liquid) fertilizer; and (iii) IFFCO may approach the DOF for grant of NOC on case to case basis in prescribed proforma as per DGFT Notification dated 7th January, 2019. Nano Urea (liquid) can now be exported to other European countries, America, Sri Lanka, Nepal, Thailand, Kenya, Tanzania and Canada as requested by IFFCO.

Expanding the Indigenous Marketing Reach

IFFCO, through its robust network of 36,000 primary agriculture cooperative societies (PACS) and 103 farmer service centre (FSC), is marketing Nano Urea (liquid) to the farmers. Apart from this, IFFCO's JVs/ subsidiaries sale points such as 2,050 IFFCO bazar centres, 8369 IFFDC societies; and CSC kisan points are also providing valuable services to farmers besides, selling nano urea (liquid). There are more than 3 lakh CSC – VLEs in operation across the country. Current marketing efforts have helped Nano Urea (liquid) reach out to 250 districts and 4,326 sale points (**Table 2)** and to more than 15 lakh farmers of the country.

Digital marketing initiative of IFFCO through www.iffcobazar.in has also made available Nano Urea (liquid) across 26,000 pin codes of the country. Within two weeks of launch on 8th July 2021; Nano Urea (liquid) became the highest sold item on iffcobazar.in. Currently, through this online platform 1,925 districts of 34 states & UTs have been covered.

Nano Urea (liquid) is strategically priced @ Rs 240 (10 % lower than one bag (45 kg) of urea @ Rs 266.50/-). Incentives are provided to channel partners for facilitating farmers in spraying operations at nominal cost. They are also educated regarding salient features of Nano Urea (liquid) and its application in agriculture for getting better net returns. Support has been provided to the channel partners by supplying about 1 lakh battery operated sprayer pumps with spare batteries, mask and other accessories. Other spraying options and models for promoting spraying are being explored to help the channel partners and sellers to enhance reach of Nano Urea (liquid). This will incentivize farmers to use this product and also provide them with much needed support in terms of better service on hired basis.

Table 2. Coverage of districts and societies/sale points for sale of IFFCO Nano Urea (liquid) as on 15th August, 2021

S.No.	States/UTs	Districts covered	Societies/sale points
1	Andhra Pradesh	6	57
2	Bihar	17	190
3	Chhattisgarh	7	147
4	Gujarat	36	221
5	Haryana	22	528
6	Himachal Pradesh	5	183
7	Jammu & Kashmir	2	61
8	Jharkhand	3	101
9	Karnataka	17	608
10	Kerala	3	23
11	Madhya Pradesh	30	490
12	Maharashtra	29	359
13	Odisha	14	78
14	Rajasthan	15	273
15	Tamil Nadu	16	206
16	Telangana	8	47
17	Uttar Pradesh	13	624
18	Uttarakhand	4	82
19	West Bengal	3	48
	Total	**250**	**4326**

Farmers can easily carry or stock Nano Urea (liquid) bottles. Packing size has been determined as per the farmer's demand *i.e.* 24 bottles/carton or 12 bottles/ carton. Packaging is also made attractive to catch attention of the farmers. Promotional campaigns are being organized with the channel partners to persuade farmers by demonstrating them the benefits of this new product. Timely demand and supply is ensured through online indenting and by adopting effective movement strategy as it is not a bulk commodity. IFFCO is ensuring the supplies to the sale points/ demand place in the earliest possible time. Handling & Transportation and C&F agents are also playing vital role in effective delivery system.

Effective Sale, Publicity and Promotional Programmes

For successful introduction of any new product, awareness among the farmers has to be created by various programmes. Any new product or technology inadvertently follows the path of adoption in step by step process *i.e.* Awareness - Interest – Evaluation – Learning - Trial – Adoption (AIELTA) cycle. At each of these conjectures, respective promotional and extension programmes and sale promotional and marketing strategy is employed for deriving maximum adoption. Thus, a holistic strategic plan was chalked out by IFFCO by using different scientific and marketing principles to take the product benefits to the channel partners, sale point personnel/dealers, policy makers, researchers and farmers in a systematic manner.

IFFCO has popularized the Nano Urea (liquid) and is selling it through its market channel and selling out of its marketing channel for realizing immediate sales and feedback. Farmers are encouraged to purchase it by undertaking sales campaigns and providing incentives to 'Buy now'. Sales promotion complements advertising which is being taken up at local, national and international levels. IFFCO has deployed effective sales, publicity and promotional efforts for popularizing Nano Urea (liquid) through a series of

programmes (**Figure 2**). Simultaneously, promotion and market development programmes are also being undertaken.

Crop Demonstrations: India is bestowed with more than 200 crops which have distinct agronomies. In tune with the concept of 'Seeing is Believing' IFFCO had conducted on-farm and on-station trials in major agro-climatic regions and on major crops of the country. Research trials at farmers' fields have been conducted in more than 94 crops in 15 agro-climatic regions of the country. Progressive and nearby farmers have also visited these trials which helped in generating interest and awareness about the product.

Short video films of Nano Urea (liquid: Technical and educational videos of short duration (4-6 minutes) displaying the unique benefits and complete package of application of IFFCO Nano Urea (liquid) have been made available through online platforms. These videos are being screened to farmers after keeping in view the existing COVID protocols either in physical form or are shared in farmer's friend Whats App groups. Farmers testimonial videos (120 seconds; 60 seconds)) showcasing their experience and the benefits of this new fertilizer is also circulated to channel partners, cooperative officials and policy makers. To take advantage of the limited attention span of viewers, short clips or 'Feeler' Videos of Nano Urea (liquid) (20-30 seconds) have been created. These videos are being screened or showcased at social, mass media and digital platforms at national and international cooperative platforms at seminars, symposiums and workshops. Product details are communicated to the farmers visiting farmers' haat, agriculture fairs and village community centres. IFFCO journey of R& D, production and marketing has been shot by DD Kisan for the benefit of farmers and other stakeholders. This film will be showcased to viewers as an innovation of 'New Bharat' for the

Figure 2. Promotion, publicity and marketing efforts for nano urea (liquid)

benefit of farmers of the nation.

Print & Electronic Media: The product promotion through print and electronic media has been extensively undertaken. Press releases in the print and digital media have been a regular occurrence. Advertisements have been printed in leading newspaper and also displayed on social media and digital network. Farmer's success stories about use of Nano Urea (liquid) have found mention in leading newspapers as well as in agriculture centric regional and local newspapers. Webinar on Nano Urea (liquid) have been conducted in collaboration with State Agricultural Universities in presence of Vice Chancellor and leading agricultural scientists and cooperators. Benefits, application methodology and other details of the fertilizer are discussed and viewer's queries are suitably answered during the webinars. Research work done by the scientists is documented in form of research as well as popular articles in local/regional magazines, newspapers, periodicals, etc. They act as a reference point for gaining knowledge and understanding about Nano Urea (liquid). Special dedicated issues of popular magazine/periodicals on nano-fertilizers are being brought out highlighting case studies/success stories of Nano Urea (liquid).

To catch the imagination of young and impressionable minds, Nano Urea (liquid) awareness programmes/ quizzes are being conducted in village schools. Advertisements on All India Radio/Community Radio/Regional Channels are integral part of sales promotion and marketing efforts of Nano Urea (liquid). Information about Nano Urea (liquid) has been covered by international media also.

Mass Media Campaigns: Mass media campaigns are integral part of publicity and promotional efforts for Nano Urea (liquid). Audio visual and publicity vans are in operation for promotion and last mile delivery of product and services. Progressive and entrepreneur farmers work as brand ambassador. Different aspects of application of Nano Urea (liquid), its content and benefits for the farmers and the environment are emphasized. Nano Urea (liquid) news is also played as breaking/ troll news at the bottom of national/ regional news. Selective SMS messages are being sent to IFFCO progressive farmers informing them about availability of this product. Radio Jingles /Audio Clips / Songs in local language are played at premium time at regional / All India Radio while audio messages are also circulated in various farmers Whats App groups.

Nano Urea (liquid) is displayed as profile display picture and as cover page of social media sites (such as Facebook, Twitter, Instagram, Whats App of employees of IFFCO and its subsidiaries/JVs as well other stakeholders. These cover pictures also have relevant content messages showing the benefits of nano fertilizer.

Publicity matter for creating awareness campaigns in form of catchy poems, couplets and slogans are being circulated or displayed at appropriate platforms related to salient features of the product associated with farmers. Banners (**Photo 3)** and posters are displayed at prominent places in addition to wall/ tractor trolley/bus panel/ rickshaw/three-wheeler paintings, hoardings, etc. Digital displays are placed at vantage and strategic points and also at places registering maximum farmers footfalls viz. at all sale points as shown in, farmer friend clubs; krishi vigyan kendras; farmers stores; Common Service Centres; farmer producer organizations, kisan mandis and haats, etc.

IFFCO is also sponsoring Nano Urea (liquid) specific shows, skit, street plays and local vocal groups. Spray campaigns are being carried out where spraying cost is subsidized in line with size of landholding and group spraying or mass crop spraying operations are undertaken at farmer's plots. The awareness programmes are being conducted in the sidelines of important national / international programmes such as Amrut Mahotsav; Earth Day; World Environment Day, World Food Day, etc. Dispatches of Nano Urea (liquid) from Kalol plant were started on 5th June 2021 (World Environment Day).

Photo 3. Display of banners at sale points

Publicity Material, Gifts & Awards: Cooperatives and other sale points have been provided with publicity material such as stickers, display charts, brochure, pamphlets, literature of Nano Urea (liquid) ; replica and souvenir of Nano bottles; T-shirts, Caps, key chains, umbrella, toran, etc. Samples of Nano Urea (liquid) and brochures / folders are provided to dignitaries and scientists. Progressive farmers

engaged in its promotion are honored at various forums.

Dedicated Internet Site: Dedicated internet site have been created for Nano Urea (liquid). This is the 1st product based platform created by IFFCO. Site is operable on all kind of internet platforms and is android / iOS-based. It works as a knowledge resource and repository on Nano Urea (liquid), its benefits, journey of IFFCO in nanotech space, nano-fertilizers, farmers' testimonials, endorsements by public figures and opinion leaders. Apart from resources and documents specific to the product which are required by a user and buyer; a photo gallery depicts programmes being organized for Nano Urea (liquid). Queries of the visitors are also addressed. Videos of Nano Urea (liquid) usage and benefits are also available at the site.

Training & Awareness programmes: Nano Urea (liquid) is an innovative and novel product. Therefore, for its proper knowledge and awareness, training programmes are regularly being organised at district/ block / village level / cooperative / retailer level exercising COVID protocol. The trainings and workshops, symposium, webinar, panel discussion, 'Live in' and 'Stream in' programmes are being organised. These training programmes address the problems faced by agriculture in general and environment in particular and how Nano Urea (liquid) can help mitigate some of the ill effect of intensive agriculture practices. Participants are also made aware of the safety aspects and precautions which need to be exercised. Feedback of the training is collected from trainees for possible corrections and advancement. Trainers of these training programmes are IFFCO officials and technical and extension experts from research institutes, state agriculture universities and ICAR-Krishi Vigyan Kendras. Emphasis is also being given on training of the trainers. Participants of these programmes besides farmers are technical & extension experts; nanotechnologist; public figures; opinion leaders & influencers; celebrities; entrepreneurs; government officials; environment experts; vice-chancellors; directors of SAUs / Research Institutes etc. Nano Urea (liquid) is also being noticed and mentioned by premium research institutes engaged in nanotechnology such as Indian Institute of Technology, New Delhi.

State-wise Flag off Programmes & Endorsement by Opinion Leaders, Government Officials and Scientists: Unique state-wise flag off programmes involving Chief Minister, Agriculture Minister, Agriculture Commissioner, Director, Agriculture, cooperative leaders, important dignitaries of concerned states have been undertaken for 17 states/UTs (**Photo 4**). This has resulted into sensitisation of the state machinery, agricultural department, channel partners, production and distribution network in regard to Nano Urea (liquid) supply and availability as well as its promotion amongst farmers and channel partners. Agriculture department of the states are also conducting trials at state farms and at farmers' fields. Some states are also helping increase the acceptability of Nano Urea (liquid) by

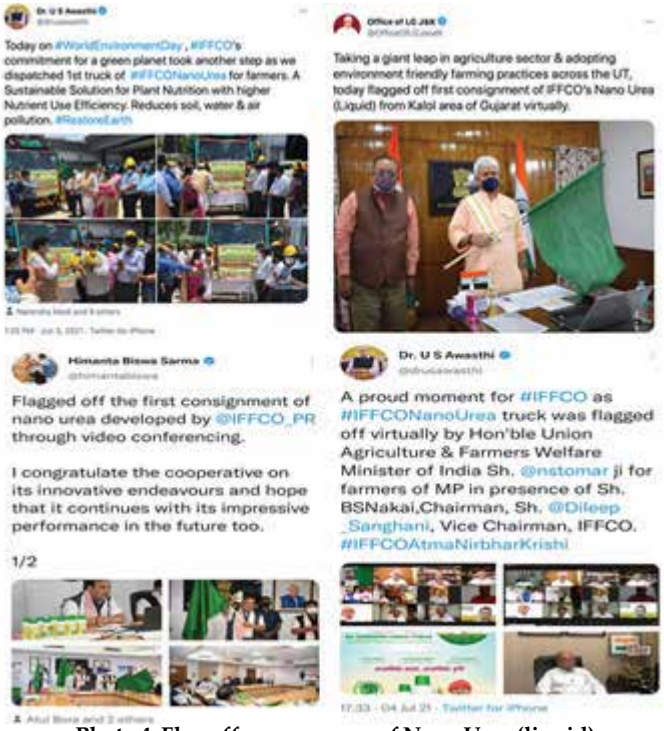

Photo 4. Flag off programmes of Nano Urea (liquid)

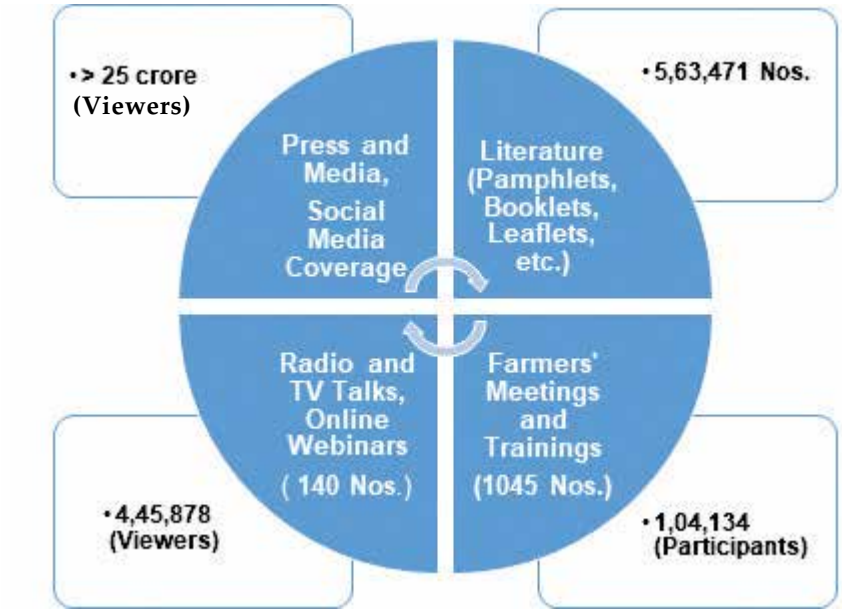

Figure 4. Sales promotion & Marketing efforts for Nano Urea (liquid) (as on 31st July, 2021)

sharing information about the product, conducting demonstrations and by promoting it amongst the farmers.

Achievements of the Efforts and MoUs for Futuristic Research

Sales promotion and marketing efforts of IFFCO have resulted into enhanced awareness about Nano Urea (liquid). As on 31st July 2021, IFFCO efforts in pitching the product campaign vide coverage through press, media and social media have helped to reach out to 25 crore viewers **(Figure 4).** 5.63 lakh copies of literatures on Nano Urea (liquid) has been printed and distributed in different local languages. Webinars / radio & TV talks have benefited more than 4.45 lakh viewers. Farmers meetings, trainings have directly helped to reach out to 1.4 lakh farmers. For providing impetus to research efforts, IFFCO MoU with Indian Institute of Technology, Delhi for research consultancy, knowledge transfer and collaborative projects was formalised on 20th July 2021. This will facilitate advanced research in the area of nanotechnology for futuristic applications.

Way Forward

India is an agrarian country and agriculture provides food and livelihood security to majority of the population. With the intensification of agriculture and limited land and other resources, economy in use of inputs is of vital importance. Environment cost of imbalanced application of agri-inputs like chemical fertilizers has compounding effect. Recent report by Intergovernmental Panel on Climate Change (IPCC) has been rightly said as "a code red for humanity". Global temperatures have already risen by 1.1^0 Celsius since the 19th century. Thus, environment is becoming first priority and every citizen and industry in the country have to play their own part.

Indiscriminate and excessive application of fertilizers such as urea needs to be balanced for ensuring agriculture sustainability. Scientists have evolved slow and controlled release and enhanced efficiency of fertilizers for addressing low and declining use efficiency of nutrients. Though the technology has its benefits but high cost and acceptability at farmers level is a key deterrent. This certainly shifts focus towards other high tech but affordable agri-inputs which can lead to rationalisation in application of chemical fertilizers. Here, nanotechnology has come as a saviour as it can play unique role due to their size, shape and effect. This has motivated innovators to utilise nanomaterial to solve the problems faced by mankind. Smart and intelligent nutrient management with the use of nano-fertilizers has the potential to re modulate the concept of integrated nutrient management. It fulfils its utility as a part of 4 R nutrient stewardship by promoting precision and targeted application of nutrients.

Nano Urea (liquid), recently notified in FCO, is a step in this direction. Novel methods to enhance nutrient use efficiency have to be brought in for bringing the desired outcome. Nano Urea (liquid) is in sync with the vision to improve our soil health, reduce soil, air and water pollution and enhance farmer's profitability. This fertilizer has to be synchronised with the package of practices of different crops for its

wider applicability. To enhance confidence in nanotechnology and its widespread adoption, continuous studies on nanomaterial's residual effect, impact on soil fertility and productivity in long-run is equally important.

Sales promotion and marketing of Nano Urea (liquid) require same nationalistic fervour and cooperation as was evident at the time of Green Revolution to address challenges being faced as a result of modern day agriculture. Robust promotional and extension programmes can create awareness amongst the farmers and the channel partners, state agriculture department and ICAR institutes become relevant for the successful outcome in introduction of nano-fertilizers. ICAR research institutes and state agriculture universities can guide in bringing out a detailed application programmes for nano-fertilizers for the whole country. Department of farm mechanisation can help in designing better spraying solutions as per crop and geography. Spraying options such as boom sprayers, electrostatic sprayers, drone and battery operated sprayers in custom hiring mode can also promote nano-fertilizers. A community based model for economising cost of spraying by utilising various modes and modules of spraying would be a best fit.

IFFCO has done all-round efforts to provide innovative solution to challenges being faced by modern day agriculture and for sustainability. It is high time that the like-minded institutions come together and usher an evergreen revolution based on nanotech based solutions. This will certainly lead to boom in agriculture productivity with no concomitant reduction in soil fertility and productivity. These conjoint efforts will certainly pave the way for 'Evergreen Sustainable Agriculture Revolution' that will lead to farmers' prosperity and environment safety.

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Promotion of Organic Fertilizers/Sources
Challenges and Strategies

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Abstract

Use of organic manures/fertilizers is as old as agriculture itself. Organic sources help in improving physical, chemical and biological properties of soil. However, these sources/fertilizers contain low amount of essential nutrients required for normal growth of the plants. Due to intensification of agriculture, use of high yielding varieties, imbalanced use of fertilizers, adoption of same cropping system over the years, shrinking use of organic fertilizers, etc., there has been constant decline in crop response to per unit of fertilizer application. Ways and means need to be put in place to improve crop response to fertilizer application and fertilizer use efficiency. The organic carbon content has to be improved for sustainable agriculture. To achieve this, organic sources/fertilizers need to be given more emphasis by all concerned. In this paper, an attempt has been made to discuss the organic sources/fertilizers and their marketing strategies and challenges encountered in their promotion.

Key words: Organic fertilizers, microorganism, soil health, fertiliser control order, marketing strategies, challenges, Government efforts

Introduction

Use of organic manures is as old as agriculture itself. Soil organic matter (SOM) is any material produced originally by living organisms (plant or animal) that is returned to the soil or goes through the decomposition process (www.fao.org /docrep/009/a0100e/a0100e02.htm). In addition to supplementing nutrient requirement of crops and habitat to organisms living in the soil, organic matter also binds soil particles into aggregates and improves the water holding capacity of soil. It is now established that plants recognize specific ionic forms rather than a source (whether organic or inorganic) for absorption by the roots. Nutrients applied through organic sources have to undergo through the decomposition process by micro-organisms present in the soil termed as mineralization. This process releases organically locked nutrients into soil solution, ready for absorption by plant roots. Organic sources are characterized by low nutrient contents. Therefore, these sources need application of large quantities to meet the demand of the crops on per hectare basis. Nutrient contents of organic sources are given **Table 1**.

Organic Fertilizers

In the Indian context, organic fertilizer means substances made up of one or more unprocessed material(s) of a biological nature (plant/animal) and may include unprocessed mineral materials that have been altered through microbiological decomposition process. Organic fertilizers were included under Schedule IV of FCO as on 24th March, 2006 (FCO, 2006). Only three organic fertilizers namely city compost, vermi-compost and press mud were incorporated. Later on, press mud was taken out of the FCO as sugar mills were unable to adhere to the specifications. Now there are 10 organic fertilizers in the order (FCO, 2021). FCO includes two animal-origin products namely raw and steamed bone meal as P-containing fertilizers having total and 2% citric acid soluble P_2O_5 content (minimum) of 20 and 8, and 22 and 16%, respectively. Further it also includes phosphate rich organic manure having total P_2O_5 content of 8%. List of organic fertilizers included in the FCO along with the specifications is presented in **Tables 2** and **3**. Different organic sources which find potential use in Indian agriculture (Yadav et al., 2016) are discussed here.

Crop Residues

As per a study sponsored by Ministry of New and Renewable Energy Resources (MNRE), Government of India (www.mnre.gov.in/biomassresources), the current availability of biomass is estimated at about 750 million tonnes (Mt) yr^{-1}. The study indicated biomass availability of about 230 Mt yr^{-1} covering agricultural residues. Farmers have the tendency to burn those crop residues which are not being used by them for other uses, such as grazing of animals particularly of wheat straw and stover/straw of maize and coarse millets, in the field itself creating lot of environmental problems. Pathak et al. (2012) reported that 92 Mt yr^{-1} of crop residues are burnt; principal among these are the residues of rice (44.0 Mt), wheat (25.4 Mt) and cotton (25.0 Mt). The burning of crop residues results in loss of nutrients, particularly N and P_2O_5 due to the high content of these nutrients in the residues. Potash remains at the site. Stalks and

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Table 1. Average chemical composition of some organic manures (Source : FAI, 2020)

Material		Nitrogen (as N)	Phosphate (as P_2O_5)	Potash (as K_2O)
I.	**Bulky organic manures**			
	Farmyard manure	0.5—1.5	0.4—0.8	0.5—1.9
	Compost (Urban)	1.0—2.0	1.0	1.5
	Compost (Rural)	0.4—0.8	0.3—0.6	0.7—1.0
	Green manures (various averages)	0.5—0.7	0.1—0.2	0.6—0.8
II.	**Oil cake**			
(a)	Non-edible cake			
	Castor cake	5.5—5.8	1.8—1.9	1.0—1.1
	Mahua cake	2.5—2.6	1.8—1.9	1.8—1.9
	Karanj cake	3.9—4.0	0.9—1.0	1.3—1.4
	Neem cake	5.2—5.3	1.0—1.1	1.4—1.5
	Safflower cake (undecorticated)	4.8—4.9	1.4—1.5	1.2—1.3
(b)	Edible cake			
	Coconut	3.0—3.2	1.8—1.9	1.7—1.8
	Cotton seed (Decorticated) cake	6.4—6.5	2.8—2.9	2.1—2.2
	Cotton seed (Undecorticated) cake	3.9—4.0	1.8—1.9	1.6—1.7
	Groundnut cake	7.0—7.2	1.5—1.6	1.3—1.4
	Linseed cake	5.5—5.6	1.1—1.5	1.2—1.3
	Niger cake	4.7—4.8	1.8—1.9	1.3—1.4
	Rapeseed cake	5.1—5.2	1.8—1.9	1.1—1.3
	Sesamum or til cake	6.2—6.3	2.0—2.1	1.2—1.3
III.	**Manure of animal origin**			
	Fish manure	4.0—10.0	3.0—9.0	0.3—1.5
	Bird guano	7.0—8.0	11.0—14.0	2.0—3.0
	Bonemeal (Raw)	3.0—4.0	20.0—25.0	—
	Bonemeal (Steamed)	1.0—2.0	25.0—30.0	—
	Activated sludge (Dry)	5.0—6.5	3.0—3.5	0.5—0.7
	Settled sludge (Dry)	2.0—2.5	1.0—1.2	0.4—0.5
	Night soil	1.2—1.3	0.8—1.0	0.4—0.5
	Human urine	1.1—1.2	0.1—0.2	0.2—0.3
	Cattle dung and urine mixed	0.6	0.15	0.45
	Horse dung and urine mixed	0.7	0.25	0.55
	Sheep dung and urine mixed	0.95	0.35	1

woody stems of pigeon pea, cotton and mustard are used as fuels in the rural areas. The important point is whatever the residue which is surplus and is available should be ploughed back in to the soil. Ways and means need to be developed in this direction. Further, technology is available for generation of power from bio-mass such as bagasse, rice husk, straw, cotton stalk, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, ground shells, saw dust, etc. (www.mnre.gov.in/biomassresources). Central financial assistance and fiscal incentives are also available for undertaking such projects. Some states have already taken a lead. The scheme needs to be gainfully utilized by the states.

Animal Dung

As per 20th Livestock Census released by Ministry of Animal Husbandry & Dairying in October 2019, total livestock population in 2019 was 535.78 million comprising of 192.49 million cattle, 109.85 million buffalos, 74.26 million sheep, 148.88 million goats, 9.06 million pigs and 1.23 million others (dahd.nic.in). Poultry constituted 815.81 million. Considerable quantity of dung in form of dung cakes is still used in the country for biofuel purpose. On a very conservative estimate, contribution of dung in the form of nutrients may be around 3.5 Mt. Biogas technology making use of the animal dung and other biodegradable wastes provides the clean biofuel. Slurry emanating from the biogas plants is a rich source of nutrients.

Municipal Solid Wastes

Rapid urbanization is generating ever increasing wastes. Realizing the need, processing of this waste was started at the state levels in different cities under

Table 2. Specifications of seven organic fertilizers as per Fertiliser (Inorganic, Organic or Mixed) (Control) Order 1985

S.No.	Specifications	City compost	Vermicompost	PROM	Organic manure	Bio-enriched organic manure	Fermented organic manure
1	Moisture, per cent by weight	25 (maximum)	15-25	25 (maximum)	25 (maximum)	30-40 (maximum)	30-40 (maximum)
2	Colour	-	Dark brown to black	-	-	-	-
3	Odour	-	Absence of foul odour	-	-	-	-
4	Bulk density(g cm^{-3})	<1.20	0.7-0.9	<1.6	<1.0	<1.0	-
5	Total organic carbon per cent by weight, minimum	12	18	10	14	14	14
6	Total nitrogen per cent by weight, minimum	1.2 for total N, P and K minimum	1.0	0.4	0.5 all nutrients should not be less than 3.0 %	0.8 all nutrients should not be less than 3.0 %	1.2 for total N, P and K minimum
7	Total P_2O_5 per cent by weight, minimum		0.8	8.0	0.5	0.5	-
8	Total K_2O per cent by weight,minimum		0.8	-	0.5	0.8	-
9	C:N ratio	<20	-	<20	<20	<18	<20
10	pH	6.0-8.0	-	6.7 maximum	6.5-7.5	6.5-8.0	6.5-8.0
11	Heavy metal content (mg kg^{-1}), maximum						
	Arsenic as (AS_2O_3)	10	-	10	10	10	10
	Cadmium (as Cd)	5	5	5	5	5	5
	Chromium (as Cr)	50	50	50	50	50	50
	Copper (as Cu)	300	-	300	300	300	300
	Mercury (as Hg)	0.15	-	0.15	0.15	0.15	0.15
	Nickel (as Ni)	50	50	50	50	50	50
	Lead (as Pb)	100	100	100	-	100	100
	Zinc (as Zn)	1000	-	1000	1000	1000	1000
12	Conductivity (as dSm^{-1}) not more than	6	-	10	5	4	-

(Source: FCO, 2021)

the State Urban Local Bodies (Municipalities) schemes for production of city compost. Promotion and use of city compost address the issue of disposal of waste from cities for more productive uses in agriculture and other problems related to health and environment.

In response to a Public Interest Writ Petition in Hon'ble Supreme Court of India, Government of India constituted on 26th March 2003 an Inter-Ministerial Task Force on Integrated Plant Nutrient Management using City Compost. The Task Force submitted its report to the Hon'ble Supreme Court of India in May 2005. The report dealt with the issues related to importance of city compost in agriculture, marketing, and promotion in agriculture and recommended co-marketing of compost with chemical fertilizers as a "basket approach" in a ratio of 4-3 bags of compost with every 6-7 bags of chemical fertilizers in addition to other recommendations. Hon'ble Court, vide its order dated 1st September, 2006, directed the Government to implement the recommendations of the report. Department of Fertilizers (DOF) vide its circular dated 2nd June, 2009 requested the fertilizer companies for compliance of the directions of the Supreme Court (DOF, 2009). Fertilizer companies started marketing city compost in 2009-10. The sale of city compost reached a level of 187,000 MT in 2011-12.

Further, policy for promotion of city compost was

Table 3. Specifications of three organic fertilizers as per Fertiliser (Inorganic, Organic or Mixed) (Control) Order 1985 (Source: FCO, 2021)

S. No.	Specifications	Raw bone	Steamed bone	Potash derived from Rhodophytes
1	Moisture, per cent by weight, maximum	8.0	7.0	5.0
2	Acid insoluble matter per cent by weight, maximum	12.0	-	-
3	Total P_2O_5 per cent by weight, minimum	20.0	22.0	-
4	2 per cent citric acid soluble P_2O_5 per cent by weight, minimum	8.0	16.0	-
5	Nitrogen content of water insoluble portion per cent by weight, minimum	3.0	-	-
6	Water soluble potash, per cent by weight, minimum	-	-	20.0
7	Total sulphur (as S), per cent by weight, minimum	-	-	1.5
8	Heavy metal (mg kg^{-1}), maximum	-	-	As in city compost

notified by the DOF on 10th February, 2016. As per the policy, market development assistance (MDA) in the form of fixed amount of Rs. 1500 t^{-1} of city compost is provided for enhancing production and consumption of the product. Before direct benefit transfer (DBT) policy, fertilizer marketing companies used to be eligible for 'on-account' payment of MDA up to 50% only on the basis of first point sale to the dealer/ retailer and balance on receipt of retailer's acknowledgement in Mobile Fertilizer Management System (mFMS) as well as required certificates relating to quantity and quality issued by the respective state governments in prescribed forms. However, balance payment of MDA has not been reimbursed to the companies for 2016-17 and 2017-18. The State Governments had certified the quantities and the retailers had also acknowledged the receipt in the mFMS. However, since the State Governments did not have the facilities for the analysis of city compost, they certified the quality as 'samples drawn-nil and quantity rejected nil'. Department of Fertilizers should reimburse the legitimate balance amount of MDA to the fertilizer companies. Sale of city compost by the fertilizer companies from 2016-17 to 2020-21 is given in **Table 4**. City compost needs to be monitored for the presence and content of heavy metals.

Press Mud

Press mud is also a good source of organic carbon.

Table 4. Sale of City Compost (Source : https://reports.dbtfert.nic.in/mfmsReports/compostSaleByMarketerFinYearWiseDtoData.action)

(000 MT)

S. No.	Name of the Company	2016-17	2017-18	2018-19	2019-20	2020-21
1	Coromandel International Ltd.	10.11	7.13	23.30	23.90	24.53
2	FACT	4.18	5.86	9.37	13.10	13.24
3	Greenstar Fertilizers Ltd.	3.92	5.64	5.53	3.77	4.86
4	GNFC	5.19	6.25	12.99	4.00	3.52
5	Grasim Industries Ltd.	1.33	4.58	4.32	2.83	4.85
6	GSFC	0.69	3.53	7.16	7.01	2.05
7	IPL	1.32	7.30	14.21	11.71	13.19
8	Indorama India Pvt. Ltd.	1.26	6.48	6.17	11.79	22.15
9	KRIBHCO	12.17	20.70	26.98	39.63	65.32
10	MCFL	3.74	5.29	5.60	5.65	9.19
11	MFL	1.71	8.61	8.09	12.04	6.40
12	NFL	2.66	11.69	21.31	25.05	21.77
13	PPL	0.02	1.48	2.68	5.93	7.74
14	RCF	1.51	12.34	35.62	40.33	50.93
15	Others	9.99	11.12	9.48	8.97	9.45
	Total	**59.81**	**118.00**	**192.82**	**215.73**	**259.20**

India is the largest producer of sugar in the world after Brazil. Therefore, large amounts of press mud are released by the sugar mills. Press mud contains more than 70% moisture. It needs further composting, treatment with microorganisms, and mixing with distillery effluents etc. for its possible use as a nutrient source. It should be made mandatory for the sugar mills to develop infrastructure like environmentally-benign sheds which will help in facilitating composting of press mud by way of maintaining desired temperatures and moistures for the bacteria to survive and function.

Vermi-compost

This is a simple process of composting in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end-product. Earthworms may also remain active up to 40 °C. Earthworms used for making vermi-compost are non-burrowing types *Eisenia fetida* and *Eudrilus eugenae* and these live/ act in the surface soil layers. These earthworms survive mainly on organic waste materials and convert the organic waste into vermi-compost. Quite large quantity of kitchen and other agricultural wastes are generated in the villages. Villagers need to be educated to use these wastes for more productive uses by converting them into vermi-compost. The vermi-compost is being produced and sold by good numbers of entrepreneurs but they are operating in an unorganized sector.

Green Manuring

Some of the green manuring legumes are *dhaincha,* sunhemp, cowpea, mung bean, *guar* and *berseem*, etc. Benefit of green manuring accrues from the fact that organic matter is incorporated into the soil. The practice of green manuring has been practiced by the farmers for decades. Green crops are ploughed back into the soil after 40-50 days of sowing and may supply up to as high as 50 kg N ha^{-1} in the well managed conditions. For raising green manure crops, a farmer should have irrigation facilities. It is mentioned that farmers lose one crop in the case of going in for raising green manure crop but then the benefits accruing from the practice like nutrient addition and amelioration of soil health more than compensate the losses incurred in sacrificing one crop. Mostly farmers grow sunhemp and *dhaincha* but arrangement of seeds continues to be a daunting task.

Government of India Initiatives in Promotion of Organic Fertilizers

Soil Health Management (SHM) of the Department of Agriculture, Cooperation and Famers Welfare (DAC&FW), Ministry of Agriculture and Farmers Welfare under National Mission of Sustainable Agriculture aims at promoting integrated nutrient management through judicious use of fertilizers inclusive of secondary-and micro-nutrients in conjunction with organic manures and bio-fertilizers for improving soil health and its productivity; strengthening soil and fertilizers testing facilities to provide soil test best recommendations to farmers for improving soil fertility, ensuring quality control requirement of fertilizers, bio-fertilizers and organic fertilizers under FCO, 1985; upgradation of skill and knowledge of soil testing & extension staff and farmers through training and demonstrations; and promoting organic farming practices, etc. Further there are schemes like Paramparagat Krishi Vikas Yojana; Organic Value Chain Development in North Eastern Region; coverage of compost pits for production of organic manure and production of vermi-compost under MGNREGA, etc, to give fillip for promotion of organic sources in agriculture (agricoop.nic.in).

Advantages of Organic Fertilizers/Sources

The use of organic-based fertilizers/sources for sustainable agriculture benefits farmers, growers, consumers, and the environment in many ways:

- Organic fertilizers bind soil particles into structural units called aggregates. These aggregates help to maintain a loose, open, granular condition congenial for easy and rapid infiltration and percolation of water. The granular condition of soil sustains conditions optimum for aeration and permeability.
- Water-holding capacity of the soil becomes better with increased use of organic fertilizers/sources.
- Surface run off and erosion are reduced by organic matter as there is good infiltration. Organic matter or organic manure on the soil surface reduces losses of soil by wind erosion.
- Surface mulching with coarse organic matter buffers the ambient soil temperatures; it helps in keeping soil temperatures lower in the summers and warm in the winters.
- The organic matter serves as a source of energy for the growth of soil microorganisms.
- Organic matter serves as a reservoir of chemical elements that are essential for plant growth. Most of the soil nitrogen (N) occurs in organic combination. Also, a considerable quantity of phosphorus (P) and sulphur (S) exist in organic forms. Mineralization of N, P, S and micronutrients containing soil organic matter supplies the nutrients needed by growing plants, as well as release many biostimulants-containing hormones and antibiotics.
- Fresh organic matter has a special function in making soil phosphorus more readily available in the acid soils.
- Organic acids released from decomposing organic matter help to reduce alkalinity in the soil.

- Fresh organic matter supplies food for such soil life as earthworms, ants, and rodents. These macro-organisms improve drainage and aeration. Earthworms can flourish only in soils that are well provided with organic matter.
- Organic matter on decomposition produces organic acids and carbon dioxide which help to dissolve minerals such as potassium and make them more available to growing plants.
- Humus (highly decomposed organic matter) is a storehouse for the exchangeable and available cations – potassium (K), calcium (Ca), and magnesium (Mg). Humus also prevent ammonium ions from leaching by way of holding it as the exchangeable cation.
- It acts as a buffering agent and resists changes in pH.

Challenges in Organic Fertilizers

Requirement of total fertilizer nutrients is estimated to be around 60 million tonnes (In terms of Nutrients NPK) by 2050 (comprising of 45 million tonnes of fertilizers and 15 million tonnes of organic and bio-fertilizers) as against the current nutrient consumption of 34 million tonnes (containing 32 million tonnes of fertilizers and balance organic and bio-fertilizers). On an average of 1.5% nutrients in organic sources, requirement may be around 1000 million tonnes to meet the demand of 15 million tonnes nutrients from these sources. Further the challenge may be related to ensuring right quality.

Some of the major challenges regarding Organic fertilizers are:

- Organic fertilizers are bulky in nature and need to be applied in large quantities
- Nutrients are made available slowly and requires long time for decomposition
- Organic fertilizers have low nutrient composition and cannot fulfil all the nutrient requirements of the crops
- Organic fertilizers vary widely in quality depending on its source
- The benefits of organic fertilizers are long term in nature and may not show immediate benefits like Chemical fertilizers (Urea) and farmers try to compare with chemical fertilizers
- Due to bulky nature, the transportation is an issue in making available the organic fertilizers in large quantities
- In many parts of the country tenant farmers are in large number and they are interested to get maximum imput during that season/year and not concerned about soil health.

Integrated Nutrient Management Involving Organic Manure in Indian Context

There is no doubt that with the application of fertilizers, production of agricultural crops has shown a tremendous increase. As per 4th Advance Estimate issued by the Ministry of Agriculture and Farmers Welfare on 11th August, 2021, country produced 308.65 million MT of food grains in 2020-21. Production of horticultural crops as per 2nd Advance Estimate is 329.86 million MT during the year. However, fertilizer response ratios (kilograms of additional crop produced per kilogram of additional plant nutrient applied) has shown declining trend over the years due to intensification of agriculture, use of high analysis fertilizers, imbalanced use of fertilizers, non-adoption of soil test based fertilizer recommendations, scant/little use of organic fertilizers/sources, adoption of same cropping system, etc. Soil health is deteriorating year after year. Efficiency of fertilizer use continues to remain low. The optimal use of all possible sources of plant nutrients - organic manure, biological fixation as well as mineral fertilizers in an integrated plant nutrition systems (IPNS) approach is a sustainable option.

Investigations carried out under All India Coordinated Research Project on 'Long Term Fertilizer Experiments' over five decades at fixed sites have indicated that continuous use of nitrogenous fertilizer alone had deleterious effect on soil health and crop productivity, showing the emergence of deficiencies of other major and micronutrients. Even with recommended doses of NPK and more, deficiency of micro and secondary nutrients has become yield limiting factors over the years. Deficient nutrient may also affect plant growth and cause plant physiological disorders. There is also a possibility of nitrate contamination in groundwater above the permissible limit of 10 mg NO_3-N L^{-1} due to excessive/over-use of nitrogenous fertilizers, particularly in light textured soils that has consequence on human/animal health if used for drinking purpose. ICAR recommends soil test based balanced and integrated nutrient management (INM) through conjunctive use of both inorganic and organic sources of plant nutrients to prevent deterioration of soil health and environment, and contamination of groundwater. In addition, split application, and placement of fertilizers, use of slow releasing N-fertilizers and nitrification inhibitors, growing leguminous crop,s and use of resource conservation technologies are also advocated.

Role of Fertilizer Industry in Promoting Organic Fertilizers

In order to create widespread awareness among the farmers on the benefits of organic fertilizers and sustenance of soil health, fertilizer industry has been carrying out various need- based progarmmes/ activities at the grass root level. Glimpse of these activities are discussed and certain suggestive measures are also suggested.

1. Fertilizer companies are engaged in marketing of city compost as already discussed.

2. In addition to traditional fertilizers, secondary- and micro-nutrients, bio-stimulants, water soluble fertilizers, etc. are also being made available to the farmers for sustainable agriculture.
3. Many companies have soil testing laboratories to advise the farmers on benefits of using fertilizers in conjunction with organic fertilizers as per soil test based recommendations.
4. Certain companies have their own agro-service centers for catering to the need of farmers for various agri-inputs and in-charges of the centers remain in constant touch with the farmers to understand their problems and advise them on remedial measures. Coromandel has 800 mana growmore and nama growmore centers in the States of Andhra Pradesh, Telangana, Karnataka and Maharashtra. These centers provide valuable services to the farmers in addition to making availability of agri-inputs under one roof.
5. The field staff of the fertilizer companies organize various programmes/activities such as farmers' meetings, crop seminars, visits of farmers to agricultural universities/ ICAR Institutes/ agro-service centers, demonstrations at farmers' fields, meetings of the farmers at the demonstration sites near maturity of crops, etc. Objective behind such activities is to educate the farmers to use fertilizers in balanced proportion and organic sources as per soil test report.
6. Fertilizer industry should come up with innovative organic fertilizer formulations which are less bulky in nature with standardized quality. Any combined formulations of organic with chemical fertilizers needs to be investigated which will create good impact on soil health. In this regard, the scope of coating fertilizers with organic carbon and beneficial solubilizing bacteria can be investigated.
7. Awareness should be created among the villagers about the benefits occurring to the farmers from various schemes of Central and State Governments such as soil health management, etc.
8. Large scale participation of small and medium enterprises should be encouraged to take up the manufacturing of compost fertilizers from the urban waste. Government should consider offering "performance-linked incentives" for existing players with a thrust on quality and large-scale production.
9. Fertilizer has played and will continue to play a vital role in education of the farmers for adoption of integrated nutrient management as per the resources available to famers for sustainable agriculture.

