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Functioning of Direct Benefit Transfer in Fertiliser at Retail Point in Gujarat State

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Foreword

India is one of the major producers as well as consumers of chemical fertilizers. The Green revolution technology comprised of high yielding variety seeds, fertilizer and irrigation adopted during mid-sixties has brought country out of chronic food shortage stage to food grains surplus country. The usage of chemical fertilizers with quality seeds and irrigation helped to increase food grains production in the country by almost five and half times during last seven decades' period and achieving the self-sufficiency. Fertilizers also play a major role in the advanced short duration crop production. In view of diminishing land for cultivation and in order to maintain the self-sufficiency of food grain production in years to come, availability of fertilizer at reasonable prices in quality time is very necessary.

Over the years, intensity of fertilizer consumption has increased significantly, i.e. from 5.09 kg/ha in 1966-67 to 137.4 kg/ha in 2018-19 having huge variations across the States. Gujarat has reported the per hectare consumption of fertilizer (136.01 kg/ha) higher than national average (128.5 kg/ha) and the highest in Western Zone of India during TE 2017-18. Though fertilizer consumption has reported significant increase, but many reports have highlighted its uneven, untimely and faulty distribution which had become prone to 'leakages' as well as pro-rich large farmer group. It was estimated that about two third of total fertilizers produced in the country does not reaches the intended beneficiaries viz., small and marginal farmers. Besides, some reports have highlighted industry use of fertilizer. In order to tackle these issues, Government of India had taken various initiatives including technological interventions such as Fertilizer Management System in 2007, Neem Coated of Urea in 2008, Mobile Fertilizer Monitoring System in 2012 and Integrated Fertilizer Monitoring System in 2016 which has helped to increase transparency in the fertilizer distribution system and its management. While these initiatives could not fully curb the leakage, excess use as well as misuse of fertilizer. As subsidy on fertilizer is the second largest subsidy after food subsidy provided the by the government, therefore, Government of India decided to bring fertilizer subsidy under the Direct Benefit Transfer (DBT) system w.e.f., 1st October 2016 in 17 districts under which government remits a subsidy amount to fertilizer companies after fertilizer retailers have sold fertilizer to farmers through Point of Sale (PoS) machines through biometric authentication. Any farmer can purchase any required quantity of subsidized fertilizer regardless of the land size availed with him at subsidized rate. The Pan India rollout of DBT was completed by March 2018. It was therefore important to find out the degree of variation among various sources of data at the retailer level. With this view, the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India entrusted our Centre a study on 'Functioning of Direct Benefit Transfer in Fertiliser at Retail Point in Gujarat State'. Agricultural Development and Rural

Transformation Centre, Institute for Social and Economic Change, Bangalore, Karnataka has coordinated this all India study. The ultimate objective of the study was to see how much reliance can be placed on the PoS data for the purpose of policy planning and movement/supply of fertilizers in the Gujarat and what corrective action need to be undertaken to reconcile data across various data sources.

The study is based on secondary and primary level data. For primary data, two districts, viz. Anand and Botad were selected covering different agro climatic zones with one district covering irrigated and the other one covering rain-fed/ dry land area. The total sample for Gujarat state was 60 retailers, 100 top twenty buyers, 50 most frequent buyers and 100 random walk buyers selected from the same villages where from top and frequent buyers are selected. The study results indicate that existing scheme of DBT in fertilizers is very good. While major problems in functioning of DBT at retailer level reported were poor internet network connectivity, frequent server down, failure of Aadhaar authentication of farmers, frequently session log out after some time, battery getting down in short time, battery do not get charge during the operational/working time/way, updated version of PoS is not user friendly, roll of print out is not easily available in the market, poor service issues, ink of the print out receipt is not long durable. Most of the farmers are found illiterate or with very low level education and they do not understand the receipt of sales transaction which is in English language. During the field visit, it was observed that despite of these challenges, the new system has increased the overall accountability of stakeholders, including wholesalers and retailers, besides enhancing the transparency with improved tracking of physical movement of fertilizer in the district or state. During the conversation with the retailers, they revealed that the instead of PoS machine, the laptops and computer systems is very user friendly and can be used at high speed broadband service for fertilizer sales in desktop version. The desktop software is more robust and secure than PoS machine. As many as retailers sell manually in initially and adjust immediately in peak season while another adjust it later on or in evening. Retailers are having lack of knowledge about the computer system, even lack of training facilities of the same and therefore training should be arranged frequently for issues raised

I am thankful to authors and their research team for putting in a lot of efforts to complete this excellent piece of work. I also thank the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India for the unstinted cooperation and support. I hope this report will be useful for those who are interested in understanding the DBT in fertilizer uses in agriculture.

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List of Abbreviations

ADRTC	-	Agricultural Development and Rural Transformation Centre
AeFDS	-	Aadhaar-enabled Fertilizer Distribution system
AERC	-	Agro Economic Research Centre
APS	-	Ammonium Phosphate Sulphate
ARCOGUL	-	Anand regional co-operative growers union limited
AS	-	Ammonium Sulphate
Av.	-	Average
DAC		Department of Agriculture & Cooperation
DAP	-	Di-Ammonium Phosphate
DBT	-	Direct Benefit Transfer
DBT-F	-	Direct Benefit Transfer in Fertilizer
DOA	-	Directorate of Agriculture
DOF	-	Department of Fertilizers
ECA	-	Essential Commodities Act
FAI	-	Fertilizer Association of India
FB	-	Frequent Buyers
FCO	-	Fertilizer Control Order
FMS	-	Fertilizer Management System
FY	-	Financial Year
GCA	-	Gross cropped Area
GDP	-	Gross Domestic Product
GOG	-	Government of Gujarat
GOI	-	Government of India
GRM	-	Grievance Redress Mechanism
Ha./ha	-	Hectare
HYVs	-	High Yielding Varieties
iFMS	-	Integrated Fertilizer Monitoring System
INR	-	Indian Rupee