Conclusion and Way Forward

The usage of organic fertilizers in agriculture has become a major need of the hour. Instead of debating endlessly on whether organic fertilizers are superior to its chemical counterpart or vice-versa, the need is to evolve an effective INM approach. Both chemical and organic fertilizers are equally important for Indian agriculture; however, ensuring the right and adequate usage as per the soil nutrient levels is more important. This calls for large scale concept promotion on educating the farmers on the right usage of organic fertilizers involving Government institutions and the private industry players. To put it in a layman's term, chemical fertilizers are like BIRYANI and Organic manures are like curd rice and if we eat continuously Biryani without curd rice what will happen to our stomach will happen to the soil if we don't use organic manures.

Organic manures and chemical fertilizers are not competitors to each other. Rather these are complimentary and there is a need to encourage usage of both in right proportion in order maintain health of our soils for our feature generations since healthy soils produce healthy crops which will create and sustain heathy and wealthy societies on the planet Earth.

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Role of Marketing Research in Fertilizer Sector

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Abstract

In essence, management is about decision making and decision making is invariably surrounded by uncertainties and, therefore, risks. Marketing research is expected to help to reduce the level of uncertainty with which marketing managers must cope. Marketing research is a form changing activity in that it takes facts and figures and set of relevant data and converts this to information, in which form it is useful to decision makers. The term used here is that of 'marketing research' rather than 'market research' signifies that a great deal of the research effort is typically devoted to identifying marketing issues *e.g.* improved distribution systems, packaging development, studies of business trends, product development, customer segmentation, long range forecasts of demographics, etc. whereas the narrower term, 'market research' is indicative only of research into markets. Competition in Indian fertilizer market has intensified during past few decades making it necessary for companies to constantly understand and foresee the impending challenges of market to improvise own presence and performance. In today's world, marketing research has become one of the most effective tools for informed decision making. Fertilizer, being a world market commodity, is exposed to global supply and demand, market fluctuations and international trade policies. Indian fertilizer industry, which is one of the largest in the world, is bound to deal with complexities in the global as well as domestic marketing ecosystem. There is growing need for industry to adopt an alert marketing research system that can be relied for taking decisions in consonance with market dynamics. Fertilizer marketing in 21st century needs a data driven scientific approach integrated with decision making process. Creating a strong marketing information system with a research orientation within the organisational structure is going to be one the most reliable decision support system in present times.

Key words: Marketing research, gap, emerging focus, key research areas, relevance

Introduction

India continues to be the agriculture based economy as agriculture and its other associated spheres continue to employ 54.6% of total workforce and contribute 17.8% to the GDP. Fertilizers are used for increasing agricultural production with quality produce, and maintaining soil fertility over the period. The Indian fertilizer industry is known for its significant contribution in improving food production in the country. Adoption of HYVs, coupled with increased application of fertilizers, has paved the way for self-sufficiency in food grains. A synergy between food production and fertilizers application has resulted growth in overall fertilizer consumption in India at a CAGR of 2.0% from 50.6 million tonnes in FY 2009 to 61.4 million tonnes in FY2020 (Casey, 2020). Role of fertilizer industry in meeting future requirements of food grain has become more critical especially under shrinking, as well as, stressed natural resources.

Impact of climate change on agriculture production system is visible now. According to some reports, the warmer temperatures and changing rainfall patterns could reduce global food production by around 10% by 2030. Extreme weather events and the changing climate will the force farmers to change the crops they grow. Depending on location-specific situation, farmers will need to change to new varieties or types of crops, efficient fertilizer and water management. As an integral part of agriculture, fertilizer industry must look at how the sector is prepared to align the products and services to address these changes. With no scope for increase in arable land, fertilizers are one of the key drivers for productivity enhancement.

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Marketing Defined

The concept of marketing has been debated and evaluated regularly since marketing was recognised as a distinctive discipline and domain. Many definitions of marketing have been put forward over the years as each generation tries to capture what marketing is and what it means to them. Over the past 50 years, marketing has been redefined to fit new contexts, for example in not-for-profit, political and social sectors. In recent years new technologies, techniques and media have brought with them more opportunities for re-defining marketing. Given the different perspectives in relation to defining marketing, it is evident that marketing theories and definitions will continue to be redefined and adapted to suit the next generations.

- Marketing, as defined by American Marketing Association, "is an organisational function and a set of processes for creating, communicating and

delivering value to customers and for managing customers in a way that benefits the organisation and its stakeholders".

- "The analysing, organizing, planning and control of the firm's customer-impinging resources, policies, and activities with a view to satisfying the needs and wants of chosen customer groups at a profit" (Kotler, 1967).
- "Marketing is an exchange process between producers and consumers, in which the producer matches a marketing offering (the product or service, plus its promotion, distribution and price) to the wants and needs of the consumer" (Mandall and Rosenberg, 1981).
- "Marketing is a very simple philosophy which requires producers to start with the identification and specification of consumer needs, and then mobilise their companies' assets and resources to achieve a mutually satisfying exchange relationship from which both parties derive the benefits they are seeking" (Baker, 1991).

Further, the service dominant logic theory (SDL) is currently being expounded based on the argument that "organisations, markets and society are

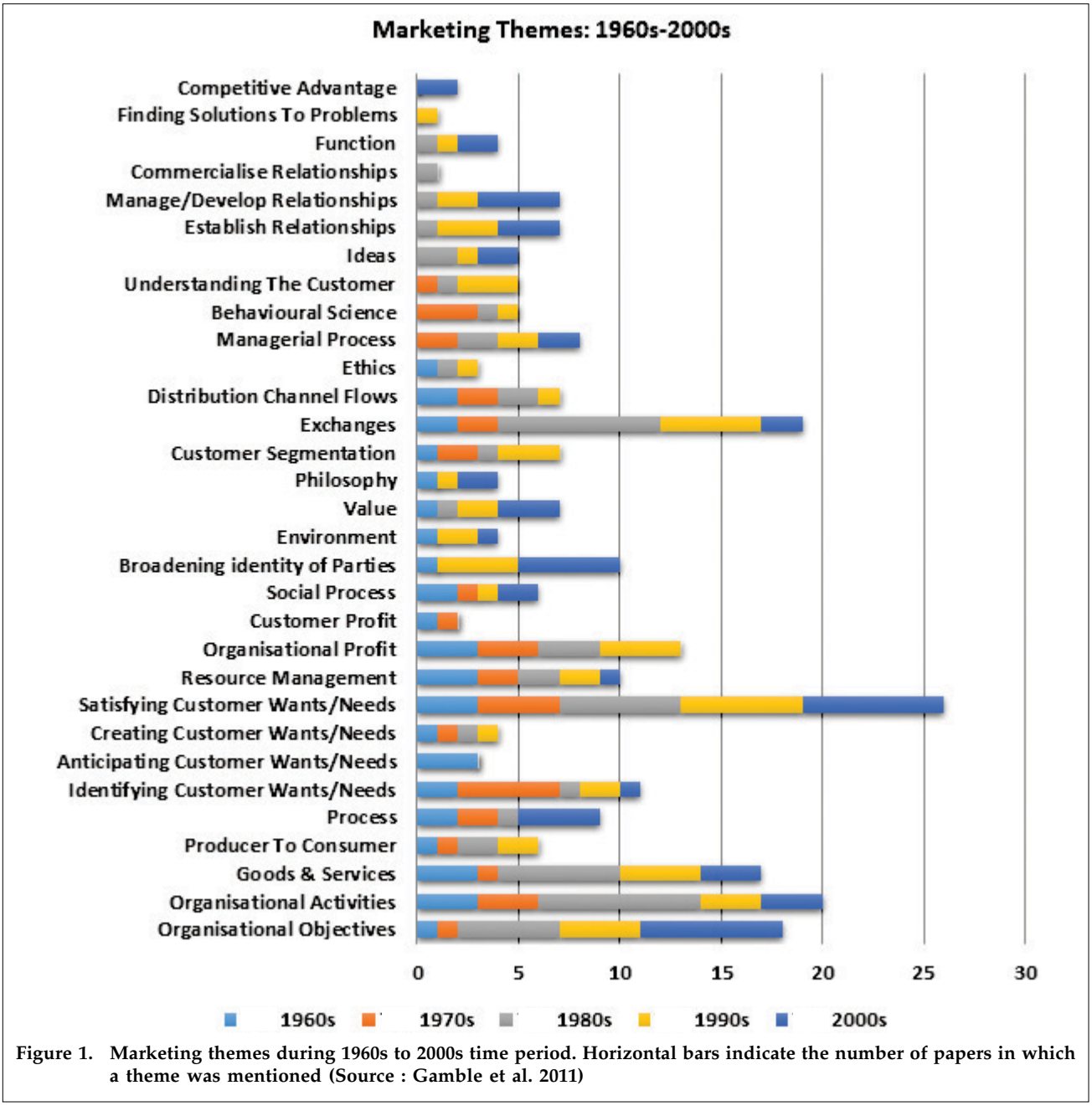

Figure 1. Marketing themes during 1960s to 2000s time period. Horizontal bars indicate the number of papers in which a theme was mentioned (Source : Gamble et al. 2011)

fundamentally concerned with exchange of service – the applications of competences (knowledge and skills) for the benefit of a party" and that 'service is the fundamental basis of exchange' (Vargo and Lusch 2004).

The illustration given in **Figure 1** makes it clear that marketing functions have always been customer centric. New age marketing concepts also suggest that goal of an organisation should be offering value to customers and invoking customer satisfaction rather than the profit maximisation. Ideally, a sustainable marketing should ensure everyone achieves a satisfactory level of reward. Building long-term relationships that result in repeat business and more spending from key customers has become integral to success in the competitive 21st century landscape.The growth in global markets and competitiveness will continue to increase consumer choice and demand and this will impact on the nature of interactions and level of customisation required for companies to maintain a competitive advantage.

New Age Marketing

Marketing, as a business process, has evolved with the time ever since the onset of industrial revolution. Technological advances in the field of information communication technology, evolution of artificial intelligence (AI), internet of things (IOT) have become the most critical tools in present new age marketing. New wave technology, consisting affordable computers and mobile phones, low cost internet, and open source, has enabled enhanced connectivity and interactivity of individuals and groups. One of the enablers of new wave technology is the rise of social media. According to Kotler et al., 2010, who postulated Marketing 3.0, underlined that marketing has to focus on the customer as a human being in its entirety, with material, emotional and spiritual needs and to be capable of satisfying humanism's noblest instances. Transition of marketing during post industrial revolution period is presented in **Table 1**.

The new wave technologies have enabled consumers accessing social media platforms in a significant way. As per India Social Media Statistics 2021, Indians on average, spend about 2.25 hours on social media daily. The number of Internet users in India has grown to a whopping 624 million, which is roughly 45% of the total population of India. Further, there were 1.10 billion mobile connections in India in January 2021 [https://www.theglobalstatistics.com]. With the affordable internet rates and smart phones, now social media has become one of the most essential parts of daily internet usage in India. With this phenomenal change in digital access has brought sea change in consumers' profile and buying behaviour.

Evolution and Transformation of Fertilizer Marketing

Fertilizers are crucial productivity augmenting inputs. To meet the challenge of rising demand for food, feed, and fibre with limited land and water resources, it is imperative to augment land productivity and one way to do this is to make fertilizers easily accessible to farmers and ensure their efficient use. Commercial fertilizer is responsible for 40 to 60% of the world's food production. Innovative fertilizer products and best management practices will improve nutrient efficiency and reduce losses, helping to ensure that crops successfully adapt to and thrive in new environments while reducing greenhouse gas emissions. Therefore, fertiliser industry in general and marketing function in particular has to develop and employ management practices that ensures use of fertilizers effectively and efficiently.

Indian fertilizer sector is second largest producer and consumer of fertilizers in the world and charged with meeting requirements of a highly diverse consumer base spread over an equally diversified agro-climatic situation. In the process, industry has to ensure

Table 1. Transition in marketing approaches over time (Source: Kotler et al. 2010)

Marketing Stages	Product centric era	Consumer oriented	Values driven
Objective	Sell products	Satisfy and retain the customer	Make the world a better place
Enabling forces	Industrial Revolution	Information technology	New wave technology
How companies see the market	Mass buyers with physical needs	Smarter consumer with mind and heart	Whole human with mind, heart and spirit
Key marketing concept	Product development	Differentiation	Values
Company marketing Guidelines	Product specification	Corporate and product positioning	Corporate mission, vision and values
Value proposition	Functional	Functional and emotional	Functional, emotional and spiritual
Interaction with consumers	One-to many transactions	One-to one relationship	Many-to many collaboration

Figure 2. Dimensions of Fertilizer Market in India
(Source: Fertilizer Statistics 2019-20;
*** Research&Markets.com 2019)**

availability of huge volumes of fertilizers within a defined regulatory framework.

Fertilizers are produced at around 140 locations in the country and distributed among farmers in over 6.4 lakh villages through a network of private traders which accounts for 79 per cent and through cooperative and other institutional agencies contributing about 21 per cent. Some quantities are also sold through the manufacturers' own outlets. Despite strong historical growth, fertilizer consumption in India remains highly skewed. There are currently a number of states in India which still have a very low penetration of fertilizers. This leaves a lot of room for future growth. The overall fertilizer consumption in India has grown at a CAGR of 2.0% from 50.6 million t in FY2009 to 61.4 million t in FY2020 and projected to register a CAGR of 11.9% during the forecast period 2021-2026 (India Fertiliser Market, 2021). With limited arable land and rising food needs, the long-term potential for increase in fertilizer usage is moderately high in India. Key dimensions of Indian fertilizer market in India are depicted in **Figure 2.**

Advent of Intensive Agriculture

At the time when India attained independence in 1947, the agricultural production was around 50 million tonnes. After independence when Five Year Plans were initiated in 1950, agriculture was given priority. However, it was only during nineteen sixties, when a number major schemes and programme got implemented and investments were made for infrastructural developments - with priority to electricity generation and irrigation projects. There had been remarkable achievement towards increase in food grain production by about 21 million tonnes in 1967-68 over the previous year in the Green Revolution era after release of high yielding varieties (HYVs) of wheat and rice. This ushered India into an era of food self-sufficiency and intensive agriculture gathered momentum with the support of improved agri inputs – mainly HYVs and fertilizers.

The introduction of high-yielding varieties in the 1960s boosted fertilizer use. The high food grain and fertilizer prices on the international markets during the oil crisis of 1973–74 provided a further impetus to policies aimed at improving the country's fertilizer supplies and food security. Many a research findings have acknowledged the role of dwarf wheat/rice varieties and increased adoption of fertilizers in success of Green Revolution and growing food grain production in subsequent decades. It is worth to mention here that food grain production showed an increase of about 23 million tonnes in 1983-84 compared to previous year. The growth in fertilizer consumption was 1.3 million tonnes during the period under reference.

Plateauing Crop Yields

Adoption of intensive agricultural practices involving high yielding (high nutrient requiring also) varieties under increasing application of irrigation and fertilizer impacted the natural resources. Multi-nutrient deficiency and soil health issues became a larger concern for a sustainable agriculture. The signs were visible and resulted into stagnation as yield levels were hovering around 1-1.5 tonne ha^{-1} during 1980 to 2000 period. The most detrimental effect was observed on soil health as the fertilizer response ratio went down from 13.4 in 1970 to 3.2 in 2010 (Chaudhari et al., 2015). In order to correct the deceleration in farm production, several initiatives have been taken during last two decades to revive and sustain the agri- production system.

Facilitated with policy interventions and ever evolving agriculture production system have prompted the fertilizer industry to align its marketing approach which is evidenced with more focus on delivery of efficient products suited for varied agronomic situations. Industry is endeavouring to bring efficiencies in operations, introduce newer concepts, sensitise farming community to address soil health issues and using balanced crop nutrition – a prerequisite for sustainable agriculture.

Sectoral Reforms

Considering deteriorating fertilizer response as a major cause of stagnation in crop yields, it was urgently needed to improve the soil health and

fertilizer use efficiency. Since, imbalanced use of nutrients led to disproportionate mining from the soil, nutrient based subsidy (NBS) policy on phosphatic and potassic fertilizers in 2010 was introduced. By linking subsidy to nutrient composition rather than products per se, NBS was expected to wean away farmers from applying too much urea containing only nitrogen. The government, in its continued effort to reform its fertilizer sector, also took a big step by including the fertilizer subsidy under the direct benefit transfer system in fertilizers (DBT-F) in 2016–17 with pilot project and state-wise roll out of the scheme in phases was completed in March, 2018 . DBT-F has facilitated real-time tracking of fertilizer movement, demand estimation, and stock availability. It has also reduced record keeping and paperwork for fertilizer dealers. Routing all sales through POS (point of sale) device has created an efficient and transparent distribution system. Marketers are immensely benefitted by having access to a more reliable and almost real time data that are helpful in formulating marketing strategies.

Digital Age

Digital technologies, including the Internet, mobile technologies and devices, data analytics, artificial intelligence, digitally-delivered services and apps are changing agriculture and the food system. Examples abound at different stages of the agri-food value chain, farm machinery automation allows precision of inputs and reduces demand for manual labour; remote satellite data and in-situ sensors improve the accuracy and reduce the cost of monitoring crop growth and quality of land or water; and traceability technologies and digital logistics services offer the potential to streamline agri-food supply chains, while also providing trusted information for/from consumers.

Several digital interventions introduced during the past decade have helped in establishing a more transparent and efficient fertilizer sales and distribution model. In India, the numbers of social media users have been growing in 2021 at a steady rate of 448 million due to deep penetration of internet connectivity among people. The number of internet users in India has grown to a whopping 624 million, which is roughly 45% of the total population of India (The Social Media Statistics, 2021). Currently, rather than a subtype of conventional marketing, digital marketing has become a new phenomenon that brings together customisation and mass distribution to accomplish marketing goals. Technological convergence and the multiplication of devices have pushed the boundaries towards a new concept of digital marketing—user-centred, more measurable, ubiquitous and interactive. Rather slow but the trend is setting up in fertilizer marketing also.

Transformations of agriculture after Green Revolution and periodic policy interventions have played a catalytic role in transforming fertilizer sector in India. The process of fertilizer marketing has enormously changed after introduction of DBT/Aadhaar enabled fertilizers distribution system (AeFDS). The Fertilizer sales are being monitored online through web based Integrated fertilizer management system (iFMS) enabling all stakeholders to have access to almost real-time fertilizer distribution and sales data. Access to such a dynamic data, specifically regarding production, movement, availability and consumption, offers immense opportunity to align the marketing strategy based on more accurate facts compared to the past.

Marketing Research

Noticeably, the term used here is 'marketing research' rather than 'market research' is in recognition of the fact that a great deal of the research effort is typically devoted to identifying marketing problems (*e.g.* improved distribution systems, packaging development, studies of business trends, long range forecasts of demographics, etc.) whereas the narrower term, 'market research' is indicative only of research into markets (Crawford, 1997). In fact marketing research is not the only tool used by the decision makers. Market information system (MIS) is a structure consisting of people, equipment, and procedures to gather, sort, analyse, evaluate, and distribute needed, timely, and accurate information to marketing decision makers and sounds very much like marketing research – providing information to aid decision making. However, marketing research is a component of MIS along with internal report system, marketing intelligence system, decision support system, etc.

Marketing complexities have increased manifold in recent years and related decision making has also got complex by the day. As these complexities in market increase, the decision makers feel increasing need for understanding market and its players be it consumers, channel partners, suppliers or policy interventions. Any decision taken without adequate understanding may lead to a disastrous loss and customers' trust (Gamble et.al., 2011). Market research offers informed choices, based on relevant, accurate and timely information to the decision makers. Market research alone, however, does not guarantee success; the intelligent use of market research in the key to business achievement.

In a present day world, there are very few technological secrets, therefore, commercial success is dependent more than ever, not on technological superiority, but on a better understanding of customers' needs and using this information (data) to guide decision making. Understanding customers' potential and potential customers' needs, through market research, is one of the best ways to obtain a

sustainable competitive advantage. The aim of marketing management is to satisfy the needs of the consumer. Marketing research helps in achieving this (Mandall and Rosenberg, 1981).

Research is often described as an active, diligent, and systematic process of inquiry aimed at discovering, interpreting and revising facts. Therefore, marketing research is the systematic and objective collection and interpretation of data to help reduce risk in marketing decisions *i.e.* a good market research turns data into intelligence. Classification and a typical marketing research process is illustrated in **Figure 3.**

Marketing research can be concerned with any of a variety of aspects of the market; the product, sales, buyer behaviour, promotion, distribution, pricing, packaging, etc. Since the researcher cannot investigate everything about a market, one must be selective. Marketing research focuses mainly on understanding the customer, the company, and the competition. These relationships are at the core of marketing research (Vargo and Lusch, 2004). Companies must understand and respond to what customers want from their products. However, this relationship is often influenced by competitors and how their products are received by the market. Research is the only tool for an organization to keep in contact with its external operating environment. The market success goes to those companies that are best matched to the current environmental imperatives. Those companies, that can deliver what the people want and can delight the Indian customers, are the market leaders.

The consumer perspective has been present in the definition of marketing since the 1960s even if it was only in recent decades that it took centre stage in any marketing strategy (Kotler 1967). This approach has led to the incorporation of aspects such as consumer satisfaction, market orientation or consumer value in marketing management (Rust et.al. 2004). However, many marketers still think in terms of product, place, promotion and price, McCarthy's variables or 4Ps model (McCarthy, 1964), which does not leave any role to consumers. This production-focused marketing paradigm was later challenged by Lauterborn's user-centred models (Lauterborn, 1990). The 4Ps of the marketing mix yield to the 4Cs that turn product into customer solution, price into cost to the customer, place into convenience and promotion into communication. This is a new perspective for operational marketing that will be of special relevance for the marketing world which is riding high on digitalisation of everything.

Businesses have fully realised the significance of market research as it provides an idea of the business and the consumer market pattern. Research findings help to economic and business development resulting into generating profit for the organisation. Besides, market research involves giving insight to all the categories of marketing - valuation, distribution, promotion of product and services. For betterment and improvement, market research is absolutely essential.

Marketing Research in India

Given the standard of market research in India today, it is hard to believe that this field was almost non-existent till a few years back. The demand for market research services has grown rapidly through the late years of the twentieth century though there are signs that some sectors of this youthful industry are now maturing. There was little focus on the consumers, their desires, likes and dislikes before the economic reforms initiated in 1990s. In the absence of choices, sales were assured. Hence, there was almost no emphasis on market research and development.Over the last 15 -20 years, there has been an increase in the availability of marketing research agencies. Besides the old marketing research organizations, mainly of large advertising

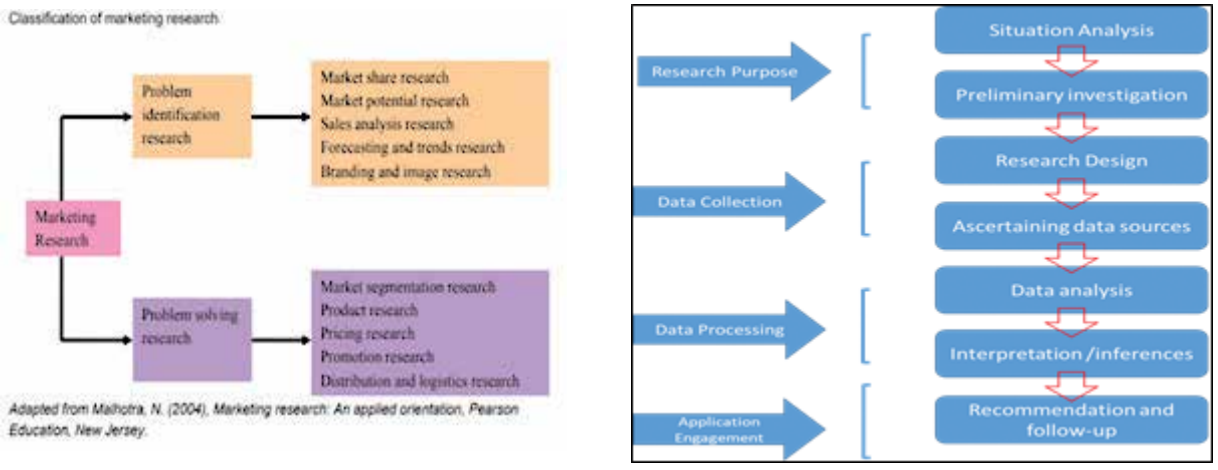

Figure 3. Classification and a typical marketing research process flow

agencies, a large number of medium-to-smaller organizations formed by professionals is an emerging trend in India.

The European Society for Opinion and Marketing Research (ESOMAR) has listed 54 Market Research companies operating in India (ESOMAR-Directory, 2021). These market research agencies and consulting firms operating in India are known for conducting customised researches and offer excellent options. Among the major, IMRB International which is considered as the ground breaker in Indian market research and other leading ones are -Delphi Research Services, ORG-MARG, MRUC and Nielson India. The market research agencies in India cover all the main areas of marketing - spanning B2B and industrial research, social research, media research, brand research, corporate and employee research, channel and retail research, product and packaging research, pricing research and business-specialized consumer research.

Marketing research in India has been focusing more on fast moving consumer goods (FMCG) followed by auto, telecom, healthcare sectors, and durable goods industries. Customer satisfaction and customer insights in all industry sectors are the growing segments for market research. It has been posited that research expertise available in India is truly top of the rung, and methodologies used in India are comparable with the best in the world (Abraham, 2004).

Marketing Research in Fertilizer Industry

With a population of over 1.3 billion and growing at about 1.6 % per annum, India continues to be a large and growing base for agribusiness. With a significant shift in India's demographic profile in favour of younger population, increasing education, rising digitisation farming patterns are steadily changing. Fertilizer sector is to deal with diverse agro-climatic situations and meet the expectations of farming community stratified on the basis of parameters like economic status, education, and simultaneous level of adaptability. The present day marketing seeks to incorporate a dynamic, systemic, stakeholder focus, with multiple and integrated inputs-particularly in the tasks of production, processing, distribution, and marketing communications (Edwards and Shultz, 2005). New demands such as rapid product innovation, leveraging scale-economies, driving revenue growth, capturing market share, adding sufficient value, co-marketing with competitors, and sensitivity to environmental impacts have become dominant managerial concerns to deal with.

Gap

Marketing research is yet to become a function of organizational culture in fertilizer industry. A large number of organizations would fall into category of ad-hoc users. Generally, in organizational restructurings, there are hardly any administrative provisions for marketing research in most of the organizations. Depending upon the situation, marketing research is carried out as an ad-hoc activity. This can be done either by a temporary task group or by outside agencies.

Emerging Focus

Until recently, the major preoccupation of the organizations used to be restricted to the quantification of the demand and the demand-supply gap. A recent development is their realization that the Indian customer is not averse to superior products at higher prices. Because of this, organizations have started appreciating the inclusion of competitive analysis, research on organizational buying behaviour, gaps in the service packages of the competitors, etc. The organizations have also started acknowledging that market share and success would be an outcome of an entrepreneurial decision rather than mere opportunities as reflected through the demand-supply gaps. This is a welcome change.

- With market research gradually gaining significance in Indian fertilizer industry, a more structured adoption of this tool is expected in future.
- The prominent focus will be more on the existing customers and to ensure their satisfaction. The coming in of online content has proven to be extremely helpful for businesses. It is being realised that customers will no longer wait for one to describe the product because a majority are going to do most of the research on their own.
- Development of new products/improvisation and value addition to the existing products is a going to be a key driver for the growth of fertilizer industry. Offering a product as solution to a problem, matching with financial limitations of consumers, is more relevant in agri-production system. A top down approach without assessing the ground realities may lead to failure and hence, the decision makers are increasingly relying on scientific approaches to understand the customer needs and market response.

Key Research Areas

At present fertilizer industry has access to real time data on production, distribution and consumption. Besides, data related to consumers (farmers), cropping pattern, weather forecasts are getting more accurate and becoming accessible. The situation is a big traction for companies to conduct market studies largely engaging market research agencies. Companies may also develop in-house market research capabilities in future. Some of the most common types of market

research undertaken in fertilizer sector include:

- Product Development
- Competitor Research
- Brand Research/Equity
- Consumer Research
- Customer/Market Segmentation Research
- Campaign Effectiveness
- Business Vertical Integration
- Customised Research

Current trends suggest that customer satisfaction research is one the most popular research services offered in India as 62% of the firms offer this specific marketing research service. Advertising research is the second most common (55%); following by segmentation research (45%), usage and attitude (44%), consumer research (42%), concept testing (40%), product testing (40%), brand research (38%), pricing research (36%), tracking study (33%) (Segal and Junhong, 2015). Besides, the market studies for market potential and opportunity analysis, some organizations have also started conducting research on advertising effectiveness, media, product-service attributes, image feedback studies, and many customized requirements. Companies, by and large, conduct research to learn what went wrong. After-the–fact research is the most common type of research in the world (Malhotra, 2004). However, the trend is changing towards more proactive and explorative researches.

Relevance of Market Research

Farm sector is expected to meet the future challenges while maintaining a balance with natural resources. Farmers' quest for innovative technologies and products to meet emerging challenges on production, environmental safety and sustainability aspects are becoming a priority for industry. Redressal of these issues is not possible without an in-depth and continuous understanding of the farmers and their farming needs operating under a particular situation. There is a paradigm shift from production-focused marketing to user/consumer-centred models which sees product into customer solution and price into cost to the customer with convenience. This is a new perspective for operational marketing that will be of special relevance for the world dominated by digital interventions.

- ***Farmers First:*** Farmers (consumers) act as a dominant change agent because they impel agribusiness, and shape and reshape its boundaries - they ultimately are determining any value attached to a product or service. As farmers demand to satisfy their expression of uniqueness, they drive the brand proliferation significantly. Narrowing the gap between their expression of uniqueness and offered uniqueness, in a product or service, is possible through a comprehensive research and implementation of recommendations.
- ***Informed Customer Base:*** With increased access to information, farming community has become more informed, skilled and progressive in adoption of technologies. Significant rise in rural literacy coupled with internet and smart phone penetration have propelled rural/farming community to a new trajectory. India has improved remarkably in its digital connectivity and market access has become comparatively easy. The number of internet users is projected to reach 666.4 million in 2025. Farmers will be behaving more smartly with mobiles in hands and would be able to be more aware and informed.
- ***More from Less:*** Fertilizer and farm sectors have a strong synergistic interdependence. Though agriculture production is a function of many factors, the pivotal role played by fertilizers in augmenting food grain production cannot be denied. As response of key natural resources has changed under intensive agriculture, normalcy has become transient. Under changing agro-climatic parameters, old prescriptions will not work for improvement in productivity and driving a shift from conventional to precision agriculture. Marketing approaches need to align with these transitions more precisely and respond with matching pace.
- ***Convergence and Cooperation:*** Indian agriculture is predominantly characterised by large number of dispersed and fragmented small land holdings. Development of farmers' producers' organisation (FPO) is seen as a potent solution to make fragmented farm holdings economically viable. It is expected that member farmers in a FPO will be more empowered and bold in decision making. In future, FPOs will be more demanding and result oriented. This calls for a change in conventional marketing approaches in both agri-inputs and output segments.
- ***Market Competition:*** During late 1970s, policy environment in India encouraged entry of new manufacturers leading to emergence of a competitive environment. In subsequent years, companies realised the significance of branding and market development efforts got the

prominence. Currently, market competition has become more intense as new fertilizers and structural composites are likely to displace existing products coupled with entry of global players. Marketing research is expected to stack up against competition with competitive insights and drive results by taking timely actions to improve/retain the market share.

Conclusion

Marketing research helps establish what products are right for the market, which channels of distribution are most appropriate, how best to promote products and what prices are acceptable to the market. As with other marketing functions, data/facts can be collected by the company or another party such as a government agency, the Ministry of Agriculture & Farmers Welfare and Ministry of Food Processing Industries, or some other specialized organisations. What important is that how it is analysed, interpreted and carried out. There are enough examples of product and business failures simply because adequate market research was not done. Planning to launch a new product, or export to a new market without adequate research leads to unexpected challenges and loss of business. Companies need to really understand their customers and also the competitors before taking any new project or expansion. In a bid to address new age requirements in the agriculture production system of the country, fertilizer sector in India has adequately acquired efficiency and technological prowess. However, understanding of farming and farmers' requirements is a dynamic process which needs to be the integrated with marketing management by agri - input industry.

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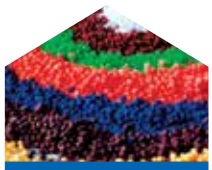

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Role of Single Super Phosphate in Indian Agriculture

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Abstract

Objective of the paper is to make single super phosphate (SSP) more familiar among other fertilizers in Indian agriculture scenario, as the SSP market is not increasing except one or two good years in last one decade. Farmer thinks that SSP is single nutrient product and complex fertilizer is the right solution to get better yield. The inherent advantage of SSP is the presence of other nutrients such as calcium and sulphur along with P_2O_5. Therefore use of SSP overcomes deficiency of sulphur in soils and plants. Further special SSP products available in the market with micronutrients such as boron, zinc and combination of both have added advantage to overcome deficiencies of these nutrients in the deficient soils and crops. The ways and means for SSP to cope up with fast phase modernization and diversification of Indian agriculture, manufacturing capacity and demand fulfilment are also enumerated.

Key words: SSP, production, dispatch, consumption, doses, manufacturing process, subsidy, segmentation, FCO, advantages, key drivers

Introduction

Single super phosphate is the oldest chemical fertilizer manufactured in India, as first chemical fertilizer plant was started by E.I.D. Parry (India) Limited at Ranipet, Tamil Nadu in 1906. SSP, a multi-nutrient fertilizer, provides 16 % citrate soluble P_2O_5 out of which 14.5 % is water soluble P_2O_5, 11-12% sulphur (S) and 21% calcium (ca).

Prior to 1960/61, India produced only straight nitrogenous fertilizers [ammonium sulphate (AS), urea, calcium ammonium nitrate (CAN) and ammonium chloride. The production of NP complex fertilizers has commenced in later part of 1960. Currently, India produces many grades of NP / NPK complex fertilizers. In addition, India produces various grades of simple and granulated mixtures. Chronology of fertilizer products is given in **Table 1**.

Since then, there have been major developments in terms of both the quantity and the types of fertilizers produced, the technologies used, and the feed stocks employed.

SSP Industry Scenario

SSP accounts for 16.6% in P_2O_5 fertilizer production of in India. Its share in DBT sale of P_2O_5 was about 8% in 2020-21. India ranks third in global consumption of SSP, next to Brazil and China as per the latest data available for 2018. Coromandel International is the leading manufacturer of SSP in India and having about 14% market share in production.

Total installed capacity of SSP plants in India is 12.49 million MT with 112 manufacturing units spread out the entire country out of which 90 plants were in operation during 2020-21. The total operating (effective) capacity as on 31st March 2021 was 10.7 million MT as against 10.26 million MT in the corresponding period of the previous year.

SSP production in India was 4.92 million MT in 2020-21 an increase of 15.8% over 2019-20 (Soni and Sati, 2021). Capacity utilization remained 45.9% in 2020-21 compared to 41.4% in 2019-20. The SSP industry witnessed substantial increase in dispatch quantities and showed a rise of 18.2% during 2020-21 over 2019-20. There had been increase DBT sale of SSP by 20.3% in 2020-21 over consumption in 2019-20. Total quantity of DBT sale was 4.49 million MT in 2020-21. Though this is an encouraging trend, there is a long way ahead in increasing the sales quantity.

Production of SSP is mainly concentrated in west zone comprising of Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra and Rajasthan states in which 65% of total dispatches of SSP also took place in 2020-

Table 1. Chronology of fertilizer production in India

Year of manufacture	Fertilizer product
1906	SSP
1933	AS
1959	Ammonium sulphate nitrate
1959	Urea
1959	Ammonium chloride
1960	Ammonium phosphate
1961	CAN
1965	Nitro phosphate
1967	DAP
1968	TSP
1968	Urea ammonium phosphate
1968	NPK complex fertilizers

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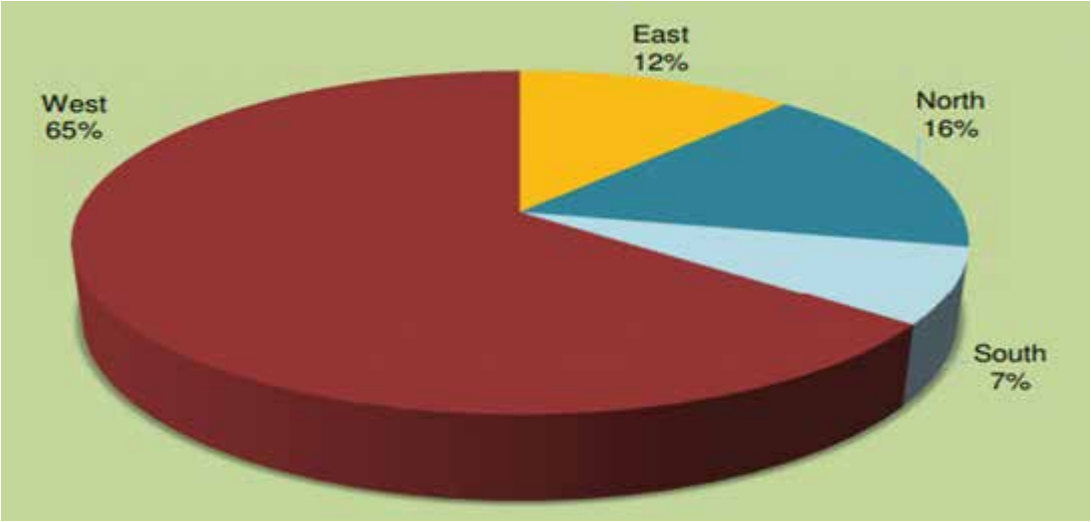

Figure 1. Zone-wise share of SSP to total dispatch during 2020-21

21 (**Figure 1**). The descending order of zones in total dispatches of SSP is west>north>east>south. Six states namely Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, West Bengal and Chhattisgarh contribute more than 70% of total SSP consumption in India (**Table 2**).

SSP industry has taken the lead for making available zincated or boronated SSP or granular SSP fortified with Zn+B to the farming community. Out of total dispatch of 0.942 million MT of zincated SSP, more than 90% was in Rajasthan, Madhya Pradesh Gujarat, Uttar Pradesh and Maharashtra. Dispatch of boronated SSP was 0.101 million MT in 2020-21 and share of four states namely Madhya Pradesh, Uttar Pradesh, Gujarat and Rajasthan had been more than 90%. Dispatch quantity in case of granular SSP fortified with Zn and B was 0.184 million MT and Rajasthan, Maharashtra, Gujarat, Madhya Pradesh and Uttar Pradesh are the major consuming states (Soni and Sati, 2021). These fertilizers are part of the overall SSP production and dispatch.

Subsidy Rates for SSP

The Government of India implemented nutrient based subsidy (NBS) policy for SSP w.e.f 1st May 2010. The subsidy on SSP was initially fixed at Rs. 4,400 MT^{-1} under the policy in 2010-11 and increased to Rs. 5,359 MT^{-1} in 2011-12. However, it was reduced to Rs. 3,673 MT^{-1} in 2012-13. There had been further reduction in subsidy to Rs. 3,173 MT^{-1} in 2013-14 and remained the same for the following two years. For 2016-17, 2017-18, 2018-19, 2020-21 (up to 19th May 2021), subsidy on SSP was Rs. 2,343, Rs. 2,166, Rs.2,734, Rs.2,826 and Rs.2,643 MT^{-1}, respectively. However, w.e.f. 20th May 2021, the subsidy on SSP is Rs. 7,513 MT^{-1} in line with other P&K fertilizers on P content basis. This will applicable up to 31st October, 2021. There is a provision of additional subsidy for fortification of fertilizers

Table 2. SSP consuming states in 2019-20 and 2020-21

States	2019-20		2020-21	
	Sales (000 MT)	Market share (%)	Sales (000 MT)	Market share (%)
Madhya Pradesh	1046	24.87	1045	23.3
Maharashtra	781	18.58	990	22.1
Rajasthan	455	10.83	453	10.1
Uttar Pradesh	432	10.27	443	9.9
West Bengal	339	8.06	343	7.6
Chhattisgarh	200	4.76	220	4.9
Andhra Pradesh	161	3.83	180	4.0
Haryana	152	3.63	149	3.3
Gujarat	136	3.25	135	3.0
Punjab	106	2.53	111	2.5

with zinc and boron at Rs. 500 MT^{-1} and Rs. 300 MT^{-1}, respectively.

Segmentation of SSP Market

Based on form, SSP market can be segmented into powder and granules. Granules is projected to be a major segment of the Indian market soon, owing to handy use and increased uptake of nutrients into the plant offered by granular SSP. Also, SSP in the granular form avoids spillage of powder in the air, thereby helping in easy transportation of SSP. Granular SSP is commonly used in cultivation of sugarcane, oilseeds, paddy, vegetables, and fruits.

In terms of type, SSP market can be segmented into boronated and zincated. The boronated segment is expected to hold a major share of the Indian market during the forecast period. Boron is commonly added to SSP, to function as a key source for development of the plant cells. Boron also imparts high disease tolerance. Also, boron helps in growth of taller sugarcanes; restricting of flower drop in cotton; and increase in the yield of banana. Also, boronated SSP can be used in cultivation of sugarcane, pulses, and vegetables.

SSP Manufacturing Process

The major raw material required for manufacturing SSP is naturally occurring rock phosphate which is mixed with dilute sulphuric acid and cured to form SSP. The process is to make insoluble locked phosphorus in rock phosphate to soluble phosphorus in the form of HPO_4^{-2} and $H_2PO_4^{-1,}$ which plant can absorb easily.

Rock Phosphate + Sulphuric Acid = Single Super Phosphate

SSP manufacturing process uses blends of various rock phosphate sources. Critical steps in the process include:

- Grinding the rock phosphate to suitable size
- Accurately metering the rock phosphate, sulphuric acid, and water
- Mixing thoroughly
- Allowing time for the reactions to occur

A plant overview of manufacturing process of SSP is elaborated in **Figure 2**.

Single superphosphate in powder form is then stored for a period of 2-3 weeks to allow further reactions to occur within the product to maximise the proportion of available phosphate in the commercial product. The cured SSP is dried, screened and fed into a granulation drum and after drying and cooling, granulated SSP is produced.

Different forms and variants of SSP are being manufactured, like, plain granulation, zincated SSP, boronated SSP, enhanced SSP etc. Such types of SSP are available in the market to cater to the need of different demands arising from the dealers/farmers.