ISEC	-	Institute for Social and Economic Change
K	-	Potassium
KCC	-	Kisan Credit Card
LFS	-	Lead Fertilizer Supplier
LMT	-	Lakh Metric Tones
MCO	-	Movement Control Order
MDA	-	Market Development Assistance
mFMS	-	Mobile Fertilizer Management System
MOP	-	Murate of Potash
MRP	-	Maximum Retail Price
MT	-	Metric tonne
N	-	Nitrogen
NBS	-	Nutrient-based Subsidy Scheme
No..Nos	-	Number
NPK	-	Nitrogen Phosphate Potash
OBC	-	Other Backward Class
P	-	Phosphorous
PACS	-	Primary Agricultural Credit Society
PAN	-	Presence Across Nation
PoS	-	Point of Sale
Qty.	-	Quantity
RE	-	Revised Estimate
RPS	-	Retention Price Scheme
RW	-	Random walk
SSP	-	Single Super Phosphate
SSP (P)	-	Single Super Phosphate (Powder)
SSP(G)	-	Single Super Phosphate (Granular)
TB	-	Top Buyers
UK	-	United Kingdom
USD	-	United States dollar
UT	-	Union Territory

Executive Summary

Functioning of Direct Benefit Transfer in Fertiliser at Retail Point in Gujarat State

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1. Backdrop

India is one of the major producers as well as consumers of chemical fertilisers in the World. The N & P (P_2O_5) fertilizers production in India was reported to be 18.16 million tonnes that accounts for 10.35 per cent of the World's N & P (P_2O_5) fertilizers production in 2017 and rank second position. The total fertiliser product consumption in India was reported to be 26.59 million tonnes in 2017-18 which accounted for 13.80 per cent of total fertiliser consumption in the World and rank at second position. However, as compared to the most of the countries in the World, average intensity of fertilizer use in India remains much lower which is highly skewed, with wide inter-regional, inter-state, and inter-district variations. In India, the most commonly accepted NPK ratio is reported to be 4:2:1, while it was estimated 6.6:2.6:1.0 in 2018-19.

Fertilisers have been considered as an essential input to Indian agriculture for increasing agricultural production so as to meet the food grains requirements of growing population of the country. A very close association is observed between growth in use of fertilisers and crop production and productivity in almost all the states of the country. The Green revolution technology adopted during mid-sixties comprised of high yielding variety seeds (HYVs), fertilizer and irrigation has brought country out of chronic food shortage stage to food grains surplus country. With the advent of fertiliser responsive crop varieties, total consumption of fertilisers have increased from about 1.1 million tonnes in 1966-67 to 27.23 million tonnes in 2018-19. It was estimated that urea accounts for 82 per cent of total nitrogen consumption and di-ammonium phosphate accounted for 61 per cent of phosphate consumption in 2018-19. The intensity of use of fertilisers in India has increased from 6.99 kg per ha of gross cropped area in 1966-67 to 137.40 kg per ha during 2018-19. However, the level of consumption of fertilisers was highly varied within as well as between the States, i.e. from 223.6 kg/ha in Punjab to 53.4 kg/ha in Rajasthan to 25 kg/ha in Tripura during TE 2018-19. The variability in consumption of fertilisers can be attributed to different cultivation methods, type of crops and subsidy on fertilisers. Further, the consumption of fertilisers has also varied across farm size groups with the highest amount of consumption recorded among group of small farmers. Besides, there are concerns about the indiscriminate use of chemical fertilisers by the farmers with a view to increase the crop yield. This has led to deterioration of soil structure, wastage of nutrients, destruction of soil micro-organisms and scorching of plants at the extreme cases.

Though fertilizer consumption has reported significant increase, but many reports have highlighted its uneven, untimely and faulty distribution which had become prone to 'leakages' as well as pro-rich large farmer group. It was estimated that about two third of total fertilizers produced in the country does

not reaches the intended beneficiaries viz., small and marginal farmers. Besides, some reports have highlighted industry use of fertilizer. Fertilizer subsidies in India currently account for the second-largest government transfer, with estimated outlays of over 700 billion rupees (USD 10 billion) projected for the 2018-19 fiscal year. Because of the vast size of fertilizer subsidies and the subsequent market distortions they introduce, India's fertilizer subsidies have been the subject of much scrutiny for some time. Among other effects, these subsidies introduce arbitrage opportunities whereby subsidized fertilizer supplies from India can be smuggled across porous borders into Nepal and Bangladesh and sold in so-called 'grey markets.' In order to tackle these issues, GOI had taken various initiatives including technological interventions such as Fertilizer Management System in 2007, Neem Coated of Urea in 2008, Mobile Fertilizer Monitoring System in 2012 and Integrated Fertilizer Monitoring System in 2016 which has helped to increase transparency in the fertilizer distribution system and its management. While these initiatives could not fully curb the leakage, excess use as well as misuse of fertilizer.

As subsidy on fertilizer is the second largest subsidy after food subsidy provided the by the government, GOI has decided to bring fertilizer subsidy under the Direct Benefit Transfer (DBT) system w.e.f., 1st October 2016 in 17 pilot districts under which government remits a subsidy amount to fertilizer companies after fertilizer retailers have sold fertilizer to farmers through Point of Sale (PoS) machines through biometric authentication. Any farmer can purchase any required quantity of subsidized fertilizer regardless of the land size availed with him at subsidized rate. The different states were put on Go—Live mode w.e.f 01.09.2017 and Pan India rollout of DBT was completed by March 2018. The implementation of the DBT in Fertilizer Scheme required deployment of PoS devices at every retailer shop and training of retailers for operating PoS device. Across the country, Lead Fertilizer Supplier have conducted 10878 training sessions. So far 2.26 Lakh PoS devices have been deployed across all States. A total of 1182.04 Lakh Metric Tons Fertilizers have been sold through PoS devices under DBT Scheme till December 2019. Approximately, 2.39 lakh retailers were sensitized during the introductory training sessions conducted by lead fertilizer suppliers (LFS). The DBT system entails 100 per cent payment of subsidy to the fertilizer manufacturing companies on the basis of actual sales by the retailer to the beneficiary. NITI Aayog has conducted four extensive evaluations through an independent agency M/s Microsave in the DBT pilot and received positive feedback after which the deployment of PoS devices was extended to all the States/UTs across the country.

Based on circumstantial evidences, it has been found that the information regarding opening stock, daily/weekly/monthly sales, closing stocks of fertilizers at retail points do not match from various sources, i.e., PoS, physical sale/stock register maintained by the retailer. Further, the daily/weekly/monthly sales as per the physical bill book maintained by retailer do not match with each other. For example, stocks of fertilizers on a particular date at a retail point as shown in the PoS generated records and the physical registers/books of the retailer do not reconcile. Since the release or the entitlement to subsidy is established through sales recorded in the PoS machine, it is critical that the system of operation of PoS at the retail point is strictly adhered to. Therefore, it is needed to verify such information at the first hand. Additionally, it is essential to check not only at the retail point, but also it is desirable to cross check with the farmers about their purchase of fertilizers; the identification source used by

them; their ease of doing business with this new PoS system; and seek their opinion about the functioning of the PoS system. Therefore, present study was undertaken to find out the degree of variation among various sources of data at the retailer level in Gujarat state.

The study is based on both primary and secondary level data. The secondary data required for the study were compiled from published sources. The primary data for the study were collected by interviewing personally the retailers and fertiliser buyers from two selected districts by recall method. The quantitative/qualitative data were collected in a structured questionnaire; keeping in view the objectives of the study. As per the methodology provided by the coordinator, two districts were selected covering different agro climatic zones with one district covering irrigated area and the other one covering rain-fed/dry land area. Accordingly, Anand (irrigated area) and Botad (rainfed/dry land area) district were selected. From each selected district, a total number of 30 retailers were selected for the purpose of investigation which have the representation of private retailers, company owned shops and cooperative societies. In addition, from each selected district, a list of top 20 buyers and frequent 10 buyers were obtained for the last six months (i.e., from January 2019 to June 2019). Thus, from this list of 120 top-twenty buyers and 60 frequent buyers, a total number of 50 top-twenty buyers and 25 frequent buyers/farmers (as generated from IFMS) were selected randomly for detailed investigation and verification for operational holdings, crops sown etc. Further, 50 farmers from each district were selected as random walk for further purchase verification through PoS. Thus, the aggregate sample for Gujarat state was 60 retailers, 100 top-twenty buyers, 50 most frequent buyers and 100 random walk buyers selected from the same villages where from top and frequent buyers were selected. The data were collected for the agricultural year 2018-19.

2. Fertiliser Consumption in Gujarat

Gujarat is not only the fastest growing states of India but also one of those states where economy has always performed better than the national average. Agriculture and allied sector plays major role in the growth of State economy as activities of agriculture and allied sectors are the primary source of occupation for the majority of the rural people in the State. Gujarat has been consistently clocking impressive agricultural growth rates. This has been possible because the government has focused on improving not only irrigation, quality of seeds and power but also subsidiary sectors like animal husbandry. Gujarat has seen intensification in agricultural practices during the last two decades with increase in the consumption of chemical fertilisers. The major highlights of fertiliser use in Gujarat are as follows:

- Total fertiliser consumption in Gujarat has increased from 17.2 thousand tonnes in TE 1962-63 to 538.5 thousand tonnes in TE 12002-03 and then to 1681.5 thousand tonnes in TE 2018-19. Gujarat has reported the per hectare consumption of fertilizer (133.7 kg/ha) close to national average of 134.18 kg/ha in TE 2018-19, which was the highest in across the states in Western Zone of India.
- During the period from 1960-61 to 2018-19, total fertiliser consumption in Gujarat has increased at the rate of 7.32 per cent per annum. Among the nutrients, rate of growth was highest in case of K (8.4 per cent p.a.) followed by use of N (7.3 per cent p.a.) and P (6.7 per cent p.a.). Increase in

consumption of fertiliser has also increased the intensity of fertiliser use over the period of time. The per hectare use of total fertiliser has increased from 1.7 kg/ha in TE 1962-63 to 76.9 kg/ha in TE 2002-03 and 133.7 kg/ha in TE 2018-19.