Specifications of powdered and granulated SSP are enlisted in **Table 3** (The Fertiliser (Inorganic, Organic or Mixed) (Control) Order 1985). Boron (as B) should be 0.2-0.3 per cent in boronated SSP. Zinc (as Zn) in zincated SSP should be minimum 0.5 per cent by weight. For granular SSP fortified with zinc and boron,

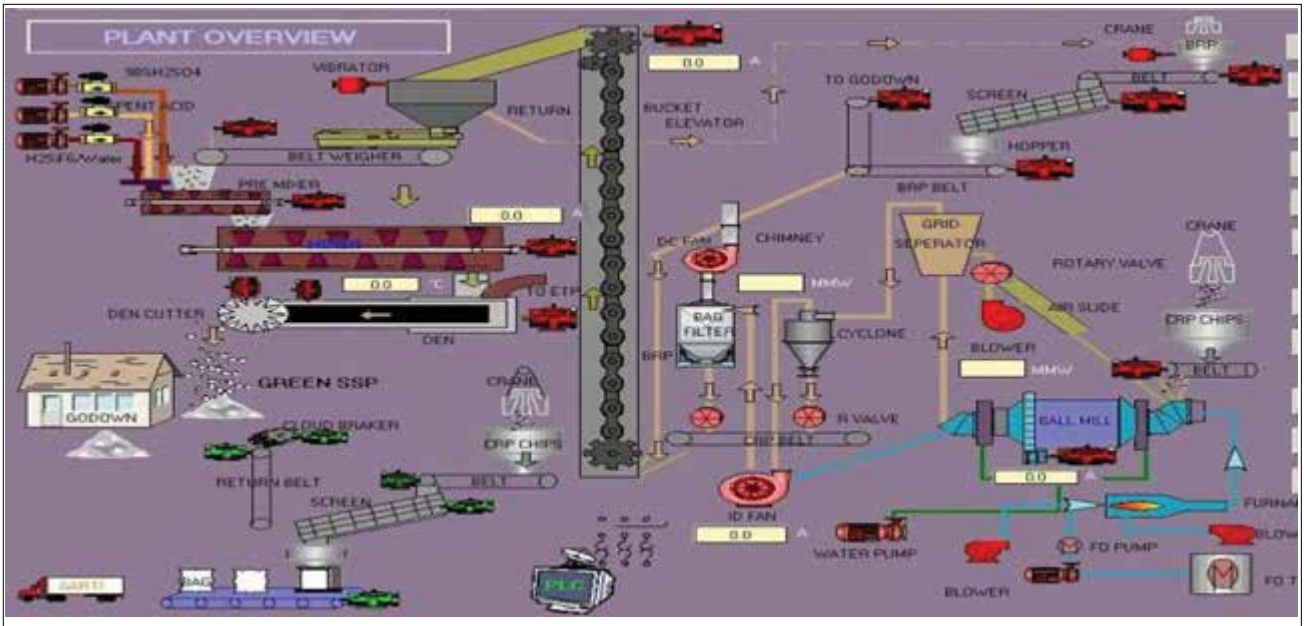

Figure 2. SSP manufacturing process (plant overview)

Table 3. FCO specifications of SSP

Particulars	Powdered SSP	Granulated SSP
Moisture per cent by weight, maximum	12.0	5.0
Free phosphoric acid (as P_2O_5) per cent by weight, maximum	4.0	4.0
Available phosphorus (as P_2O_5) per cent by weight, minimum	16.0	16.0
Water soluble phosphorus (as P_2O_5) per cent by weight, minimum	14.5	14.5
Sulphate sulphur (as S), per cent by weight, maximum	11.0	11.0

zinc (as Zn) and boron (as B) should be minimum per cent by weight as 0.5 and 0.3, respectively.

Particle size for the variants of granulated SSP: Minimum 90 per cent of the material shall be retained between 1 mm and 4 mm IS sieve.

The Granulated SSP product can be stored in godowns up to 6 months. It did not absorb moisture from the air and can be used in a wide range of situations.

SSP as a Source of Phosphorus

In India, phosphorus deficiency is often a yield-limiting factor for major crops especially for pulses and oilseeds, particularly in the soils having high calcium carbonate content, which reduces the phosphorus solubility. P is an expensive fertilizer compared to nitrogen and potassium and is required in higher quantity under the fore-mentioned conditions to achieve targeted crop yields. SSP is a multi-nutrient fertilizer that contains 16% available phosphorus, 11% sulphur and 21% calcium. SSP is applied as basal fertilizer with other chemical and organic fertilizers. It has tremendous impact on plant growth, yield of crops and assists in maintaining soil health and provides protection against pests and diseases. SSP is a highly demanded fertilizer, mostly at the time of preparation of land. SSP, being called as poor man's fertilizer (price-wise), is a very good option to use under P and S deficiency conditions in soils (as Indian soils are 80%, and 40% deficient in P and sulphur, respectively). It serves as major source of both P and S for the crops like pulses, oilseeds, sugarcane, fruits, vegetables, and tea, etc.

SSP as a Source of Sulphur

The main reasons for S deficiencies in Indian conditions are use of high yielding varieties, continuous use of S free fertilizers over the years, adoption of same cropping patterns by farmers, shrinking use of organic fertilizers/sources, leaching losses of S in coarse textured soils, etc. Special variability in available S deficiency status in soils of India is depicted in **Figure 3**. Sulphur is a secondary nutrient and is necessary to enhance farm productivity, farmers' income and production of quality produce. Having realized the importance, Government of India brought this nutrient in subsidy scheme in 2008. Further, it was also included in NBS policy in 2010. Every effort needs to be made by all concerned to promote this nutrient in Indian agriculture as it plays a vital role in plant metabolism. It is required for synthesis of S containing amino acids like methionine, cystine and cysteine and also for protein synthesis. It increases oil content in oilseed crops. Sulphur is present in the crops like onion, mustard, cabbage and cauliflower, etc. as polysulfides. Sulfhydryl (-SH) groups in plants are related to increased cold resistance. It is also required for N-fixation in legumes and is a part of nitrogenase enzyme system. Sulphur has an indirect nutritive value as soil amendments in salt affected and calcareous soils.

SSP as a Source of Calcium

In addition to 16% available P_2O_5 and 11% S, it also contains 21% Ca. Calcium gives binding strength to the soil i.e. flocculation of particles resulting in better aeration. In plant, it is constituent of cell wall in the form of calcium pectate. It is also crucial in activating certain enzymes and to send signals that coordinate certain cellular activities. In agronomic studies where SSP has been demonstrated to be superior to other P sources, may be due to presence of additional S and Ca nutrients. When locally available, SSP was found wide-spread use for fertilizing pastures where P, S and Ca are needed. Up to certain extent, use of SSP helps in reclamation of sodic soils due to presence of S and Ca. Important point emerged from deliberations is the recommended dose of SSP for various crops enabling the farmers to use accordingly and the same are given in **Table 4** as collected from various sources.

Advantages of SSP in Indian Agriculture

i) Helps in improving root growth and development which is a key to uptake of plant nutrients and water thereby resulting in better crop yields.

ii) Improves soil structure, aeration and increases

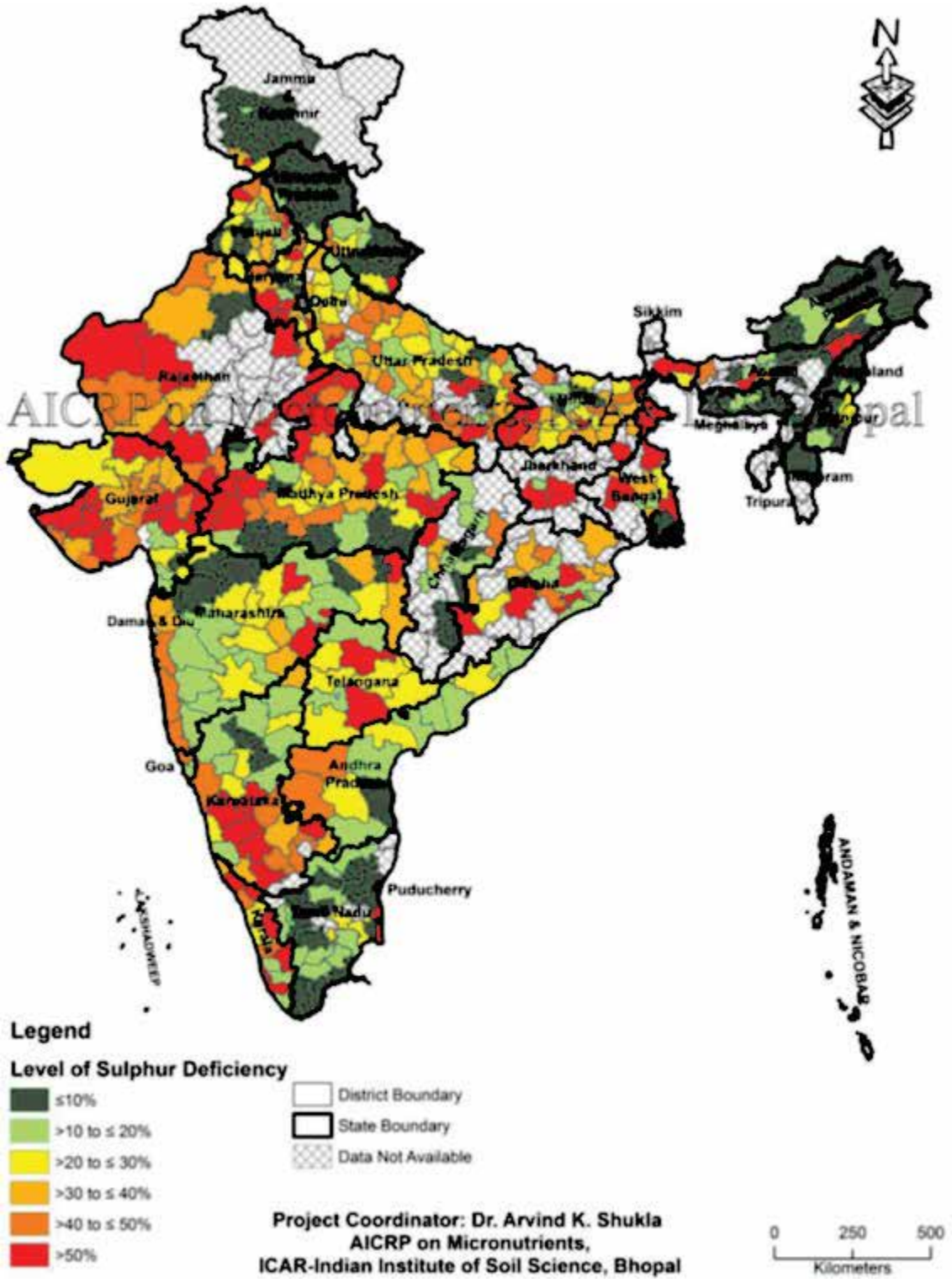

Figure 3. Special variability in available S deficiency status in soils of India, 2017 (Source : FAI, 2020)

Table 4. Recommended doses of SSP in various crops

Crops	Time of application	Kg acre^{-1}	PAU recommendations* (kg acre^{-1})	PJTSU recommendations** (kg acre^{-1})
Cotton	At sowing	100-150	75	150
Sugarcane	At sowing	175-200	75	100-120
Tobacco	At sowing	100-125		
Wheat	At sowing	125-150	155	125
Rice	At sowing	100-150	75	120-150
Maize	At sowing	125-150	150	120-150
Bajra/sorghum	At sowing	100-125	50-100	60-100
Groundnut	At sowing	75-125	50	100
Castor	At sowing	100-125		100
Sesamum/til	At sowing	75-100	100	100
Mustard	At sowing	100-125	50-75	100
Gram	At sowing	100-125		125
Arhar	At sowing	150-175	100	125
Green gram/black gram/Soybean	At sowing	75-100	100-150	125
Garlic	At sowing	100-125		
Onion	At sowing	125-150		
Potato	At planting	300-375		
Ginger/turmeric	At planting	100-150		
Chilly	At planting	75-100		
Tomato	At planting	100-125		
Other vegetables	At planting	75-100		
Grape	At sowing	200-250		
	At flowering	200-250		

(Source : *PAU, 2020; **Vyavasaaya Panchangam. 2018-19)

water holding capacity of the soil.

iii) Helps in the quality improvement in all pulse, oilseed and other crops.

iv) Increases the sugar content in sugarcane, oil per cent in oilseed crops due to the presence of amino acids on account of S.

v) Higher calcium helps for the good quality of vegetable crops and drought tolerance in dry land crops.

vi) Acts as soil reclaiming agent under salt affected soils.

vii) Helps in root nodulation on the roots of leguminous crops.

viii) Increases resistance power of the plants against the attack of pests and diseases.

ix) Helps in increasing protein content in pulses.

x) Helps to improve soil physical as well as chemical properties thereby improving soil structure, porosity, and hydraulic conductivity.

xi) Due to presence of calcium and sulphur keeps the soil in good shape by maintaining structure and providing a balance of nutrients.

xii) The most cost-effective forms of phosphate and also supplies S and Ca.

xiii) A low-cost source of P and S in a wide range of pastures.

xiv) Can be mixed with ammonium sulphate and muriate of potash and also can be blended with other fertilizers except urea.

xv) Can be stored easily for long periods, without taking up moisture.

xvi) Reduces flower drop and increases fruit setting.

xvii) Zinc and B can be provided through fortified SSP fertilizers.

Yield and Quality Improvement

Application of the phosphorus and sulphur in the form of SSP recorded maximum seed yield in green gram compared to other sulphur sources such as gypsum and magnesium sulphate (Bera and Gosh, 2015; Banik

and Gupta, 2012). Bandyopadhyay and Samui (2000) found that gypsum and SSP sources performed better and recorded significantly higher yield and yield attributing characters of groundnut over pyrites. Use of sulphur at 40 kg ha^{-1} either through gypsum or SSP recorded higher seed yield & oil and protein contents of soybean (Gokhale et al., 2005). Wadile et al. (2005) observed significantly higher sesame seed yield where sulphur was applied through SSP over the other sources of S. Application of P as SSP fertilizer and humic acid significantly improved wheat growth, yields, P uptake and post-harvest soil extractable and water-soluble P contents in calcareous soils. (Izhar Shafi et al., 2020). Application of 40 kg S ha^{-1} resulted in significant increase in yield, nodulation, growth and physiological characters of soybean in SSP over gypsum and pyrite (Chourasia et al., 2009). Direct effect of sulphur through SSP on hybrid sunflower resulted in significant increase of 34 per cent in seed yield and 44 per cent in oil yield (Babu and Hegde, 2002). Duhoon et al. (2005) reported that application of 15 kg S ha-1 through gypsum or SSP gave remarkably higher seed and oil yields of sesame with higher benefit cost ratio on Vertisol of Amerli and Jalgaon. In phosphorus deficient soil, application of SSP showed higher plant height, number of tillers, 1000-grain weight, grain yield and net income of wheat compared to other sources of P fertilizers (Ali et al.2015).

Key Drivers of SSP

Rise in the crop production demand and nutritional security is expected to drive the Indian fertilizer industry in the next few years for a better nutrition solution. Moreover, implementation of awareness programmes of the government and private organizations in India is anticipated to create lucrative opportunities for farmers in terms of utilization of fertilizers in large amounts to improve the yields of commercial and horticultural crops. SSP is a good source of primary nutrient phosphorus in addition to S and Ca. The nutrients, in turn, maintain health of soils and improve quality of the produce in addition to yields. SSP is lower in price than other fertilizers. This makes it one of the most preferred fertilizers among small and marginal farmers. Due to its lower cost, SSP is expected to witness rise in the demand in the following years. SSP, being called as poor man's fertilizer (price-wise), is a very good option to use as it also helps in correcting S deficiency. Use of SSP also reduces the burden on exchequer by reducing outflow of subsidy to the import of DAP.

SSP is extremely essential for oilseeds & pulses due to presence of S. Government of India is putting lot of efforts to increase production of oilseeds/pulses to avoid imports of these two commodities which may continue for another 20-30 years. Therefore, significance of SSP becomes more specific as S comes almost free of cost through this fertilizer.

Rise in the development of manufacturing processes for production of highly advanced SSP grades is likely to augment its demand in the near future. To capitalize this transformation in agriculture, more research is being made to increase market share of SSP and fit as best fertilizer among the farmers in performance and economics. SSP can play stellar role in growth of Indian agriculture due to its inherent advantages and its low cost. This, in turn, is likely to drive the SSP market in the future.

Conclusion

To meet the growing demand for agricultural products, it is necessary to increase productivity of available land through proper planning and optimum utilization of resources such as fertilizers, seeds, water, etc. Balanced fertilizer use is essential for raising agricultural productivity. Though, there has been substantial increase in production and consumption of fertilizers over the years, nutrient response ratio is not so encouraging in our country mainly due to imbalanced use of fertilizers and lack of use of micro- and secondary-nutrients.

The increase in food production cannot be achieved without sustaining the soil health. There is a need to educate and guide the farmers in intensive soil fertility management such as adoption of fertilizer recommendations as per soil health cards, application of organic manures to the maximum extent possible, application of secondary-and micro-nutrients. SSP provides P, S and Ca. Micronutrients such as Zn and B can be provided through fortified SSP grades. The deficiency of micronutrients can hamper some of the critical plant functions. The net result is low yield, reduced growth, and other plant abnormalities. Micronutrient fertilizers also improve the nutritional content of horticultural crops. Based on nutrient deficiency in soils, there is a substantial scope to increase the consumption of micronutrient, Zn and B based fortified fertilizers in India.

The SSP industry needs to put more efforts for promoting their different SSP products & their agronomics advantages among the farmers especially for various crops & soils conditions on standalone basis. More emphasis should be on promotional and educational programmes and field demonstrations showing the importance of the SSP as core phosphatic fertilizer. The industry should also have a team of agricultural graduates to carry out such programmes. The Fertilizer Ministry along with its associated regulatory bodies also needs to continue their efforts to ensure that all players in SSP industry should supply FCO norms compliant Quality SSP products

to the farmers to increase their confidence level that they are getting their value for money by purchasing SSP fertilizers. Once the farmers are satisfied with the results of the quality product, there will be increase in its demand which can help SSP industry in increasing it very low (less than 50%) capacity utilisation of its plant & will make them more economical viable industry while assuring FCO norms complaint quality products to the farmers at comparatively cheaper price than other fertilizers.

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रामबाण

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at

India Habitat Centre, New Delhi

Thursday, December 2, 2021

SESSION I : CHALLENGES OF INDIAN FERTILIZER SECTOR

- World Supply-demand of Fertilizers & Fertilizer Raw Materials
- International Price Trends of Fertilizers and Fertilizer Raw Materials
- Challenges and Way Forward for Urea Industry
- Challenges and Remedies for P&K Fertilizer Industry

SESSION II : MEETING CHALLENGES IN AGRICULTURE

- Water Management: Issues and Strategies
- Innovations in Nutrient Management
- Climate Smart Agriculture
- Developments in Fertiliser (Control) Order

Friday, December 3, 2021

SESSION III : SUSTAINABLE FERTILIZER PRODUCTION

- Fertilizer Production through Low Carbon Options
- Energy Efficiency Measures Implemented in an Ammonia-Urea Complex
- Technologies for Improving Efficiency of Urea Plants
- Improving Productivity of Acid and Complex Fertilizer Production

SESSION IV : STRATEGIES FOR FERTILIZER MARKETING

- Effective Logistics Strategy
- DBT/iFMS- Issues and Suggested Measures
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Fertilizer Scene

Production of fertilizer nutrients registered mixed growth during July 2021 over July 2020. Production of N at 1.215 million metric tonnes (million MT) during July 2021 declined by 0.3% over July 2020. However, production of P_2O_5 at 0.434 million MT registered an increase of 4.5% during the same period. Among the major fertilizers, production of urea, DAP and SSP fell by 1.1%, 8.6% and 5.7%, respectively, during July 2021 over July 2020. However, production of NP/NPKs rose by 16.5% during the period. Most of the NP/NPK complex fertilizer grades showed increase in production except 20-20-0-13 (APS), 20-20-0 (ANP) and 28-28-0. Capacity utilization of N showed a decline from 102.1% during July 2020 to 101.8% during July 2021. In case of P_2O_5, it increased from 70.8% to 73.2% during the same period.

Production of N and P_2O_5 fell short from respective targets by 107.3 and 53.1 thousand tonnes, respectively, during July 2021.

As compared to the previous month, *i.e.*, June 2021, production of N increased by 4.9% during July 2021, whereas, production of P_2O_5 fell by 1% during the period.

Production of total fertilizer nutrients (N+P_2O_5) at 5.854 million MT during April-July 2021 declined by 1.8% over the corresponding period in the previous year. Production of N at 4.369 million MT registered decline of 2.9% during April-July 2021 over April-July 2020. However, production of P_2O_5 at 1.485 million MT witnessed an increase of 1.6% during the same period. Among the major fertilizers, production of urea and DAP declined by 3.9% and 12.3%, respectively, during April-July 2021 over April-July 2020. However, production of NP/NPK complex fertilizers and SSP recorded increase of 12.7% and 2.1%, respectively, during the period. Most of the NP/NPK complex fertilizer grades showed increase in production except 20-20-0 (ANP), 28-28-0 and 15-15-15 which showed negative growth during April-July 2021 over April-July 2020. Capacity utilization of N reduced from 94.2% during April-July 2020 to 91.5% during April-July 2021. However, capacity utilization of P_2O_5 increased from 62.3% to 62.7% during the same period.

Production of N and P_2O_5 fell short from respective targets by 456 thousand tonnes and 339.8 thousand tonnes, respectively, during April-July 2021. T**able** given below shows production of N and P_2O_5 during July and April-July 2021 compared to the corresponding period in the previous year.

All India Production Target, Production and Capacity Utilization of N and P_2O_5 July and April/July 2021 & 2020

Item	June 2021[P]	July 2021[P]	July 2020	± % variation in July 2021 over July 2020	Cumulative (April/July)		± % variation in April/July 2021 over April/July 2020
					2021[P]	2020	
	('000 tonnes)				('000 tonnes)		
I. NITROGEN (N)							
A. Target of Production	**1239.0**	**1322.7**	**1255.4**	**5.4**	**4824.9**	**4610.1**	**4.7**
B. Production	**1158.4**	**1215.4**	**1218.6**	**-0.3**	**4368.9**	**4497.6**	**-2.9**
a) Straight fertilizers	973.8	1003.3	1019.2	-1.6	3678.4	3829.5	-3.9
b) Complex fertilizers*	184.6	212.1	199.4	6.4	690.5	668.2	3.3
C. Capacity Utilization (%)	**97.0**	**101.8**	**102.1**		**91.5**	**94.2**	
II. PHOSPHATE (P_2O_5)							
A. Target of Production	**463.1**	**486.8**	**447.9**	**8.7**	**1824.9**	**1609.9**	**13.4**
B. Production	**438.1**	**433.7**	**415.1**	**4.5**	**1485.1**	**1461.5**	**1.6**
a) Straight fertilizer(through SSP)	86.4	70.4	74.7	-5.8	274.3	268.6	2.1
b) Complex fertilizers*	351.7	363.2	340.4	6.7	1210.8	1193.0	1.5
C. Capacity Utilization (%)	**74.0**	**73.2**	**70.8**		**62.7**	**62.3**	

P = Provisional. Note: Totals may not exactly tally due to rounding of figures. * = DAP+ NP/NPKs

ANNUAL REVIEW OF FERTILIZER PRODUCTION AND CONSUMPTION 2020-21 HIGHLIGHTS

Mixed growth in production

- ***Fertilizer nutrients:*** Production in 2020-21: N: 13.75 million MT (+0.2%), P_2O_5: 4.74 million MT (-1.1%), N+P_2O_5: 18.48 million MT (-0.2%).
- ***Fertilizer products:*** Production in 2020-21: Urea: 24.60 million MT (+0.6%); DAP: 3.77 million MT (-17.1%); SSP: 4.92 million MT (+15.8%); NP/NPKs: 9.33 million MT (+7.6%).

High imports

- ***Imports of fertilizer products in 2020-21:*** Total products: 20.53 million MT (+10.7%)
- Urea: 9.83 million MT (+7.7%); DAP: 4.88 million MT (+0.2%); NP/NPKs: 1.39 million MT (+86.3%); MOP: 4.23 million MT (+15.2%).

Retail prices of fertilizers

- Basic retail price (MRP) of urea remained unchanged at Rs.5360/- per tonne (Rs.268 per bag of 50 kg). Size of bag rationalized from 50 kg to 45 kg. Price per bag of urea of 45 kg fixed at Rs. 242/- w.e.f. 1st March 2018. 5% extra for coating of urea with *neem* oil.
- MRP of P & K fertilizers is market driven under NBS policy.

Robust growth in fertilizer consumption

- ***Consumption of nutrients in 2020-21:*** N: 20.40 million MT (+6.8%); P_2O_5: 8.98 million MT (+17.2%); K_2O: 3.15 million MT (+21.0%); Total (N+P_2O_5+K_2O): 32.54 million MT (+10.8%).
- ***Consumption of fertilizer products in 2020-21:*** Urea: 35.04 million MT (+4.5%); DAP: 11.91 million MT (+18.1%); MOP: 3.42 million MT (+19.5%); NP/NPK complex fertilizers: 11.81 million MT (22.4%); SSP: 4.49 million MT (20.3%); Total products: 67.61 million MT (+11.6%).

NPK use ratio improved

- All-India NPK use ratio improved from 7.3:2.9:1 during 2019-20 to 6.5:2.8:1 during 2020-21.

Per hectare use increased

- Per hectare use of total fertilizer nutrients (N+P_2O_5+K_2O) increased from 145.6 kg in 2019-20 to 161.3 kg in 2020-21.

92% consumption in 13 states

- Uttar Pradesh had the largest share (17.3%), followed by Maharashtra (10.5%), Madhya Pradesh (8.9%), Karnataka (6.8%), Andhra Pradesh (6.2%), Gujarat (6.0%), Punjab and Bihar (5.9% each), Telangana (5.6%), Rajasthan (5.5%), West Bengal (5.3%), Haryana (4.5%) and Tamil Nadu (3.4%).

Above normal monsoon at the country level

- Rainfall was 109% of the LPA during Southwest monsoon 2020.
- Out of 36 meteorological sub-divisions, 31 received excess/ normal rainfall and remaining 5 sub-divisions received deficient rainfall.

Production of major crops up

- ***Production of major crops in 2020-21:*** Food grains: 308.7 million MT (+3.7%); oilseeds 36.1 million MT (+8.7%), sugarcane 399.3 million MT (+7.8%); cotton 35.4 million bales (-1.9%) and jute & mesta 9.6 million bales (-3.2%).

Fertilizer Policies

- ***Payment situation***
  - The year 2020-21 started with unpaid subsidy dues of previous years of about Rs. 48,000 crores.
  - Department of Fertilizers (DoF) consistently released higher funds for fertilizer subsidy in spite of quarterly restriction of 20% imposed by the Finance Ministry due to COVID situation. This facilitated clearance of past dues and timely payment of current bills right from the beginning of the year 2020-21.
  - Additional allocation of Rs. 65,000 crore for 2020-21 helped clearing most of the long pending dues of the industry.
- ***Urea***
  - Implementation of modified NPS-III policy, as amended on 30th March, 2020 and payment of increased fixed cost for production upto reassessed capacity were made. Such payments for urea production beyond RAC remained to be made.
  - Approval of minimum fixed cost remained under consideration of the Government.
  - Energy norms of 2018 under NUP 2015 for remaining 14 gas based urea units implemented w.e.f. 1st October, 2020.
- ***P & K fertilizers***
  - NBS rates for N, P, K and S reduced during 2020-21 compared to 2019-20. A new grade of fertilizer 14-28-0-0 was included in the notification of NBS scheme for 2020-21.
  - Issue of equitable treatment of taxes like GST in cost and realization in determination of reasonableness of profit/ MRP remained under consideration of the Government.
- ***Taxation***
  - Customs duty on raw materials and intermediate products continued to impact competitiveness of domestic manufacturing of P&K fertilizers compared to imports. Rate of subsidy on domestic and imported P&K fertilizers is same.
  - The issue of delay in refund of accumulated input tax credit arising from inverted GST structure on inputs, non-refund of ITC on account of input services and IGST on ocean freight on imported on CIF basis remain to be addressed. ■

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FERTILIZER PRODUCTION AND CONSUMPTION 2020-21

EXECUTIVE SUMMARY

Timely arrival of Southwest monsoon and overall good rainfall facilitated higher coverage under *kharif* and *rabi* crops during 2020-21. The high growth in fertilizer consumption was mainly due to exceedingly good monsoon, comfortable availability of water in the reservoirs, increase in area under cultivation and adequate availability of fertilizers from opening inventory, indigenous production and imports. It resulted in higher agricultural production during the year.

SOUTHWEST MONSOON

Southwest monsoon 2020 arrived in Kerala on time, i.e., 1st June, 2020. Overall rainfall from 1st June to 30th September, 2020 was 109% of long period average (LPA). Out of 36 meteorological sub-divisions, 31 sub-divisions received normal to excess rains and remaining 5 sub-divisions received deficient rains during the period.

Water storage position in major reservoirs was comfortable in 2020. Live storage in 123 reservoirs at the end of *kharif* 2020 was 148.25 BCM as against 151.07 BCM during the corresponding period in the previous year. This was 98% of the last year and 114% of the normal storage.

FERTILIZER CONSUMPTION

Fertilizer consumption recorded a robust growth in 2020-21. Total estimated nutrient consumption ($N+P_2O_5+K_2O$) was 32.54 million metric tonnes (million MT) as against 29.37 million MT in the previous year recording a growth of 10.8%. The consumption of N, P_2O_5 and K_2O at 20.40 million MT, 8.98 million MT and 3.15 million MT during 2020-21 represented growth of 6.8%, 17.2% and 21%, respectively, over 2019-20.

In terms of products, consumption of urea at 35.04 million MT, DAP at 11.91 million MT, MOP at 3.42 million MT, NP/NPK complex fertilizers at 11.81 million MT and SSP at 4.49 million MT during 2020-21 recorded increase of 4.5%, 18.1%, 19.5%, 22.4% and 20.3%, respectively, over 2019-20. Total consumption of fertilizer products increased from 60.60 million MT during 2019-20 to 67.61 million MT in 2020-21 representing increase of 11.6%.

All-India NPK use ratio improved from 7.3:2.9:1 during 2019-20 to 6.5:2.8:1 during 2020-21.

Per hectare use of total nutrients ($N+P_2O_5+K_2O$) increased from 145.6 kg in 2019-20 to 161.3 kg in 2020-21.

FERTILIZER INVENTORY

Adequate inventory at the beginning of the year facilitated positioning of fertilizers for sowing operations before the onset of cropping season. Inventory of urea at various points excluding stock at the dealers' point was more than 1.4 million MT at the beginning of the year. Similarly, inventory of DAP and NP/NPKs together was about 2.5 million MT, SSP 0.66 million MT and MOP 0.48 million MT.

PRODUCTION OF FERTILIZERS

Fertilizer production at 18.483 million MT ($N+P_2O_5$) during 2020-21 witnessed a marginal decline of 0.2% over 2019-20. While production of nitrogen (N) increased marginally by 0.2% to 13.745 million MT, phosphate (P_2O_5) declined by 1.1% to 4.737million MT in 2020-21.

In terms of products, production of urea at 24.603 million MT, NP/NPK complex fertilizers at 9.325 million MT and SSP at 4.916 million MT during 2020-21 marked increase of 0.6%, 7.6% and 15.8%, respectively, over 2019-20. However, production of DAP at 3.774 million MT witnessed a sharp decline of 17.1% during 2020-21.

GAS AVAILABILITY

Supply of domestic gas to fertilizer plants has dwindled gradually over the years. This has made

fertilizer plants more and more dependent on imported LNG. Supply of domestic gas declined further from 12.8 MMSCMD in 2019-20 to 10.2 MMSCMD in 2020-21. Thus domestic gas constituted only 23.7% of total gas consumed during the year.

IMPORT OF FERTILIZERS

Import of urea at 9.83 million MT, DAP at 4.88 million MT, MOP at 4.23 million MT and NP/NPK complex fertilizers at 1.39 million MT during 2020-21 recorded increase of 7.7%, 0.2%, 15.2% and 86.3%, respectively, over 2019-20.

RETAIL PRICES OF FERTILIZERS

The basic retail price of urea remained unchanged at Rs.5360 per tonne since November 2012. *W.e.f.* 25th May, 2015, Government of India (GoI) made it mandatory for all indigenous urea manufacturers to produce 100% *neem* coated urea of their total urea production. The same policy is applied for imported urea at the port. GoI allowed the manufacturers / importers to charge 5% extra on the MRP of urea. Therefore, the retail price of *neem* coated urea (excluding tax) works out to Rs. 5628 per tonne.

Government has made it mandatory to resize urea bag from 50 kg to 45 kg. Department of Agriculture, Cooperation and Farmers Welfare notified price per bag of urea of 45 kg at Rs. 242/- *w.e.f.* 1st March 2018 from Rs. 268/- per bag of 50 kg earlier.

The retail prices of P & K fertilizers covered under NBS scheme are market driven and announced by the fertilizer companies from time to time.

PRODUCTION OF MAJOR CROPS

Total production of food grains increased from 297.50 million MT in 2019-20 to 308.65 million MT in 2020-21 representing an increase of 3.7%. Among food grain crops, production of rice increased by 2.9%, wheat by 1.5%, coarse cereals by 7.1% and pulses by 11.7% during 2020-21 over 2019-20. Similarly, production of oilseeds increased by 8.7% and sugarcane by 7.8% during the period. However, production of cotton and jute & mesta showed decline of 1.9% and 3.2%, respectively, during the period.

POLICY AND PAYMENT ISSUES

The need for additional budget allocation for 2020-21 in view of inadequacy of BE at Rs.71,309 crore only and the past dues of about Rs.48,000 crore engaged the attention of DoF, Finance Ministry and the PMO. DoF also recommended for additional allocation of funds for fertilizer subsidy. Accordingly, the Finance Minister announced additional allocation of Rs.65,000 crore for fertilizer subsidy as part of packages for Atmanirbhar Bharat. With additional allocation of Rs.65,000 crore, RE for 2020-21 became Rs.1,33,947.30 crore. This provided a great relief to the industry from perpetual liquidity problem, as most of the long pending dues were cleared by the government.

Government implemented the Modified NPS-III policy, as amended on 30th March, 2020, and payment of increased fixed cost for production upto reassessed capacity were made. Such payment for urea production beyond RAC remained to be made. Approval of minimum fixed cost remained under consideration of the Government. Government has implemented energy norms of 2018 under NUP 2015 for remaining 14 gas based urea units w.e.f. 1st October, 2020.

NBS rates for N, P, K and S reduced for 2020-21 compared to 2019-20. The NBS rates for N, P, K and S had been fixed at Rs.18.789, Rs.14.888, Rs.10.116 and Rs.2.374 per kg for 2020-21 *w.e.f* 1st April, 2020. A new grade of fertilizer 14-28-0-0 was included in the notification of NBS scheme for 2020-21.

Issue of equitable treatment of taxes like GST in cost and realization in determination of reasonableness of profit/ MRP remained under consideration of the Government. Customs duty on raw materials and intermediate products continued to impact competitiveness of domestic manufacturing of P&K fertilizers. Rate of subsidy on imported and domestic P&K fertilizers is same. The issue of delay in refund of accumulated input tax credit arising from inverted GST structure on inputs, non-refund of ITC on account of input services and IGST on ocean freight on imports on CIF basis remain to be addressed.■

OUTLOOK FOR 2021-22

POLICY AND PAYMENT ISSUES

Budget allocation for 2021-22 is Rs. 79,529.68 crore comprising Rs. 58,767.68 crore for urea and Rs. 20,762.00 crore for P&K fertilizers. Allocation for P&K fertilizers as per BE for 2021-22 has been reduced compared to BE of Rs. 23,504.00 crore in 2020-21.

In view of continuing increase in international prices of fertilizers and raw materials for P&K fertilizers and increase in prices of imported LNG for urea, the subsidy requirement for 2021-22 will increase compared to allocation.

On 9th April, 2021, DoF extended NBS rates for N, P, K and S of 2020-21 for 2021-22 till further order. In the meantime, there has been significant increase in international prices of finished fertilizers, raw materials and the intermediates used for manufacture of P & K fertilizers compared to the prices in 2020-21. In view of this, DoF, revised the NBS rates of P from Rs.14.888 per kg to Rs. 45.323 per kg w.e.f. 20th May, 2021. Increase in subsidy rates of P is applicable only upto 31st October, 2021. However, NBS rates per kg for N, K and S remained unchanged at the previous year's level.

Accordingly, NBS rate per tonne of DAP and SSP increased from Rs. 10231 and Rs.2643 for 2020-21 to Rs. 24231 and Rs. 7513 per tonne for 2021-22, respectively. NBS rates for NP/NPK grades of fertilizers are now in the range of Rs. 11134 per tonne to Rs. 19910 per tonne. However, NBS rates for MOP and ammonium sulphate remained unchanged at Rs. 6070 and Rs. 4398 per tonne, respectively for 2021-22. In addition, two new NPK complex fertilizers (8-21-21 and 9-24-24) have been included in the NBS policy.

Government has announced additional allocation of Rs. 14,775 crore to cover the increase in subsidy on P&K fertilizers due to increase in rate of subsidy notified on 20th May, 2021 which is applicable upto 31st October, 2021.

SOUTH-WEST MONSOON

The Southwest monsoon made onset over Kerala coast on 3rd June 2021 with a delay of two days. Actual rainfall during June 2021 was 10% above LPA but in July it was 7% below LPA. IMD predicted normal (94 to 106% of LPA) rainfall during August 2021. Overall rainfall performance from 1st June to 31st July, 2021 was 1% below LPA. Actual rainfall was 449 mm as against normal rains of 452.2 mm. Out of 36 meteorological sub-divisions, 29 sub-divisions received normal to excess rains and remaining 7 sub-divisions received deficient rains during the period. Out of 694 reported districts, 72% districts received normal to excess rains during the period.

Total live storage in 130 reservoirs was 85.36 BCM as on 29th July, 2021 as against 70.77 BCM on the same date in the previous year. Current year's storage is 121% of the last year storage.

CROP SITUATION

As the progress of monsoon got stalled over most parts of India after a timely start, there has been decline in sown area of major *kharif* crops. As per the available information, total area sown under all *kharif* crops was 84.82 million hectares (million ha) as on 30th July, 2021 as compared to 89.00 million ha during the corresponding period in the previous year. This was 4.7% lower than the corresponding period in the previous year.

FERTILIZER SALE

Delayed monsoon and decline in sown area affected fertilizer demand during April/July 2021 over April/July 2020. Sale of urea at 10.19 million MT, DAP at 2.72 million MT, NP/NPKs at 3.69 million MT and MOP (for direct application) at 0.91 million MT during April/July 2021 witnessed decline of 11.4%, 26.6%, 4.6% and 7.9%, respectively, over April/July 2020. However, sale of SSP at 1.90 million MT registered an increase of 5.8% during the period.

PROSPECTS OF FERTILIZER CONSUMPTION

Overall Southwest monsoon (June-September) 2021 is anticipated to be normal. This is likely to increase cropped area during the remaining period of *kharif* 2021. Normal Southwest monsoon is likely to leave good moisture contents in the soil for ensuing *rabi* crop season. Water availability in the reservoirs at the end of *kharif* season is also likely to be comfortable. Continuing increase in international prices of fertilizers and raw materials remains the challenge for timely availability of fertilizers. The total consumption of fertilizers during 2021-22 is likely to remain at the level of 2020-21. ■

Annual Review of Fertilizer Production and Consumption 2020-21

1.0 POLICIES RELATED TO FERTILIZER SECTOR

1.1 Issues of Urea Industry

1.1.1 Minimum Fixed Cost

Fixed cost, which was supposed to be revised every three years under the policy, remained unrevised under new pricing scheme (NPS) and continued to be reimbursed at the level of costed year 2002-03. This badly impacted the viability of domestic urea manufacturing units. After years of deliberations and consultations at various levels including Committee of Secretaries, Group of Ministers and Cabinet Committee on Economic Affairs, the Modified NPS-III (MNPS-III) Policy was notified on 2nd April, 2014. This policy made three important provisions to at least partially compensate for the increase in fixed cost elements over the level of 2002-03. These included increase in fixed cost of Rs.350/MT, special allowance of Rs.150/MT to plants more than 30 year old and minimum fixed cost of Rs.2300/MT of urea. These provisions were made based on cost data upto 2008-09. These were grossly inadequate in comparison to actual increase in fixed costs but were expected to provide some relief. But, this policy was not implemented for 6 years after notification. It was finally reviewed and approved for implementation on 30th March, 2020. However, the clause pertaining to minimum fixed cost was removed from the original Modified NPS-III Policy as notified on 2nd April, 2014.

The issue of minimum fixed cost is impacting production from three major urea units which are receiving a very low historical fixed cost. It is also impacting production beyond reassessed capacity (RAC) of all urea units. This is because reimbursement of production beyond RAC is based on the minimum fixed cost of all operating urea units under NUP 2015. On representation of FAI and industry, government is considering the issue. Necessary inputs and cost data have been submitted by the industry to the DoF.

1.1.2 Energy Consumption Norms

Revision in energy consumption norms should be based on scientific studies assessing the potential of further reduction and the cost involved in realizing the potential in energy efficiency. Further, the policy related to energy norms must allow recovery of investment made/needed for energy improvement projects within reasonable period for such projects to be financially viable and bankable. Indian urea plants are already one of the best in the world in terms of energy efficiency. Any further reduction in energy consumption norms, beyond the levels prescribed under New Urea Policy (NUP) from June, 2015, require huge capital investment with very long payback period if investments were to be recovered only through energy savings. Energy savings realized by urea units with large investments have been mopped by 2018 norms. This has made it difficult to service the investment. Hence, the industry pleaded for extension of 2015 energy norms till policy of fixed cost reimbursement is corrected or reform in the sector is implemented. However, in spite of elaborate representations and discussion before DoF and the Niti Aayog, energy norms of 2018 were implemented for 11 gas based units from 1st April, 2018 and for remaining 14 gas based units from 1st October, 2020 with some penalty for the intervening period. This has seriously impacted the finances of urea units.

1.1.3 Incentive in Energy Consumption Norms for Coal Using Units

Urea units which use coal as fuel for steam power generation, consume more energy than units using gas as fuel. But, these units have lower cost of production due to much cheaper coal energy. Therefore, government was requested to allow these units somewhat higher energy norms. This has been a part of deliberations on energy norms with DoF and Niti Aayog. Industry has submitted relevant data and also made presentation before the DoF and Niti Aayog. The issue is under consideration of the DoF.

1.1.4 Increase in Fixed Cost beyond 2008-09

Urea units have been suffering from under-recovery of fixed cost after implementation of New Pricing Scheme in 2003. Fixed cost data was not updated over the cost levels of 2002-03 which was allowed under the New Pricing Scheme (NPS). After long deliberations for several years, a nominal increase in fixed cost was allowed under Modified NPS-III policy notified in April, 2014 to partly cover increase in selected four elements of fixed cost up to the year 2008-09 over 2002-03. These four elements included salaries & wages, contract labour, repair & maintenance and selling expenses. Actual increase in these cost elements as per data available with DoF/FICC was much higher, but only Rs.350 per MT was approved in the policy. This increase too was paid only recently with a delay of almost 6 years after notification.

But, increase in fixed cost elements, other than the 4 selected elements, over 2002-03 and also further increase in these 4 elements over 2008-09 remain to be updated. To keep the plant running safely, continuous capital investments are made which reflect in capital related charges (CRC) which is a part of

fixed cost. The fixed cost data have been collected by the DoF a number of times, which have shown significant increase in fixed cost of all urea units over what is being reimbursed. As such, the industry continues to suffer from significant under-recovery of fixed cost.

To avoid detail pricing exercise by the DoF which takes long time and is generally delayed, as has been the experience of past several years, there is a need for linking reimbursement of fixed cost with suitable price index for providing further increase at least for the period beyond 2008-09. This will increase ease of doing business for the industry and ease of administration of pricing policy for the government.

1.1.5 Poor Profitability of Urea Sector due to Under-recovery of Costs and Delayed Payments

Viability of urea industry has been badly impacted due to under-recoveries of costs under urea pricing and freight policies. Repeated mopping up of energy efficiency by the government has also impacted the viability of the industry. More than 50% of the operating urea units are suffering losses and the urea industry as a whole is having negative return or very thin margins even after implementation of the provisions of Modified NPS III policy as given in the following **Table**.

Profitability of urea manufacturing industry in India

Year	Profit After Tax (PAT) as % of Networth (Equity+Free Reserves)
2014-15	(-) 1.85%
2015-16	1.49%
2016-17	1.63%
2017-18	(-) 0.41%
2018-19	(-) 1.86%
2019-20	(-) 3.06%

Based on data provided by 25 urea units.