- The consumption ratio of N& P to K in Gujarat was estimated to be very wrost during TE 1962-63 (25.9:12.7:1), which has lower done and balanced as 13.6:6.9:1 in TE 1972-73 and got closer to stipulated one (4:2:1) in TE 1982-83, i.e 6.2:3.1:1. While then after again, ratio of fertliers nutrients have got in favor of N till date and it was estimated as 9.5:2.9:1 in TE 2019-20.
- Across the districts, the highest quantity of fertiliser use is reported in Banaskantha district followed by Rajkot, Surat, Surendranagar, Kheda, Ahmedabad, Anand, Sabarkantha, Kutch and Bhavnagar. These top ten selected districts together accounted for 52 per cent of total fertiliser consumption in the State during 2018-19.
- Out to total fertiliser use across the districts of Gujarat, 52 per cent was used in Kharif season and rest was used in Rabi season.
- Most of the districts in Saurashtra region (viz. Amreli, Bhavnagar, Botad, Devbhoomi Dwarka, Jamnagar) and tribal district of Dang have reported around three fourth of total fertiliser use in kharif season. While use of fertiliser was higher in Rabi season than kharif season in the districts of Ahmedabad, Anand, Vadodara, Mehsana, Banaskantha and Sabarkantha.
- The consumption of N&P ratio to K use was estimated to be the highest and extra orbitant towards N in Dahod district (317.7:38.8:1), followed by Patan (55.4:13.5:1) and the lowest was in Surat (2.9:1.1:1). Except Surat and Vasari districts, all other district has higher use of N as compared to stipulated one (4:2:1). While out of total 33, 19 districts have higher use of N as compared to State average (9.6:2.9:1).
- The intensity of use of fertiliser across districts of Gujarat was found the highest in Surat district (332 kg/ha) and the lowest was in Dang district (16 kg/ha). Other top fertiliser user districts having higher use of fertiliser that State average were Navsari, Anand, Gandhinagar, Vadodara, Sabarkantha, Chhota Udepur, Panchmahal, Kheda, Mahisagar, Rajkot, Banaskantha, Narmada, Arvalli, Morbi, Tapi and Bharuch.

3. Functioning of DBT in Fertiliser at Retailers' End

- Out of the selected retailers, 31.6 per cent were private retailers, 23.3 per cent were company owned depot/retailers and remaining 45 per cent were cooperatives-PACS.
- All the retailers have the PoS Machine for entry of purchase and sell of the fertilizers at their outlets. Majority of the retailers (98.3 per cent) have the 'Oasis company' machine for the purchase sale entry operation while very few have Analogic company machine. All the retailers had gone through the training about the operation of the PoS machine.
- In majority of the cases, retailer along with his helper had participated in training of PoS machine (as in some cases, more than one training was attended from each retail shop).

- Around 95 per cent of total retailers had started raising invoices w.e.f February, 2018. All the retailers have emphasized on the Aadhaar based authentication via PoS machines.
- All the retailers have faced problems in handling the PoS machine. Around 90 per cent of total retailers had faced some issues in PoS machine related to software and authentication issues, while one third of total retailers have faced hardware issues and around 38 per cent retailers have faced stock issues. Network problem was the another biggest issue faced by almost 82 per cent retailers at the aggregate.
- Among the software issues, 98.1 per cent retailers have faced the problem of frequent logout/Session expired/took more time for up-dation issues in new version while rest of them had experienced non-acceptance of finger print of retailer as well as of farmer.
- In case of hardware issues, about two third of retailers have faced issues related print issue/non-availability of print roll/print ink fade away while rest have faced problem of early drain-out of battery /more time for charging/Screen not display properly.
- All the retailers have reported problem related to figure print authentication while 52 per cent of retailers have reported problem of authentication of farmer's thumb.
- Retailers have also faced the issues related to the slowdown of server, late receiving of dispatch ID acknowledgement, slow processing of updating PoS new version, updating the present stock, Aadhaar authentication, and small screen size on the PoS.
- In the context of the stock related issues, it arises during the peak season period when there was heavy rush of farmers for fertilizer purchase and thus it was difficult to match the stock at that time. Besides, farmers had demanded fertilizers on the credit basis for which no credit bill can be generated and thus matching the stock was very difficult.
- One of the pertinent problem reported by retailers was that after receiving the stock from the fertilizer company, they need to update the stock in the stock invoice to generate online receipt records. However, updating of stock is not possible until the company stock number is entered into the PoS. But, fertilizer companies have not been updating the Demand Draft number for the stock provided and thus it was always difficult for the retailer to sell the same stock through PoS until that entry was made. This was one of the biggest issues faced by retailers for not updating PoS at the time of current fertilizer sale.
- The issues faced by the retailers were reported to State DBT coordinator, fertilizer company representatives and department officials. All the issues were raised by the retailers were rectified by the Fertilizer company representatives and POS company representatives. Majority of the retailers have reported that issues were addressed immediately and services offered by the POS staff was reported satisfactory.
- Majority of retailers have used multiple sources of stock records wherein manual book keeping and computer system /PoS for record keeping of fertilizers are major one. While few of them had computer operated management system in Talley or such softwares. The management of stock and sale information through multiple system of book keeping/computer

operated systems/POS by retailers have increased their workload enormously. Many retailers have been maintaining two systems (the first was a PoS to record sale transactions and the second was system generated as well as /or manual record). Retailers have reported that increase in workload consumed their productive time and they felt burden of record keeping.

- The receipts generated through the PoS devices get fade away very early and thus it was very difficult to maintain record for long time. Retailers have suggested that the government should link the PoS application with the tally/any such system software at their end.
- More than half of the retailers have reported that updation of the stock was delayed by more than a day. Most of the retailers faced issues of stock mismatched of the PoS and physical stock received which had happened because of the gaps in the back-end stock updation process. Even though the physical stock reached to the retail point but same was not reflected in their PoS machine. Retailers could not sell the stock unless it was updated in the PoS. Thus, as per practice adopted, retailer sold their old stock manually and after that same was adjusted in the new stock. Retailers have reported that due to slower internet network connectivity at village level, they couldn't perform updation of PoS on daily basis.
- The major three reasons reported by the retailers for the mismatch for the POS stock with physical stock were heavy rush of farmers during the seasons/hurriedness of the farmers/it is time consuming process (by 40 per cent of retailers), followed by authentication were not proper due to muddy hand (by 29 per cent of retailers) and farmer did not bring Aadhaar card always (by 26 per cent retailers).
- More than half of the retailers had purchased fertilizers directly from fertiliser company followed by one fifth of total retailers had purchased from Wholesaler, while more than 28 per cent of retailers had purchased fertiliser from both the sources, i.e wholesalers as well as Companies.
- More than half of the retailers have reported the raising of invoices in POS on the daily basis. While rest of them had generated invoices in PoS once in a week basis due to various reasons such as difficulty in authentication of purchases (34.52 per cent), followed by difficulty in multiple records keeping (28.57 per cent), farmers did not bring Aadhaar card at the time of purchasing fertilizers (19.1 per cent). The transaction receipts getting fade away within a month that is way there were not able to use that receipt after a month and therefore they had avoided raising invoices in POS.
- The retailers also reported that network connectivity problem was another hurdle along with technical problem. Besides, short battery life was also a major issue. The majority of retailers faced problem in managing transactions during peak agriculture season.
- None of the retailer had reported that PoS required too many documents for the selling of fertilizers as only Aadhaar card was required for the authentication.
- Almost two third of retailers have reported that problem of authentication by thumb impression (due to muddy hand & fate line disappeared due to heavy work done by hand on the farm) and linking of Aadhaar card at the time of sale was the major issue. While almost one third of the total retailers have

reported that farmers did not keep Aadhaar card with them while purchasing the fertilisers.

- More than half of the total retailers have reported that they have checked details on land holding and cropping pattern status while selling fertilizer in large quantity to buyers. Almost half of the retailers agreed for the implications of obtaining the declaration from farmer regarding operational holding at the time of PoS.
- The details on stock reports as per PoS devices, physical stock and manual records at the time of visit to retailers indicate that in case of the all types of the retailers, mis-match between stock as per PoS and physical verification, as well as manual records was observed. There was a difference in closing stock as per PoS and physical verification as well as manual record maintained. In case of private retailers, the highest difference in closing stock as per PoS and physical verification was observed in case of entry of Urea (452 Qtls.) while difference in stock as per PoS and Manual record was the highest in case of SSP fertilizers (438 Qtls.) with Private retailers. In case of Company owned depot as well as PACS, same situation was found wherein the highest difference in stock as per PoS and physical verification, as well as manual records was found in case of Urea and DAP, respectively. In fact, difference was more than 10000 quintals in case of PACS data entry, i.e POS stock, physical verification and as per manual record. At overall level, the highest mismatch across various types of fertiliser was estimated in case of DAP.
- There are various reasons behind the stock mismatches between PoS and physical as well as manual records, such as stocks are not getting updated on a real time basis; there are irrational changes and numerous glitches in the PoS machine/software; sale of fertilizers by the retailers without PoS machines; poor internet connectivity in rural areas; problem of authentication of Aadhaar number of the farmers; poor maintenance of PoS machines; farmer did not possess Aadhaar card at the time of purchasing of fertilizers (farmers generally directly come from the farm); auto driver purchases fertilizer on behalf of the farmers and the auto driver uses his own Aadhaar number to authenticate the transaction. Some time, transactions are made by representatives of farmers as relative or friend who happens to visit the town for his work (buys fertilizer/seeds on behalf of the farmer). During the peak season, if retailers are not able to cater to the large number of farmers coming to shop, his sales may decrease because of limitations of the PoS machine (therefore they switch to manual transactions which are later 'adjusted) and the horridness of the purchasers. Therefore, the issue of mismatch of physical stock with PoS stock continues to persist.
- The difference of sales as per PoS and manual record was the highest in case of data entry of Urea fertilizers for all three types of selected retailers. Thus, at overall level, sale of urea fertilisers was the highest and also the highest difference of sales as per PoS and manual record was observed.
- The details about training on application of PoS devices at the selected districts of Gujarat state indicate that all the retailers were sensitized during the introductory training sessions conducted by LFS. During the field it is observed that average duration of training 1-2 days. A dedicated 15-member Multi-lingual HelpDesks were set up to provide quick response to the queries of wide range of stakeholders across the country as a preparatory to DBT implementation.

- On the supply side of AeFDS (Aadhaar enabled Fertilizer Distribution System), retailers stated that PoS doesn't require too many documents neither create hassles in selling fertilizers. More than two third of the retailers have expressed the problems of linking Aadhaar with sale, while more than half of the retailers have opined about checking land holding or cropping pattern of the purchaser. Administrative compliance implication was opined to be needed by more than half of the retailers.
- The retailers have given suggestions to improve the DBT system as follows:
    - The measurement of quantity should be in terms of per bag in the PoS instead of per tonne or per quintal that is easily understood both by retailers as well as farmers.
    - Desktop version / Computer system instead of PoS machine is preferable and moresuitable.
    - Software and service issues should be addressed immediately.
    - Provide improved version and best service system set-up. Poor network issues need solution.
    - Frequent trainings, user friendly version and prompt services at the doorstep of retailerswill help the system work more efficiently.
    - Acknowledgement receipt if given at the time of delivery it will enable provision of prompt services.
    - Frequent rebooting of PoS delays the service and need a permanent solution.
    - Improve infrastructure facilities and provide service centres at village level.