As can be seen from the above table, profit after tax as percentage of networth for the urea industry has been negative in the past 4 out of 6 years. This is against the benchmark of 12% post tax return allowed under the original urea pricing and subsidy policy. Such a situation is not sustainable. This is needless to say that a number of urea units have large negative return in spite of being efficient and facing existential crisis. Revision in fixed cost and timely payment of subsidy will go a long way in making urea units viable and sustaining production.

1.1.6 GST on Natural Gas

Government is contemplating bringing natural gas under GST regime. This is likely to reduce substantially the total incidence of tax on natural gas and consequently reduce the cost of production of urea. This would also result in substantial saving of subsidy to the government. But, this will also result in large amounts of unutilized accumulated input tax credit (ITC) for the industry. This is due to higher amount of tax on full value of natural gas against 5% GST on subsidized value of urea. MRP represents only 25% of the cost of urea which is liable to GST. The cost of natural gas represents more than 70% of the cost of urea. Hence, unutilized ITC is likely even if GST @ 5% is levied on natural gas. In case, GST on natural gas is fixed at higher rates of 12% or 18%, the blockage of funds will be much higher.

There is a need to assess current incidence of taxes like excise and VAT on natural gas supplied from various imported and domestic sources and assess the likely impact under GST regime. Currently, total cost of natural gas including taxes and duties are reimbursed under urea policy, which may get impacted after bringing natural gas under GST. Hence, there will be need to review the urea policy, if natural gas is brought under GST. Government needs to be sensitized on the issue.

1.1.7 Urea Production beyond Re-assessed Capacity (RAC)

With setting up of all new urea plants currently under construction, a situation may arise where production over Re-assessed Capacity (RAC) may not be encouraged by the government. There is a need for drawing strategy to deal with such situations. Available options are that government allows urea units to sell part of production beyond RAC to P&K manufacturers or other industries or even export to neighboring countries. Options of disposing urea production beyond RAC for non-agricultural purposes will have tax implications like higher rate of GST of up to 18% and higher rate of customs duty on import of LNG for such urea production. The issue needs further deliberations for appropriate policy options.

1.2 Policies Related to P&K Fertilizers

1.2.1 NBS Policy for 2020-21

Department of Fertilizers vide O.M. dated 3rd April, 2020 notified NBS rates of Rs.18.789, Rs.14.888, Rs.10.116 and Rs. 2.374 per kg for N, P, K and S, respectively. The subsidy rates were lower for all nutrients for 2020-21 than the subsidy rates applicable for the previous year i.e., 2019-20. Subsidy rates for 2019-20 were Rs.18.901 per kg, Rs.15.216 per kg, Rs.11.124 per kg and Rs.3.562 per kg for N, P K and S respectively. A new grade of fertilizer 14-28-0-0 was also included in the notification of NBS scheme for 2020-21.

1.2.2 NBS Policy for 2021-22

The Department of Fertilizers extended the per unit subsidy rates of 2020-21 for 2021-22 vide O.M. dated 9th April, 2021 till further order. In the meantime, the

international prices of raw materials, intermediates for P&K fertilizers and also finished fertilizers witnessed sharp increase in comparison to the levels prevailing in 2020-21. In view of this, Department of Fertilizers, vide O.M. dated 20th May, 2021 notified revised subsidy rate of P from Rs. 14.888 to Rs.45.323 per kg nutrient. Revised rate was made effective from 20th May to 31st October, 2021. This was an increase of more than 200%. However, NBS rates per kg for N, K and S remained unchanged at the previous year's level. NBS rate per MT of DAP and SSP increased from Rs. 10,231 and Rs. 2,643 for 2020-21 to Rs. 24,231 and Rs. 7,513, respectively, for 2021-22. NBS rates for NP/NPK grades of fertilizers also increased and ranged between Rs. 11,134 per MT to Rs. 19,910 per MT, respectively. NBS rates for MOP and ammonium sulphate remained unchanged at previous year's level of Rs. 6,070 and Rs. 4,398 per MT, respectively, for 2021-22.

Rate of subsidy on phosphates was revised in May 2021 to insulate Indian farmers from skyrocketing prices of phosphatic fertilizers in the international market. But, international prices of raw materials and finished fertilizers continued to rise. Moreover, availability in the global market also became tight for fertilizers as well as raw materials. Increase in subsidy for P is applicable only upto October, 2021. Therefore, it has become more challenging for the industry to ensure adequate availability of P & K fertilizers at reasonable cost to the Indian farmers for the ensuing *Rabi* crop season.

1.2.3 Issues of Reasonableness of MRP of P&K Fertilizers

The issue of reasonableness of MRP of P&K fertilizers continued to bother the industry. This is due to inclusion of taxes like VAT/GST in value of realization from MRP by the companies in the formulae for reasonableness, but not allowing the same as cost. The formula for reasonableness needs revision for equitable treatment of taxes. The Committee on reasonableness had formulated the guidelines providing equitable treatment of these taxes in realization as well as cost. The matter is currently under consideration of the DoF.

1.3 Other Policy Related Issues

1.3.1 Budget Allocation and Payment Situation

1.3.1.1 FAI Pre-Budget Memorandum & Taxation Issues

As every year, FAI submitted pre-budget memorandum for Union Budget 2021-22. The memorandum *inter-alia* included suggestions on direct and indirect taxes and duties related to fertilizers and raw materials and emphasized need for additional allocation of funds for 2020-21 and adequate allocation for the year 2021-22.

1.3.1.2 Release of Budget Overriding COVID Related Quarterly Restrictions

In view of large amount of unpaid subsidy dues of 2019-20 of about Rs.48,000 crore and inadequate budget allocation of Rs. 71,309 crore for 2020-21, there was legitimate demand from the industry for removal of monthly/quarterly restrictions in release of allocated budget to facilitate payment of past dues and the current bills. The Government allocated Rs. 22,018 crore for April 2020 itself which was 31% of annual budget (BE of Rs. 71,309 crore). This was allowed by overriding quarterly restriction of (20%) on release of funds imposed by the Finance Ministry in view of COVID-19 pandemic. Monthly allocation for subsequent months were also comparatively higher, as a result of which cumulative release of funds remained consistently higher than the permitted limits of quarterly restrictions.

1.3.1.3 Additional Allocation for 2020-21 under Atmanirbhar Bharat

The need for additional budget allocation for 2020-21 was realized in view of inadequacy of BE at Rs.71,309 crore only and the past dues of about Rs.48,000 crore. This issue engaged the attention of DoF, Finance Ministry and the PMO. The DoF also recommended and made efforts for additional allocation of funds for fertilizer subsidy. Accordingly, the Finance Minister announced additional allocation of Rs.65,000 crore for fertilizer subsidy as part of packages for Atmanirbhar Bharat. The Finance Ministry also started releasing funds out of this additional allocation from January 2021 under special arrangement (invoking Appendix 10 of General Financial Rules (GFR 2017), pending approval of the Revised Estimate (RE) for 2020-21 in the Parliament. With additional allocation of Rs.65,000 crore, RE for 2020-21 became Rs.1,33,947.30 crore. This provided a great relief to the industry from perpetual liquidity problem, as most of the long pending dues were cleared by the government.

However, in spite of the best efforts by all concerned, about Rs.7,000 crore out of allocated budget could not be released to the industry by 31st March, 2021 due to various COVID related problems faced by the DoF, including a number of staff members in FICC/DoF suffering from COVID. Accordingly, actual expenditure for 2020-21 was proportionately less than the RE of Rs.1,33,947.30 crore. Pending payments *inter-alia* included payment of increased fixed cost for

urea production beyond RAC and escalation claims for 2019-20 and 2020-21.

1.3.1.4 Budget Allocation 2020-21 and 2021-22

Budget Estimate, Revised estimate for 2020-21 and Budget estimate for 2021-22 are given below:

Budget provision for 2021-22 is Rs. 79, 530 crore. This comprises Rs. 58,768 crore for urea and Rs. 20,762 crore for P & K fertilizers. Although, total budget allocation for 2021-22 is higher than BE of Rs. 71,309 crore for 2020-21, the allocation for P & K fertilizers for 2021-22 has been lower than BE for 2020-21 of Rs. 23,504 crore. Total budget allocation for 2021-22 is also inadequate in comparison to estimated requirement. There has been increase in cost of gas for domestic urea and sharp increase in international prices for imported urea. In view of increase in cost of P&K fertilizers, the government vide notification dated 20th May, 2021, increased the rate of subsidy on P & K fertilizers valid till 31st October, 2021. This enhanced the subsidy requirement by an additional amount of Rs.14,775 crore on P & K fertilizers. This additional amount has been allocated for P&K fertilizers. For remaining part of the year from November 2021 to March, 2022, subsidy requirement may increase further by similar amount or even more, as the international prices of fertilizers and raw materials continued to rise.

Increase in LNG prices has resulted in sharp increase in pool price of gas for domestic urea. Pool price of gas has increased by about Rs.190/MMBTU from average of 2020-21 at Rs. 655.47/MMBTU on NCV basis to Rs. 845.22/MMBTU for May, 2021. This translates into an increase of Rs. 4400 per tonne of urea, assuming pool price remains at May 2021 levels for the rest of the year. But, the pool price of gas may rise further increasing the need for higher subsidy. Thus, the requirement of subsidy will be much higher than BE for 2021-22 both for urea and P & K fertilizers.

1.3.1.5 Payment of Subsidy during 2021-22

Payment of monthly subsidy under DBT scheme has been almost regular during the first four months of 2021-22. As per status as on 31st July, 2021, payment of DBT subsidy on urea has been made for the period upto 3rd week of July, 2021 for most companies. DBT payment for imported P & K fertilizers has been made up to 2nd week of July, 2021 and for domestic P & K fertilizers it has been paid upto 1st week of July, 2021. But, non-DBT payments still remain pending. These include payment of increased fixed cost for urea production beyond RAC and payment of freight on P & K fertilizers pending since April/May 2020 for most companies. Freight on urea has been paid up to May 2021. However, the payments are expected to be affected after allocated budget gets exhausted.

1.4 Taxation Issues

1.4.1 Customs Duty on Raw Materials and Intermediate Products

Levy of customs duty on import of raw materials and intermediate products for P & K fertilizers increases domestic cost of manufacturing vis-à-vis imports. Rate of subsidy is same for imported and domestic P & K fertilizers. Customs duty on rock phosphate and sulphur is currently 2.5%. For phosphoric acid and ammonia, it is @5%. All these raw materials are majorly imported. Industry has been pleading for the past few years for exemption from customs duty on these raw materials/intermediates. This was also part of FAI pre-Budget Memorandum for Union Budget for

Fertilizer subsidy 2020-21 and 2021-22 (Rs. Crore)

Particulars		2020-21		2021-22
		BE	RE	BE
(A)	**Urea Subsidy**	**47,805.00**	**94,957.42**	**58,767.68**
	Indigenous Urea	38,375.00	74,487.80	43,236.28
	Imported Urea	12,050.00	25,049.62	19,550.00
	DBT in Fertilizer subsidy	10.00	10.00	11.40
	Recovery	-2,630.00	-4,590.00	-4,030.00
(B)	**Nutrient Based Subsidy**	**23,504.00**	**38,989.88**	**20,762.00**
	Indigenous P&K	14,179.00	23,901.53	12,460.00
	Imported P&K	9,296.00	15,015.37	8,260.00
	City Compost	29.00	72.98	42.00
	Grand Total (A+B)	**71,309.00**	**1,33,947.30**	**79,529.68**

Source: Union Budget - 2021-22. BE=Budget Estimate, RE= Revised Estimate.

last few years. Department of Fertilizers, Ministry of Chemicals & Fertilizers has also been recommending the same to the Finance Ministry. But, no relief has come so far. The issue needs to be addressed for restoring competitiveness of domestic production vis-à-vis imports in the interest of Atma Nirbhar Bharat.

Other customs duty related issues include reduction of customs duty on micronutrients from 7.5% to 5% to bring it at par with other fertilizers and exemption from customs duty on urea and MOP when imported as raw materials for manufacture of other fertilizers.

Customs duty of 2.5% on import of liquefied natural gas (LNG) also continues to increase the cost of production of urea. The proportion of imported LNG in total consumption by domestic urea industry has been increasing and has reached more than 75% due to dwindling supply from domestic gas sources. The cost of gas represents about 70% of cost of urea production. Pool price of gas for urea sector has been increasing due to rise in share of imported LNG and also due to sharp rise in cost of imported gas. Exemption from import duty on LNG will help reducing the cost of indigenous urea production.

1.4.2 Issues Related to GST

Indian fertilizer industry continues to suffer under GST regime due to delay in refund of large amounts of accumulated input tax credit arising from inverted tax structure of GST on inputs. There are other issues like non-refund of ITC on input services, levy of IGST on ocean freight on reverse charge basis when fertilizers are imported on CIF basis. These issues have already been taken up by FAI with concerned government authorities, including Finance Ministry, GST Council and the DoF. Some industries/organizations have also taken legal recourse on issues like non-refund of ITC on services and GST on ocean freight on reverse charge basis when goods are imported on CIF basis. The government decisions on these issues depend largely on final outcome of these Court cases.

Micronutrients are part and parcel of integrated use of farm nutrients. However, micronutrients attract higher rate of GST of 12% (as against 5% on fertilizers), which discourages there use and hence affecting yield and quality of farm produce. GST on transportation of fertilizers by road transport agencies and Railways, which were exempted under erstwhile service tax regime, are also increasing delivered cost of fertilizers which are being otherwise subsidized heavily. These levies are further increasing the blockage of unutilized ITC. Fertilizer sector is already suffering from large amounts of unutilized ITC due to inverted duty structure.

1.4.3 Issues of Direct Taxes

Major direct tax issues taken up by FAI/fertilizer industry in pre-budget memorandum included the following:

(i) Extension of tax concessions/exemptions allowed to Indian companies to the co-operative sector.

(a) Reduced rate of income tax on dividend received from subsidiaries abroad.
(b) Exemption from capital gains on transfer of assets to wholly owned subsidiaries, and
(c) Abolition of surcharge on income tax.

(ii) Restoration of weighted deduction of 200% under section 35 (2AB) to promote in-house research and innovation in fertilizer sector which is badly needed to improve agricultural productivity.

(iii) Accelerated depreciation on investment in creation of infrastructure through energy saving projects in the fertilizer sector. This will be specifically very useful for Indian urea sector which has a continuous pressure for energy reduction requiring huge investment. The urea policy has not allowed enough provision for recovery of such investments. Tax incentives for such projects will provide some relief.

(iv) Extension of weighted deduction under section 35 CCC of IT Act beyond April, 2021 to incentivize Indian companies and cooperative sector to create infrastructure for farmers' education and training programmes to in turn give a boost to extension services by the fertilizer industry.

2.0 FERTILIZER PRODUCTION

2.1 General

In spite of pandemic due to COVID-19 and resultant lock down in initial months of 2020-21, fertilizer production increased by almost 2%. Production in terms of nutrients went down from 18.513 million tonnes (million MT) in 2019-20 to 18.483 million MT in 2020-21. Production of nitrogen (N) increased by 0.2% to 13.745 million MT. But production of phosphate (P_2O_5) declined by 1.13% to 4.737 million MT. In terms of products, production of urea increased from 24.455 million MT in 2019-20 to 24.603 million MT in 2020-21. However, production of DAP nosedived by 17.05% from 4.550 million MT to 3.774 million MT during the period. Production

Table 1. Zone-wise capacity, production and capacity utilization of nitrogenous and phosphatic plants in 2019-20 and 2020-21 (April-March)

(Capacity and production in '000 tonnes)

Zone	Nitrogen (N)								Phosphate (P_2O_5)							
	2019-20				2020-21				2019-20				2020-21			
	No. of plants	Capacity	Production	Capacity utilization (%)	No. of plants	Capacity	Production	Capacity utilization (%)	No. of plants	Capacity	Production	Capacity utilization (%)	No. of plants	Capacity	Production	Capacity utilization (%)
East	9	897.7	711.4	79.2	9	897.7	712.0	79.3	10	1604.7	1365.5	85.1	11	1623.9	1419.0	88.0
North	11	4159.5	4654.0	111.9	11	4159.5	4486.7	107.9	10	137.8	56.7	55.9	10	142.6	58.6	55.1
South	13	2604.0	1888.7	72.5	13	2604.0	1935.7	74.3	25	2063.1	1339.2	65.3	25	2063.1	1157.8	56.3
West	21	6637.9	6468.1	97.4	21	6668.0	6611.0	99.1	85	3563.2	2029.3	61.9	85	3563.2	2102.0	63.1
All India	**54**	**14299.1 (14299.1)**	**13722.2**	**96.0**	**54**	**14329.2 (14329.2)**	**13745.4**	**95.9**	**130**	**7368.9 (7037.4)**	**4790.7**	**68.1**	**131**	**7392.8 (7106.8)**	**4737.3**	**66.7**

Note : Figures in parentheses are operating capacities. Capacity utilization is based on operating capacity.

of complex fertilizers witnessed a reverse trend where production increased from 8.665 million MT in 2019-20 to 9.325 million MT in 2020-21. Production of SSP also increased by 15.75% from 4.247 million MT to 4.916 million MT during the same period.

A few urea units suffered loss of production due to equipment problems and constraint in availability of working capital. Production of DAP suffered due to lack of availability of sufficient quantity of imported raw materials and unfair competition from imports.

2.2 Installed Capacity

Data on number of plants, installed capacity and production in terms of nutrients are given in **Table 1**. Similar data for SSP as products are given in **Table 2**.

All India production capacity of nitrogen increased marginally by 30 thousand MT from a total of 14.299 million MT during 2019-20 to 14.329 million MT at the end of the year 2020-21. The increase in capacity was mainly due to enhanced capacity of one ammonium sulphate plant during the year.

The production capacity of P_2O_5 also increased nominally by 24 thousand MT from a total of 7.369 million MT during 2019-20 to 7.393 million MT during 2020-21. The increase in capacity was mainly due to commissioning of one new SSP plant in West Bengal. After excluding capacity of the idle / closed SSP plants, the total operating (effective) capacity of P_2O_5 was 7.107 million MT as on 31st March 2021 compared to 7.037 million MT a year before.

2.3 Capacity Utilization

Capacity utilization of nitrogen was almost same, being 96.0% in 2019-20 and 95.9% in 2020-21. Capacity utilization of phosphate declined from 68.1% to 66.7% during the same period mainly due to lower production of DAP.

Capacity utilization of SSP plants improved from 41.4% in 2019-20 to 45.9% in 2020-21 which is reflected in higher production of SSP during 2020-21.

Capacity utilization of nitrogen remained the highest in north zone. But it declined from 111.9% to 107.9% during the period under review. Capacity utilization of nitrogen in west zone improved from 97.4% to 99.1% during the same period. South zone N plants registered a marginal increase from 72.5% to 74.3%

Table 2. Zone-wise capacity, production and capacity utilization of SSP plants in 2019-20 and 2020-21 (April-March)

('000 tonnes product)

Zone	2019-20			2020-21		
	Capacity	Production	Capacity utilization (%)	Capacity	Production	Capacity utilization (%)
East	847.8	506.6	59.8	967.8	522.3	58.2
North	861.5	354.5	55.9	891.2	366.1	55.1
South	1,346.9	276.0	21.7	1,346.9	330.4	25.4
West	9,280.5	3,109.6	41.4	9,280.5	3,697.2	47.2
All India	**12,336.7 (10,264.7)**	**4,246.7**	**41.4**	**12,486.4 (10,698.9)**	**4,916.0**	**45.9**

Note : 1. Figures in parentheses are operating capacities. Capacity utilization is based on operating capacity.
2. Totals may not exactly tally due to rounding of figures.

Table 3. Number of plants in various ranges of capacity utilization - N & P_2O_5 in 2019-20 and 2020-21 (April-March)

Capacity utilization range (%)	N		P_2O_5	
	2019-20	2020-21	2019-20@	2020-21@
Above 100	22	21	4 (-)	6 (1)
> 90 to 100	8	10	6 (3)	5 (2)
> 80 to 90	9	9	8 (3)	13 (11)
> 70 to 80	3	1	11 (8)	7 (4)
> 60 to 70	-	5	3 (3)	8 (7)
> 50 to 60	1	-	14 (12)	9 (8)
> 40 to 50	7	1	12 (12)	14 (13)
Upto 40	4	6	47 (45)	45 (42)
Nil/ Not Available	-	1	25 (25)	24 (24)
Total number of plants	**54**	**54**	**130 (111)**	**131 (112)**

( ) = Figures in parentheses are for SSP plants.
@ = Includes 19 DAP/NP/NPK plants.

Table 4. Percentage share of fertilizer products to total nutrient production in 2019-20 and 2020-21 (April-March)

Fertilizer	% share of total nutrient			
	2019-20		2020-21	
	N	P_2O_5	N	P_2O_5
I. Straight nitrogenous	83.2	-	83.6	-
1. Urea	82.0	-	82.3	-
2. Others	1.2	-	1.3	-
II. Straight phosphatic	-	14.2	-	16.6
1. Single superphosphate	-	14.2	-	16.6
2. Others	-	-	-	-
III. Complex fertilizers	16.8	85.8	16.4	83.4
1. DAP	6.0	43.7	4.9	36.6
2. NP/NPKs	10.8	42.1	11.5	46.8
Grand total (I+II+III)	**100.0**	**100.0**	**100.0**	**100.0**

capacity utilization. East zone plants for nitrogen production operated at a low capacity of 79.3% in 2020-21 which is similar to capacity utilization in 2019-20. Capacity utilization of phosphate plants in east zone improved for third consecutive year. It increased from 85.1% in 2019-20 to 88.0% in 2020-21. Phosphate plants in north zone registered a decline from 55.9% to 55.1% and in south zone a decline from 65.3% to 56.3% during the period. There was improvement in capacity utilization of phosphate plants in west zone from 61.9% to 63.1%. However, with the exception of east zone, the three other zones continued to operate at low capacity utilization.

Table 3 shows the number of nitrogen and phosphate plants achieving various levels of capacity utilization. Number of nitrogen plants operating at more than 90% capacity utilization increased from 30 in 2019-20 to 31 in 2020-21. Nine nitrogen plants achieved capacity utilization between 80 and 90% in both the years. In the category of phosphate number of plants achieving capacity utilization higher than 90% increased to 11 in 2020-21 from 10 in the previous year. Number of plants in the range of 80 to 90% capacity utilization also increased from 8 to 13 during the same period. But most plants continued to operate at less than 60% capacity utilization.

2.4 Share of Products

Nitrogen production continues to be dominated by urea with a share of 82.3% in total N production. This is marginally higher than 82.0% in 2019-20 (**Table 4**). Share of complex fertilizers including DAP in N production corresponding declined from 16.8% in 2019-20 to 16.4% in 2020-21. While share of DAP in nitrogen production declined, share of NP/NPK fertilizers increased. This is consistent with production trends where production of NP/NPK increased and that of DAP declined sharply in 2020-21 compared to previous year. DAP continued to remained dominant product in phosphate segment accounting for 36.6% of total production and all other NP/NPK products contributed 46.8% to phosphate production in 2020-21. The relative contribution of DAP and NP/NPK fertilizers to phosphate production witnessed trend similar to nitrogen where share of NP/NPK increased from 42.1% in 2019-20 to 46.8% in 2020-21 at the expense of DAP. The share of later declined sharply from 43.7% to 36.6% during the same period. SSP increased its share in phosphate production from 14.2% to 16.6% during the period.

2.5 Share of Feedstock/Raw Materials

Table 5 shows production of nitrogen based on different sources of inputs. Excluding external ammonia (which is mainly imported), natural gas accounted for 96.3% production of N in the country in 2020-21. Naphtha contributed only 2.8% of N production. Only one urea plant used naphtha for production of urea for full year. Another urea plant switched to natural gas from naphtha during the year. It has also switched to natural gas partially. External ammonia accounted for 14.0% of N production which was used for production of complex fertilizers.

Production of phosphate utilized rock phosphate or intermediate phosphoric acid. Nearly, 90% rock

Table 5. Feedstock-wise share in total capacity and production with capacity utilization of Nitrogen (N) in 2019-20 and 2020-21 (April-March)

(Per cent)

Feedstock/ Intermediate	Capacity		Production		Capacity utilization	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
Gas	79.4	80.7	82.1	83.0	99.2	98.7
Naphtha	4.1	2.8	3.1	2.8	74.0	95.8
External ammonia	16.2	16.2	14.6	14.0	86.3	82.9
Others*	0.3	0.3	0.2	0.2	64.3	60.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**96.0**	**95.9**

* = Others include COG and other sources.

phosphate was imported and accounted for nearly 50% phosphate production in the country. Imported phosphoric acid and domestic rock phosphate contributed to the balance production of the nutrient phosphate.

2.6 Sector-wise Performance

Fertilizer plants in public, private and cooperative sectors contribute to fertilizer production in India. **Table 6** gives sector-wise performance and their share of contribution to fertilizer production in the country. Almost half (49.2%) of N production capacity is in private sector. The balance capacity is equally shared by public and cooperative sectors at 25.4% each in 2020-21. This share remained unchanged from the previous year. In production capacity of phosphate, dominance of private sector is more pronounced with share of 71.6%. Cooperative sector and public sector accounted for 23.2% and 5.2% share in capacity respectively. Capacity utilization of N was the highest at 106.8% in cooperative sector during 2020-21. This is a decline from 109.7% in the previous year. Public and private sector plants improved their capacity utilization marginally at 93.4% and 91.6%, respectively. Phosphate plants in all the three sectors showed decline in capacity utilization in 2020-21 compared to 2019-20. Phosphate plants continued to operate at low capacity utilization in public sector (67.8%) and private sector (59.3%) and only cooperative sector operated at reasonable level of 87.9% capacity utilization.

Private sector contributed 47.0% to production of N and 62.7% to the production of P_2O_5. Cooperative sector accounted for 28.3% of N production and 31.8% of P_2O_5 production. Public sector contributed 24.7% and 5.5% to the production of N and P_2O_5, respectively which is proportionate to its share in capacity of these two nutrients.

2.7 Reasons for Loss of Production

Production of major fertilizer products fell short of targets for the year 2020-21. Production of urea was lower by almost a million tonne at 24.60 million MT compared to target of 25.67 million MT. Several plants faced production loss due to variety of equipment problems. There was disruption in supply of natural gas for three days in September 2020 due to fire incident at ONGC-Hazira plant. Production was also affected in April 2020 due to lockdown, which temporarily affected availability of various supplies and evacuation of finished products. Two urea plants suffered loss of

Table 6. Sector-wise share of capacity and production with capacity utilization of N and P_2O_5 in 2019-20 and 2020-21 (April-March)

(Per cent)

Sector	Share of capacity				Share of production				Capacity utilization			
	2019-20		2020-21		2019-20		2020-21		2019-20		2020-21	
	N	P_2O_5	N	P_2O_5	N	P_2O_5	N	P_2O_5	N	P_2O_5	N	P_2O_5
Public	25.5	5.2	25.4	5.2	24.5	5.5	24.7	5.5	92.3	68.7	93.4	67.8
Cooperative	25.4	23.2	25.4	23.2	29.1	32.1	28.3	31.8	109.7	89.7	106.8	87.9
Private	49.1	71.6	49.2	71.6	46.4	62.4	47.0	62.7	90.8	60.5	91.6	59.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**96.0**	**68.1**	**95.9**	**66.7**

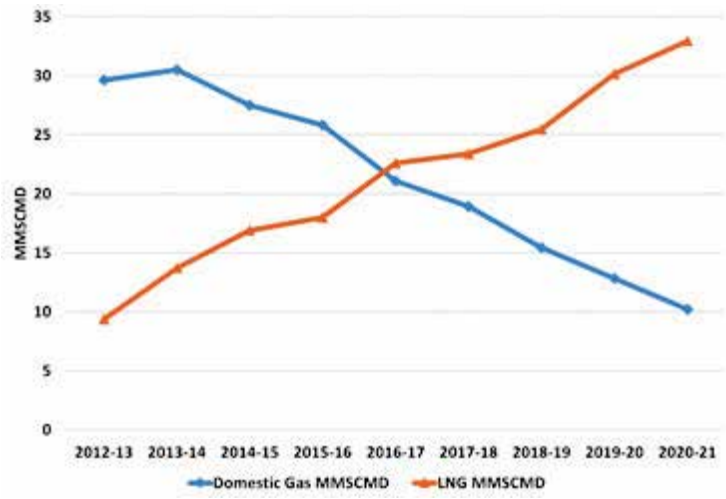

Figure 1. Supply of Natural Gas to Fertilizer (Urea) Sector

production due to constraint in availability of working capital. A few urea plants could produce more but for a cap prescribed under urea pricing policy.

DAP and complex fertilizer plants also did not achieve production target. There was shortfall both in production of DAP and complex fertilizers. Production in these plants suffered for two main reasons. One, there was insufficient supply of raw materials and second these plants continue to face unfair competition from imports. Therefore, the capacity utilization of these plants remained low.

2.8 Supply of Natural Gas

Natural gas is essential input both as feed and fuel for production of nitrogen containing fertilizers including straight fertilizers like urea and ammonium sulphate and various grades of complex fertilizers. Earlier priority of fertilizer sector in allocation of domestic natural gas has dispensed with. The natural gas from new findings is auctioned and given to the highest bidder. The share of domestic gas in total gas utilization in fertilizer sector has dwindled gradually over the years. Domestic gas share declined from 29.8% in 2019-20 to 23.7% in 2020-21. In absolute terms, average supply of domestic gas declined from 12.8 MMSCMD in 2019-20 to 10.2 MMSCMD in 2020-21. **Figure 1** shows the trend in consumption of domestic gas in fertilizer sector.

Government has established a pool account for supply of natural gas to urea sector. The weighted average cost of gas in the pool every month is taken as input for calculation of cost of production of urea units and hence subsidy for each unit. The cost of pooled gas has been going up due to increase in share of imported LNG which is usually more expensive than domestic gas. GAIL as pool operator should be mandated to maximize the supply of domestic gas to fertilizer sector. This will help to reduce the cost of domestic urea and hence the out go from public exchequer on account of subsidy.

2.9 Efforts for Improvement in Efficiency of Fertilizer Plants

The very nature of fertilizer plants requires continuous investment to maintain the health of plants. Safe and efficient operation of plants is necessary to remain in business. This requires modernization of equipment which may even require complete replacements. Some of the measures implemented by fertilizer plants recently are given here by way of example.

MCFL, Mangalore and SPIC, Tuticorin switched from naphtha to natural gas with availability of pipeline connectivity after wait of several years. With this, almost entire ammonia and urea production in the country is now based on natural gas. A small part of domestic ammonia is also used for production of complex fertilizers.

KRIBHCO, Hazira completed the installation and commissioning of electric motor drive for CO_2 compressor for higher efficiency. This is first time in the country that a large compressor drive has been changed from steam turbine drive to motor drive. RCF, Thal replaced the steam driven refrigeration compressor with motor driven compressor in ammonia plant there by saving energy. SPIC, Tuticorin changed the turbine of syn-gas compressor to a new latest design turbine which will save large amount of steam and hence energy. NFL, Vijaipur upgraded its syn-gas compressor and

Table 7 (a). Nutrient-wise consumption, production and gap from 2010-11 to 2020-21 (April-March)

('000 tonnes)

Year	Consumption					Production			Gap		
	N	P_2O_5	$N+P_2O_5$	K_2O	$N+P_2O_5+K_2O$	N	P_2O_5	$N+P_2O_5$	N	P_2O_5	$N+P_2O_5$
2010-11	16,558.2	8,049.7	24,607.9	3,514.3	28,122.2	12,178.6	4,371.2	16,549.8	4,379.6	3,678.5	8,058.1
2011-12	17,300.3	7,914.3	25,214.5	2,575.5	27,790.0	12,288.3	4,363.7	16,652.0	5,012.0	3,550.6	8,562.5
2012-13	16,820.9	6,653.4	23,474.4	2,061.8	25,536.2	12,237.3	3,826.0	16,063.3	4,583.6	2,827.4	7,411.1
2013-14	16,750.1	5,633.5	22,383.6	2,098.9	24,482.4	12,408.6	3,972.0	16,380.6	4,341.5	1,661.5	6,003.0
2014-15	16,949.6	6,098.9	23,048.5	2,532.9	25,581.4	12,433.7	4,118.9	16,552.6	4,515.9	1,980.0	6,495.9
2015-16	17,372.3	6,978.8	24,351.1	2,401.5	26,752.6	13,475.9	4,425.8	17,901.7	3,896.4	2,553.0	6,449.4
2016-17	16,735.9	6,705.5	23,441.4	2,508.5	25,949.9	13,376.8	4,552.7	17,929.5	3,359.1	2,152.8	5,511.9
2017-18	16,959.3	6,854.4	23,813.7	2,779.7	26,593.4	13,422.6	4,724.4	18,147.0	3,536.7	2,130.0	5,666.7
2018-19	17,637.8	6,910.2	24,547.9	2,680.3	27,228.2	13,336.8	4,590.5	17,927.3	4,301.0	2,319.7	6,620.6
2019-20 (P)	19,101.3	7,662.0	26,763.4	2,607.0	29,370.4	13,722.2	4,790.7	18,512.9	5,379.1	2,871.3	8,250.5
2020-21 (P)	20,404.0	8,977.9	29,381.9	3,153.7	32,535.6	13,745.4	4,737.2	18,482.6	6,658.6	4,240.7	10,899.3

(P) = Provisional. Note: 1. Gap does not take into account stocks available at the beginning of the year.
2. Entire requirement of K_2O is met through imports.

steam turbine to improve its energy efficiency by reducing steam and power consumption.

Commissioning of Gas Turbines for power and steam generation at Panipat, Bathinda and Nangal plants are expected to be commissioned this year. These plants will have significant energy savings after switching from coal to natural gas for power generation.

It may be highlighted that given the vintage of fertilizer plants, there is need for replacement of capital equipment. This required large investment with long payback period. Fertilizer plants should be able to generate sufficient funds under the policies for the sector in order to make capital investment every year. This is necessary both for safe and efficient operation of these plants.

3.0 FERTILIZER IMPORT

3.1 Imports

Indigenous production is inadequate to fulfil the entire demand for fertilizers. About 30% of the total requirement of fertilizer materials is fulfilled through imports. During 2020-21, gap of nitrogen (N) was 6.66 million MT and phosphate (P_2O_5) 4.24 million MT (**Table 7a).** Entire requirement of potash (K_2O) is fulfilled through imports as there is no known commercial source of potash in the country. During 2020-21, import of N, P_2O_5 and K_2O was 5.64, 2.57 and 2.71 million MT, respectively **(Table 7b)**.

In terms of fertilizer products, import of all major fertilizers increased during 2020-21 over 2019-20. Import of urea increased by 7.7%, DAP by 0.2%, NP/NPK complex fertilizers by 86.3% and MOP by 15.2% during 2020-21 over 2019-20. The quantum

Table 7 (b). Import of N, P_2O_5 and K_2O from 2010-11 to 2020-21 (April-March)

('000 tonnes)

Year	N	P_2O_5	$N+P_2O_5$	K_2O	$N+P_2O_5+K_2O$
2010-11	4,569.6	3,738.7	8,308.3	3,899.5	12,207.7
2011-12	5,577.6	4,263.6	9,841.2	2,557.8	12,399.0
2012-13	4,801.0	2,797.2	7,598.2	1,573.7	9,172.0
2013-14	3,920.3	1,588.2	5,508.5	1,954.4	7,462.8
2014-15	4,813.0	1,902.9	6,715.9	2,588.0	9,303.8
2015-16	5,081.3	2,899.5	7,980.8	2,075.9	10,056.7
2016-17	3,411.7	2,129.0	5,540.7	2,341.1	7,881.8
2017-18	3,618.4	2,044.6	5,663.0	2,925.2	8,588.2
2018-19	4,716.7	3,167.2	7,883.9	2,648.4	10,532.3
2019-20 (P)	5,209.0	2,413.2	7,622.2	2,309.4	9,931.6
2020-21 (P)	5,637.5	2,565.4	8,202.9	2,706.2	10,909.1

(P) = Provisional.

imports of urea, DAP, NP/NPKs and MOP was of the order of 9.83, 4.88, 1.39 and 4.23 million MT, respectively, during 2020-21. **Table 8** shows production, consumption, and import of urea, DAP and MOP during 2010-11 to 2020-21.

4.0 INVENTORY OF FERTILIZERS

Adequate inventory at the beginning of the year facilitates positioning of fertilizers for sowing operations before the onset of cropping season. The year 2020-21 began with large opening inventory of fertilizers. Inventory of urea at various points excluding stock at the dealers' point was more than 1.4 million MT at the beginning of the year. Similarly, inventory of DAP and NP/NPKs together was about 2.5 million MT, SSP 0.66 million MT and MOP 0.48

Table 8. Production, consumption and import of Urea, DAP and MOP from 2010-11 to 2020-21 ('000 tonnes)

Year	Urea			DAP			MOP	
	Consumption	Production	Import	Consumption	Production	Import	Consumption*	Import
2010-11	28,112.5	21,872.5	6,610.0	10,869.9	3,545.6	7,411.0	3,931.6	6,357.0
2011-12	29,565.3	21,992.3	7,834.0	10,191.2	3,951.3	6,905.2	3,028.9	3,984.6
2012-13	30,002.2	22,586.6	8,044.0	9,154.1	3,646.8	5,702.3	2,211.0	2,496.1
2013-14	30,600.5	22,718.7	7,088.0	7,357.4	3,628.2	3,261.1	2,280.4	3,180.0
2014-15	30,610.0	22,592.9	8,749.0	7,625.6	3,445.4	3,853.0	2,853.4	4,197.0
2015-16	30,634.8	24,461.3	8,474.0	9,107.2	3,821.8	6,008.0	2,466.9	3,243.0
2016-17	29,613.6	24,200.8	5,481.0	8,963.5	4,333.4	4,385.0	2,863.2	3,736.0
2017-18	29,894.4	24,026.0	5,975.0	9,294.1	4,654.0	4,217.0	3,158.2	4,736.0
2018-19	31,418.1	23,899.2	7,481.0	9,211.1	3,898.6	6,602.0	2,956.6	4,214.0
2019-20 (P)	33,540.7	24,455.2	9,123.0	10,089.7	4,549.5	4,870.0	2,866.6	3,670.0
2020-21 (P)	35,042.5	24,602.8	9,829.0	11,911.5	3,773.8	4,882.0	3,424.9	4,227.0

(P) = Provisiona * = for direct application.

Note: In the absence of productwise consumption data, DBT sale figures assumed as consumption for 2020-21.

million MT. Hence, availability of fertilizers from opening stock, domestic production and imports was adequate to take care of the demand for 2020-21.

5.0 WEATHER

Rainfall and its distribution over time and space is the basic factor which influences fertilizer consumption. Therefore, fertilizer use depends heavily on rainfall received particularly from Southwest monsoon. Failure of seasonal rains adversely affects fertilizer demand. About 74% of the total rains are received during Southwest monsoon and 13% during post monsoon seasons. Remaining quantities of rainfall are received during pre-monsoon and winter monsoon.

5.1 Southwest Monsoon

Southwest monsoon 2020 arrived in Kerala on time, *i.e.*, 1st June, 2020. Overall rainfall from 1st June to 30th September, 2020 was 109% of long period average (LPA). Actual rainfall was 957.6 mm as against normal rains of 880.6 mm. On month to month basis, rainfall during June was 18% above LPA. It was 10% below LPA during July and touched a record level of 27% above LPA in August 2020. During September, it was 4% above LPA.

Out of 36 meteorological sub-divisions, 31 sub-divisions received normal to excess rains and remaining 5 sub-divisions received deficient rains during the period **(Table 9)**. Out of 685 reported districts, 75% districts received normal to excess rains during the period. Timely onset, delayed withdrawal and even distribution across different regions were the key features for the monsoon behaviour of 2020. The Southwest monsoon 2020 withdrew from the entire country on 28th October, 2020. Standing major *kharif* crops like pulses, oilseeds and cotton in Madhya Pradesh, Maharashtra and Gujarat were affected due to delayed withdrawal of monsoon.

Water storage position in major reservoirs was comfortable in 2020. Live storage capacity in 123 reservoirs in the country was 171.09 BCM in 2020. Live storage available in these reservoirs was 148.25 BCM as on 1st October, 2020 as against 151.07 BCM on the same date in the previous year. Live storage during the period was 98% of the last year and 114% of the normal storage.

Table 9. Distribution of meteorological sub-divisions according to excess/normal or deficient/scanty rainfall Southwest Monsoon period (June-September)

Item	2012	2013	2014	2015	2016	2017	2018	2019	2020
Excess/Normal	23	30	25	20	27	30	24	31	31
Deficient/Scanty	13	6	11	16	9	6	12	5	5
Total	**36**	**36**	**36**	**36**	**36**	**36**	**36**	**36**	**36**
% of districts with normal to excess rains	58	72	55	51	68	66	62	77	75
% of LPA rainfall	92	106	88	86	97	95	91	110	109

Excess = +20% or more Normal = +19% to -19% Scanty = -60% or less Deficient = -20% to -59%

Table 10. No. of sub-divisions received excess/normal rainfall during four monsoon seasons from 2012-13 to 2020-21
(No.)

Monsoon - period	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
March-May	22	16	27	34	24	18	19	13	28
June-September	23	30	25	20	27	30	24	31	31
October-December	15	22	12	10	10	19	5	32	20
January-February	29	21	18	6	10	3	16	18	14

5.2 Post-monsoon

Post-monsoon season (Northeast) is the major period of rainfall activity over south peninsula, particularly in the eastern half comprising of the meteorological sub-divisions of Coastal Andhra Pradesh, Rayalaseema, Tamil Nadu and Puducherry. For Tamil Nadu, this is the main rainy season accounting for about 48% of the annual rainfall. Coastal districts of the State get nearly 60% of the annual rainfall and the interior districts get about 40-50% of the annual rainfall.

During post-monsoon 2020, rainfall was normal. It was 1% higher than the LPA for the country as a whole. Out of 36 meteorological sub-divisions, 20 received normal to excess rains during the period. Remaining 16 sub-divisions received deficient/large deficient rainfall during post- monsoon season. Performance of the post-monsoon rainfall is shown in **Table 10**.

6.0 FERTILIZER CONSUMPTION

6.1 All-India Consumption

In spite of challenges due to COVID-19 pandemic, the year 2020-21 ended with a robust growth in fertilizer consumption supported by exceedingly good monsoon, comfortable availability of water in the reservoirs, increase in area under cultivation and adequate availability of fertilizers.

Growth in 2020-21

During 2020-21, consumption of fertilizers in terms of nutrients ($N+P_2O_5+K_2O$) estimated at 32.54 million MT which recorded a robust growth of 10.8% over 2019-20. The consumption of N, P_2O_5 and K_2O was 20.40, 8.98 and 3.15 million MT during 2020-21 represented growth of 6.8%, 17.2% and 21%, respectively, over 2019-20.

In terms of products, consumption of urea at 35.04 million MT, DAP at 11.91 million MT, MOP at 3.42 million MT, NP/NPK complex fertilizers at 11.81 million MT and SSP at 4.49 million MT during 2020-21 recorded increase of 4.5%, 18.1%, 19.5%, 22.4% and 20.3%, respectively, over 2019-20. Total consumption of fertilizer products increased from 60.60 million MT during 2019-20 to 67.61 million MT in 2020-21 representing increase of 11.6%.