4. Functioning of DBT in fertilizer at Farmers' Level

- The average age of selected respondent was 44.2 years in which random walk respondents were older (49.3 years) than frequent buyers (41.6 years) and top 20 buyers (40.5 years). Thus, top 20 buyers were from the younger generation in the agriculture.
- All the sample respondents were male which indicate dominance of male culture in Indian society.
- The average level of education of all the respondents was estimated to be around 9 years only. The Average year of schooling of top 20 buyers and frequent buyers was around 9 years while same was 8.4 years for random walk buyers. As it was expected that younger generation of top 20 buyers may be educated till graduation, same was not found at ground level.
- The average family size of sample households was estimated to be 6.6 persons at overall level, which was relatively small in case of top 20 and random walk group respondent than frequent buyers group which had family size of 7 persons.
- Majority of buyers belongs to General category (60.8 per cent) followed by 34.4 per cent from Other Backward Classes social group while rest of them belongs to SC and ST categories.
- Agriculture was the main occupation of the selected 83 per cent of respondents while 10.8 per cent respondents were salaried persons. The

subsidiary occupation of the selected respondents was reported to be self-employed in household industry followed by agriculture labour and activities related agriculture and allied sectors.

- The total farming experience of the all types of buyers was estimated to be about 22 years, in which random walk respondents were more experienced (28.33 years) followed by top 20 buyers (15.56 years) and the lowest experienced was reported by frequent buyers (15.06 years).
- On an average, owned area of the sampled household was estimated to be 9.30 acres, in which top 20 buyers had the highest size of owned area (12.24 acres) and the lowest was with frequent buyers (5.46 acres). On aggregate net operated area was slightly higher (13.1 acres) than the owned area indicating net lease-in exceeding the net lease-out area by the selected households. Almost 97 per cent area reported was irrigated. Cropping intensity was around 138 per cent at overall level, which was highest in case of frequent buyers and the lowest was in case of random walk buyers.
- The average annual income from agriculture of selected buyers was highest in case of top twenty buyers (Rs. 400530/-) and the lowest was for random walk buyers (Rs. 194180/-). At overall level, average income from agriculture was reported to be Rs. 277922 followed by income from non-agriculture sources (Rs, 100318) and the lowest was from allied activities (Rs. 16060/-).
- Cotton was the main crop being grown by the selected households (39.10 percent) followed by paddy (17.65 per cent), Tobacco (13.10 per cent) and Wheat (10.33 per cent). These four crops together accounted for 80 per cent of gross cropped area of the selected household. Thus, at overall level, hardly 38 per cent area was under food grain crops, 3 per cent was under oilseed crops, 52 percent was under cash crops (Cotton and Tobacco) and rest was under horticultural and perennial crops. Same kind of trend was observed in all three categories of respondents.
- Among the all categories of the buyers, the highest percent of buyers (40.8 per cent) purchased fertilizers from cooperative societies may be due to availability of PACS at village level and easy access for respective buyers. About 19 per cent of households had purchased fertilisers from private dealers followed by 3.2 percent respondents from company owned shops. The 37.2 per cent of buyers had purchased fertilisers from all these three sources.
- At overall level, almost three fourth of respondents had purchased fertilisers themselves while very meagre share of respondents had send someone to purchase the same for them. One fourth of respondents have used both the options, i.e self-purchase or through someone. Almost same trend was observed in case of use of purchased fertilizer. More than two third of respondents had purchased fertilisers for their own use, while almost 5 per cent have purchased it for neighbours' use. Some buyers have reported that they had purchased fertilizers for others and they had charged around Rs. 37 per quintal extra and across the groups, the lowest extra charges were in case of random walk buyers and the highest was in case of top 20 buyers. None of them had purchased fertilisers from others.
- Almost 93 percent buyers have reported that they had received receipt for their purchase. However, around 80 per cent of them had received manual hand written receipt. Hardly 6.03 per cent of buyers have reported receipt of

POS generated receipt which is main aim of the whole DBT in fertiliser scheme.

- More than 98 per cent of all categories of buyers have reported that price/sale amount mentioned had matched with the payment made by them, and around 45 per cent have understood that how much subsidy is provided on purchase.
- About 96 percent of respondents have reported that price as well as sale amount mentioned matches with the payment made by them. However, only 45 percent were aware about how much subsidy is provided on purchase made by them. It is clearly indicating that sensitization among the farmers is needed towards what proportion subsidy could make available to farmers towards the purchasing of fertilizers.
- Almost 96 per cent of buyers have reported that retailers have insisted on Aadhaar card or Voter ID submission for the sale of fertilisers. Most of the farmers did not carry Aadhaar Card when they visit retailers to buy fertiliser. Therefore, there is a need for carrying out a communication campaign to increase farmers' awareness so that they bring their Aadhaar to buy fertiliser.
- Almost 56 per cent of respondents have reported that they had some problem in producing Aadhaar/Voter ID while purchasing fertilisers as they could not carry same at the time of purchase of fertilisers.
- While 48 per cent of respondents were aware about the fact that DBT in fertiliser and sale of fertiliser through POS is mandatory.
- Around 42 per cent of respondents had insisted for the receipt of transaction through POS but due to either no identity was provided or failure of authentication through Aadhaar as it was mandatory or could not authenticate or both were the major reasons behind the same.
- Almost 94 per cent of respondents reported that they purchased fertilisers as and when required while remaining purchased sometime in advance or sometime instant. Thus, purchase of fertiliser by the farmers was as per requirement on time and majority of them did not make any advance purchase and stock of fertilisers.
- About 94 percent of buyers had purchased fertilisers recently through POS device at the retail point. Across the buyers, percentage of buyers was highest in case of group of top twenty and frequent buyers (96 per cent) while same was 91 per cent in case of random walk buyers.
- Around 98 per cent of total fertilisers purchased by top 20 and frequent buyers was through POS. As it was expected, random walk buyers' had partially purchased fertilizers through PoS machine. All of those who had purchased fertiliser have reported that POS device was in operation at the shop.
- The fertiliser purchase data of by top 20 buyers and frequent buyers was for last two years but in case of random walk buyers, it was for the current year. None of the buyers have carried forward stock from previous year.
- When respondents were asked about their opinion on acceptability for compulsory declaration regarding operational holdings and sale of fertilizer as per farming requirement at the time of PoS, around 39 per cent of total respondents have agreed for same and around 36 per cent were opined that it is workable proposition and it is possible to fix the requirement looking at