Season-wise Performance

Kharif 2020

Timely arrival of monsoon and normal rains received during the entire monsoon season, consumption of total fertilizer nutrients during *kharif 2020* recorded an increase of 27.3% over *kharif* 2019. The consumption of all the three nutrients registered positive growth during the season. The consumption of N, P_2O_5 and K_2O increased by 20.6%, 42.6% and 38.6%, respectively, during *kharif* 2020 over *kharif* 2019. The consumption of N, P_2O_5 and K_2O was 10.27, 4.29 and 1.49 million MT, respectively, during *kharif* 2020.

Rabi 2020-21

There was adequate moisture availability in the soil and comfortable water availability in the reservoirs for the use of fertilizers during *rabi* 2020-21. The consumption of P_2O_5 at 4.69 million MT and K_2O at 1.66 million MT increased by 0.8% and 8.6%, respectively, during *rabi* 2020-21 over *rabi* 2019-20. However, consumption of N at 10.13 million MT showed a decline of 4.2% during the period. Overall nutrient consumption during *rabi* 2020-21 was lower by 1.7% over *rabi* 2019-20.

NPK Use Ratio and per hectare Consumption

NPK use ratio improved to some extent during 2020-21 due to proportionately higher increase in consumption of K_2O compared to increase in N and P_2O_5. All-India NPK use ratio improved from 7.3:2.9:1 during 2019-20 to 6.5:2.8:1 during 2020-21.

Per hectare use of fertilizer nutrients increased considerably due to sizeable increase in total consumption of fertilizer nutrients. Per hectare use of total nutrients ($N+P_2O_5+K_2O$) increased from 145.6 kg in 2019-20 to 161.3 kg in 2020-21.

6.2 Zone-wise Comments

Consumption of total fertilizer nutrients increased during 2020-21 in all zones. Increase in consumption in east, north, south and west zones was of the order of 6.3%, 7.2%, 19.5% and 10.6%, respectively, during 2020-21 over 2019-20 (**Table 11**).

Per hectare consumption of fertilizer nutrients ($N+P_2O+K_2O$) in 2020-21 was the highest in north zone (212.5 kg), followed by south (211.8 kg), east (158.4 kg), and west (118.5 kg).

Table 11. Season-wise consumption of N, P_2O_5 & K_2O from 2018-19 to 2020-21 and

S. No.	Zone/State	Nutrient	Consumption ('000 tonnes)								
			2018-19			2019 -20(P)			2020-21 (P)		
			Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
I.	**EAST**	**N**	**1,207.43**	**1,448.62**	**2,656.05**	**1,184.80**	**1,528.26**	**2,713.06**	**1,384.35**	**1,387.94**	**2,772.29**
		P_2O_5	**546.32**	**536.59**	**1,082.91**	**373.94**	**766.00**	**1,139.94**	**533.74**	**743.56**	**1,277.30**
		K_2O	**322.86**	**303.20**	**626.06**	**204.32**	**438.50**	**642.82**	**273.01**	**457.32**	**730.33**
		Total	**2,076.61**	**2,288.41**	**4,365.02**	**1,763.06**	**2,732.76**	**4,495.82**	**2,191.10**	**2,588.82**	**4,779.92**
1	Arunachal Pradesh	N	-	-	-	-	-	-	-	-	-
		P_2O_5	-	-	-	-	-	-	-	-	-
		K_2O	-	-	-	-	-	-	-	-	-
		Total	-	-	-	-	-	-	-	-	-
2	Assam	N	84.48	108.84	193.32	92.90	88.85	181.75	90.54	85.09	175.63
		P_2O_5	22.07	24.54	46.61	19.83	30.30	50.13	24.37	30.39	54.76
		K_2O	29.50	20.65	50.15	21.61	24.87	46.48	21.58	27.65	49.23
		Total	136.05	154.03	290.08	134.34	144.02	278.36	136.49	143.13	279.62
3	Bihar	N	481.54	706.16	1,187.70	454.01	781.31	1,235.32	563.10	722.18	1,285.28
		P_2O_5	176.91	218.66	395.57	100.69	322.66	423.35	151.74	306.23	457.97
		K_2O	66.61	81.84	148.45	32.14	129.69	161.83	44.10	123.61	167.71
		Total	725.06	1,006.66	1,731.72	586.84	1,233.66	1,820.50	758.94	1,152.02	1,910.96
4	Jharkhand	N	68.56	59.03	127.59	67.20	64.70	131.90	102.10	42.09	144.19
		P_2O_5	35.16	13.17	48.33	23.09	22.09	45.18	39.00	19.24	58.24
		K_2O	5.18	0.96	6.14	1.54	3.05	4.59	3.34	2.39	5.73
		Total	108.90	73.16	182.06	91.83	89.84	181.67	144.44	63.72	208.16
5	Manipur	N	9.25	3.53	12.78	11.04	1.78	12.82	7.49	3.23	10.72
		P_2O_5	4.60	1.43	6.03	1.53	2.17	3.70	1.07	1.47	2.54
		K_2O	4.29	1.08	5.37	0.33	0.65	0.98	0.50	1.11	1.61
		Total	18.14	6.04	24.18	12.90	4.60	17.50	9.06	5.81	14.87
6	Meghalaya	N	-	-	-	-	-	-	-	-	-
		P_2O_5	-	-	-	-	-	-	-	-	-
		K_2O	-	-	-	-	-	-	-	-	-
		Total	-	-	-	-	-	-	-	-	-
7	Mizoram	N	3.20	1.38	4.58	2.89	0.88	3.77	0.54	0.45	0.99
		P_2O_5	1.25	0.11	1.36	0.07	0.14	0.21	0.09	0.04	0.13
		K_2O	1.10	0.09	1.19	0.09	-	0.09	-	-	-
		Total	5.55	1.58	7.13	3.05	1.02	4.07	0.63	0.49	1.12
8	Nagaland	N	0.71	0.52	1.23	0.32	0.16	0.48	0.23	0.07	0.30
		P_2O_5	0.42	0.42	0.84	0.05	0.03	0.08	0.04	-	0.04
		K_2O	0.26	0.29	0.55	-	-	-	-	-	-
		Total	1.39	1.23	2.62	0.37	0.19	0.56	0.27	0.07	0.34
9	Odisha	N	254.56	95.26	349.82	237.82	110.39	348.21	254.50	92.74	347.24
		P_2O_5	114.97	37.38	152.35	100.56	50.65	151.21	129.61	49.28	178.89
		K_2O	52.71	22.05	74.76	47.85	27.10	74.95	58.76	26.31	85.07
		Total	422.24	154.69	576.93	386.23	188.14	574.37	442.87	168.33	611.20
10	Sikkim	N	-	-	-	-	-	-	-	-	-
		P_2O_5	-	-	-	-	-	-	-	-	-
		K_2O	-	-	-	-	-	-	-	-	-
		Total	-	-	-	-	-	-	-	-	-

total by states and percentage variation (April-March) (continued)

± % variation over previous season/year

2018-19			2019-20(P)			2020-21 (P)			Nutrient	Zone / State	S. No.
Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total			
4.24	**11.11**	**7.88**	**-1.87**	**5.50**	**2.15**	**16.84**	**-9.18**	**2.18**	**N**	**EAST**	**I.**
23.27	**-17.37**	**-0.89**	**-31.55**	**42.75**	**5.27**	**42.73**	**-2.93**	**12.05**	**P_2O_5**		
17.60	**-22.67**	**-6.08**	**-36.72**	**44.62**	**2.68**	**33.62**	**4.29**	**13.61**	**K_2O**		
10.69	**-2.42**	**3.40**	**-15.10**	**19.42**	**3.00**	**24.28**	**-5.27**	**6.32**	**Total**		
-100.00	-	-100.00	-	-	-	-	-	-	N	Arunachal Pradesh	1
-100.00	-	-100.00	-	-	-	-	-	-	P_2O_5		
-100.00	-	-100.00	-	-	-	-	-	-	K_2O		
-100.00	-	-100.00	-	-	-	-	-	-	Total		
23.18	23.40	23.31	9.97	-18.37	-5.98	-2.54	-4.23	-3.37	N	Assam	2
2.18	-13.89	-6.97	-10.15	23.47	7.55	22.89	0.30	9.24	P_2O_5		
40.48	-13.96	11.44	-26.75	20.44	-7.32	-0.14	11.18	5.92	K_2O		
22.37	9.47	15.17	-1.26	-6.50	-4.04	1.60	-0.62	0.45	Total		
3.73	8.81	6.69	-5.72	10.64	4.01	24.03	-7.57	4.04	N	Bihar	3
31.18	-13.02	2.42	-43.08	47.56	7.02	50.70	-5.09	8.18	P_2O_5		
27.73	-22.76	-6.11	-51.75	58.47	9.01	37.21	-4.69	3.63	K_2O		
11.34	0.03	4.47	-19.06	22.55	5.13	29.33	-6.62	4.97	Total		
-10.34	267.56	37.89	-1.98	9.61	3.38	51.93	-34.95	9.32	N	Jharkhand	4
14.08	-66.90	-31.55	-34.33	67.73	-6.52	68.90	-12.90	28.91	P_2O_5		
121.37	-92.20	-58.06	-70.27	217.71	-25.24	116.88	-21.64	24.84	K_2O		
-0.67	7.35	2.41	-15.67	22.80	-0.21	57.29	-29.07	14.58	Total		
-4.05	115.24	13.30	19.35	-49.58	0.31	-32.16	81.46	-16.38	N	Manipur	5
2.45	333.33	25.10	-66.74	51.75	-38.64	-30.07	-32.26	-31.35	P_2O_5		
0.70	260.00	17.76	-92.31	-39.81	-81.75	51.52	70.77	64.29	K_2O		
-1.36	166.08	17.04	-28.89	-23.84	-27.63	-29.77	26.30	-15.03	Total		
-	-	-	-	-	-	-	-	-	N	Meghalaya	6
-	-	-	-	-	-	-	-	-	P_2O_5		
-	-	-	-	-	-	-	-	-	K_2O		
-	-	-	-	-	-	-	-	-	Total		
33.33	-40.00	-2.55	-9.69	-36.23	-17.69	-81.31	-48.86	-73.74	N	Mizoram	7
-	-	-	-94.40	27.27	-84.56	28.57	-71.43	-38.10	P_2O_5		
-	-	-	-91.82	-100.00	-92.44	-100.00	-	-100.00	K_2O		
131.25	-31.30	51.70	-45.05	-35.44	-42.92	-79.34	-51.96	-72.48	Total		
-2.74	-1.89	-2.38	-54.93	-69.23	-60.98	-28.13	-56.25	-37.50	N	Nagaland	8
-	-	-	-88.10	-92.86	-90.48	-20.00	-100.00	-50.00	P_2O_5		
-3.70	-	-1.79	-100.00	-100.00	-100.00	-	-	-	K_2O		
-2.11	-0.81	-1.50	-73.38	-84.55	-78.63	-27.03	-63.16	-39.29	Total		
-0.38	37.01	7.62	-6.58	15.88	-0.46	7.01	-15.99	-0.28	N	Odisha	9
7.90	10.53	8.53	-12.53	35.50	-0.75	28.89	-2.70	18.31	P_2O_5		
0.36	16.11	4.54	-9.22	22.90	0.25	22.80	-2.92	13.50	K_2O		
1.85	26.44	7.45	-8.53	21.62	-0.44	14.66	-10.53	6.41	Total		
-	-	-	-	-	-	-	-	-	N	Sikkim	10
-	-	-	-	-	-	-	-	-	P_2O_5		
-	-	-	-	-	-	-	-	-	K_2O		
-	-	-	-	-	-	-	-	-	Total		

Table 11. Season-wise consumption of N, P_2O_5 & K_2O from 2018-19 to 2020-21 and

S. No.	Zone/State	Nutrient	Consumption ('000 tonnes)								
			2018-19			2019-20 (P)			2020-21 (P)		
			Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
11	Tripura	N	3.63	4.69	8.32	1.25	7.48	8.73	4.65	2.63	7.28
		P_2O_5	1.43	2.41	3.84	2.22	3.39	5.61	3.25	2.93	6.18
		K_2O	0.81	2.03	2.84	2.21	3.07	5.28	1.33	1.26	2.59
		Total	5.87	9.13	15.00	5.68	13.94	19.62	9.23	6.82	16.05
12	West Bengal	N	301.50	469.21	770.71	317.37	472.71	790.08	361.20	439.46	800.66
		P_2O_5	189.51	238.47	427.98	125.90	334.57	460.47	184.57	333.98	518.55
		K_2O	162.40	174.21	336.61	98.55	250.07	348.62	143.40	274.99	418.39
		Total	653.41	881.89	1,535.30	541.82	1,057.35	1,599.17	689.17	1,048.43	1,737.60
II.	**NORTH**	**N**	**2,951.83**	**3,271.11**	**6,222.94**	**2,939.51**	**3,595.40**	**6,534.91**	**3,271.22**	**3,577.93**	**6,849.15**
		P_2O_5	**693.26**	**1,058.15**	**1,751.41**	**529.11**	**1,423.68**	**1,952.79**	**761.41**	**1,446.01**	**2,207.42**
		K_2O	**174.28**	**140.95**	**315.23**	**114.59**	**202.50**	**317.09**	**163.91**	**216.89**	**380.80**
		Total	**3,819.37**	**4,470.21**	**8,289.58**	**3,583.21**	**5,221.58**	**8,804.79**	**4,196.54**	**5,240.83**	**9,437.37**
1	Haryana	N	517.74	583.62	1,101.36	424.43	645.21	1,069.64	453.41	653.61	1,107.02
		P_2O_5	154.30	147.91	302.21	100.11	202.82	302.93	112.79	205.65	318.44
		K_2O	35.26	13.42	48.68	23.11	14.76	37.87	23.56	15.63	39.19
		Total	707.30	744.95	1,452.25	547.65	862.79	1,410.44	589.76	874.89	1,464.65
2	Himachal Pradesh	N	16.74	19.53	36.27	16.77	21.52	38.29	19.47	18.27	37.74
		P_2O_5	3.18	8.04	11.22	2.97	7.41	10.38	4.20	7.06	11.26
		K_2O	1.76	8.42	10.18	2.20	7.74	9.94	3.32	6.93	10.25
		Total	21.68	35.99	57.67	21.94	36.67	58.61	26.99	32.26	59.25
3	Jammu & Kashmir	N	31.53	41.92	73.45	31.06	19.76	50.82	82.65	31.44	114.09
		P_2O_5	9.04	20.01	29.05	9.48	7.35	16.83	28.45	9.10	37.55
		K_2O	2.46	12.58	15.04	9.62	1.57	11.19	19.15	9.69	28.84
		Total	43.03	74.51	117.54	50.16	28.68	78.84	130.25	50.23	180.48
4	Punjab	N	667.26	721.21	1,388.47	670.78	829.00	1,499.78	710.17	785.01	1,495.18
		P_2O_5	88.80	240.75	329.55	82.99	280.06	363.05	109.28	273.37	382.65
		K_2O	22.52	19.37	41.89	21.19	21.85	43.04	28.14	27.28	55.42
		Total	778.58	981.33	1,759.91	774.96	1,130.91	1,905.87	847.59	1,085.66	1,933.25
5	Uttar Pradesh	N	1,642.07	1,838.75	3,480.82	1,722.86	2,017.36	3,740.22	1,936.09	2,027.64	3,963.73
		P_2O_5	427.18	623.98	1,051.16	323.13	903.69	1,226.82	493.64	933.19	1,426.83
		K_2O	107.79	81.98	189.77	55.37	150.54	205.91	86.14	152.29	238.43
		Total	2,177.04	2,544.71	4,721.75	2,101.36	3,071.59	5,172.95	2,515.87	3,113.12	5,628.99
6	Uttarakhand	N	72.94	59.83	132.77	68.98	54.90	123.88	65.83	54.85	120.68
		P_2O_5	10.23	16.78	27.01	9.85	20.88	30.73	12.41	16.58	28.99
		K_2O	4.49	5.18	9.67	2.89	5.92	8.81	3.45	4.92	8.37
		Total	87.66	81.79	169.45	81.72	81.70	163.42	81.69	76.35	158.04
7	Chandigarh	N	-	-	-	-	-	-	-	-	-
		P_2O_5	-	-	-	-	-	-	-	-	-
		K_2O	-	-	-	-	-	-	-	-	-
		Total	-	-	-	-	-	-	-	-	-
8	Delhi	N	3.55	6.25	9.80	4.63	7.65	12.28	3.60	7.11	10.71
		P_2O_5	0.53	0.68	1.21	0.58	1.47	2.05	0.64	1.06	1.70
		K_2O	-	-	-	0.21	0.12	0.33	0.15	0.15	0.30
		Total	4.08	6.93	11.01	5.42	9.24	14.66	4.39	8.32	12.71

total by states and percentage variation (April-March) (continued)

± % variation over previous season/year

2018-19			2019-20 (P)			2020-21 (P)			Nutrient	Zone / State	S. No.
Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total			
3.71	-17.28	-9.27	-65.56	59.49	4.93	272.00	-64.84	-16.61	N	Tripura	11
68.24	1.26	18.89	55.24	40.66	46.09	46.40	-13.57	10.16	P_2O_5		
-46.71	13.41	-14.20	172.84	51.23	85.92	-39.82	-58.96	-50.95	K_2O		
	-7.22	-4.52	-3.24	52.68	30.80	62.50	-51.08	-18.20	Total		
9.27	-0.35	3.20	5.26	0.75	2.51	13.81	-7.03	1.34	N	West Bengal	12
32.25	-18.56	-1.86	-33.57	40.30	7.59	46.60	-0.18	12.61	P_2O_5		
16.32	-23.74	-8.54	-39.32	43.55	3.57	45.51	9.97	20.01	K_2O		
16.92	-11.11	-1.01	-17.08	19.90	4.16	27.20	-0.84	8.66	Total		
5.68	**6.25**	**5.98**	**-0.42**	**9.91**	**5.01**	**11.28**	**-0.49**	**4.81**	**N**	**NORTH**	**II.**
4.79	**-10.00**	**-4.68**	**-23.68**	**34.54**	**11.50**	**43.90**	**1.57**	**13.04**	**P_2O_5**		
-10.58	**-23.28**	**-16.74**	**-34.25**	**43.67**	**0.59**	**43.04**	**7.11**	**20.09**	**K_2O**		
4.65	**0.72**	**2.50**	**-6.18**	**16.81**	**6.22**	**17.12**	**0.37**	**7.18**	**Total**		
9.22	1.46	4.96	-18.02	10.55	-2.88	6.83	1.30	3.49	N	Haryana	1
11.38	4.35	7.83	-35.12	37.12	0.24	12.67	1.40	5.12	P_2O_5		
17.53	-17.21	5.35	-34.46	9.99	-22.21	1.95	5.89	3.49	K_2O		
10.08	1.60	5.56	-22.57	15.82	-2.88	7.69	1.40	3.84	Total		
-2.90	0.88	-0.90	0.18	10.19	5.57	16.10	-15.10	-1.44	N	Himachal Pradesh	2
33.05	8.80	14.72	-6.60	-7.84	-7.49	41.41	-4.72	8.48	P_2O_5		
15.03	-12.84	-9.03	25.00	-8.08	-2.36	50.91	-10.47	3.12	K_2O		
2.46	-1.15	0.17	1.20	1.89	1.63	23.02	-12.03	1.09	Total		
-9.50	-9.97	-9.77	-1.49	-52.86	-30.81	166.10	59.11	124.50	N	Jammu & Kashmir	3
-16.14	1.01	-5.03	4.87	-63.27	-42.07	200.11	23.81	123.11	P_2O_5		
-56.23	-26.30	-33.72	291.06	-87.52	-25.60	99.06	517.20	157.73	K_2O		
-16.02	-10.70	-12.73	16.57	-61.51	-32.92	159.67	75.14	128.92	Total		
-2.10	12.23	4.85	0.53	14.95	8.02	5.87	-5.31	-0.31	N	Punjab	4
-39.43	58.10	10.26	-6.54	16.33	10.17	31.68	-2.39	5.40	P_2O_5		
-39.59	37.77	-18.41	-5.91	12.80	2.75	32.80	24.85	28.76	K_2O		
-10.04	21.30	5.10	-0.46	15.24	8.29	9.37	-4.00	1.44	Total		
9.66	6.48	7.96	4.92	9.71	7.45	12.38	0.51	5.98	N	Uttar Pradesh	5
20.94	-25.58	-11.79	-24.36	44.83	16.71	52.77	3.26	16.30	P_2O_5		
-8.03	-32.73	-20.62	-48.63	83.63	8.51	55.57	1.16	15.79	K_2O		
10.63	-5.30	1.43	-3.48	20.70	9.56	19.73	1.35	8.82	Total		
-14.32	-8.00	-11.58	-5.43	-8.24	-6.70	-4.57	-0.09	-2.58	N	Uttarakhand	6
13.04	7.84	9.75	-3.71	24.43	13.77	25.99	-20.59	-5.66	P_2O_5		
40.75	8.82	21.64	-35.63	14.29	-8.89	19.38	-16.89	-4.99	K_2O		
-9.97	-4.17	-7.26	-6.78	-0.11	-3.56	-0.04	-6.55	-3.29	Total		
-	-	-	-	-	-	-	-	-	N	Chandigarh	7
-	-	-	-	-	-	-	-	-	P_2O_5		
-	-	-	-	-	-	-	-	-	K_2O		
-	-	-	-	-	-	-	-	-	Total		
18.33	117.77	66.95	30.42	22.40	25.31	-22.25	-7.06	-12.79	N	Delhi	8
-47.00	23.64	-21.94	9.43	116.18	69.42	10.34	-27.89	-17.07	P_2O_5		
-100.00	-100.00	-100.00	-	-	-	-28.57	25.00	-9.09	K_2O		
0.25	97.44	45.25	32.84	33.33	33.15	-19.00	-9.96	-13.30	Total		

Table 11. Season-wise consumption of N, P_2O_5 & K_2O from 2018-19 to 2020-21 and

S. No.	Zone/State	Nutrient	Consumption ('000 tonnes)								
			2018-19			2019-20 (P)			2020-21 (P)		
			Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
III.	**SOUTH**	**N**	**1,773.09**	**1,614.62**	**3,387.71**	**1,659.44**	**1,994.56**	**3,654.00**	**2,299.86**	**1,930.46**	**4,230.32**
		P_2O_5	**881.23**	**680.36**	**1,561.59**	**803.92**	**885.53**	**1,689.45**	**1,158.74**	**932.08**	**2,090.82**
		K_2O	**479.03**	**409.90**	**888.93**	**355.99**	**495.25**	**851.24**	**524.89**	**554.60**	**1,079.49**
		Total	**3,133.35**	**2,704.88**	**5,838.23**	**2,819.35**	**3,375.34**	**6,194.69**	**3,983.49**	**3,417.14**	**7,400.63**
1	Andhra Pradesh	N	411.17	516.04	927.21	388.36	592.59	980.95	511.05	628.58	1,139.63
		P_2O_5	203.40	223.39	426.79	199.47	290.81	490.28	279.29	339.30	618.59
		K_2O	92.31	110.04	202.35	77.31	134.49	211.80	107.79	159.93	267.72
		Total	706.88	849.47	1,556.35	665.14	1,017.89	1,683.03	898.13	1,127.81	2,025.94
2	Telangana	N	494.69	393.58	888.27	515.01	472.09	987.10	708.17	461.56	1,169.73
		P_2O_5	212.99	130.15	343.14	214.49	155.19	369.68	299.08	175.51	474.59
		K_2O	63.05	51.45	114.50	51.75	70.66	122.41	84.96	88.26	173.22
		Total	770.73	575.18	1,345.91	781.25	697.94	1,479.19	1,092.21	725.33	1,817.54
3	Karnataka	N	595.43	340.92	936.35	526.83	490.76	1,017.59	753.65	425.80	1,179.45
		P_2O_5	342.99	193.20	536.19	297.92	262.41	560.33	438.22	249.99	688.21
		K_2O	192.20	114.85	307.05	139.83	143.16	282.99	203.53	151.65	355.18
		Total	1,130.62	648.97	1,779.59	964.58	896.33	1,860.91	1,395.40	827.44	2,222.84
4	Kerala	N	33.85	39.26	73.11	36.28	42.99	79.27	44.29	43.77	88.06
		P_2O_5	20.48	20.32	40.80	16.14	17.63	33.77	19.91	18.05	37.96
		K_2O	33.19	34.69	67.88	28.50	33.33	61.83	37.63	37.47	75.10
		Total	87.52	94.27	181.79	80.92	93.95	174.87	101.83	99.29	201.12
5	Tamil Nadu	N	235.79	320.10	555.89	190.80	391.51	582.31	278.46	366.39	644.85
		P_2O_5	100.77	112.24	213.01	75.31	158.25	233.56	121.24	148.08	269.32
		K_2O	97.57	98.23	195.80	58.29	113.01	171.30	90.33	116.39	206.72
		Total	434.13	530.57	964.70	324.40	662.77	987.17	490.03	630.86	1,120.89
6	Puducherry	N	2.00	4.49	6.49	2.16	4.62	6.78	4.24	4.23	8.47
		P_2O_5	0.49	0.85	1.34	0.59	1.24	1.83	1.00	1.15	2.15
		K_2O	0.67	0.56	1.23	0.31	0.60	0.91	0.65	0.90	1.55
		Total	3.16	5.90	9.06	3.06	6.46	9.52	5.89	6.28	12.17
7	A & N Islands	N	0.16	0.23	0.39	-	-	-	-	0.13	0.13
		P_2O_5	0.11	0.21	0.32	-	-	-	-	-	-
		K_2O	0.04	0.08	0.12	-	-	-	-	-	-
		Total	0.31	0.52	0.83	-	-	-	-	0.13	0.13
8	Lakshadweep	N	-	-	-	-	-	-	-	-	-
		P_2O_5	-	-	-	-	-	-	-	-	-
		K_2O	-	-	-	-	-	-	-	-	-
		Total	-	-	-	-	-	-	-	-	-
IV.	**WEST**	**N**	**2,692.08**	**2,678.98**	**5,371.06**	**2,738.76**	**3,460.59**	**6,199.35**	**3,318.76**	**3,233.40**	**6,552.16**
		P_2O_5	**1,422.46**	**1,091.78**	**2,514.24**	**1,299.12**	**1,580.72**	**2,879.84**	**1,831.98**	**1,570.41**	**3,402.39**
		K_2O	**499.32**	**350.77**	**850.09**	**401.94**	**393.90**	**795.84**	**530.48**	**432.60**	**963.08**
		Total	**4,613.86**	**4,121.53**	**8,735.39**	**4,439.82**	**5,435.21**	**9,875.03**	**5,681.22**	**5,236.41**	**10,917.63**
1	Gujarat	N	573.00	562.00	1,135.00	603.47	692.97	1,296.44	617.57	732.10	1,349.67
		P_2O_5	196.00	149.00	345.00	174.00	207.65	381.65	208.37	262.43	470.80
		K_2O	61.00	57.00	118.00	45.46	68.12	113.58	48.63	88.29	136.92
		Total	830.00	768.00	1,598.00	822.93	968.74	1,791.67	874.57	1,082.82	1,957.39

total by states and percentage variation (April-March) (continued)

± % variation over previous season/year									Nutrient	Zone / State	S. No.
2018-19			2019-20 (P)			2020-21 (P)					
Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total			
7.80	**-6.37**	**0.55**	**-6.41**	**23.53**	**7.86**	**38.59**	**-3.21**	**15.77**	**N**	**SOUTH**	**III.**
19.13	**-8.82**	**5.09**	**-8.77**	**30.16**	**8.19**	**44.14**	**5.26**	**23.76**	**P_2O_5**		
10.86	**-6.19**	**2.29**	**-25.69**	**20.82**	**-4.24**	**47.45**	**11.98**	**26.81**	**K_2O**		
11.24	**-6.97**	**1.99**	**-10.02**	**24.79**	**6.11**	**41.29**	**1.24**	**19.47**	**Total**		
0.29	1.24	0.82	-5.55	14.83	5.80	31.59	6.07	16.18	N	Andhra Pradesh	1
3.94	-1.90	0.80	-1.93	30.18	14.88	40.02	16.67	26.17	P_2O_5		
-7.74	-8.97	-8.41	-16.25	22.22	4.67	39.43	18.92	26.40	K_2O		
0.17	-1.03	-0.49	-5.90	19.83	8.14	35.03	10.80	20.37	Total		
-2.06	0.50	-0.94	4.11	19.95	11.13	37.51	-2.23	18.50	N	Telangana	2
6.64	-12.84	-1.69	0.70	19.24	7.73	39.44	13.09	28.38	P_2O_5		
-28.47	-11.02	-21.56	-17.92	37.34	6.91	64.17	24.91	41.51	K_2O		
-2.81	-3.94	-3.29	1.36	21.34	9.90	39.80	3.92	22.87	Total		
20.58	-11.31	6.62	-11.52	43.95	8.68	43.05	-13.24	15.91	N	Karnataka	3
32.70	-3.80	16.74	-13.14	35.82	4.50	47.09	-4.73	22.82	P_2O_5		
32.90	1.49	19.11	-27.25	24.65	-7.84	45.56	5.93	25.51	K_2O		
26.06	-7.08	11.55	-14.69	38.12	4.57	44.66	-7.69	19.45	Total		
-54.09	-39.11	-47.10	7.18	9.50	8.43	22.08	1.81	11.09	N	Kerala	4
-12.96	2.78	-5.77	-21.19	-13.24	-17.23	23.36	2.38	12.41	P_2O_5		
7.03	17.75	12.25	-14.13	-3.92	-8.91	32.04	12.42	21.46	K_2O		
-31.77	-17.10	-24.87	-7.54	-0.34	-3.81	25.84	5.68	15.01	Total		
49.28	-13.65	5.15	-19.08	22.31	4.75	45.94	-6.42	10.74	N	Tamil Nadu	5
63.69	-23.86	1.93	-25.27	40.99	9.65	60.99	-6.43	15.31	P_2O_5		
44.89	-14.57	7.39	-40.26	15.05	-12.51	54.97	2.99	20.68	K_2O		
51.34	-16.19	4.86	-25.28	24.92	2.33	51.06	-4.81	13.55	Total		
-51.81	31.67	-14.15	8.00	2.90	4.47	96.30	-8.44	24.93	N	Puducherry	6
-14.04	-8.60	-10.67	20.41	45.88	36.57	69.49	-7.26	17.49	P_2O_5		
-18.29	1.82	-10.22	-53.73	7.14	-26.02	109.68	50.00	70.33	K_2O		
-42.96	20.65	-13.14	-3.16	9.49	5.08	92.48	-2.79	27.84	Total		
6.67	43.75	25.81	-100.00	-100.00	-100.00	-	-	-	N	A & N Islands	7
-35.29	16.67	-8.57	-100.00	-100.00	-100.00	-	-	-	P_2O_5		
-60.00	-33.33	-45.45	-100.00	-100.00	-100.00	-	-	-	K_2O		
-26.19	13.04	-5.68	-100.00	-100.00	-100.00	-	-	-	Total		
-	-	-	-	-	-	-	-	-	N	Lakshadweep	8
-	-	-	-	-	-	-	-	-	P_2O_5		
-	-	-	-	-	-	-	-	-	K_2O		
-	-	-	-	-	-	-	-	-	Total		
-2.34	**7.18**	**2.19**	**1.73**	**29.18**	**15.42**	**21.18**	**-6.57**	**5.69**	**N**	**WEST**	**IV.**
5.62	**0.002**	**3.11**	**-8.67**	**44.78**	**14.54**	**41.02**	**-0.65**	**18.15**	**P_2O_5**		
-2.18	**-1.18**	**-1.77**	**-19.50**	**12.30**	**-6.38**	**31.98**	**9.82**	**21.01**	**K_2O**		
0.0002	**4.44**	**2.05**	**-3.77**	**31.87**	**13.05**	**27.96**	**-3.66**	**10.56**	**Total**		
-13.50	-10.31	-11.95	5.32	23.30	14.22	2.34	5.65	4.11	N	Gujarat	1
-10.08	-24.82	-17.10	-11.22	39.36	10.62	19.75	26.38	23.36	P_2O_5		
-7.74	-18.86	-13.47	-25.48	19.51	-3.75	6.97	29.61	20.55	K_2O		
-12.31	-14.19	-13.23	-0.85	26.14	12.12	6.28	11.78	9.25	Total		

Table 11. Season-wise consumption of N, P_2O_5 & K_2O from 2018-19 to 2020-21 and

S. No.	Zone/State	Nutrient	Consumption ('000 tonnes)								
			2018-19			2019-20 (P)			2020-21 (P)		
			Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
2	Madhya Pradesh	N	611.98	828.41	1,440.39	560.74	1,112.31	1,673.05	766.79	965.91	1,732.70
		P_2O_5	400.27	342.67	742.94	299.49	594.82	894.31	480.29	540.33	1,020.62
		K_2O	67.44	34.19	101.63	42.66	73.36	116.02	63.96	76.24	140.20
		Total	1,079.69	1,205.27	2,284.96	902.89	1,780.49	2,683.38	1,311.04	1,582.48	2,893.52
3	Chhattisgarh	N	222.88	89.64	312.52	344.30	105.38	449.68	392.60	132.49	525.09
		P_2O_5	126.57	51.11	177.68	177.49	48.03	225.52	208.51	63.48	271.99
		K_2O	39.89	23.43	63.32	48.69	13.46	62.15	55.70	18.83	74.53
		Total	389.34	164.18	553.52	570.48	166.87	737.35	656.81	214.80	871.61
4	Maharashtra	N	873.90	530.53	1,404.43	827.57	733.39	1,560.96	1,075.66	624.19	1,699.85
		P_2O_5	488.70	350.25	838.95	490.97	407.23	898.20	732.73	395.20	1,127.93
		K_2O	310.62	216.18	526.80	255.26	226.86	482.12	351.86	233.95	585.81
		Total	1,673.22	1,096.96	2,770.18	1,573.80	1,367.48	2,941.28	2,160.25	1,253.34	3,413.59
5	Rajasthan	N	409.09	667.73	1,076.82	401.66	815.89	1,217.55	464.44	778.11	1,242.55
		P_2O_5	209.97	198.37	408.34	156.45	322.62	479.07	201.13	308.64	509.77
		K_2O	19.72	19.78	39.50	9.23	11.73	20.96	9.78	14.88	24.66
		Total	638.78	885.88	1,524.66	567.34	1,150.24	1,717.58	675.35	1,101.63	1,776.98
6	Goa	N	1.08	0.53	1.61	0.80	0.54	1.34	1.20	0.58	1.78
		P_2O_5	0.91	0.33	1.24	0.58	0.30	0.88	0.60	0.33	0.93
		K_2O	0.65	0.19	0.84	0.64	0.37	1.01	0.55	0.41	0.96
		Total	2.64	1.05	3.69	2.02	1.21	3.23	2.35	1.32	3.67
7	Daman & Diu	N	0.09	0.05	0.14	-	-	-	-	-	-
		P_2O_5	0.01	-	0.01	-	-	-	-	-	-
		K_2O	-	-	-	-	-	-	-	-	-
		Total	0.10	0.05	0.15	-	-	-	-	-	-
8	Dadra & Nagar Haveli	N	0.06	0.09	0.15	0.22	0.11	0.33	0.50	0.02	0.52
		P_2O_5	0.03	0.05	0.08	0.14	0.07	0.21	0.35	-	0.35
		K_2O	-	-	-	-	-	-	-	-	-
		Total	0.09	0.14	0.23	0.36	0.18	0.54	0.85	0.02	0.87
	All India	**N**	**8,624.43**	**9,013.33**	**17,637.76**	**8,522.51**	**10,578.80**	**19,101.31**	**10,274.22**	**10,129.75**	**20,403.97**
		P_2O_5	**3,543.27**	**3,366.88**	**6,910.15**	**3,006.09**	**4,655.95**	**7,662.04**	**4,285.87**	**4,692.07**	**8,977.94**
		K_2O	**1,475.49**	**1,204.82**	**2,680.31**	**1,076.84**	**1,530.16**	**2,607.00**	**1,492.29**	**1,661.41**	**3,153.70**
		Total	**13,643.19**	**13,585.03**	**27,228.22**	**12,605.44**	**16,764.91**	**29,370.35**	**16,052.38**	**16,483.23**	**32,535.61**

(P) = Provisional.

Note : 1. Fertiliser consumption by Plantation crops in east and south zones is included in the total of respective states.
2. Due to rounding off, total for the State/Zone/All-India (Horizontal & Vertical) may not exactly tally.
3. DBT sale assumed as consumption for 2019-20 and 2020-21.

There is a wide variation in NPK use ratio among the zones. During 2020-21, NPK use ratio in east zone was 3.8:1.7:1, south 3.9:1.9:1 and west 6.8:3.5:1 as against 18.0:5.8:1 in north zone.

6.3 State-wise Comments

Among 21 major fertilizer consuming states, as many as 20 states recorded positive growth in fertilizer consumption during 2020-21 over 2019-20. Only 1 state (Uttarakhand) witnessed negative growth during the period. (**Table 12**).

Out of total nutrient consumption of 32.54 million MT in the country, Uttar Pradesh had the largest share (17.3%), followed by Maharashtra (10.5%), Madhya Pradesh (8.9%), Karnataka (6.8%), Andhra Pradesh (6.2%), Gujarat (6.0%), Punjab and Bihar (5.9% each), Telangana (5.6%), Rajasthan (5.5%) and West Bengal (5.3%). These 11 states accounted for about 84% of the total consumption in the country. Next in order were

total by states and percentage variation (April-March) (concluded)

± % variation over previous season/year									Nutrient	Zone / State	S. No.
2018-19			2019-20 (P)			2020-21 (P)					
Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total			
8.37	18.64	14.05	-8.37	34.27	16.15	36.75	-13.16	3.57	N	Madhya Pradesh	2
12.68	14.37	13.45	-25.18	73.58	20.37	60.37	-9.16	14.12	P_2O_5		
14.60	-12.87	3.61	-36.74	114.57	14.16	49.93	3.93	20.84	K_2O		
10.31	16.21	13.35	-16.38	47.73	17.44	45.20	-11.12	7.83	Total		
-13.07	21.64	-5.32	54.48	17.56	43.89	14.03	25.73	16.77	N	Chhattisgarh	3
-0.79	23.39	5.14	40.23	-6.03	26.92	17.48	32.17	20.61	P_2O_5		
2.52	87.89	23.24	22.06	-42.55	-1.85	14.40	39.90	19.92	K_2O		
-7.93	28.69	0.56	46.52	1.64	33.21	15.13	28.72	18.21	Total		
-5.36	-9.49	-6.96	-5.30	38.24	11.15	29.98	-14.89	8.90	N	Maharashtra	4
0.43	-11.05	-4.71	0.46	16.27	7.06	49.24	-2.95	25.58	P_2O_5		
-6.37	-2.54	-4.84	-17.82	4.94	-8.48	37.84	3.13	21.51	K_2O		
-3.94	-8.72	-5.89	-5.94	24.66	6.18	37.26	-8.35	16.06	Total		
17.48	29.89	24.87	-1.82	22.19	13.07	15.63	-4.63	2.05	N	Rajasthan	5
32.66	25.30	28.98	-25.49	62.64	17.32	28.56	-4.33	6.41	P_2O_5		
39.36	81.63	57.75	-53.19	-40.70	-46.94	5.96	26.85	17.65	K_2O		
22.69	29.65	26.64	-11.18	29.84	12.65	19.04	-4.23	3.46	Total		
-5.26	1.92	-3.01	-25.93	1.89	-16.77	50.00	7.41	32.84	N	Goa	6
-2.15	-13.16	-5.34	-36.26	-9.09	-29.03	3.45	10.00	5.68	P_2O_5		
1.56	-38.71	-11.58	-1.54	94.74	20.24	-14.06	10.81	-4.95	K_2O		
-2.58	-13.22	-5.87	-23.48	15.24	-12.47	16.34	9.09	13.62	Total		
-	-	-	-100.00	-100.00	-100.00	-	-	-	N	Daman & Diu	7
-	-	-	-100.00	-	-100.00	-	-	-	P_2O_5		
-	-	-	-	-	-	-	-	-	K_2O		
11.11	-	7.14	-100.00	-100.00	-100.00	-	-	-	Total		
-71.43	-	-50.00	266.67	22.22	120.00	127.27	-81.82	57.58	N	Dadra & Nagar	8
-80.00	-16.67	-61.90	366.67	40.00	162.50	150.00	-100.00	66.67	P_2O_5	Haveli	
-	-	-	-	-	-	-	-	-	K_2O		
-75.00	-6.67	-54.90	300.00	28.57	134.78	136.11	-88.89	61.11	Total		
3.25	**4.73**	**4.00**	**-1.18**	**17.37**	**8.30**	**20.55**	**-4.24**	**6.82**	**N**	**All India**	
11.03	**-8.09**	**0.81**	**-15.16**	**38.29**	**10.88**	**42.57**	**0.78**	**17.17**	**P_2O_5**		
4.50	**-11.91**	**-3.58**	**-27.02**	**27.00**	**-2.74**	**38.58**	**8.58**	**20.97**	**K_2O**		
5.30	**-0.38**	**2.39**	**-7.61**	**23.41**	**7.87**	**27.34**	**-1.68**	**10.78**	**Total**		

Source: 1. Ministry of Agriculture & Farmers Welfare, Government of India.
2. State Departments of Agriculture.
3. mfms.nic.in

Haryana (4.5%) and Tamil Nadu (3.4%). In other words, these 13 states accounted for about 92% of total consumption in the country. Balance 8% was shared by the remaining states/UTs (**Table 13**).

There is a wide variation in the use of fertilizers among various states. The per hectare use of total fertilizer nutrients varies from as low as 0.6 kg in Nagaland to as high as 314.8 kg in Telangana. All-India per hectare consumption of total nutrients was 161.3 kg in 2020-21. The major states which had consumption higher (kg/ha) than All-India average include, Telangana (314.8), Andhra Pradesh (277.7), Bihar (258.0), Punjab (248.5), Haryana (221.8), Uttar Pradesh (209.5), Tamil Nadu (197.6), West Bengal (174.5), Karnataka (164.0) and Gujarat (163.2). In the remaining states, per hectare consumption was lower than the All-India

Table 12. States according to descending order of contribution to total increase in consumption ($N+P_2O_5+K_2O$) 2020-21 over 2019-20 and 2019-20 over 2018-19

Ranking in terms of increase in consumption 2020-21 over 2019-20	States	2020-21(P) over 2019-20(P)			Ranking in terms of increase in consumption 2019-20 over 2018-19	States	2019-20(P) over 2018-19		
		Increase in absolute terms ('000 MT)	Share in contribution to total increase (%)	Cumulative share (%)			Increase in absolute terms ('000 MT)	Share in contribution to total increase (%)	Cumulative share (%)
States with Positive Growth									
1	Maharashtra	472.31	14.86	14.86	1	Uttar Pradesh	451.20	20.01	20.01
2	Uttar Pradesh	456.04	14.35	29.21	2	Madhya Pradesh	398.42	17.67	37.69
3	Karnataka	361.93	11.39	40.60	3	Gujarat	193.67	8.59	46.28
4	Andhra Pradesh	342.91	10.79	51.38	4	Rajasthan	192.92	8.56	54.83
5	Telangana	338.35	10.65	62.03	5	Chhattisgarh	183.83	8.15	62.99
6	Madhya Pradesh	210.14	6.61	68.64	6	Maharashtra	171.10	7.59	70.58
7	Gujarat	165.72	5.21	73.86	7	Punjab	145.96	6.47	77.05
8	West Bengal	138.43	4.36	78.21	8	Telangana	133.28	5.91	82.96
9	Chhattisgarh	134.26	4.22	82.44	9	Andhra Pradesh	126.68	5.62	88.58
10	Tamil Nadu	133.72	4.21	86.64	10	Bihar	88.78	3.94	92.52
11	Jammu & Kashmir	101.64	3.20	89.84	11	Karnataka	81.32	3.61	96.13
12	Bihar	90.46	2.85	92.69	12	West Bengal	63.87	2.83	98.96
13	Rajasthan	59.40	1.87	94.56	13	Tamil Nadu	22.47	1.00	99.96
14	Haryana	54.21	1.71	96.26	14	Himachal Pradesh	0.94	0.04	100.00
15	Odisha	36.83	1.16	97.42					
16	Punjab	27.38	0.86	98.28					
17	Jharkhand	26.49	0.83	99.11					
18	Kerala	26.25	0.83	99.94					
19	Assam	1.26	0.04	99.98					
20	Himachal Pradesh	0.64	0.02	100.00					
	Sub Total	**3178.37**					**2254.44**		
States with Negative Growth									
1	Uttarakhand	5.38	100.00	100.00	1	Jharkhand	0.39	0.36	0.36
					2	Odisha	2.56	2.37	2.73
					3	Uttarakhand	6.03	5.58	8.30
					4	Kerala	6.92	6.40	14.70
					5	Assam	11.72	10.84	25.54
					6	Jammu & Kashmir	38.70	35.79	61.33
					7	Haryana	41.81	38.67	100.00
Sub Total		**-5.38**					**-108.13**		
All India		**3,165.26 $**					**2142.13 $**		

(P) = Provisional. $ = Includes small states/UTs/Plantations.
Note: For consumption figures, see Table 11.

average of 161.3 kg. **Table 14** shows the state-wise consumption of plant nutrients per hectare of gross cropped area.

As mentioned earlier, All-India NPK use ratio was 6.5:2.8:1 during 2020-21. However, NPK use ratio widely varied among various states. While NPK use ratio was around 4.1:2.1:1 in Odisha, it was 50.4: 20.7:1 in Rajasthan during 2020-21. The state-wise details of the ratio of N and P_2O_5 in relation to K_2O are shown in **Table 15**.

All India product-wise DBT sale of fertilizers is shown in **Table 16**. Sale of major fertilizers, viz. urea at 35.04 million MT, DAP at 11.91 million MT, NP/NPK complex fertilizers at 11.81 million MT, SSP at 4.49 million MT and MOP at 3.42 million MT recorded increase of 4%, 17.9%, 19.8%, 1.9% and 22.9%, respectively, during 2020-21 over 2019-20. Total sale of fertilizer products increased from 61.69 million MT during 2019-20 to 67.61 million MT in 2020-21 representing increase of 10.7%.

The details of state-wise review of fertilizer consumption, weather & crop situation and fertilizer sale points during 2020-21 are presented in the following paragraphs.

I. EAST ZONE

i) Assam

Fertilizer Consumption

Consumption of total fertilizer nutrients

Table 13. States according to descending order of share of consumption to All-India consumption ($N+P_2O_5+K_2O$) in 2019-20 and 2020-21 (Provisional)

Ranking		States	Share of All India total (%)	
2019-20	2020-21		2019-20	2020-21
1	1	Uttar Pradesh	17.6	17.3
2	2	Maharashtra	10.0	10.5
3	3	Madhya Pradesh	9.1	8.9
5	4	Karnataka	6.3	6.8
9	5	Andhra Pradesh	5.7	6.2
7	6	Gujarat	6.1	6.0
4	7	Punjab	6.5	5.9
6	8	Bihar	6.2	5.9
11	9	Telangana	5.0	5.6
8	10	Rajasthan	5.8	5.5
10	11	West Bengal	5.4	5.3
12	12	Haryana	4.8	4.5
13	13	Tamil Nadu	3.4	3.4
14	14	Chhattisgarh	2.5	2.7
15	15	Odisha	2.0	1.9
16	16	Assam	0.9	0.9
17	17	Jharkhand	0.6	0.6
18	18	Kerala	0.6	0.6
20	19	Jammu & Kashmir	0.3	0.6
19	20	Uttarakhand	0.6	0.5
21	21	Himachal Pradesh	0.2	0.2

Note: 1. For consumption figures, see Table 11.
2. Share of All-India consumption relates to ranking of states in individual years.

($N+P_2O_5+K_2O$) in Assam at 279.62 thousand tonnes (thousand MT) in 2020-21 showed a marginal increase of 0.5% over 2019-20. Consumption of total fertilizer nutrient increased in *kharif* but declined in *rabi* seasons. It increased by 1.6% in *kharif 2020* and declined by 0.6% in *rabi* 2020-21 over the corresponding seasons of the previous year. *Kharif:rabi* share in total consumption changed marginally from 48:52 during 2019-20 to 49:51 during 2020-21.

Consumption of N at 175.6 thousand MT during 2020-21 fell by 3.4% over 2019-20. However, consumption of P_2O_5 and K_2O at 54.8 and 49.2 thousand MT increased by 9.2% and 5.9%, respectively, during the period. NPK use ratio changed from 3.9:1.1:1 during 2019-20 to 3.6:1.1:1 during 2020-21. Per hectare use of fertilizer nutrients improved marginally from 69.5 kg during 2019-20 to 69.8 kg during 2020-21.

Weather and Crop Situation

Total rainfall was excess in Southwest monsoon 2020 (June-September) at 2147 mm. Out of 27 districts, 16 districts received normal rains, 8 received excess to large excess rains and 3 received deficient to large deficient rains during the season. During *kharif 2020*, area sown under pulses was higher by 2 thousand hectares (thousand ha) and coarse cereals by 4 thousand ha over *kharif* 2019. In contrast, area under rice was lower by 5 thousand ha, oilseeds and jute & mesta by 1 thousand ha each during the period.

During post-monsoon 2020 (October-December), rainfall was normal at 215 mm. Out of 27 districts, 2 received normal rains, 14 received excess to large excess rains and 11 received deficient to large deficient rains during the season. During *rabi 2020-21*, area sown under major crops increased during the period. Area sown under wheat, rice, pulses, coarse cereals and oilseeds was higher by 1, 10, 11, 6 and 36 thousand ha, respectively, during *rabi* 2020-21 over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points was 7,565 at the beginning of 2020-21. Out of these sale points, share of private channel was 93% and the balance 7% was of cooperative and other institutional channels.

ii) Bihar

Fertilizer Consumption

Total fertilizer nutrient consumption in Bihar at 1.911 million MT in 2020-21 recorded a growth of 5% over the previous year. Consumption of total fertilizer nutrients increased in *kharif* 2020 by 29.3% but declined in *rabi* 2020-21 by 6.6% over the corresponding seasons of the previous year. *Kharif:rabi* share in consumption of total nutrients changed from 32:68 during 2019-20 to 40:60 during 2020-21.

Consumption of N at 1.285 million MT, P_2O_5 at 0.458 million MT and K_2O at 0.168 million MT during 2020-21 increased by 4%, 8.2% and 3.6%, respectively, over 2019-20. NPK use ratio changed from 7.6:2.6:1 during 2019-20 to 7.7:2.7:1 during 2020-21. Consumption of total nutrients per hectare of gross cropped area increased from 245.8 kg during 2019-20 to 258 kg during 2020-21.

Weather and Crop Situation

The state received excess rains during Southwest monsoon at 1273 mm. Out of 38 districts in the state, 15 received normal rains, 20 received excess rains and 3 received deficient rains during the season. During *kharif 2020*, area under rice, pulses and coarse cereals was higher by 535, 23 and 1 thousand ha, respectively, over *kharif* 2019. However, area under

Table 14. Consumption of plant nutrients per unit of gross cropped area from 2018-19 to 2020-21 (Provisional)

(kg/ha)

Zone/State	2018-19				2019-20				2020-21			
	N	P_2O_5	K_2O	Total	N	P_2O_5	K_2O	Total	N	P_2O_5	K_2O	Total
East	**88.0**	**35.9**	**20.8**	**144.7**	**89.9**	**37.8**	**21.3**	**149.0**	**91.9**	**42.3**	**24.2**	**158.4**
Arunchal Pradesh	-	-	-	-	-	-	-	-	-	-	-	-
Assam	48.3	11.6	12.5	72.4	45.4	12.5	11.6	69.5	43.9	13.7	12.3	69.8
Bihar	160.4	53.4	20.0	233.8	166.8	57.2	21.9	245.8	173.5	61.8	22.6	258.0
Jharkhand	69.9	26.5	3.4	99.8	72.3	24.8	2.5	99.6	79.0	31.9	3.1	114.1
Manipur	27.2	12.8	11.4	51.5	27.3	7.9	2.1	37.3	22.8	5.4	3.4	31.7
Meghalaya	-	-	-	-	-	-	-	-	-	-	-	-
Mizoram	24.6	7.3	6.4	38.3	20.2	1.1	0.5	21.8	5.3	0.7	-	6.0
Nagaland	2.3	1.6	1.0	5.0	0.9	0.2	-	1.1	0.6	0.1	-	0.6
Odisha	77.3	33.7	16.5	127.4	76.9	33.4	16.6	126.9	76.7	39.5	18.8	135.0
Sikkim	-	-	-	-	-	-	-	-	-	-	-	-
Tripura	17.1	7.9	5.8	30.8	17.9	11.5	10.8	40.3	15.0	12.7	5.3	33.0
West Bengal	77.4	43.0	33.8	154.2	79.3	46.2	35.0	160.6	80.4	52.1	42.0	174.5
North	**140.1**	**39.4**	**7.1**	**186.5**	**147.1**	**44.0**	**7.1**	**198.2**	**154.2**	**49.7**	**8.6**	**212.5**
Haryana	166.7	45.8	7.4	219.9	161.9	45.9	5.7	213.5	167.6	48.2	5.9	221.8
Himachal Pradesh	39.7	12.3	11.1	63.1	41.9	11.4	10.9	64.1	41.3	12.3	11.2	64.8
Jammu & Kashmir	63.0	24.9	12.9	100.9	43.6	14.4	9.6	67.7	97.9	32.2	24.8	154.9
Punjab	178.5	42.4	5.4	226.2	192.8	46.7	5.5	245.0	192.2	49.2	7.1	248.5
Uttar Pradesh	129.6	39.1	7.1	175.8	139.2	45.7	7.7	192.6	147.5	53.1	8.9	209.5
Uttarakhand	129.0	26.2	9.4	164.7	120.4	29.9	8.6	158.8	117.3	28.2	8.1	153.6
Chandigarh	-	-	-	-	-	-	-	-	-	-	-	-
Delhi	172.5	21.3	-	193.8	216.2	36.1	5.8	258.1	188.6	29.9	5.3	223.8
South	**97.0**	**44.7**	**25.4**	**167.1**	**104.6**	**48.4**	**24.4**	**177.3**	**121.1**	**59.8**	**30.9**	**211.8**
Andhra Pradesh	127.1	58.5	27.7	213.3	134.4	67.2	29.0	230.7	156.2	84.8	36.7	277.7
Telengana	153.8	59.4	19.8	233.1	170.9	64.0	21.2	256.2	202.6	82.2	30.0	314.8
Karnataka	69.1	39.6	22.7	131.3	75.1	41.3	20.9	137.3	87.0	50.8	26.2	164.0
Kerala	28.4	15.9	26.4	70.7	30.8	13.1	24.0	68.0	34.2	14.8	29.2	78.2
Tamil Nadu	98.0	37.6	34.5	170.1	102.7	41.2	30.2	174.0	113.7	47.5	36.4	197.6
Puducherry	242.9	50.2	46.0	339.1	253.8	68.5	34.1	356.3	317.0	80.5	58.0	455.5
A&N Islands	8.8	7.2	2.7	18.8	-	-	-	-	2.9	-	-	2.9
Lakshadweep	-	-	-	-	-	-	-	-	-	-	-	-
West	**58.3**	**27.3**	**9.2**	**94.8**	**67.3**	**31.2**	**8.6**	**107.2**	**71.1**	**36.9**	**10.5**	**118.5**
Gujarat	94.6	28.8	9.8	133.2	108.1	31.8	9.5	149.4	112.5	39.3	11.4	163.2
Madhya Pradesh	57.4	29.8	4.0	91.0	66.6	35.6	4.6	106.8	69.0	40.6	5.6	115.2
Chhattisgarh	55.7	31.7	11.3	98.6	80.1	40.2	11.1	131.4	93.5	46.5	13.3	155.3
Maharashtra	58.6	35.0	22.0	115.7	65.2	37.5	20.1	122.8	71.0	47.1	24.5	142.5
Rajasthan	42.5	16.1	1.6	60.2	48.1	18.9	0.8	67.9	49.1	20.1	1.0	70.2
Goa	10.7	8.3	5.6	24.6	8.9	5.9	6.7	21.6	11.9	6.2	6.4	24.5
Dman & Diu	50.0	3.6	-	53.5	-	-	-	-	-	-	-	-
D & N Haveli	6.4	3.4	-	9.9	14.2	9.0	-	23.2	22.3	15.0	-	37.3
All India	**87.5**	**34.3**	**13.3**	**135.0**	**94.7**	**38.0**	**12.9**	**145.6**	**101.2**	**44.5**	**15.6**	**161.3**

Note: 1. Consumption of plant nutrients per hectare have been worked out on the basis of latest gross cropped area available for 2018-19.

2. Due to rounding of figures, totals may not exactly tally.

Table 15. Consumption ratio of N & P_2O_5 in relation to K_2O from 2018-19 to 2020-21

Zone/State	2018-19			2019-20 (P)			2020-21 (P)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
East	**4.2**	**1.7**	**1**	**4.2**	**1.8**	**1**	**3.8**	**1.7**	**1**
Arunachal Pradesh	-	-	-	-	-	-	-	-	-
Assam	3.9	0.9	1	3.9	1.1	1	3.6	1.1	1
Bihar	8.0	2.7	1	7.6	2.6	1	7.7	2.7	1
Jharkhand	20.8	7.9	1	28.7	9.8	1	25.2	10.2	1
Manipur	2.4	1.1	1	13.1	3.8	1	6.7	1.6	1
Meghalaya	-	-	-	-	-	-	-	-	-
Mizoram	3.8	1.1	1	41.9	2.3	1	-	-	-
Nagaland	2.2	1.5	1	-	-	-	-	-	-
Odisha	4.7	2.0	1	4.6	2.0	1	4.1	2.1	1
Sikkim	-	-	-	-	-	-	-	-	-
Tripura	2.9	1.4	1	1.7	1.1	1	2.8	2.4	1
West Bengal	2.3	1.3	1	2.3	1.3	1	1.9	1.2	1
North	**19.7**	**5.6**	**1**	**20.6**	**6.2**	**1**	**18.0**	**5.8**	**1**
Haryana	22.6	6.2	1	28.2	8.0	1	28.2	8.1	1
Himachal Pradesh	3.6	1.1	1	3.9	1.0	1	3.7	1.1	1
Jammu & Kashmir	4.9	1.9	1	4.5	1.5	1	4.0	1.3	1
Punjab	33.1	7.9	1	34.8	8.4	1	27.0	6.9	1
Uttar Pradesh	18.3	5.5	1	18.2	6.0	1	16.6	6.0	1
Uttarakhand	13.7	2.8	1	14.1	3.5	1	14.4	3.5	1
Delhi	-	-	-	37.2	6.2	1	35.7	5.7	1
South	**3.8**	**1.8**	**1**	**4.3**	**2.0**	**1**	**3.9**	**1.9**	**1**
Andhra Pradesh	4.6	2.1	1	4.6	2.3	1	4.3	2.3	1
Telangana	7.8	3.0	1	8.1	3.0	1	6.8	2.7	1
Karnataka	3.0	1.7	1	3.6	2.0	1	3.3	1.9	1
Kerala	1.1	0.6	1	1.3	0.5	1	1.2	0.5	1
Tamil Nadu	2.8	1.1	1	3.4	1.4	1	3.1	1.3	1
Puducherry	5.3	1.1	1	7.5	2.0	1	5.5	1.4	1
A & N Islands	3.3	2.7	1	-	-	-	-	-	-
West	**6.3**	**3.0**	**1**	**7.8**	**3.6**	**1**	**6.8**	**3.5**	**1**
Gujarat	9.6	2.9	1	11.4	3.4	1	9.9	3.4	1
Madhya Pradesh	14.2	7.3	1	14.4	7.7	1	12.4	7.3	1
Chhattisgarh	4.9	2.8	1	7.2	3.6	1	7.0	3.6	1
Maharashtra	2.7	1.6	1	3.2	1.9	1	2.9	1.9	1
Rajasthan	27.3	10.3	1	58.1	22.9	1	50.4	20.7	1
Goa	1.9	1.5	1	1.3	0.9	1	1.9	1.0	1
Daman & Diu	-	-	-	-	-	-	-	-	-
D & N Haveli	-	-	-	-	-	-	-	-	-
All India	**6.6**	**2.6**	**1**	**7.3**	**2.9**	**1**	**6.5**	**2.8**	**1**

(P) = Provisional.

Table 16. Sale* of fertilizer products in 2019-20 and 2020-21 (April-March) (Provisional) **('000 tonnes)**

Fertilizers		Grade	Sale	
			2019-20	2020-21
I.	**Straight nitrogenous**			
1.	Ammonium sulphate	20.6% N	793.0	891.3
2.	Urea	46 % N	33,695.4	35,042.5
3.	Calcium ammonium nitrate	25 % N	-	-
4.	Ammonium chloride	25 % N	25.9	10.9
II.	**Straight phosphatic**			
1.	Single superphosphate	16 % P_20_5	4,403.1	4,488.8
2.	Triple superphosphate	46 % P_20_5	-	-
3.	Rock phosphate	20 % P_20_5	29.7	30.0
III.	**Straight potassic**			
1.	Muriate of potash	60 % K_2O	2,787.5	3,424.9
2.	Sulphate of potash	50 % K_2O	-	-
IV.	**Complex**			
	Diammonium phosphate	18-46-0	10,099.8	11,911.5
	Mono Ammonium Phosphate	11-52-0	-	-
	Total NP/NPK Complex ferts. (other than DAP/MAP)		9,856.9	11,811.0
	Total Product		**61,691.1**	**67,610.8**

* DBT sale = Sale by retailers through PoS machines to farmers.

oilseeds, sugarcane and jute & mesta was lower by 8, 34 and 3 thousand ha, respectively, during the period.

During post-monsoon 2020, state received deficient rains at 30 mm only. Out of 38 districts, as many as 36 received deficient to large deficient rains and only 1 district received excess and 1 district received normal rains during the period. During *rabi* 2020-21, area under wheat, pulses, coarse cereals and oilseeds was higher by 28, 15, 20 and 8 thousand ha, respectively, over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points was 23,600 at the beginning of 2020-21. Out of these sale points, share of private channel was 89% and the balance 11% was of cooperative and other institutional channels.

iii) Jharkhand

Fertilizer Consumption

Total consumption of fertilizer nutrients at 208.16 thousand MT during 2020-21, recorded increase of 14.6% over the previous year. The growth in consumption was 57.3% in *kharif* 2020 but it declined by 29.1% in *rabi* 2020-21 over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer consumption changed from 51:49 during 2019-20 to 69:31 during 2020-21.

Consumption of N at 144.2 thousand MT, P_2O_5 at 58.2 thousand MT and K_2O at 5.7 thousand MT recorded increase of 9.3%, 28.9% and 24.8%, respectively, in 2020-21 over 2019-20. NPK use ratio changed from 28.7:9.8:1 during 2019-20 to 25.2:10.2:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 99.6 kg during 2019-20 to 114.1 kg during 2020-21.

Weather and Crop Situation

Rainfall received during Southwest monsoon 2020 at 899 mm was normal. Out of 24 districts, 15 received normal rains and 9 received deficient rainfall during the season. During *kharif 2020*, area coverage under rice, pulses and coarse cereals was higher by 391, 4 and 54 thousand ha, respectively, over *kharif* 2019. However, area under oilseeds was down by 1 thousand ha during the period.

During post-monsoon, rainfall was deficient at 67 mm. Out of 24 districts, 6 received normal rains, 4 received excess to large excess and 14 received deficient to large deficient rains during the period. There was increase in area under all *rabi* crops. Area under wheat, pulses, coarse cereals and oilseeds was higher by 20, 49, 5 and 158 thousand ha, respectively, during *rabi* 2020-21 over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points was 3,325 at the beginning of 2020-21. Out of these sale points, share of private channel was 86% and the balance 14% was of cooperative and other institutional channels.

iv) Odisha

Fertilizer Consumption

Consumption of total fertilizer nutrients at 0.611 million MT during 2020-21 recorded an increase of 6.4% over 2019-20. During *kharif 2020*, total fertilizer nutrient increased by 14.7% whereas in *rabi* 2020-21, it declined by 10.5% over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer consumption changed from 67:33 in 2019-20 to 72:28 in 2020-21.

While consumption of N at 0.347 million MT declined by 0.3%, P_2O_5 at 0.179 million MT and K_2O at 0.085 million MT registered increase of 18.3% and 13.5%, respectively, in 2020-21 over 2019-20. NPK use ratio changed from 4.6:2.0:1 in 2019-20 to 4.1:2.1:1 during 2020-21. Per hectare consumption of fertilizer nutrients improved from 126.9 kg in 2019-20 to 135 kg in 2020-21.

Weather and Crop Situation

The cumulative rainfall received in the state during Southwest monsoon 2020 was normal at 1141 mm. Out of 30 districts in the state, 25 received normal to excess rains and 5 received deficient rains during the season. During *kharif* 2020, area under pulses, coarse cereals and cotton was higher by 7, 14 and 2 thousand ha, respectively, over *kharif* 2019. However, area under rice, oilseeds and sugarcane was lower by 40, 5 and 4 thousand ha, respectively, during the season.

During the post-monsoon season, actual rainfall at 167 mm was excess. Out of 30 districts in the state, 8 received normal rains, 18 received excess to large excess rains and 4 received deficient rains during the season. During *rabi* 2020-21, area under rice was higher by 31 thousand ha over *rabi* 2019-20. However, area under pulses, coarse cereals and oilseeds was lower by 37, 6 and 5 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 10,543 at the beginning of 2020-21. Out of these sale points, share of private channel was 97% and the balance 3% was of cooperative and other institutional channels.

v) West Bengal

Fertilizer Consumption

Total fertilizer nutrient consumption in West Bengal increased by 8.7%, from 1.599 million MT during 2019-20 to 1.738 million MT during 2020-21. Total nutrient consumption increased in *kharif* but declined in *rabi* seasons. During *kharif 2020*, it increased by 27.2% whereas in *rabi* 2020-21, it declined marginally by 0.8% over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer consumption changed from 34:66 during 2019-20 to 40:60 during 2020-21.

Consumption of N at 0.801 million MT, P_2O_5 at 0.519 million MT and K_2O at 0.418 million MT during 2020-21 recorded increase of 1.3%, 12.6% and 20%, respectively, over 2019-20. NPK use ratio changed from 2.3:1.3:1 during 2019-20 to 1.9:1.2:1 during 2020-21. Per hectare use of total fertilizer nutrients increased from 160.6 kg to 174.5 kg during the period.

Weather and Crop Situation

Rainfall received during Southwest monsoon was excess at 2665 mm in Sub-Himalayan West Bengal sub-division. Gangetic West Bengal received normal rains at 1061 mm. Out of 19 districts, 13 received normal rains, 3 received excess rains and 3 received deficient rains during the season. During *kharif 2020*, area under rice, pulses, coarse cereals, oilseeds and jute & mesta was higher by 303, 1, 22, 1 and 17, thousand ha, respectively, over *kharif* 2019. However, area under sugarcane was down by 2 thousand ha during the period.

During post-monsoon, the cumulative rainfall was deficient at 122 mm in Sub Himalayan West Bengal and 81 mm in Gangetic West Bengal sub-divisions. Out of 19 districts, 3 received normal rains and 16 received deficient to large deficient rains during the season. During *rabi* 2020-21, area coverage under wheat and coarse cereals was higher by 64 and 7 thousand ha, respectively, over *rabi* 2019-20. However, area under pulses was lower by 11 thousand ha during the period.

Sale Points

Total number of fertilizer sale points was 26,325 at the beginning of 2020-21. Out of these sale points, share of private channel was 92% and the balance 8% was of cooperative and other institutional channels.

II. NORTH ZONE

i) Haryana

Fertilizer Consumption

Consumption of total fertilizer nutrients in Haryana increased by 3.8%, from a total of 1.410 million MT during 2019-20 to 1.465 million MT during 2020-21. Total nutrient consumption increased in *kharif 2020* by 7.7% and in *rabi* 2020-21 by 1.4% over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer nutrient consumption changed from 39:61 during 2019-20 to 40:60 during 2020-21.

On nutrient basis, the consumption of N at 1.107 million MT, P_2O_5 at 0.318 million MT and K_2O at 0.039 million MT during 2020-21 increased by 3.5%, 5.1% and 3.5%, respectively, over 2019-20. NPK use ratio changed marginally from 28.2:8.0:1 during 2019-20 to 28.2:8.1:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 213.5 kg during 2019-20 to 221.8 kg during 2020-21.

Weather and Crop Situation

Overall rainfall received during the Southwest monsoon season was normal at 380 mm. Out of 21 districts, 8 received normal rains, 3 received excess rains and 10 had deficient to large deficient rains during the season. During *kharif 2020*, area sown under pulses was higher by 22 thousand ha, coarse cereals by 6 thousand ha, oilseeds by 3 thousand ha and cotton by 36 thousand ha over *kharif* 2019. In contrast, area under rice was lower by 29 thousand ha and sugarcane by 14 thousand ha during the period.

During post-monsoon, total rains received was deficient at 9 mm only. Out of 21 districts, 3 received normal rains and 17 districts received deficient to large deficient rains during the period. One district did not receive any rain. During *rabi 2020-21*, area sown under wheat was higher by 31 thousand ha and oilseeds by 48 thousand ha over *rabi* 2019-20. However, area under pulses was lower by 9 thousand ha and coarse cereals by 4 thousand ha during the period.

Sale Points

Total number of fertilizer sale points was 8,799 at the beginning of 2020-21. Out of these sale points, share of private channel was 76% and in cooperative and other institutional channels, it was 24%.

ii) Himachal Pradesh

Fertilizer Consumption

Consumption of total fertilizer nutrients in Himachal Pradesh increased marginally by 1.1% in 2020-21 over the previous year. Total fertilizer nutrient consumption was 59.3 thousand MT during 2020-21 compared to 58.6 thousand MT in the previous year. Total consumption of fertilizer nutrients increased by 23% in *kharif* 2020 but declined in *rabi* 2020-21 by 12% over the respective seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer consumption changed from 37:63 during 2019-20 to

46:54 during 2020-21.

Nutrient-wise breakup shows decline in N consumption and increase in P_2O_5 and K_2O consumption during 2020-21 over 2019-20. Consumption of N at 37.7 thousand MT declined by 1.4% whereas P_2O_5 at 11.3 thousand MT and K_2O at 10.3 thousand MT increased by 8.5% and 3.1%, respectively, during 2020-21 over 2019-20. NPK use ratio changed from 3.9:1.0:1 during 2019-20 to 3.7:1.1:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased marginally from 64.1 kg in 2019-20 to 64.8 kg in 2020-21.

Weather and Crop Situation

The state received 565 mm rainfall during Southwest monsoon which was deficient. Out of 12 districts in the state, 4 received normal rains and 8 received deficient to large deficient rains during the season.

During post-monsoon, the state received normal rainfall at 78 mm. Out of 12 districts, 7 received normal rains, 1 received excess rains and 4 received deficient rains during the period.

During 2020-21, area sown under rice increased by 1 thousand ha and *rabi* pulses by 12 thousand ha over 2019-20. However, area sown under oilseeds was down by 1 thousand ha during the period.

Sale Points

Total number of fertilizer sale points was 2,120 at the beginning of 2020-21. Out of these sale points, share of private channel was 24% and in cooperative and other institutional channels, it was 76%.

iii) Jammu & Kashmir

Fertilizer Consumption

Consumption of fertilizer nutrients recovered in 2020-21 after a setback in 2019-20. Consumption of total fertilizer nutrients in the state recorded an increase of 128.9%, from a total of 78.8 thousand MT during 2019-20 to 180.5 thousand MT during 2020-21. Total fertilizer nutrient consumption increased in both the seasons. Consumption of total nutrients recorded increase of 159.7% during *kharif* 2020 and 75.1% during *rabi* 2020-21 over the corresponding seasons of the previous year. Accordingly, *kharif :rabi* share changed from 64:36 during 2019-20 to 72:28 during 2020-21.

Consumption of N at 114.1 thousand MT, P_2O_5 at 37.6 and K_2O at 28.8 thousand MT during 2020-21 showed increase of 124.5%, 123.1% and 157.7%, respectively, over 2019-20. NPK use ratio improved from 4.5:1.5:1 during 2019-20 to 4.0:1.3:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 67.7 kg during 2019-20 to 154.9 kg during 2020-21.

Weather and Crop Situation

During Southwest monsoon, Jammu & Kashmir and Ladakh sub-division received deficient rains at 376 mm. Out of 20 districts in Jammu & Kashmir, 6 received normal rains and 14 received deficient to large deficient rains during the season. During *kharif* 2020, area sown under pulses and oilseeds was down by 1 thousand ha each over *kharif* 2019. However, area under rice and coarse cereals was higher by 1 and 12 thousand ha, respectively, during the period.

During post-monsoon season, Jammu & Kashmir and Ladakh sub-division received normal rains at 108 mm. Out of 20 districts in Jammu & Kashmir, 4 received normal rains, 3 received excess to large excess rains and 13 received deficient to large deficient rains during the period. During *rabi* 2020-21, area sown under wheat was up by 29 thousand ha over *rabi* 2019-20. However, area under pulses and coarse cereals was down by 1 thousand ha each during the period.

Sale Points

Total number of fertilizer sale points was 3,482 at the beginning of 2020-21. Out of these sale points, share of private channel was 95% and balance 5% in cooperative and other institutional channels.

iv) Punjab

Fertilizer Consumption

Consumption of total fertilizer nutrients in Punjab at 1.933 million MT during 2020-21 registered an increase of 1.4% over the previous year. Consumption of total fertilizer nutrients increased in *kharif* 2020 by 9.4% but declined in *rabi* 2020-21 by 4% over the corresponding seasons of the previous year. *Kharif:rabi* share in total consumption of fertilizer nutrients changed from 41:59 during 2019-20 to 44:56 during 2020-21.

Nutrient-wise analysis shows that while consumption of N at 1.495 million MT declined by 0.3%, P_2O_5 at 0.383 million MT and K_2O at 0.055 million MT increased by 5.4% and 28.8%, respectively, during 2020-21 over 2019-20. NPK use ratio changed from 34.8:8.4:1 during 2019-20 to 27.0:6.9:1 in 2020-21. Per hectare consumption of fertilizer nutrients increased from 245 kg during 2019-20 to 248.5 kg during 2020-21.

Weather and Crop Situation

The state received normal rainfall at 392 mm during Southwest monsoon. Out of 20 districts, 9 received normal rains, 2 received excess to large excess rains and 9 received deficient rains during the season. Coverage of area under pulses during *kharif 2020* was higher by 4 thousand ha, coarse cereals by 85 thousand ha, oilseeds by 3 thousand ha, sugarcane

by 1 thousand ha and cotton by 99 thousand ha over *kharif* 2019. But area under rice was lower by 184 thousand ha during the period.

During post-monsoon, the sate received only 21 mm of rains which was deficient. Out of 20 districts, 4 received normal rains, 3 received excess to large excess rains and 13 districts had deficient to large deficient rains during the period. During *rabi 2020-21*, area sown under wheat and coarse cereals was down by 6 and 1 thousand ha, respectively, over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points increased from 10,750 during 2019-20 to 11,726 during 2020-21. The increase was mainly in private channel. Out of 11,726 sale points, share of private channel was 69% and it was 31% in cooperative and other institutional channels.

v) Uttar Pradesh

Fertilizer Consumption

Uttar Pradesh is the largest fertilizer consuming state in the country having a share of about 17% of All-India consumption of fertilizer nutrients. During 2020-21, consumption of total fertilizer nutrients in the state marked a robust growth of 8.8% over the previous year. Total consumption of fertilizer nutrients increased from 5.173 million MT during 2019-20 to 5.629 million MT during 2020-21. Consumption of fertilizer nutrients increased in both the seasons. During *kharif* 2020, it increased by 19.7% and in *rabi* 2020-21 by 1.4% over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer nutrient consumption changed from 41:59 during 2019-20 to 45:55 during 2020-21.

During 2020-21 as a whole, consumption of N at 3.964 million MT, P_2O_5 at 1.427 million MT and K_2O at 0.238 million MT increased by 6%, 16.3% and 15.8%, respectively, over 2019-20. NPK use ratio changed from 18.2:6.0:1 during 2019-20 to 16.6:6.0:1 during 2020-21. Per hectare consumption of fertilizer nutrients increased from 192.6 kg to 209.5 kg during the period.

Weather and Crop Situation

During the Southwest monsoon, rainfall was normal in East Uttar Pradesh sub-division at 785 mm and deficient in West Uttar Pradesh sub-division at 455 mm. Out of 75 districts, rainfall was normal in 24 districts and excess to large excess in 9 districts. Balance 42 districts received deficient to large deficient rains during the season. During *kharif* 2020, area sown under rice and coarse cereals was higher by 9 thousand ha each and sugarcane by11 thousand ha over *kharif* 2019. However, area sown under pulses was lower by 6 thousand ha and oilseeds by 8 thousand ha during the period.

During post-monsoon, rainfall was large deficient in both the sub-divisions, *i.e.* East Uttar Pradesh sub-division at 9 mm and West Uttar Pradesh sub-division at 5 mm only. Out of 75 districts, only 1 received normal rains, 12 received deficient rains, 50 received large deficient rains and 12 districts reported no rains during the season. During *rabi* 2020-21, area sown under pulses increased by 59 thousand ha and oilseeds by 6 thousand ha over *rabi* 2019-20. However, area sown under wheat and coarse cereals was lower by 1 and 4 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 54,648 at the beginning of 2020-21. Out of these sale points, share of private channel was 82% and balance 18% in cooperative and other institutional channels.

vi) Uttarakhand

Fertilizer Consumption

Among the major fertilizer consuming states, Uttarakhand is the only state which received negative growth in consumption of fertilizer nutrients in 2020-21 over 2019-20. Total consumption of fertilizer nutrients declined by 3.3%, from a total of 163.4 thousand MT during 2019-20 to 158.0 thousand MT during 2020-21. Consumption of total fertilizer nutrients declined in both the seasons. While it declined marginally by 0.04% in *kharif* 2020, but it declined by 6.6% in *rabi* 2020-21, over the corresponding seasons of the previous year. *Kharif:rabi* share in total fertilizer consumption changed from 50:50 during 2019-20 to 52:48 during 2020-21.

Consumption of N at 120.7 thousand MT, P_2O_5 at 29.0 thousand MT and K_2O at 8.4 thousand MT during 2020-21 declined by 2.6%, 5.7% and 5%, respectively, over 2019-20. NPK use ratio changed from 14.1:3.5:1 during 2019-20 to 14.4:3.5:1 during 2020-21. Per hectare consumption of total fertilizer nutrients declined from 158.8 kg to 153.6 kg during the period.

Weather and Crop Situation

The state received 943 mm rains during Southwest monsoon of 2020, which was deficient. Out of 13 districts, 4 received normal rains, 1 received large excess rains and 8 received deficient rains during the season. During *kharif 2020*, area sown under pulses and coarse cereals was higher by 1 thousand ha and 2 thousand ha, respectively, over *kharif* 2019. However, area under sugarcane was lower by 2 thousand ha during the period.

During the post-monsoon, the rainfall received was 18 mm only which was large deficient. Out of 13 districts, only 1 district received normal rains and

balance 12 received deficient to large deficient rains during the period. During *rabi* 2020-21, area sown under wheat was down by 21 thousand ha and coarse cereals by 1 thousand ha over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points remained unchanged at the previous year's level of 1,492 during 2020-21. Out of these sale points, share of private channel was 52% as against 48% in cooperative and other institutional channels.

III. SOUTH ZONE

i) Andhra Pradesh

Fertilizer Consumption

Consumption of total fertilizer nutrients in Andhra Pradesh recorded a sharp increase of 20.4%, from 1.683 million MT during 2019-20 to 2.026 million MT during 2020-21. Total nutrient consumption increased in both the seasons. During *kharif 2020*, consumption of fertilizer nutrients increased by 35% and in *rabi* 2020-21, it increased by 10.8% over the corresponding seasons of the previous year. *Kharif:rabi* share in total consumption of fertilizer nutrients changed from 40:60 in 2019-20 to 44:56 in 2020-21.

During 2020-21, consumption of N at 1.140 million MT, P_2O_5 at 0.619 million MT and K_2O at 0.268 million MT recorded increase of 16.2%, 26.2% and 26.4%, respectively, over 2019-20. NPK use ratio changed from 4.6:2.3:1 during 2019-20 to 4.3:2.3:1 in 2020-21. Per hectare consumption of total nutrients improved from 230.7 kg to 277.7 kg during the period.

Weather and Crop Situation

Rainfall during Southwest monsoon was excess in Coastal Andhra Pradesh sub-division at 725 mm. and large excess in Rayalaseema sub-division at 756 mm. Out of 13 districts, 2 received normal rains, 10 received excess to large excess rains while 1 district received deficient rains during the season. During *kharif* 2020, area under rice was higher by 80 thousand ha and oilseeds by 203 thousand ha over *kharif* 2019. However, area under pulses, coarse cereals, sugarcane and cotton was lower by 26, 7, 6 and 55 thousand ha, respectively, during the period.

During post-monsoon also, rainfall was excess at 419 mm in Coastal Andhra Pradesh and 343 mm in Rayalaseema sub-divisions. All 13 districts received normal to excess rains during the period. However, during *rabi* 2020-21, area sown under rice, pulses, coarse cereal and oilseeds was lower by 8, 31, 68 and 8 thousand ha, respectively, over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points was 11,434 at the beginning of 2020-21. Out of these sale points, share of private channel was 79% and remaining 21% in cooperative and institutional channels.

ii) Karnataka

Fertilizer Consumption

Total fertilizer nutrient consumption recorded an increase of 19.5%, from 1.861 million MT during 2019-20 to 2.223 million MT during 2020-21. On seasonal basis, consumption of total nutrients increased by 44.7% in *kharif 2020* but declined by 7.7% in *rabi* 2020-21 over the corresponding seasons of the previous year. *Kharif:rabi* share in total consumption changed from 52:48 during 2019-20 to 63:37 during 2020-21.

Consumption of N at 1.179 million MT, P_2O_5 at 0.688 million MT and K_2O at 0.355 million MT during 2020-21 recorded increase of 15.9%, 22.8% and 25.5%, respectively, over the previous year. NPK use ratio changed from 3.6:2.0:1 during 2019-20 to 3.3:1.9:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 137.3 kg to 164 kg during the period.

Weather and Crop Situation

During Southwest monsoon, rainfall was normal in Coastal Karnataka sub-division at 3685 mm and excess in South Interior Karnataka and North Interior Karnataka sub-divisions at 818 mm and 739 mm, respectively. Out of 30 districts, rainfall was normal in 7 districts, excess in 18 districts and large excess in 5 districts during the season. During *kharif* 2020, area sown under rice, pulses, coarse cereals, oilseeds, sugarcane and cotton was higher by 188, 313, 187, 191, 10 and 106 thousand ha, respectively, over *kharif* 2019.

During post-monsoon, rainfall was normal in South Interior Karnataka sub-division at 203 mm and excess in Coastal Karnataka and North Interior Karnataka sub-divisions at 333 mm and 180 mm, respectively. Out of 30 districts, rainfall was normal in 16 districts, excess in 8 districts, large excess in 2 districts and deficient in 4 districts during the period. During *rabi* 2020-21, area sown under rice and oilseeds was higher by 1 and 19 thousand ha over *rabi* 2019-20. However, area sown under wheat, pulses and coarse cereals was down by 7, 59 and 41 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 12,673 at

the beginning of 2020-21. Out of these sale points, share of private channel was 74% and remaining 26% in cooperative and institutional channels.

(iii) **Kerala**

Fertilizer Consumption

Total fertilizer nutrient consumption at 201.1 thousand MT during 2020-21 in the state recorded an increase of 15% over the previous year. Positive growth in consumption was reported both in *kharif* as well as *rabi* seasons. During *kharif 2020*, total nutrient consumption increased by 25.8% and in *rabi* 2020-21 by 5.7% over the respective seasons of the previous year. *Kharif:rabi* share in total fertilizer nutrient consumption changed from 46:54 during 2019-20 to 51:49 during 2020-21.

Consumption of N at 88.1 thousand MT, P_2O_5 at 38 thousand MT and K_2O at 75.1 thousand MT during 2020-21 recorded increase of 11.1%, 12.4% and 21.5%, respectively, over the previous year. NPK use ratio changed from 1.3:0.5:1 during 2019-20 to 1.2:0.5:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 68 kg to 78.2 kg during the period.

Weather and Crop Situation

The state received normal rains during Southwest monsoon at 2228 mm. Out of 14 districts, 9 received normal rainfall and 5 received excess rains during the season. During *kharif* 2020, area sown under rice was higher by 5 thousand ha over *kharif* 2019.

During post-monsoon, state received deficient rains at 365 mm. Out of 14 districts, 7 received normal rains and 7 received deficient rains during the season. During *rabi* 2020-21, area sown under rice was higher by 11 thousand ha over *rabi* 2019-20.

Sale Points

Total number of fertilizer sale points was 2,987 at the beginning of 2020-21. Out of these sale points, share of private channel was 56% and remaining 44% was with cooperative and institutional channels.

iv) Tamil Nadu

Fertilizer Consumption

Consumption of total fertilizer nutrients in Tamil Nadu during 2020-21 recorded a growth of 13.6% over the previous year. Total nutrient consumption increased from 0.987 million MT during 2019-20 to 1.121 million MT during 2020-21. There was sharp increase in consumption during *kharif 2020* but decline in *rabi* season. During *kharif 2020*, total fertilizer nutrient consumption increased by 51.1% whereas it declined by 4.8% during *rabi* 2020-21 over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total fertilizer consumption changed from 33:67 during 2019-20 to 44:56 during 2020-21.

Consumption of N at 0.645 million MT, P_2O_5 at 0.269 million MT and K_2O at 0.207 million MT during 2020-21 recorded increase of 10.7%, 15.3% and 20.7%, respectively, over 2019-20. NPK use ratio changed from 3.4:1.4:1 during 2019-20 to 3.1:1.3:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 174 kg to 197.6 kg during the period.

Weather and Crop Situation

During Southwest monsoon, the state received excess rains at 437 mm. Out of 32 districts, 11 districts received normal rains, 14 excess, 6 large excess and 1 district received deficient rains during the season. During *kharif* 2020, area sown under rice, pulses, coarse cereals and oilseeds was higher by 109, 2, 24 and 51 thousand ha, respectively, over *kharif* 2019. However, area under sugarcane and cotton was lower by 35 and 18 thousand ha, respectively, during the period.