size of operational holdings, cropping pattern and soil test report. While they also reported that all the farmers could not understand the soil health card report and the recommendations given on the same.

- The selected buyers were asked to give their suggestions to make fertiliser use equal to the desired level. More than half of the buyers have suggested that there is a need to create awareness among the farmers, while about 32 per cent of buyers suggested need to create awareness about organic farming and 12 per cent suggested that fertilisers should be provided to farmer as per demand and requirement of soil.
- There were many reasons expressed by the surveyed farmers as it is not workable preposition for operational holdings declaration and sale of fertilizers as per farming requirements at the time of buying fertilizer through PoS. Mainly the crux of their opinion against fixing up such a requirement was in many cases almost one third of total buyers were not willing to reveal details of land holdings in order to buy fertilisers followed by around 32 per cent of buyers were not be the actual cultivators as many of respondents were either purely tenants or owner cum tenants. Therefore, farmers are not sure whether they would be cultivating the same land during the next year or in some cases even next season. Therefore, fixing up requirement may not be feasible on long term basis. In addition, there are some cases of multiple or joint ownership of land as well as disputed ownership which may create problem in provision of documentation for such fixation of requirement. Many farmers do not have ownership proof of their land which could beadditional problem.
- The farmers' insight on why it is not possible to fix the requirement of fertilizers looking at size of operational holdings, cropping pattern and soil test report. Like to the previous question a large number of respondents were of the opinion that cropping pattern changes or weather condition changes may obstruct fixing up such a requirement. However, a significant number of respondents (44 per cent) pointed out that either they do not have any soil health card made available to them or even if they do have a soil health card, they do not rely on soil health card results. Therefore, fixing up requirement based on soil health card may not work. Another significant numbers (almost one fourth) pointed out that they would rather like to continue their traditional pattern of fertilizer usage. Farmers also pointed out that it won't be a workable proposition as every year/season farmers tend to change crops or its varieties as per weather condition.
- The information relating to fertilizer purchases by respondents for the reference year 2018-19, i.e., for the season of kharif and rabi and summer 2019 2018 (July 2018 to June 2019) indicate that various variants/types of fertilizers had purchased by the selected buyers during the reference year. The highest quantity of fertilizers purchased during the reference year/month was ASP and Urea and out of total transactions, more than 90 percent (except random walk buyers) was done through PoS machine.
- Almost all types of fertilizers were purchased through PoS machine by top twenty buyers and frequent buyers but in the case of random walk buyers, unavailability of Aadhaar card with them at the time of purchasing restricted entry through POS.
- The use of different variants of fertilizers by the selected farmers for the crops grown during the reference year of 2018-19 indicate that Cotton,

tobacco, paddy and wheat were the major crops grown by the selected farmers. It was observed that the increase in consumption of urea and decrease in consumption of other fertilizers due to price differential. Both prices and subsidies of fertilizers are important determinants of consumption level per hectare. It is observed that there are marked crop wise variations in the consumption of fertilizers. As expected, among these variants, the most intensive use was that of urea in almost all crops grown by the selected farmers. It is visible from figure that intensive use of urea was followed by DAP, MOP and SSP in the descending order.

- More than 98 per cent farmers didn't attend any training organized by any government officials or fertilizer companies. Out of total trained farmers, 60 percent had attended training of 2-7 days' duration while rests were trained for 1-2 days. Agriculture department officials had conducted all trainings during 2017 and 2018.
- Major problems faced by buyers during the fertilizer purchasing through POS device were biometric authentication related issues like failure of authentication, lower Aadhaar authentication strike rate, network related issues, poor farmers' awareness. This would need to be addressed on priority, if necessary, by applying proper policy. Almost, half of the buyers in all the categories, revealed that the mandatory authentication through Aadhaar in purchase of fertilizers create hassles in buying fertilizers during the peak season. While Aadhaar is the preferred form of identification of buyers, other forms of identification may also be used. The major suggestions for improvements in present fertilizer delivery system were that there is a need to create awareness amongst the farmers and proper implementation of the scheme and existing Scheme of DBT in Fertilizers is very good.
- Interestingly, despite of these challenges and constraints faced by the buyers, farmers (and buyers) prefer the DBT system.