During post-monsoon, the state received normal rains at 477 mm. The state government added 5 new districts during the later part of the year. Out of 37 districts, 22 received normal rains, 10 received excess rains and remaining 5 districts received deficient rains during the season. During *rabi* 2020-21, area sown under rice was higher by 9 thousand ha over *rabi* 2019-20. However, area sown under pulses, coarse cereals and oilseeds was down by 11, 45 and 11 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 13,167 at the beginning of 2020-21. Out of these sale points, share of private channel was 66% and remaining 34% belonged to cooperative and institutional channels.

v) Telangana

Fertilizer Consumption

Total fertilizer nutrients consumption in Telangana showed a robust growth of 22.9% during 2020-21 over 2019-20. Total nutrient consumption increased from 1.479 million MT during 2019-20 to 1.818 million MT during 2020-21. During *kharif* 2020, consumption of total nutrients increased by 39.8% and in *rabi* 2020-21, it increased by 3.9% over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total consumption changed from 53:47 during 2019-20 to 60:40 during 2020-21.

Consumption of N at 1.170 million MT, P_2O_5 at 0.475 million MT and K_2O at 0.173 million MT during 2020-21 increased by 18.5%, 28.4% and 41.5%, respectively, over the previous year. NPK use ratio improved from

8.1:3.0:1 during 2019-20 to 6.8:2.7:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 256.2 kg to 314.8 kg during the period.

Weather and Crop Situation

The state received excess rains at 1095 mm during Southwest monsoon season. Out of 33 districts, 7 received normal rains, 12 received excess and 14 districts received large excess rains during the monsoon season. During *kharif 2020,* area sown under rice, pulses and cotton was higher by 440, 132 and 570 thousand ha, respectively, over *kharif* 2019. However, area sown under coarse cereals, oilseeds and sugarcane was down by 319, 30 and 3 thousand ha, respectively, during the period.

Rainfall received during post-monsoon was excess at 179 mm. Out of 33 districts, 8 districts received normal rains, 7 received excess and 15 received large excess rains while 3 district received deficient rains during the season. During *rabi* 2020-21, area sown under rice was 398 thousand ha higher than *rabi* 2019-20. However, area sown under pulses, coarse cereals and oilseeds was down by 20, 25 and 26 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 11,625 at the beginning of 2020-21. Out of these sale points, share of private channel was 80% and remaining 20% in cooperative and institutional channels.

IV. WEST ZONE

i) Gujarat

Fertilizer Consumption

Consumption of total fertilizer nutrients increased by 9.3%, from 1.792 million MT during 2019-20 to 1.957 million MT during 2020-21. Consumption of total fertilizer nutrients increased in *kharif 2020* by 6.3% and in *rabi* 2020-21 by 11.8 % over the corresponding seasons of the previous year. *Kharif:rabi* share in total consumption changed marginally from 46:54 during 2019-20 to 45:55 during 2020-21.

Consumption of N at 1.350 million MT, P_2O_5 at 0.471 million MT and K_2O at 0.137 million MT during 2020-21 recorded increase of 4.1%, 23.4% and 20.6%, respectively, over 2019-20. NPK use ratio changed from 11.4:3.4:1 during 2019-20 to 9.9:3.4:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 149.4 kg to 163.2 kg during the period.

Weather and Crop Situation

During Southwest monsoon, rainfall was normal in Gujarat region and large excess in Saurashtra, Kutch & Diu sub-divisions. Rains received in Gujarat region was 1035 mm and it was 1146 mm in Saurashtra, Kutch & Diu during the season. Out of 33 districts, 13 received normal, 5 received excess, 13 received large excess and 2 districts received deficient rains during the season. During *kharif 2020,* area sown under pulses and oilseeds was higher by 33 and 490 thousand ha, respectively, over *kharif* 2019. However, area sown under rice, coarse cereals, sugarcane and cotton was down by 9, 6, 10 and 388 thousand ha, respectively, during the period.

During post-monsoon season, rainfall was deficient in Gujarat region and excess in Saurashtra, Kutch & Diu sub-divisions. Gujarat region received 24 mm rains and Saurashtra, Kutch & Diu sub-divisions received 37 mm rains. Out of 33 districts, 10 received normal rains, 8 received excess to large excess rains and 15 districts received deficient to large deficient rains during the season. During *rabi* 2020-21, area sown under pulses and oilseeds was higher by 459 and 40 thousand ha, respectively, over *rabi* 2019-20. However, area sown under wheat and coarse cereals was down by 29 and 42 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 9,912 at the beginning of 2020-21. Out of these sale points, share of private channel was 46% and remaining 54% in cooperative and institutional channels.

ii) Madhya Pradesh

Fertilizer Consumption

Madhya Pradesh is the third largest fertilizer consuming state in the country having a share of about 9% to All-India consumption of fertilizer nutrients. Total fertilizer nutrient consumption in the state at 2.894 million MT during 2020-21 registered an increase of 7.8% over 2019-20. The growth in consumption of total nutrients was positive in *kharif* and negative in *rabi* seasons. Consumption of fertilizer nutrients during *kharif 2020* increased by 45.2% whereas in *rabi* 2020-21, it declined by 11.1% over the corresponding seasons of the previous year. Accordingly, *kharif:rabi* share in total consumption changed from 34:66 during 2019-20 to 45:55 during 2020-21.

Consumption of N at 1.733 million MT, P_2O_5 at 1.021 million MT and K_2O at 0.140 million MT during 2020-21 increased by 3.6%, 14.1% and 20.8%, respectively, over the previous year. NPK use ratio changed from 14.4:7.7:1 during 2019-20 to 12.4:7.3:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 106.8 kg to 115.2 kg during the period.

Weather and Crop Situation

During Southwest monsoon, the cumulative rainfall was normal in both the sub-divisions *i.e.* West Madhya Pradesh sub-division at 971 mm and East Madhya Pradesh sub-division at 1032 mm. Out of 51 districts, 27 received normal, 17 received excess rains and there were deficient rains in 7 districts during the season. During *kharif* 2020, area sown under rice, coarse cereals, oilseeds and cotton was higher by 411, 6, 408 and 35 thousand ha, respectively, over *kharif* 2019. However, area sown under pulses and sugarcane was lower by 167 and 6 thousand ha, respectively, during the season.

During the post-monsoon, rainfall was deficient in both the sub-divisions. West Madhya Pradesh sub-division received 21 mm and East Madhya Pradesh sub-division received 38 mm rains. Out of 51 districts, 9 received normal rains, 2 received excess rains and remaining 40 districts received deficient to large deficient rains during the season. During *rabi* 2020-21, area sown under wheat and oilseeds was higher by 830 and 23 thousand ha, respectively, over *rabi* 2019-20. However, area sown under pulses and coarse cereals was lower by 141 and 36 thousand ha, respectively, during the season.

Sale Points

Total number of fertilizer sale points was 13,128 at the beginning of 2020-21. Out of these sale points, share of private channel was 61% and remaining 39% in cooperative and institutional channels.

iii) Chhattisgarh

Fertilizer Consumption

Consumption of total fertilizer nutrients recorded an increase of 18.2%, from a total of 0.737 million MT during 2019-20 to 0.872 million MT during 2020-21. It increased in *kharif 2020* by 15.1% and 28.7% in *rabi* 2020-21 over the corresponding seasons of the previous year. *Kharif: rabi* share in total consumption changed from 77:23 during 2019-20 to 75:25 during 2020-21.

Consumption of N at 0.525 million MT, P_2O_5 at 0.272 million MT and K_2O at 0.075 million MT during 2020-21 recorded increase of 16.8%, 20.6% and 19.9%, respectively, over 2019-20. NPK use ratio changed marginally from 7.2:3.6:1 during 2019-20 to 7.0:3.6:1 during 2020-21. Per hectare consumption of fertilizer nutrients increased significantly from 131.4 kg to 155.3 kg during the period.

Weather and Crop Situation

Cumulative rainfall received in the state was normal at 1234 mm during Southwest monsoon 2020. Out of 27 districts, 21 received normal rains, 3 excess and 1 large excess rains during the season. Remaining 2 districts received deficient rains during the period. During *kharif* 2020, area sown under pulses, coarse cereals and sugarcane was higher by 72, 29 and 1 thousand ha, respectively, over *kharif* 2019. However, area sown under, rice and oilseeds was lower by 49 and 23 thousand ha, respectively, during the period.

During post-monsoon, the state received excess rains at 93 mm. Out of 27 districts, 6 districts each received normal, excess and large excess rains during the season. Remaining 9 districts received deficient rains during the period. During *rabi* 2020-21, area sown under wheat, rice and oilseeds was higher by 13, 31 and 16 thousand ha, respectively, over *rabi* 2019-20. However, area sown under pulses and coarse cereals was down by 19 and 9 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points was 4,689 at the beginning of 2020-21. Out of these sale points, share of private channel was 60% and remaining 40% in cooperative and institutional channels.

iv) Maharashtra

Fertilizer Consumption

Maharashtra is the second largest fertilizer consuming state in the country having a share of about 11% to All-India consumption of fertilizer nutrients. Fertilizer nutrients consumption increased from 2.941 million MT during 2019-20 to 3.414 million MT during 2020-21 representing a robust growth of 16.1%. While total nutrient consumption increased in *kharif* 2020 by 37.3%, it declined in *rabi* 2020-21 by 8.4% over the respective seasons of the previous year. Accordingly, *kharif:rabi* share in total consumption changed from 54:46 during 2019-20 to 63:27 during 2020-21.

Consumption of N at 1.700 million MT, P_2O_5 at 1.128 million MT and K_2O at 0.586 million MT during 2020-21 recorded increase of 8.9%, 25.6% and 21.5%, respectively, over 2019-20. NPK use ratio changed from 3.2:1.9:1 during 2019-20 to 2.9:1.9:1 during 2020-21. Per hectare consumption of fertilizer nutrients increased from 122.8 kg to 142.5 kg during the period.

Weather and Crop Situation

During Southwest monsoon, Madhya Maharashtra and Marathawada sub-divisions received excess rains at 967 mm and 866 mm, respectively. Rains was normal in Vidarbha sub-division at 852 mm during the season. Out of total 36 districts, 17 received normal rains, 13 excess, 3 large excess and remaining 3 districts received deficient rains during the season. During *kharif* 2020, area sown under rice, pulses, oilseeds and sugarcane was higher by 16, 230, 320 and 187 thousand ha, respectively, over *kharif* 2019.

However, area sown under coarse cereals and cotton was down by 10 and 171 thousand ha, respectively, during the period.

During post-monsoon, rainfall was normal in Marathawada sub-division at 107 mm while it was large excess in Madhya Maharashtra sub-division at 170 mm and deficient in Vidarbha sub-division at 52 mm during the season. Out of total 36 districts, 10 received normal rains, 5 excess, 9 large excess and 11 districts received deficient to large deficient rains during the season. One district did not report the rainfall status. During *rabi* 2020-21, area sown under wheat, pulses and oilseeds was higher by 93, 320 and 3 thousand ha, respectively, over *rabi* 2019-20. However, area sown under coarse cereals was lower by 149 thousand ha during the period.

Sale Points

Total number of fertilizer sale points was 31,192 at the beginning of 2020-21. Out of these sale points, share of private channel was 92% and remaining 8% in cooperative and institutional channels.

v) Rajasthan

Fertilizer Consumption

The consumption of total fertilizer nutrients at 1.777 million MT during 2020-21, registered an increase of 3.5% over the previous year. The growth in consumption of total nutrients was positive in *kharif* but negative in *rabi* seasons. While consumption in *kharif* 2020 increased considerably by 19%, but declined by 4.2% in *rabi* 2020-21 over the corresponding seasons in the previous year. *Kharif:rabi* share in total fertilizer consumption changed from 33:67 during 2019-20 to 38:62 during 2020-21.

Consumption of N at 1.243 million MT, P_2O_5 at 0.510 million MT and K_2O at 0.025 million MT increased by 2.1%, 6.4% and 17.7%, respectively, in 2020-21 over the previous year. NPK use ratio changed from 58.1:22.9:1 during 2019-20 to 50.4:20.7:1 during 2020-21. Per hectare consumption of total fertilizer nutrients increased from 67.9 kg to 70.2 kg during the period.

Weather and Crop Situation

During south-west monsoon, rainfall in East Rajasthan sub-division at 592 mm was normal. But in West Rajasthan sub-division, rainfall at 331 mm was excess. Out of total 33 districts, 14 received normal rains, 13 received excess rains and remaining 6 districts received deficient rains during the season. During *kharif* 2020, area sown under rice, coarse cereals, oilseeds and cotton was higher by 15, 167, 176 and 53 thousand ha, respectively, over *kharif* 2019. However, area sown under pulses was down by 90 thousand ha during the period.

During the post-monsoon, rainfall was large deficient in both the sub-divisions. West Rajasthan and East Rajasthan sub-divisions received only 4 mm and 9 mm rains, respectively, during the season. Out of total 33 districts, only 2 received normal rains and balance 31 received deficient to large deficient rains during the season. During *rabi* 2020-21, area sown under oilseeds was higher by 111 thousand ha over *rabi* 2019-20. However, area sown under wheat, pulses and coarse cereals was lower by 52, 19 and 45 thousand ha, respectively, during the period.

Sale Points

Total number of fertilizer sale points increased from 15,405 during 2019-20 to 17,481 during 2020-21. The increase was noticed in both cooperative and private channels. Out of the total number of 17,481 sale points, the share of private channel was 64% and balance 36% in cooperative and other institutional channels.

7.0 CONSUMPTION PRODUCTION BALANCE

7.1 All India

The difference between consumption and domestic production is expressed as deficit or surplus. If production of fertilizers is in excess of consumption, then it is a surplus situation. On the other hand, if consumption of fertilizers is higher than production, then it is a situation of deficit.

Nitrogenous and phosphatic fertilizers are indigenously produced in India. The deficit between total requirement and indigenous production is fulfilled through imports of these fertilizers. But potash is solely imported by India as mentioned earlier. The country is deficient in the production of both N and P_2O_5 compared to consumption. During 2020-21, total consumption of nitrogen increased by 1.303 million MT over the previous year. However, domestic production of N increased by only 23 thousand MT during the year. In spite of nominal increase in production, proportionately higher increase in consumption widened the deficit from 5.379 million MT in 2019-20 to 6.659 million MT in 2020-21.

In case of P_2O_5, consumption increased by 1.316 million MT whereas production declined by 54 thousand MT during 2020-21 over 2019-20. Consequently, deficit increased from 2.871 million MT in 2019-20 to 4.241 million MT in 2020-21. Zone-wise consumption, production and surplus/ deficit of N and P_2O_5 for 2019-20 and 2020-21 are presented in **Table 17**.

7.2 East Zone

The production of N is short of consumption in the East zone. Except BVFCL-Namrup, most of the urea

Table 17. Zone-wise consumption, production and surplus/ deficit of N and P_2O_5 - 2019-20 and 2020-21 (April/March)

('000 tonnes)

Zone	N		P_2O_5	
	2019-20	2020-21	2019-20	2020-21
East				
1. Consumption	2713	2772	1140	1277
2. Production	711	712	1366	1419
3. Surplus(+)/ Deficit (-)	-2002	-2060	226	142
North				
1. Consumption	6535	6849	1953	2207
2. Production	4654	4487	57	59
3. Surplus(+)/ Deficit (-)	-1881	-2362	-1896	-2148
South				
1. Consumption	3654	4230	1689	2091
2. Production	1889	1936	1339	1158
3. Surplus(+)/ Deficit (-)	-1765	-2294	-350	-933
West				
1. Consumption	6199	6552	2880	3402
2. Production	6468	6611	2029	2102
3. Surplus(+)/ Deficit (-)	269	59	-851	-1300
All-India				
1. Consumption	19101	20404	7662	8978
2. Production	13722	13745	4791	4737
3. Surplus(+)/ Deficit (-)	-5379	-6659	-2871	-4241

Note :
(1) Consumption figures for 2019-20 and 2020-21 are provisional.
(2) Entire requirement of K_2O is met through imports.
(3) All-India totals may not exactly tally due to rounding of figures.

plants in the zone had turned sick over the years and are closed. A new ammonia-urea plant at Panagarh, West Bengal is ready for commissioning subject to availability of gas. The plant may start production during the second half of the current year. The consumption of N increased by 59 thousand MT during 2020-21 over 2019-20. As against this, production increased marginally by 1 thousand MT during the period. Consequently, the deficit in N increased from 2.002 million MT in 2019-20 to 2.060 million MT in 2020-21.

East zone is surplus in P_2O_5 production. It has 3 large sized DAP/complex fertilizer plants, besides a few SSP plants. The zone continued to remain surplus in P_2O_5 production during 2020-21. However, the surplus of P_2O_5 in the east zone reduced from 226 thousand MT in 2019-20 to 142 thousand MT in 2020-21 due to higher increase in consumption compared to increase in production.

7.3 North Zone

North zone is deficient in both N and P_2O_5. Though the zone has a large number of nitrogen producing plants (in the form of urea) but at the same time, it comprises of high fertilizer consuming states, such as, Uttar Pradesh, Punjab and Haryana. The deficit of N increased from 1.881 million MT during 2019-20 to 2.362 million MT during 2020-21. The increase in deficit was on account of increase in consumption and decline in production.

The production of P_2O_5 in the north zone is low and sourced through SSP only as there is no DAP/ NP/ NPK plant in the zone. There are 10 SSP plants in North zone, of which, currently only 6 plants are in operation. The deficit in P_2O_5 increased from 1.896 million MT during 2019-20 to 2.148 million MT during 2020-21. The increase in deficit was due to proportionately higher increase in consumption against increase in production.

7.4 South Zone

The south zone has 5 urea operating plants and 8 DAP/ NP/NPK plants. In addition, there are 17 SSP, 2 ammonium sulphate and 1 ammonium chloride plant in the zone. Nevertheless, the zone is deficient in both N and P_2O_5. The deficit in N increased from 1.765 million MT in 2019-20 to 2.294 million MT in 2020-21 due to higher increase in consumption as against increase in production of N.

The deficit in P_2O_5 increased from 0.350 million MT during 2019-20 to 0.933 million MT during 2020-21. This was due to increase in consumption as against decline in production.

7.5 West Zone

The west zone is surplus in N but deficient in P_2O_5. West zone has the largest number of nitrogenous and phosphatic fertilizer plants. There are 12 urea and 9 DAP/NP/NPK plants located in the zone. In addition, there are 77 SSP plants and 4 ammonium sulphate plants in the zone. The share of the west zone in all India production of N and P_2O_5 was 48% and 44%, respectively, during 2020-21. The surplus of N in the west zone reduced from 269 thousand MT in 2019-20 to 59 thousand MT in 2020-21 due to more increase in consumption compared to increase in production.

In case of P_2O_5, the deficit increased from 0.851 million MT in 2019-20 to 1.300 million MT during 2020-21. This was due to proportionately higher increase in consumption against increase in production.

Thus only west zone is surplus in nitrogen and only east zone is surplus in phosphate. North and South zones are deficit both in nitrogen and phosphate. This is also reflected in substantial deficit in both N and P_2O_5 at national level.

8.0 PRODUCTION OF FOOD GRAINS AND COMMERCIAL CROPS

As per the 4th Advance Estimates of crop production for 2020-21, total production of food grains increased from 297.50 million MT in 2019-20 to 308.65 million MT in 2020-21 representing an increase of 3.7%.

Among food grain crops, production of rice increased by 2.9%, wheat by 1.5%, coarse cereals by 7.1% and pulses by 11.7% during 2020-21 over 2019-20. Similarly, production of oilseeds increased by 8.7% and sugarcane by 7.8% during the period. However, production of cotton and jute & mesta showed decline of 1.9% and 3.2%, respectively, during the period **(Table 18**).

9.0 AGRICULTURAL DEVELOPMENT PROGRAMMES

Given the importance of the agriculture sector, the Government of India has recently taken several steps for its development in a sustainable manner. Steps have been taken to improve soil fertility through the Soil Health Card Scheme; provide improved access to irrigation and enhanced water efficiency through the Pradhan Mantri Krishi Sinchai Yojana (PMKSY); support organic farming through Paramparagat Krishi Vikas Yojana (PKVY); and support the creation of a unified national agriculture market to boost the income of farmers. Further, to mitigate risk in the agriculture sector, a scheme "Pradhan Mantri Fasal Bima Yojana" (PMFBY) was also launched in 2016.

Increase in crop yields depends on a number of factors which include *inter-alia* weather, improved technology and use of quality inputs. The Ministry of Agriculture and Farmers Welfare has initiated a number of programmes/schemes to ensure the adequate availability of good quality agro- inputs (seed, fertilizer, agrochemicals etc.) and to conserve natural resources, particularly land and water.

9.1 Seed

Seed is the most important and vital input for agricultural production. Indian seeds programme recognizes three classes of seeds, namely, breeder, foundation and certified seeds. There has been a continuous increase in the production of certified/ quality seeds. The annual production of certified/ quality seeds is estimated to be higher at 4836.63 thousand tonnes in 2020-21 compared to 4194.11 thousand tonnes in 2017-18 (**Table 19**).

9.2 National Mission for Sustainable Agriculture

National Mission for Sustainable Agriculture (NMSA) is one of the eight missions outlined under National Action Plan on Climate Change (NAPCC). NMSA as a programmatic intervention made operational from the year 2014-15, aims at making agriculture more productive, sustainable, and remunerative and climate-resilient by promoting location-specific integrated/composite farming systems; soil and moisture conservation measures; comprehensive soil health management; efficient water management practices and mainstreaming rainfed technologies. Major components of NMSA are; Soil Health Management; Rainfed Area Development (RAD); Climate Change and Sustainable Agriculture

Table 18 - Production of foodgrains and cash crops from 2018-19 to 2020-21

(Million tonnes)

Crop/Season	2018-19		2019-20		2020-21	
	Target	Final Estimate	Target	Final Estimate	Target	4th Advance Estimate
1. Rice	114.0	116.5	116.0	118.9	119.6	122.3
2. Wheat	102.2	103.6	100.5	107.9	108.0	109.5
3. Coarse cereals	48.1	43.1	48.3	47.8	47.8	51.2
4. Total pulses	26.0	22.1	26.3	23.0	25.6	25.7
Total Foodgrains	**290.3**	**285.2**	**291.1**	**297.5**	**301.0**	**308.7**
(i) Kharif	144.6	141.5	147.9	143.8	149.4	149.6
(ii) Rabi	145.7	143.7	143.2	153.7	151.7	159.1
5. Sugarcane	385.0	405.4	385.5	370.5	390.0	399.3
6. Oilseeds	36.0	31.5	36.1	33.2	37.0	36.1
-Out of which						
(i) Groundnut	9.1	6.7	9.2	10.0	9.1	10.2
(ii) Soyabean	14.8	13.3	15.0	11.2	14.7	12.9
(iii) Rapeseed & Mustard	8.5	9.3	8.2	9.1	9.4	10.1
7. Cotton @	35.5	28.0	35.8	36.1	36.0	35.4
8. Jute & Mesta $	11.2	9.8	11.2	9.9	10.5	9.6

@ = Million bales of 170 kg each $ = Million bales of 180 kg each

Table 19. Production of breeder and foundation seed and production and distribution of certified/quality seed from 2010-11 to 2020-21 **('000 tonnes)**

Type of seeds	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Breeder seed	11.92	12.34	11.02	8.23	8.62	9.04	11.07	10.51	10.43	9.27	8.40
Foundation seed	180.64	222.68	161.70	174.31	157.62	149.54	220.91	195.42	180.10	222.50	241.21
Certified/quality seed production/ availability	3213.59	3536.20	3285.80	3473.13	3517.66	3435.25	3802.90	4194.11	3988.77	4310.10	4836.63

* = Target

Source : Annual Report 2020-21, Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Gvernment of India.

Monitoring, Modeling, & Networking (CCSAMMN); Integrated Nutrient Management (INM); Pradhan Mantri Krishi Sinchayee Yojana (PMKSY); and Paramparagat Krishi Vikas Yojana (PKVY).

9.3 Soil Health Management

Soil Health Management (SHM) is one of the most important interventions under the National Mission for Sustainable Agriculture (NMSA). The components under Soil Health include trainings for fertilizer dealers, foreign nationals, fertilizer inspectors and fertilizer laboratory staff, setting up of new static Soil Testing Laboratories (STLs), setting up of new Mobile STLs, strengthening of existing STLs, setting up of new Fertilizer Quality Control Laboratory (FQCL), strengthening of FQCL etc. The components under INM and Organic farming/management include setting up of fruit/vegetable/agro waste compost production units, setting up of bio-fertilizer production units, setting up of bio-fertilizer and organic fertilizer quality control laboratories, etc.

Under the scheme, setting up of 15 new static STLs, 6 new mobile STLs, strengthening of 116 STLs, setting up of 1 FQCL, strengthening of 6 FQCLs, setting up of 2 new biofertilizer unit, strengthening of existing 19 bio-fertilizer units, setting up of 2 new BOQCC, strengthening of 2 BOQCC, and promotion of micronutrients in 218676 ha have been sanctioned during 2019-20 under SHM component. Funds amounting to Rs.36.13 crore have been released till 28.12.2020 under Soil Health Management.

9.3.1 Soil Health Card Scheme

Soil Health Card Scheme was approved for implementation *w.e.f.* 2015-16 to provide Soil Health Cards to all farmers in the country. Soil Health Card provides information to farmers on soil nutrient status of their soil and recommendation on appropriate dosage of nutrients to be applied for improving soil health and its fertility. Soil Health Card is issued every 2 years for all land holdings in the country so as to promote balanced and integrated use of plant nutrients. Under the scheme, 2.53 crore soil samples were collected and 10.74 crore Soil Health Cards were issued by States for the 1st Cycle (2015-16 – 2016-17). Similarly, the 2nd Cycle of the scheme commenced from May 2017 (2017-18 - 2018-19). In this cycle, 273.00 lakh soil samples were collected and 11.83 crore Soil Health Cards were distributed to farmers. Funds of Rs. 116.03 crore were released till 28.12.2020 under Soil Health Card Scheme.

During 2019-20, a pilot project 'Development of Model Villages' was taken up where soil sample collection was done at individual farm holding instead of sample collection at grids. In all, 6954 villages were identified by the States/UTs in which against the target of 22.51 lakh samples, 19.90 lakh samples were collected, 18.11 lakh samples analysed and 18.19 lakh cards distributed to farmers.

9.3.2 Generation of Soil Fertility Maps

Soil and Land Use Survey of India (SLUSI) is entrusted with the work of preparation of Soil Fertility Maps from Soil Health Card data in villages of 37 aspirational districts (NITI AAYOG) in the country under Krishi Kalyan Abhiyan (KKA-I & II). The Soil Fertility Maps of 842 villages have been completed and submitted to the INM Division, DAC&FW. The soil fertility maps developed will be displayed in villages for spreading awareness about SHC and sensitize farmers on the judicious use of fertilizers. The work of preparation of soil fertility mapping of remaining villages is expected to be completed in the FY 2020-21.

9.4 Rainfed Area Development (RAD)

Integrated Farming System (IFS) is being promoted under RAD in which activities like horticulture, livestock, fishery, agroforestry, agriculture are taken up along with crops/cropping systems. Upto 31.3.2020, the total area of 4.97 lakh ha was covered under NMSA-RAD. As on 31st December, 2020, a sum of Rs.80.29 crore was released to the states for implementation of the programme during current

year. Amount of Rs.1387.13 crore has been released to the states under RAD.

9.5 Drought Management

Spatial distribution and quantum of rainfall during Southwest Monsoon period (June- September) mainly determines the incidence of drought in the country as Southwest Monsoon accounts for more than 70% of annual rainfall. The Department of Agriculture and Cooperation (DAC) reviewed and updated the Crisis Management Plan (CMP) for Drought 2019. During the year 2020-21, as per information available till date, the state government of Madhya Pradesh has submitted memorandum seeking financial assistance from the National Disaster Response Fund (NDRF).

Central Research Institute for Dryland Agriculture (CRIDA) under the Indian Council of Agricultural Research (ICAR) has developed detailed district-wise contingency plans to provide a broad advisory to farmers at the district level, prescribing alternate strategies in the event of climate variability by factoring in crops / livestock/aquaculture practices / soil characteristics, infrastructural facilities, etc. DAC&FW is also in the process of preparing "Drought Proofing Plan" for 24 identified districts in association with CRIDA under ICAR.

9.6 Rashtriya Krishi Vikas Yojana

Rashtriya Krishi Vikas Yojana (RKVY) has enabled the launch of new schemes/ programmes by keeping the states flexibility and authority intact. The Scheme was revamped as the Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR) for implementation from 2017-18 to 2019- 20 with a major focus on pre & postharvest infrastructure, besides promoting agri-entrepreneurship, innovations and value addition. Continuation of the scheme has been extended up to 31.3.2021 in the present format. Several sub-schemes have been introduced under RKVY-RAFTAAR, with focused objectives. Following seven special programmes/schemes are being implemented during the current financial year under RKVY-RAFTAAR.

- *Bringing Green Revolution to Eastern India* (BGREI). Initiated in 2010-11, BGREI has targeted productivity improvement in rice-based cropping systems. The allocation for the programme in 2020-21 was Rs.327 crores.
- *Programme for Diversification* of paddy *(PDP).* The allocation for this programme during 2020-21 was Rs.120 crores.
- *Reclamation of Problem Soils.* The allocation for reclamation of problem soils in 2020-21 was Rs.25.0 crores.
- *Swachh Bharat.* This scheme was initiated in 2017-18 with an allocation of Rs. 47.50 crores for the solid and liquid waste management in agriculture. The allocation for 2020-21 was Rs.55 crores.
- *Animal Health and Disease Control.* This is a new initiative launched during 2018-19 for Brucellosis control in female calves and strengthening of veterinary infrastructure and mobile veterinary clinics. The allocation for this programme for 2020-21 was Rs.20 crores.
- *Area Expansion of Cashew.* This is another new initiative launched in 2018-19 to augment area and production of cashew in backward districts including tribal districts of states like Kerala, Karnataka, Andhra Pradesh, Odisha and Maharashtra. The allocation for the programme in 2020-21 was Rs.20 crores.
- *Pilot Intervention for Most Vulnerable Drought Prone Districts.* This is another new initiative launched under RKVY in 2018-19 for drought proofing of identified districts of Andhra Pradesh, Karnataka and Rajasthan. The allocation for the programme in 2020-21 was Rs.5.43 crores.

9.7 Agriculture Credit

Many policy initiatives have been taken for strengthening of farm credit delivery system for providing credit at lower rates of interest to support the resource requirement of the agriculture sector. Government is providing interest subvention to make short-term crop loans upto Rs.3 lakh for a period of one year available to farmers at the interest rate of 7% per annum and in case of timely repayment, the same gets reduced to 4%. Presently there are about 6.86 crore active Kisan Credit Cards (KCCs), and 167.67 (1.1.2021) lakh new KCCs have been sanctioned since February, 2020. The Government with a view to bring more farmers under the institutional credit fold, has reviewed existing KCC scheme and simplified the procedure to facilitate the farmers avail institutional credit through KCC.

Agriculture credit flow has increased consistently over the years. The agriculture credit flow target for the year 2020-21 was fixed at Rs. 15,00,000 crore and against this target the disbursement upto 30th November 2020 has been Rs. 9,73,517.80 crore.

9.8 National e-Governance Plan-Agriculture

Government is implementing National e-Governance Plan in Agriculture (NeGP-A) for a more focused implementation of e-governance activities in the agriculture sector. NeGP-A aims to achieve rapid development in India through use of Information & Communication Technology (ICT) for timely access to agriculture-related information for the farmers.

9.9 MKisan-Use of Basic Mobile Telephony

Since the penetration of smart phones with internet in rural areas is around 18% only, mobile telephony is considered to be the alternate and the best option to deliver services to farmers. The DAC&FW has developed a portal – mKisan (mkian.gov.in), where around 5.2 crore farmers are registered and experts / scientists of different departments like IMD, ICAR, State Government, State Agriculture Universities send information to farmers in 12 local languages on a regular basis.

Information related to the weather such as likelihood of rainfall, temperature, etc. enables farmers to make informed decisions in choice of seed varieties and decide on timing of sowing and harvesting. With market information, farmers are better informed to sell produce, prevailing market prices and quality demanded in the market. Thus, they can make informed decisions to sell produce at the right price and at the right time. This helps in reducing distress sales by farmers due to market supply fluctuations. More than 2462 crore SMSs have been sent through mKisan since its inception in 2013.

9.10 Farmers' Portal (www.farmer.gov.in)

Farmers' Portal is a one stop shop where a farmer can get relevant information on a range of topics including seeds, fertilizer, pesticides, credit, good practices, dealer network availability of inputs, Agromet advisory, etc. This information can be drilled down through the pictorial view of the Map of India placed on the Home Page as well. This centralized repository is the back bone of all mobile apps and SMS advisories. This portal provides information across all stages of crop management right from sowing of seeds till post harvesting. An important feature of this web based portal is that one can drill down to the block level and get information of the particular block.

9.11 Development of Mobile Apps

Disseminating agriculture related information to farmers in the poorest communities has been made easier by proliferation of mobile phones. Today, mobile apps and services are being designed and released in different parts of the world. Mobile apps help to fulfil the larger objective of farmers' empowerment and facilitates in dissemination of extension services to address food security issues. Various mobile apps have been developed for farmers. Details of Kisan Suvidha are listed below:

KisanSuvidha: It is an omnibus mobile app to help farmers by providing relevant information to them quickly. It has a simple interface and provides information on critical parameters – weather, input dealers, market price, plant protection, expert advisories, Soil Health Card, cold storages & godowns, crop insurance. An additional tab directly connects the farmer with the Kisan Call Centre where agriculture experts answer their queries. Unique features like extreme weather alerts and market prices of commodities in the nearest area and the maximum price in the State as well as in India have been added to empower farmers in the best possible manner. With the click of a button, farmers can obtain all this information in hand provided they have a smart phone and decent internet connectivity. Total downloads: 13,69,263 (31st December, 2020).

9.12 Doubling of Farmers' Income

The Government has set a target of doubling of farmers' income by the year 2022. An Inter-Ministerial Committee was constituted to examine issues related to this target and recommended a strategy to achieve doubling of farmers' income in real terms by the year 2022. The committee identified seven sources of income growth viz., improvement in crop and livestock productivity; resource use efficiency or savings in the cost of production; increase in the cropping intensity; diversification towards high value crops; improvement in real prices received by farmers; and shift from farm to non-farm occupations.

9.13 Per Drop More Crop Component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY-PDMC)

Per Drop More Crop Component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) became operational with effect from 2015-16. Per drop More crop mainly focuses on enhancing water use efficiency at farm level through precision/ Micro Irrigation (MI) (Drip and Sprinkler Irrigation). Besides promoting precision irrigation and better on-farm water management practices to optimize the use of available water resources, this component also supports gap filling interventions such as other interventions like micro level water storage or water conservation/ management activities to complement and supplement the drought proofing measures.

During 2020-21, an area of 50.11 lakh ha has been brought under Micro-Irrigation (MI) till December, 2020. The total area covered under PMKSY-PDMC since inception period is 38.11 lakh ha. As on 31st December, 2020 an amount of Rs. 1346.38 crores have been released to the States for implementation of the programme during the current year. A total amount of Rs. 13332.23 crores have been released to States from 2015-16 to 2020-21 under PMKSY-PDMC. During the year 2019-20, an area of 11.72 lakh ha was brought under Micro Irrigation (MI), which is the highest ever coverage in a single year so far. A dedicated Micro-Irrigation Fund (MIF) has been instituted with NABARD with an initial corpus of Rs. 5000 crores for expanding coverage of micro-irrigation.

9.14 Pradhan Mantri Fasal Bima Yojana

Government of India has formulated the new Crop Insurance Schemes *viz.* Pradhan Mantri Fasal Bima Yojana (PMFBY), which is being implemented in various States/Union Territories of the country since *kharif* 2016 through 18 General Insurance Companies. Under PMFBY, a uniform maximum premium of only 2% of the sum insured is paid by farmers for all *kharif* crops and 1.5% for all *rabi* crops. In case of annual commercial and horticulture crops, the maximum premium to be paid by farmers is only 5%. The premium rates to be paid by farmers are very low and balance of actuarial premium is being borne by the Government, to be shared equally by State and Central Government, to provide full insured amount to the farmers against crop loss on account of natural calamities. There is no upper limit on the Government subsidy.

Efforts are being made to make the scheme technology-driven with the primary objective to reduce the delays in claim payment to farmers. Capturing of Crop Cutting Experiments (CCEs) data on smartphones/CCE Agri App and its real time transfer on National Crop Insurance Portal has been made mandatory from *kharif* 2017 onwards and the states have to provide an evidence of having conducted CCEs before Government of India share in subsidy is released.

During 2017-18 (*i.e. kharif* 2017 & *rabi* 2017-18 season) about 533 lakh farmers enrolments were provided crop insurance for a sum of Rs.2.02 lakh crore covered under PMFBY and Restructured Weather Based Crop Insurance Scheme (RWBCIS). During 2019-20, 610.2 lakh farmers were insured for a sum of Rs. 2,17,709 crores.

9.15 Mission for Integrated Development of Horticulture

During XII Five-Year Plan, with effect from 2014-15, Department of Agriculture, Cooperation & Farmers Welfare has launched Mission for Integrated Development of Horticulture (MIDH) by subsuming schemes on horticulture viz. (i) National Horticulture Mission (NHM), (ii) Horticulture Mission for North East and Himalayan States (HMNEH), (iii) National Bamboo Mission (NBM), (iv) National Horticulture Board (NHB), (v) Coconut Development Board (CDB), and (vi) Central Institute of Horticulture (CIH), Nagaland.

The budget allocation of Rs. 2160.25 crore was earmarked for MIDH during 2020-21. As on 31st December, 2020, funds to the tune of Rs. 857.47crore have been released for implementation of activities of MIDH.

9.16 Pradhan Mantri Kisan Samman Nidhi

Government of India with a view to augment the income of small and marginal farmers launched a central sector scheme namely, "**Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)"**. The scheme took effect from 1st December, 2018 for transfer of benefits to eligible beneficiaries. The scheme aims to provide a payment of Rs. 6000/- per year to be transferred in three equal installments of Rs. 2000/- every four months into the bank accounts of eligible landholding farmer's families. As on 5.1.2020, an amount of around Rs. 1,14,743.289 crore has been disbursed and around 10.697 crore farmers have been granted benefit under the scheme. Project Monitoring Unit set up for PM-Kisan scheme will also take care of implementation of PM-KMY. So far (as on 5th January, 2020) 21,11,317 famers have registered for the scheme. The scheme is being implemented online through Direct Benefit Transfer (DBT) mode for which an exclusive web-portal www.pmkisan.gov.in has been created.

9.17 FAI Initiatives

The FAI with the help of its member companies has been playing a catalytic role in transfer of improved technology with special emphasis on balanced and efficient use of fertilizers. It has initiated various activities for the rapid dissemination of best management practices among the farmers. Some of the important activities undertaken during 2020-21 are given below:

9.17.1 FAI-IPI Webinar on WSFs

The Fertiliser Association of India (FAI) and International Potash Institute (IPI) jointly organized one-day Webinar "Water Soluble Fertilizers in India – Status and Way Forward" on 23rd September, 2020. Dr. S.K. Malhotra, Agriculture Commissioner, Government of India was the Chief Guest at the inaugural ceremony. Mr. Hillel Magen, Director, IPI, Switzerland gave the opening remarks. Mr. Satish Chander, Director General (DG), FAI delivered the introductory address. About 100 delegates representing Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs), Ministry of Agriculture and Farmers Welfare, Indian and International Fertilizer Industry participated in the Roundtable.

In all 9 presentations were made in two technical sessions by experts of national and international repute. Resume of Webinar along with Conclusions and Recommendations was published in the November, 2020 issue of the Indian Journal of Fertilisers.

9.17.2 Integrated Nutrient Management

The major soil health issues from crop nutrition point of view are low soil organic carbon, expanding

multinutrient deficiencies, low nutrient use efficiencies, imbalanced fertilizer use, decline in fertilizer response ratio, and burning of crop residues. Integrated nutrient supply system i.e., the combined use of fertilizers, organic manures and bio-fertilizers is the only practical, efficient, economically feasible and environmentally benign way of managing nutrients and sustaining soil health. FAI published April 2020 issue of the Indian Journal of Fertilisers as special issue on Integrated Nutrient Management. The main objective of the special issue was to highlight the increasing importance and need for evolving integrated nutrient management (INM) strategies to enhance the crop yields and improve the soil health.

9.17.3 Developments on FCO Front

A record eight meetings of the Central Fertilizer Committee (CFC) were held during 2020-21. The Director General, FAI participated in all the meetings and provided inputs on the agenda items which came up for discussion during CFC meetings. Some of the important items discussed in CFC meetings included; inclusion of new fertilizers and new schedules in FCO; amendments in specifications, tolerance limits, and method(s) of analysis of fertilizers; defining fake and sub-standard fertilizer; review of bio-fertilizers and organic fertilizers; and constitution of fertilizer development and regulatory authority. A wide range of products were approved and notified in FCO. In February this year, two new Schedules namely, Schedule VI and Schedule VII for Bio-stimulants and Nano Fertilizers, respectively were added in the FCO.

9.17.4 Reforms in Fertilizer Sector

Department of Fertilizers constituted five Working Groups to deliberate on the Challenges facing the Fertilizer Sector. One of the working groups, i.e., Working Group – III was specifically mandated to deliberate and discuss on "Administrative and Legal Reforms in Fertilizer Sector". FAI submitted a detailed note to the Convener of Working Group-III containing a number of suggestions. These included: strengthening of fertilizer testing infrastructure, digitalization of certificate of registration and authorization letter, single window clearance for sale permission, compounding for minor offences, rationalization of tolerance limits, simplifying the procedure of inclusion of new fertilizers, and allowing reprocessing of damaged/sub-standard fertilizers during storage. The Working Group has accepted most of the suggestions made by FAI in principle. Some issues have been referred to the CFC for appropriate action.

Strategy note on Working Group-II on Promotion of New/Alternative fertilizers included the following actionable points:

(i) Innovative/alternate fertilizers, such as nano, slow/controlled release, coated, fortified, chelated, organo-mineral, liquid fertilizers, bio-stimulants, customized fertilizers, etc. should be promoted for use in combination with traditional fertilizers and manure / compost. Specifications of these products should appropriately be included in Fertilizer Control Order (FCO).

(ii) Fertilizer subsidies need to be reoriented phase-wise to allow level playing ground for all products of the same nutrient. Subsidy should be completely nutrient based and not product based – all products with same nutrient should have the benefit of the same subsidy.

(iii) Strong collaborations between public –funded research institutions, academia and fertilizer industry with financial backup are needed to implement R&D on value-added/new fertilizers.

9.17.5 FAI Annual Seminar 2020

FAI Annual Seminar 2020 was devoted to theme of "Fertilizer and Agriculture during COVID-19". The session II 'Innovation in Fertilizer Management' was chaired by Dr. S.K. Malhotra, Agriculture Commissioner, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi. Four papers presented in the session included i) Specialty Fertilizers Landscape by Mr. Antoine Ramspacher, RAMS & Co, Paris, France; ii) Water Soluble Fertilizers for Protected Cultivation Technology by Dr. Murtaza Hasan, Principal Scientist, Centre for Protected Cultivation Technology (CPCT), ICAR-Indian Agricultural Research Institute, New Delhi; iii) Programmes and Policies for Improving Nutrient Use Efficiency in Indian Agriculture by Dr. Ch Srinivasarao, Director, ICAR-National Academy of Agricultural Research Management, Hyderabad; and iv) Nano Fertilizers - IFFCO Experience by Mr. Yogendra Kumar, Marketing Director, Indian Farmers Fertiliser Cooperative Limited, IFFCO, New Delhi. All the presentations made in Agriculture Session were well received and highly appreciated.

9.18 International Relations

FAI, with its professional services and valuable contributions to the industry over the years, has emerged as an important organisation in the field of agriculture and fertilizers. Its views on concerned issues are widely acclaimed and solicited both nationally and internationally. Apart from its representation and participation in national level

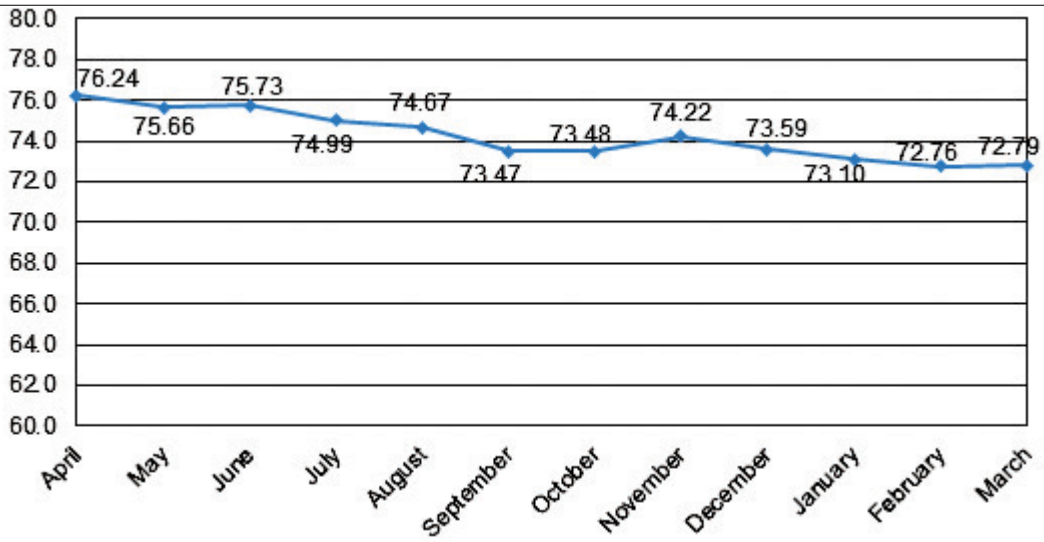

Figure 2. Exchange rate (INR per US$) - 2020-21

research and decision-making forums including Government, FAI maintains cordial relations and exchanges information with number of reputed international organisations. Some of the these organisations include Food and Agriculture Organization (FAO), Rome; The International Fertilizer Association (IFA), Paris; The Sulphur Institute (TSI), Washington DC; The International Potash Institute (IPI), Switzerland; International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India; International Fertilizer Development Centre (IFDC), Muscle Shoals, USA; International Rice Research Institute (IRRI), Los Banos, Philippines; International Maize and Wheat Improvement Center (CIMMYT), Mexico; International Zinc Association (IZA), Belgium; and many others. This helps to promote better understanding of the global developments and their impact on the Indian fertilizer and agriculture sectors.

10.0 EXCHANGE RATE

The cost of production and import of fertilizers is impacted by changes in international prices of raw materials and finished products as well as changes in exchange rates. The average value of rupee against US$ depreciated significantly during 2020-21 over 2019-20. The average exchange rate of rupee per US$ was 74.23 in 2020-21 compared to 70.90 during 2019-20. At the beginning of the year *i.e.* April 2020, the value of rupee against US$ was 76.24 which marginally improved in subsequent months and touched 72.79 during March 2021. **Figure 2** shows monthly trend in the exchange rate of rupee vis-à-vis US$ during 2020-21.

11.0 INTERNATIONAL PRICES

11.1 Raw Material/Intermediates

India is heavily dependent on imports of both raw materials and finished fertilizers. During 2020-21, out of the total estimated production of 14.81 million MT of ammonia in the country, about 97% was based on natural gas and 3% on naphtha. In addition, about 2.42 million MT of ammonia was imported during 2020-21 to supplement the requirement of ammonia for production of DAP/ complex fertilizers in the country. About 12.02 billion SM^3 (32.94 million SM^3 per day) of LNG was also imported during the year to supplement the supply of domestic gas.

With regard to phosphates, bulk of the requirement of raw materials/ intermediates is fulfilled through imports. During 2020-21, about 7.73 million MT of rock phosphate and 1.46 million MT of sulphur were imported by India. The availability of rock phosphate from domestic sources was nearly 1 million MT. Domestic availability of sulphur is about 2.0 million MT from various sources. A major portion of these raw materials is used by the fertilizer industry. About 60-65% requirement of phosphoric acid is met through imports. During 2020-21, about 2.51 million MT of phosphoric acid (as P_2O_5) was imported. International prices of these intermediates / raw materials play an important role in the cost of production of phosphatic fertilizers. The details of trends in international prices are presented in the following paragraphs.

11.1.1 Rock Phosphate

India imported 7.73 million MT of rock phosphate in 2020-21 as against 7.66 million MT during the previous year. Major exporters of rock phosphate to India include Jordan, Morocco, Egypt, Togo and UAE. Small quantities are also imported by India from a few other countries.

FOB (Morocco) prices of rock phosphate (68%-72% BPL) ranged between US$ 70-107 per MT during April-September, 2020. It increased to US$ 78-125 per MT during October 2020 to March 2021.

Simple average of maximum and minimum prices from the same source for 1st half of 2020-21 was US$ 89 per MT and second half US$ 102 per MT. Similar trends in FOB prices of rock phosphate were observed from other sources, such as, Jordan, Egypt and a few other countries. FOB prices of rock phosphate from different sources on quarterly basis are presented in **Table 20**.

11.1.2 Sulphur

During 2020-21, import of sulphur increased to 1.46 million MT from 1.24 million MT in the previous year. Major suppliers of sulphur to India are Qatar, UAE, Oman, Kuwait and Saudi Arabia. Other suppliers include Bahrain, Japan and Singapore. Small quantities of sulphur are also imported by India from South Korea and a few other countries. Sulphur is mostly recovered from petroleum refineries.

Sulphur prices went up successively during 2020-21. The range of FOB (Middle East) spot prices of sulphur was US$ 50-67 per MT during 1st quarter (April-June) of 2020 which increased to US$ 50-70 per MT during 2nd quarter (July-September) 2020. There was further rise in sulphur prices during next two quarters, i.e., US$ 67-103 per MT during the third quarter (October-December 2020) and US$ 98-200 per MT during the fourth quarter (January-March 2021). Simple averages of minimum and maximum FOB (Middle East) prices of sulphur from 1st to 4th quarter of 2020-21 were in the order of US$ 59, US $ 60, US $ 85 and US$ 149 per MT, respectively. FOB prices from other source, such as, Vancouver (Canada) also showed similar trend. FOB prices of sulphur from different sources on quarterly basis are presented in **Table 20**.

11.1.3 Ammonia

India imported 2.42 million MT of ammonia in 2020-21 as against 2.64 million MT during the previous year. India imports ammonia from various countries. Major suppliers of ammonia to India are Saudi Arabia, Qatar, Ukraine, Egypt, Turkey, Indonesia, Iran, etc. Other countries which supply in relatively smaller quantities include UAE, Bahrain, Russia, Trinidad, and a few other countries.

During April-June 2020, CFR (India) price of ammonia was in the range of US$ 195-270 per MT. It went up at US$ 220-295 per MT during second quarter, further moved to US$265-305 per MT in the third quarter and US$ 265-545 per MT during the fourth quarter. Simple average of minimum and maximum CFR prices for 1st quarter of 2020-21 was US$ 233, 2nd quarter US $ 258, 3rd quarter US $ 285 and 4th quarter US$ 405 per MT (**Table 21**).

Table 20. FOB prices of rock phosphate and sulphur from 2015 to 2021

(US$/tonne)

Year	Quarter	Phosphate Rock Bulk FOB				Sulphur Bulk FOB	
		Morocco (68-72% BPL) Contract	Egypt (60-68% BPL) Spot/Contract	Jordan Q3 2020 (66-72% BPL) Contract	Jordan Q3 2020 (73-75% BPL) Contract	Middle East Spot	Vancouver Spot
		Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
2015	Jan./March	110 - 120	62 - 75	105 - 118	128 - 137	150 - 187	140 - 175
	April/June	110 - 120	59 - 75	105 - 124	128 - 137	139 - 165	125 - 175
	July/Sept.	110 - 130	59 - 79	105 - 124	130 - 137	115 - 156	110 - 155
	Oct./Dec.	115 - 130	59 - 79	105 - 124	130 - 137	103 - 135	105 - 127
2016	Jan./March	90 - 140	59 - 79	90 - 124	120 - 137	80 - 128	75 - 127
	April/June	90 - 140	55 - 72	90 - 115	120 - 125	75 - 85	70 - 85
	July/Sept.	90 - 140	45 - 72	85 - 110	110 - 120	64 - 80	65 - 80
	Oct./Dec.	90 - 130	40 - 64	82 - 105	108 - 120	75 - 94	70 - 90
2017	Jan./March	80 - 115	40 - 64	82 - 105	106 - 120	80 - 92	78 - 90
	April/June	80 - 115	45 - 70	84 - 90	106 - 115	72 - 85	72 - 84
	July/Sept.	70 - 100	36 - 65	80 - 95	105 - 115	83 - 117	84 - 105
	Oct./Dec.	70 - 90	36 - 55	70 - 95	95 - 112	116 - 205	100 - 185
2018	Jan./March	70 - 98	36 - 50	70 - 100	95 - 110	110 - 150	110 - 140
	April/June	73 - 103	40 - 54	78 - 105	103 - 115	110 - 138	110 - 130
	July/Sept.	83 - 108	40 - 56	83 - 110	108 - 120	130 - 168	125 - 160
	Oct./Dec.	78 - 115	40 - 56	85 - 110	112 - 120	123 - 175	125 - 165
2019	Jan./March	78 - 120	40 - 56	85 - 110	112 - 120	98 - 120	98 - 130
	April/June	80 - 120	40 - 56	85 - 110	112 - 120	98 - 108	95 - 103
	July/Sept.	75 - 110	40 - 55	52 - 110	105 - 120	45 - 100	50 - 100
	Oct./Dec.	72 - 110	35 - 55	52 - 100	103 - 110	38 - 50	38 - 50
2020	Jan./March	70 - 105	35 - 55	52 - 95	100 - 105	38 - 67	38 - 65
	April/June	70 - 105	35 - 55	52 - 95	100 - 105	50 - 67	53 - 65
	July/Sept.	75 - 107	35 - 55	55 - 100	100 - 110	50 - 70	50 - 70
	Oct./Dec.	78 - 112	35 - 57	65 - 102	105 - 110	67 - 103	60 - 100
2021	Jan./March	78 - 125	37 - 60	68 - 110	105 - 120	98 - 200	95 - 170
	April/June	85 - 155	38 - 62	73 - 135	115 - 150	180 - 190	160 - 185

Table 21. Average CFR (India) prices of ammonia and phosphoric acid from 2015 to 2021

(US $/tonne)

Year	Quarter	Ammonia			Phosphoric acid		
		Min.	-	Max.	Min.	-	Max.
2015	Jan./March	430	-	600	765	-	805
	April/June	410	-	480	805	-	810
	July/Sept.	420	-	530	810	-	810
	Oct./Dec.	400	-	505	810	-	810
2016	Jan./March	330	-	400	715	-	715
	April/June	340	-	400	605	-	605
	July/Sept.	180	-	360	605	-	610
	Oct./Dec.	173	-	250	580	-	580
2017	Jan./March	219	-	394	545	-	550
	April/June	215	-	390	570	-	590
	July/Sept.	210	-	300	567	-	572
	Oct./Dec.	255	-	375	567	-	572
2018	Jan./March	280	-	380	678	-	678
	April/June	280	-	314	730	-	730
	July/Sept.	300	-	408	758	-	758
	Oct./Dec.	340	-	390	758	-	768
2019	Jan./March	270	-	350	750	-	750
	April/June	235	-	317	728	-	728
	July/Sept.	225	-	275	655	-	655
	Oct./Dec.	250	-	295	625	-	625
2020	Jan./March	250	-	305	590	-	590
	April/June	195	-	270	607	-	607
	July/Sept.	220	-	295	625	-	625
	Oct./Dec.	265	-	305	689	-	689
2021	Jan./March	265	-	545	795	-	795
	April/June	465	-	648	998	-	998

11.1.4 Phosphoric acid

India imported 2.51 million MT of phosphoric acid in 2020-21 as against 2.50 million MT during the previous year. Major suppliers of phosphoric acid to India are Morocco, Senegal, Jordan, Tunisia and USA. Small quantities are also imported from South Africa, Vietnam and a few other countries.

CFR (India) prices of phosphoric acid also went up successively during 2020-21. During April-June 2020, CFR (India) price of phosphoric acid was US$ 607 per MT. It went up at US$ 625 per MT during second quarter, US$ 689 per MT in the third quarter and US $ 795 per MT during the fourth quarter (**Table 21**).

11.2 Finished Fertilizers

Like raw materials, prices of most of the finished fertilizers also moved up during 2020-21. **Table 22** shows the source-wise range of FOB prices and **Table 23** gives average CFR (India) prices of Urea, DAP and MOP.

11.2.1 Urea

During 2020-21, consumption of urea increased considerably from 33.54 million MT during 2019-20 to 35.04 million MT during 2020-21. This was 1.5 million MT higher over the previous year. Bulk of the increased consumption was fulfilled through higher imports in addition to some additional quantities supplied from domestic production. Import of urea touched a record level of 9.83 million MT in 2020-21 compared to 9.12 million MT in the previous year. India imports urea mainly from Oman, China, Egypt, UAE, Ukraine, Algeria, Saudi Arabia, Bahrain and Russia. A few other countries which supply urea to India include Finland, Iran, Latvia, Qatar, Indonesia, Kuwait, etc.

Range of FOB spot prices of urea from Middle East was US$ 210-245 per MT during 1st quarter of 2020-21. It increased to US$ 225-280 per MT during 2nd quarter. Prices again went up to US$ 255-273 per MT in the 3rd quarter. During the 4th quarter, the prices further moved up at US$ 275-365 per MT **(Table 22)**. Simple average of minimum and maximum FOB (M. East) prices for 1st quarter of 2020-21 was US$ 228, 2nd quarter US $ 253, 3rd quarter US $ 264 and 4th quarter US$ 320 per MT.

The weighted average CFR price of urea for the quantities imported by India for the full year 2020-21 was US$ 263 per MT compared to US$ 271 per MT in 2019-20 **(Table 23)**. The buyback arrangement of Government of India with JV OMIFCO ended in July 2020. Henceforth, India had imported urea from OMIFCO at international market prices.

11.2.2 DAP

Consumption of DAP increased from 10.09 million

MT during 2019-20 to 11.91 million MT in 2020-21, an increase of 1.82 million MT. Increased consumption was fulfilled mainly from inventory and imports while production declined during the year. Import of DAP increased marginally from 4.87 million MT during 2019-20 to 4.88 million MT during 2020-21. Major suppliers of DAP to India are China, Saudi Arabia, Morocco, Jordan, USA and Russia.

FOB price of DAP from Saudi Arabia was US$ 306-311 per MT during April-June 2020. It increased to US$ 309-355 per MT during July-September 2020 and US$ 355-365 per MT in the third quarter (October-December). The prices further increased to US$ 380-561 per MT in the last quarter (January-March). Trend in FOB prices was similar from other sources **(Table 22)**. Simple average prices of minimum and maximum from Saudi Arabia for 1st, 2nd, 3rd and 4th quarters of 2020-21 were in the order of US$ 309, US $ 332, US $ 360 and US$ 471 per MT, respectively.

During the full year 2020-21, average CFR (India) price of DAP was US$ 369 per MT as against US$ 334 per MT in the previous year **(Table 23)**.

11.2.3 MOP

Consumption of MOP (for direct application) increased from 2.87 million MT during 2019-20 to 3.42 million MT in 2020-21, an increase of 0.55 million MT. Total import of MOP increased from 3.67 million MT during 2019-20 to 4.23 million MT in 2020-21. Major suppliers of MOP to India are Canada, CIS, Israel, Jordan, Lithuania and Germany.

The range of FOB spot prices of MOP from CIS (Baltic Sea) was US$ 187-264 per MT during April-June 2020, reduced to US$ 178-218 per MT during July-September 2020. Thereafter, it reduced to US$ 181-206 per MT during October-December 2020 and US$ 175-209 per MT during January-March 2021. Simple average prices of minimum and maximum from the same source for 1st, 2nd, 3rd and 4th quarters of 2020-21 were in the order of US$ 226, US $ 198, US $ 194 and US$ 192 per MT, respectively **(Table 22)**. Similar trend in FOB prices was noticed from other source countries.

Average CFR (India) price of MOP for the full year 2020-21 was US$ 239 per MT against US$ 286 per MT in 2019-20 **(Table 23)**.

12.0 DOMESTIC PRICES

12.1 Prices of Natural Gas

Figure 3 depicts the month-wise trends in the pool prices of gas for urea sector during 2020-21 and 2021-22 (upto August 2021). The average pool price (Final) on gross calorific value (GCV) of gas was Rs. 654.90 per MMBTU during April 2020 which reduced to Rs. 482.15 per MMBTU during June 2020. Thereafter, it started moving upwards and touched at Rs. 689.15 per MMBTU during March 2021. During the current year 2021-22, the average pool price of gas increased considerably. It increased from Rs.718.33 per MMTBU during April 2021 to Rs. 854.37 per MMBTU (Provisional) during August 2021.

12.2 Retail Prices of Finished Fertilizers

12.2.1 Urea

The retail basic price of urea remained unchanged at Rs.5360 per tonne since November 2012 *w.e.f.* 25th May, 2015. Government of India made it mandatory

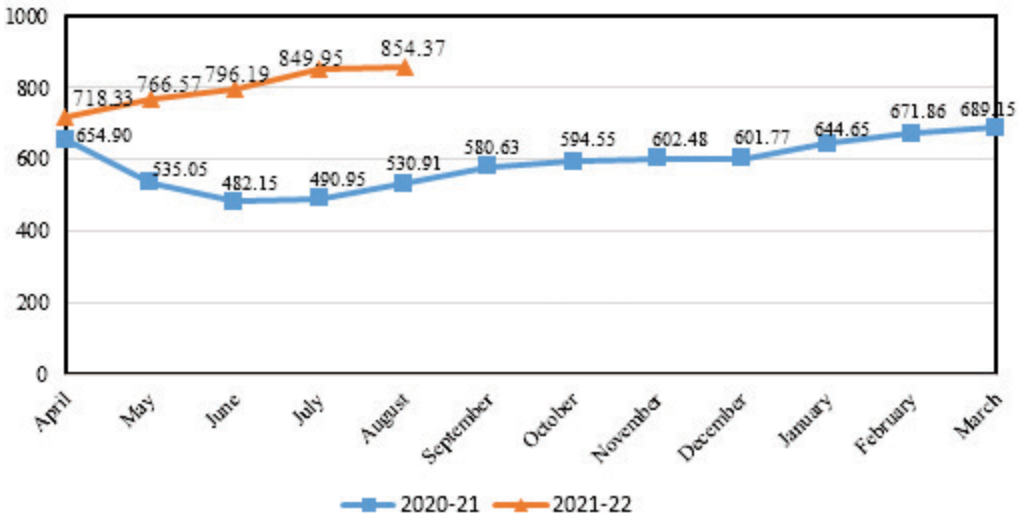

Figure 3. Month-wise trends in pool prices of natural gas (Rs. Per MMBTU) – 2020-21 and 2021-22 (upto August 2021)

Table 22. FOB prices of Urea, DAP and MOP from 2015 to 2021

(US$/tonne product)

Table 22. FOB prices of Urea, DAP and MOP from 2015 to 2021

(US $/tonne product)

Year	Quarter	Urea			DAP						MOP		
		CIS	M. East	China	US Gulf	CIS	Morocco	Jordan	Saudi Arabia	China	Vancouver	Jordan	CIS
		Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
2015	Jan./March	258 - 325	265 - 325	268 - 293	465 - 487	458 - 520	482 - 535	460 - 490	470 - 490	460 - 480	281 - 330	271 - 333	267 - 333
	April/June	245 - 296	250 - 308	263 - 307	456 - 475	450 - 500	480 - 515	467 - 480	473 - 485	460 - 475	293 - 320	290 - 310	278 - 300
	July/Sept.	240 - 287	258 - 290	258 - 303	450 - 475	440 - 500	477 - 515	440 - 482	450 - 475	440 - 470	290 - 319	284 - 316	272 - 300
	Oct./Dec.	230 - 265	238 - 263	232 - 262	390 - 450	385 - 480	450 - 495	430 - 460	398 - 470	390 - 450	280 - 310	275 - 315	263 - 306
2016	Jan./March	178 - 232	193 - 230	196 - 227	350 - 400	320 - 435	355 - 450	355 - 440	350 - 403	335 - 400	236 - 318	233 - 323	223 - 311
	April/June	183 - 208	190 - 218	200 - 227	345 - 360	320 - 370	335 - 380	332 - 350	340 - 365	331 - 343	195 - 315	185 - 321	190 - 307
	July/Sept.	170 - 193	180 - 197	188 - 203	337 - 345	320 - 345	330 - 360	328 - 338	322 - 342	310 - 334	190 - 305	185 - 305	180 - 295
	Oct./Dec.	185 - 226	192 - 235	193 - 238	315 - 340	318 - 343	330 - 353	310 - 335	308 - 328	295 - 315	190 - 240	185 - 240	180 - 235
2017	Jan./March	198 - 255	210 - 265	223 - 260	315 - 375	318 - 393	330 - 398	310 - 368	315 - 392	315 - 375	190 - 240	185 - 240	180 - 230
	April/June	173 - 216	190 - 220	208 - 233	345 - 370	330 - 390	360 - 398	345 - 368	350 - 392	340 - 370	195 - 239	192 - 237	182 - 232
	July/Sept.	178 - 258	190 - 280	222 - 285	333 - 345	330 - 360	325 - 373	340 - 355	343 - 363	336 - 358	195 - 239	191 - 236	184 - 230
	Oct./Dec.	205 - 275	220 - 288	265 - 285	340 - 385	350 - 390	350 - 410	350 - 390	360 - 420	355 - 405	207 - 238	204 - 233	190 - 229
2018	Jan./March	215 - 242	235 - 268	280 - 315	395 - 415	380 - 425	390 - 440	385 - 415	390 - 422	405 - 418	209 - 249	204 - 242	190 - 239
	April/June	211 - 262	228 - 275	290 - 308	407 - 420	395 - 425	402 - 440	410 - 423	412 - 422	406 - 417	207 - 265	205 - 254	192 - 254
	July/Sept.	236 - 279	265 - 310	278 - 320	420 - 439	410 - 445	407 - 458	410 - 420	415 - 430	412 - 418	207 - 270	204 - 270	187 - 259
	Oct./Dec.	260 - 316	275 - 349	290 - 338	417 - 437	410 - 450	407 - 458	395 - 420	407 - 435	403 - 415	247 - 290	239 - 278	234 - 276
2019	Jan./March	218 - 275	250 - 285	280 - 295	383 - 420	360 - 435	388 - 450	385 - 400	390 - 425	380 - 405	257 - 294	251 - 286	249 - 288
	April/June	225 - 269	245 - 288	283 - 305	345 - 383	335 - 420	331 - 420	345 - 385	340 - 420	335 - 385	258 - 289	260 - 289	250 - 280
	July/Sept.	228 - 267	255 - 285	253 - 285	305 - 345	292 - 363	310 - 373	315 - 345	320 - 358	312 - 338	246 - 283	241 - 283	232 - 275
	Oct./Dec.	205 - 236	233 - 261	235 - 263	260 - 308	240 - 330	275 - 333	281 - 320	290 - 325	290 - 315	227 - 272	220 - 270	214 - 257
2020	Jan./March	208 - 237	233 - 262	239 - 265	265 - 315	250 - 315	275 - 325	280 - 305	285 - 310	285 - 312	209 - 273	204 - 272	189 - 263
	April/June	194 - 227	210 - 249	225 - 248	290 - 310	280 - 310	291 - 315	295 - 305	306 - 311	304 - 312	202 - 277	196 - 276	187 - 264
	July/Sept.	208 - 255	225 - 280	225 - 276	309 - 345	295 - 348	300 - 355	303 - 360	309 - 355	306 - 355	200 - 227	191 - 219	178 - 218
	Oct./Dec.	225 - 255	255 - 273	255 - 285	345 - 390	335 - 395	340 - 405	350 - 385	355 - 365	352 - 372	196 - 222	195 - 215	181 - 206
2021	Jan./March	250 - 362	275 - 365	285 - 365	405 - 590	390 - 580	375 - 590	380 - 530	380 - 561	390 - 570	193 - 226	173 - 224	175 - 209
	April/June	310 - 445	330 - 465	320 - 470	580 - 675	550 - 695	530 - 690	530 - 610	535 - 585	533 - 570	196 - 262	189 - 251	178 - 252

Table 23. Average CFR (India) prices of Urea, DAP and MOP from 2010-11 to 2020-21

(US$/tonne)

Year	Urea[1]	DAP	MOP
2010-11	JV - 167 Direct - 327.38	593[2]	370
2011-12	JV - 215.19 Direct - 481.74	650[2]	478
2012-13	JV - 227.63 Direct - 417.40	580[2]	492
2013-14	JV - 172.41 Direct - 322.66	475[2]	375-424
2014-15	JV - 179.66 Direct - 303.94	465[2]	322
2015-16	JV - 145.83 Direct - 279.02	459[2]	332
2016-17	JV - 157.50 Direct - 210.42	366[2]	235
2017-18	Direct - 241.33	379[3]	240[1]
2018-19	JV - 180.03 Direct - 305.44	459[3]	275[3]
2019-20 (P)	JV - 180.44 Direct - 271.46	334[3]	286[3]
2020-21 (P)	Direct - 262.64	369[3]	239[3]

(P) = Provisional. CFR = Cost & Freight
1 = Weighted average price.
2 = Average FOB price + Ocean freight from published documents.
3 = Average of monthly CFR.

for all indigenous urea manufacturers to produce 100% *neem* coated urea of their total urea production. The same policy is applied for imported urea at the port. Government of India allowed the manufacturers / importers to charge 5% extra on the MRP of urea. Therefore, the retail price of urea (i.e. *neem* coated urea) works out to Rs. 5628 per tonne *w.e.f.* 25th May, 2015 exclusive of state taxes and GST.

12.2.1.1 ***Rationalizing the size of urea bag***

Government made it mandatory to resize urea bag from 50 kg to 45 kg. In this context, DoF issued a notification on 4th September 2017 conveying approval of the Government to introduce 45 kg bag of urea replacing the existing 50 kg bag. A period of six months was given as lead time to implement the introduction of 45 kg bag of urea. Subsequently, Department of Agriculture, Cooperation and Farmers Welfare notified price per bag of urea of 45 kg at Rs. 242/- w.e.f. 1st March 2018 from Rs. 268/- per bag of 50 kg earlier. A further period of two months' extension from the date of notification of MRP of 45 kg bag of urea was given as lead time to implement the introduction of 45 kg bag of urea.

12.2.2 P & K fertilizers

The retail prices of P & K fertilizers covered under NBS are market driven and announced by the companies from time to time.

13.0 SUBSIDY ON DECONTROLLED PHOSPHATIC AND POTASSIC FERTILIZERS UNDER NBS

Chapter 1 section 1.2.1 of the review covered the NBS rates per kg for 2020-21 in respect of P & K fertilizers. NBS rates for N, P, K and S for 2020-21 had been reduced. The NBS rates for N, P, K and S had been fixed at Rs.18.789, Rs.14.888, Rs.10.116 and Rs.2.374 per kg for 2020-21 *w.e.f* 1st April, 2020. The NBS rates for N, P, K and S were Rs. 18.901, Rs. 15.216, Rs. 11.124 and Rs. 3.562 per kg, respectively, during 2019-20.

Accordingly, NBS rates per MT for DAP, SSP and MOP reduced to Rs. 10231, Rs.2643 and Rs.6070, respectively, for 2020-21. NBS rate for ammonium sulphate has been reduced to Rs.4398 per MT. NBS rates for NP/NPK grades of fertilizers were in the range of Rs. 6292 per MT to Rs. 9430 per MT. A new grade 14-28-0-0 was included in the NBS scheme. **Part**

Table 24. Nutrient based subsidy for P & K fertilizers - 2020-21

A. NBS for nutrient N, P, K and S (Rs. per kg.)

Nutrient	w.e.f. 1.4.2020
N	18.789
P	14.888
K	10.116
S	2.374

B. NBS for different P & K fertilizers (Rs. per tonne)

Fertilizers	w.e.f. 1.4.2020
DAP (18-46-0)	10,231
MAP (11-52-0-0)	9,809
TSP (0-46-0-0)	6,848
SSP (0-16-0-11)	2,643
MOP (0-0-60-0)	6,070
16-20-0-13	6,292
20-20-0-13	7,044
20-20-0-0	6,735
28-28-0-0	9,430
16-16-16-0	7,007
17-17-17-0	7,445
19-19-19-0	8,321
10-26-26-0	8,380
12-32-16-0	8,637
14-28-14-0	8,215
14-35-14-0	9,258
15-15-15-0	6,569
15-15-15-09	6,783
24-24-0-0	8,082
24-24-0-8*	8,082
14-28-0-0	6,799
Ammonium Sulphate (20.5-0-0-23)	4,398

* = Subsidy on Sulphur not included.

C. Per tonne additional subsidy for fortified fertilizers with secondary and micro-nutrients (as per FCO)

Nutrients for fortification (as per FCO)	Additional subsidy per tonne of fortified fertilizers (Rs.)
Boron 'Bn'	300
Zinc 'Zn'	500

Table 25. Economics of application of N,P_2O_5 & K_2O on paddy and wheat from 1971-72 to 2020-21

Particulars	1971-72	1981-82	1991-92 Effective 14.8.91	1992-93 Effective 25.8.92	1995-96 (Kharif)	1995-96 (Rabi)	2001-02 Prior to Feb. 28 2002	2001-02 w.e.f. Feb. 28 2002	2002-03	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
A. FERTILIZER & FOODGRAINS PRICES (Rs./kg.)																					
Nutrient prices (Rs./kg.)																					
1. N based on Urea	2.01	5.11	6.65	6.00	7.22	7.22	10.00	10.50	10.50	10.50	11.54	11.54	11.59	11.65	11.65	12.23 *	12.23 *	12.23 *	12.23 *	12.23 *	12.23 *
2. P_2O_5 based on : DAP	1.86	5.83	7.57	11.78 to 12.43	16.96 to 18.48	18.11 to 19.45	15.43	16.22	16.22	16.22	17.11 to 18.85	18.85 to 39.61	47.62	44.35	46.96	48.70	43.27	43.54	54.14	47.61	47.61
3. K_2O based on MOP	0.89	2.17	2.83	7.50	6.03 to 7.57	7.00 to 8.00	7.09	7.43	7.43	7.43	7.43 to 8.43	10.00 to 20.13	28.33	26.67	27.50	26.67	18.33	19.97	26.67	31.67	29.17
Output prices(Rs./kg.) (CropYear)																					
4. Procurement prices of paddy	0.53	1.15	2.30	2.70	3.60	3.60	5.30	5.30	5.30	10.00	10.00	10.80	12.50	13.10	13.60	14.10	14.70	15.50	17.50	18.15	18.68
5. Procurement prices of wheat	0.76	1.30	2.50	3.30	3.80	3.80	6.20	6.20	6.20	11.00	11.70	12.85	13.50	14.00	14.50	15.25	16.25	17.35	18.40	19.25	19.75
B. PHYSICAL RATIOS																					
PADDY																					
6. Kg. of paddy required to buy 1 kg. N	3.79	4.44	2.89	2.22	2.01	2.01	1.89	1.98	1.98	1.05	1.15	1.07	0.93	0.89	0.86	0.87	0.83	0.79	0.70	0.67	0.65
7. Kg. of paddy required to buy 1 kg. P_2O_5 - as DAP	3.51	5.07	3.29	4.36 to 4.60	4.71 to 5.13	5.03 to 5.40	2.91	3.06	3.06	1.62	1.71 to 1.89	1.75 to 3.67	3.81	3.39	3.45	3.45	2.94	2.81	3.09	2.62	2.55
8. Kg. of paddy required to buy 1 kg. K_2O	1.68	1.89	1.23	2.78	1.68 to 2.10	1.94 to 2.22	1.34	1.40	1.40	0.74	0.74 to 0.84	0.93 to 1.86	2.27	2.04	2.02	1.89	1.25	1.29	1.52	1.74	1.56
WHEAT																					
9. Kg. of wheat required to buy 1 kg. N	2.64	3.93	2.66	1.82	1.90	1.90	1.61	1.69	1.69	0.95	0.99	0.90	0.86	0.83	0.80	0.80	0.75	0.70	0.66	0.64	0.62
10 Kg. of wheat required to buy 1 kg. P_2O_5 - as DAP	2.45	4.48	3.03	3.57 to 3.77	4.46 to 4.86	4.77 to 5.12	2.49	2.62	2.62	1.47	1.46 to 1.61	1.47 to 3.08	3.53	3.17	3.24	3.19	2.66	2.51	2.94	2.47	2.41
11 Kg. of wheat required to buy 1 kg. K_2O	1.17	1.67	1.13	2.27	1.59 to 1.99	1.84 to 2.11	1.14	1.20	1.20	0.68	0.64 to 0.72	0.78 to 1.57	2.10	1.91	1.90	1.75	1.13	1.15	1.45	1.65	1.48

* = Price of *Neem* Coated Urea. Includes 5% extra on basic MRP of urea.

W.e.f. 25th May, 2015, GoI has made it mandatory for all indigenous producers of urea to produce 100% of their production of subsidised urea as *Neem* Coated Urea. The rule is applicable for imported urea also.

The government allowed to produce *neem* coated urea upto a maximum limit as listed below.

W.e.f.	% of the company's total production
1st June, 2008	20
11th January, 2011	35
7th January, 2015	Cap/ restriction removed
1st April, 2015	75 (Mandatory)
25th May, 2015	100 (Mandatory)

A of **Table 24** gives the per kg nutrient based subsidy for N, P, K and S for 2020-21. **Part B** of **Table 24** presents the per tonne subsidy on various P & K fertilizer products. **Part C** of **Table 24** shows per tonne additional subsidy for fertilizers fortified with secondary and micro nutrients.

14.0 ECONOMICS OF FERTILIZER USE

The cost benefit ratio of fertilizer to food grain depends upon the selling prices of fertilizers and procurement/ support prices of grains. **Table 25** shows physical ratios of N, P_2O_5 and K_2O on paddy and wheat during the period 1971-72 to 2020-21. The Table shows the changes in physical ratios, i.e., kg of paddy and wheat required to buy a kg of nutrient. It may be observed that the physical ratios improved consistently from 2002-03 to 2009-10 due to stagnant retail prices of fertilizers and continued increase in procurement prices. During 2010-11, the physical ratios marginally changed due to nominal increase in retail prices of fertilizers. From 2011-12 to 2015-16, the physical ratios for P & K became considerably unfavourable due to more proportionate increase in MRP of DAP and MOP compared to increase in procurement prices of paddy and wheat. During 2016-17 and 2017-18, the physical ratios improved due to reduction in retail prices of DAP and MOP and increase in MSP of paddy and wheat. However, during 2018-19, it became unfavourable due to proportionately higher increase in retail prices of P & K fertilizers against increase in MSP of paddy and wheat. During 2019-20, the physical ratios of P improved due to reduction in retail price of DAP. However, in case of K, the physical ratios turned unfavourable due to increase in price of MOP. During 2020-21, the physical ratios improved due to increase in procurement prices of paddy and wheat against stagnant retail price of DAP and reduction in MOP price.

In case of urea, the physical ratios turned little unfavourable during 2010-11 due to increase in MRP of urea by about 10% as against nominal increase in MSP of paddy and wheat. From 2011-12 and onwards, the physical ratios continued to improve. This was due to increase in MSP for paddy and wheat as against almost stagnant price of urea.

15.0 ECONOMICS OF SULPHUR USE

Sulphur is an essential plant nutrient, besides nitrogen, phosphate, and potash. The results from experimental stations and farmers' fields indicate that the application of 20-40 kg S per hectare in addition to recommended dose of NPK is highly economical. The latest available average price per kg of bentonite sulphur was about Rs.50. As against this, the price of N (as urea) was Rs.12.23 per kg, for P (as DAP) it was Rs.47.61 per kg and for K (as MOP) it was Rs.29.17 per kg during 2020-21. As per the experimental results, the extra yield by application of one kg of sulphur is about 28 kg for paddy, 24 kg for wheat, 26 kg for maize, 20 kg each for sorghum and mustard and 12 kg for soyabean. **Table 26** shows the crop response to sulphur application and value cost ratio of sulphur for different crops. The value cost ratio of sulphur for various crops ranged from 9 to 19 showing that economic returns on sulphur application are quite good.

16.0 RECENT DEVELOPMENTS AND OUTLOOK FOR 2021-22

16.1 NBS for P & K Fertilizers

Chapter 1 section 1.2.2 of the review covered the NBS rates per kg for 2021-22 in respect of phosphatic and potassic fertilizers. Initially, Department of Fertilizers (DoF) extended NBS rates for N, P, K and S of 2020-21 for 2021-22 till further order. In the meantime, there has been significant increase in international prices of finished fertilizers, raw materials and the intermediates used for manufacture of P & K fertilizers compared to the prices in 2020-21. In view of this, DoF, revised the NBS rates of P from Rs.14.888 per kg to Rs. 45.323 per kg w.e.f. 20th May, 2021. Increase in subsidy rates of P is applicable only upto 31st October, 2021. However, NBS rates per kg for N, K and S remained unchanged at the previous year's level.

Accordingly, NBS rates per tonne of DAP and SSP increased from Rs. 10231 and Rs.2643 for 2020-21 to Rs. 24231 and Rs. 7513 per tonne, respectively, for 2021-22. NBS rates for NP/NPK grades of fertilizers are now in the range of Rs. 11134 per tonne to Rs. 19910 per tonne. However, NBS rates for MOP and ammonium sulphate remained unchanged at Rs. 6070 and Rs. 4398 per tonne, respectively for 2021-22. In addition, two new NPK complex fertilizers (8-21-21 and 9-24-24) have been included in the NBS policy. **Table 27** presents per tonne subsidy applicable for the above products.

Government has announced additional allocation of Rs. 14,775 crores to cover the increase in subsidy on P&K fertilizers due to increase in rate of subsidy notified on 20th May, 2021 which is applicable upto 31st October, 2021.

16.2 Weather

The Southwest monsoon made onset over Kerala coast on 3rd June 2021 after a delay of two days. According to 2nd stage forecasts of India Meteorological Department (IMD), rainfall during Southwest monsoon 2021 is likely to be normal at 101% of the Long Period Average (LPA) with a model error of ±4%. Actual rainfall during June 2021 was 10% above LPA but in July it was 7% below LPA. IMD predicted normal (94 to 106% of LPA) rainfall during August 2021.

Table 26. Economics of sulphur fertilizer application

Crop	Price (2020-21) Rs./kg	Yield increase * kg grain/ kg S	Value of grain Rs./kg S	Value: Cost ratio
Paddy	18.68	28	523.0	10.4
Wheat	19.75	24	474.0	9.5
Maize	18.50	26	481.0	9.6
Sorghum	26.20	20	524.0	10.5
Soyabean	38.80	12	465.6	9.3
Mustard	46.50	20	930.0	18.6
Groundnut	52.75	9	474.8	9.5

* = Data presented in the TSI/FAI/IFA Symposium on 'Sulphur in Balanced Fertilization' held during October 4-5, 2006 at New Delhi.

Latest available average price of 1 kg S = Rs. 50.08

Low intensity of rainfall over east & northeast and northwest India during July 2021 affected overall rainfall during the period. Overall rainfall performance from 1st June to 31st July, 2021 was 1% below LPA. Actual rainfall was 449 mm as against normal rains of 452.2 mm. Out of 36 meteorological sub-divisions, 29 sub-divisions received normal to excess rains and remaining 7 sub-divisions received deficient rains during the period. Out of 694 reported districts, 72% districts received normal to excess rains during the period.

Total live storage capacity in 130 reservoirs monitored by Central Water Commission is 174.23 Billion Cubic Meter (BCM) at full reservoir level. Live storage in these reservoirs was 85.36 BCM as on 29th July, 2021 as against 70.77 BCM on the same date in the previous year. Current year's storage is 121% of the last year storage.

16.3 Crop Situation

As the progress of monsoon got stalled over most parts of India with a timely start, there has been decline in sown area of major *kharif* crops. As per the available information, total area sown under all *kharif* crops was 84.82 million hectares (million ha) as on 30th July, 2021 as compared to 89.00 million ha during the corresponding period in the previous year. This was 4.7% lower than the corresponding period in the previous year. Area sown under rice, pulses, coarse cereals and oilseeds declined by 4%, 3%, 5.7% and 5.5%, respectively, over the corresponding period of the previous year. Similarly, area sown under cotton declined by 8.7% during the period. However, area sown under sugarcane and jute & mesta increased by 1.6% and 1.1%, respectively, during the period.

16.4 Fertilizer Sales

Delayed monsoon and decline in sown area affected fertilizer demand during April/July 2021 over April/July 2020. Sale of urea at 10.19 million MT, DAP at 2.72 million MT, NP/NPKs at 3.69 million MT and MOP (for direct application) at 0.91 million MT during April/July 2021 witnessed decline of 11.4%, 26.6%, 4.6% and 7.9%, respectively, over April/July 2020. However, sale of SSP at 1.90 million MT registered an increase of 5.8% during the period.

Table 27. Nutrient based subsidy for P & K fertilizers - 2021-22

A. NBS for nutrient N, P, K and S (Rs. per kg.)

Nutrient	w.e.f. 20.5.2021#
N	18.789
P	45.323
K	10.116
S	2.374

B. NBS for different P & K fertilizers (Rs. per tonne)

Fertilizers	w.e.f. 20.5.2021#
DAP (18-46-0)	24,231
MAP (11-52-0-0)	25,635
TSP (0-46-0-0)	20,849
SSP (0-16-0-11)	7,513
MOP (0-0-60-0)	6,070
16-20-0-13	12,379
20-20-0-13	13,131
20-20-0-0	12,822
28-28-0-0	17,951
16-16-16-0	11,876
17-17-17-0	12,619
19-19-19-0	14,103
10-26-26-0	16,293
12-32-16-0	18,377
14-28-14-0	16,737
14-28-0-0	15,321
14-35-14-0	19,910
15-15-15-0	11,134
15-15-15-09	11,348
24-24-0-0	15,387
24-24-0-8*	15,387
8-21-21	13,145
9-24-24	14,996
Ammonium Sulphate (20.5-0-0-23)	4,398

* = Subsidy on Sulphur not included.
# = Till 31st October 2021.

C. Per tonne additional subsidy for fortified fertilizers with secondary and micro-nutrients (as per FCO)

Nutrients for fortification (as per FCO)	Additional subsidy per tonne of fortified fertilizers (Rs.)
Boron 'Bn'	300
Zinc 'Zn'	500

16.5 Prospects of Fertilizer Consumption

Overall Southwest monsoon (June-September) 2021 is anticipated to be normal. This is likely to increase cropped area during the remaining period of *kharif* 2021. Normal Southwest monsoon is likely to leave good moisture contents in the soil for ensuing *rabi* crop season. Water availability in the reservoirs at the end of *kharif* season is also likely to be comfortable. Continuing increase in international prices of fertilizers and raw materials remains the challenge for timely availability of fertilizers. The total consumption of fertilizers during 2021-22 is likely to remain at the level of 2020-21.

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