5. Conclusions and Policy Implications

On the basis of above discussion, conclusions and policy implications are drawn and presented below:

- All the retailers have faced problems in handling the PoS machine. Around 90 per cent of total retailers had faced some issues in PoS machine related to software and authentication issues, while one third of total retailers have faced hardware issues and around 38 per cent retailers have faced stock issues. Therefore, there is topmost need to address the operational problems in the PoS machine. Retailers are complained that the screen on the device is too small. They find it difficult to make entries into the PoS while carrying out transactions, receiving/updating stocks, etc. As suggested by the retailers, PoS should be made compatible with the desktop or laptop maintained by the retailers/wholesalers.
- Though all the retailers have undergone training on use of POS, but in most of the cases, retailers were not technically very well versed about the PoS Operated sale in Fertilizers management. Either they are too old or very less technologically sound in most of the cases of cooperative society secretary or others.
- Poor Network connectivity was the biggest issue faced by almost 82 per cent retailers at the aggregate level. This problem becomes acute during the peak season when there are long queues of buyers. Therefore, there is

a need to provide them speedy internet connection facility or any other suitable system can be provided.

- Retailers have also reported problem of frequent server down, failure server down, failure of Aadhaar authentication of farmers, frequently session log out after some time, short battery charge status, battery do not get charge during the operational/working time/way, updated version of PoS are not user friendly, roll of print out is not easily available in the market, ink of the print out receipt are not long durable. Sale receipt and reports are printed on thermal paper that does not last long. Ink on thermal paper fades over a period of time. These problems need to be addressed through appropriate actions by the Department of Fertilizers.
- The devices from Analogics are of very poor quality. Among other issues, they suffer from short battery life, the devices may shutdown anytime.
- One of the pertinent problem reported by retailers was that after receiving the stock from the fertilizer company, they need to update the stock in the stock invoice to generate online receipt records. However, updating of stock is not possible until the company stock number is entered into the PoS. But, fertilizer companies have not been updating the Demand Draft number for the stock provided and thus it was always difficult for the retailer to sell the same stock through PoS until that entry was made. This was one of the biggest issues faced by retailers for not updating PoS at the time of current fertilizer sale. Therefore, there should be automatic updation to be done by Company once the delivery of the stock is dispatched which can be confirmed by the retailers on receipt of same.
- There was a huge difference in closing stock as per PoS and physical verification as well as manual record maintained. As the subsidy is attached with real time PoS transactions, it is beyond understanding who bears the brunt in case there is difference between fertilizer issued by fertilizer companies to retailers and the amount displayed in the PoS sale at retailers' end. Thus, there is a need of appropriate step at each stakeholder level to rectify the same.
- In term of farmers, it was observed that most of the top 20 buyer and frequent were retailers itself and some of them were auto/tempo drivers, only few were actual farmers. The entire system of top and frequent buyers need streamlining and a proper punishment system need to be put in place on the retailers if they generate any fake identity of top and frequent buyers.
- Most of the farmers were with very low level education and they could not understand the receipt of sales transaction which is in English language. The POS device should also have option of local/State language. Also the measurement of quantity should be in terms of per bag in the PoS instead of per tonne or per quintal that is easily understood both by retailers as well as farmers.
- More than 98 per cent farmers didn't attend any training organized by any government officials or fertilizer companies while 48 per cent of respondents were aware about the fact that DBT in fertilizer and sale of fertilizer through POS is mandatory. As suggested by the more than half of the buyers, there is a need to create awareness among the farmers. There is need to organize village training camps on the same line as that of retailers training camps have been organized by fertilizer companies.

- Farmers have reported that availability of fertilizers on the basis of operational holding, cropping pattern and soil health card is not favorable for farmers. As like Anand district has number of NRI who have leased out their land to laborer/tenant and tenet is unable to produce the land record or other document behalf of land lords. Besides, the reasons towards non-workable preposition for operational holdings declaration and sale of fertilizers as per farming requirements at the time of buying fertilizer through PoS includes mentioned by buyers were buyers were not willing to reveal details of land holdings in order to buy fertilizers; buyers were not be the actual cultivators as many of respondents were either purely tenants or owner cum tenants (therefore, farmers are not sure whether they would be cultivating the same land during the next year or in some cases even next season. Therefore, fixing up requirement may not be feasible on long term basis); In addition, there are some cases of multiple or joint ownership of land as well as disputed ownership which may create problem in provision of documentation for such fixation of requirement; many farmers do not have ownership proof of their land which could be additional problem. On the question of soil test report, a significant number of respondents pointed out that either they do not have any soil health card made available to them or even if they do have a soil health card, they do not rely on soil health card results. Therefore, fixing up requirement based on soil health card may not work. Therefore, robust methodology need to be develop to deliver the fertilizers as per crop requirements.
- Majority of the buyers have disagreed to full payment towards purchase of fertilizer and later subsidy amount deposition in bank by the government. Farmers' have pointed out that most of farmers are not economically sound to pay first and wait for subsidy for month or more. They cannot pay full amount initially as most of the time either they are in crunch of working capital to or they buy it on credit basis. Besides, tenant will not get benefit of subsidy was it will go of land holder's account. It would be acceptable to all farmers if the implementation of direct transfer of subsidy is done in such a way that the fertilizer subsidy amount is transferred to the farmer's account at the time of entry of purchase details in the PoS system through Aadhar linked bank account. As soon as the purchase details are entered in the PoS, subsidy transfer takes place simultaneously so that farmer has to pay only the balance amount to the retailer as he is paying at present. Such a system will save all hassles for the fertilizer companies as well as retailers and farmers.
- Despite of the challenges, the new system has increased the overall accountability of stakeholders, including wholesalers and retailers, besides enhancing the transparency with improved tracking of physical movement of fertilizer in the district or state.

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Chapter I

Introduction

1.1 Introduction

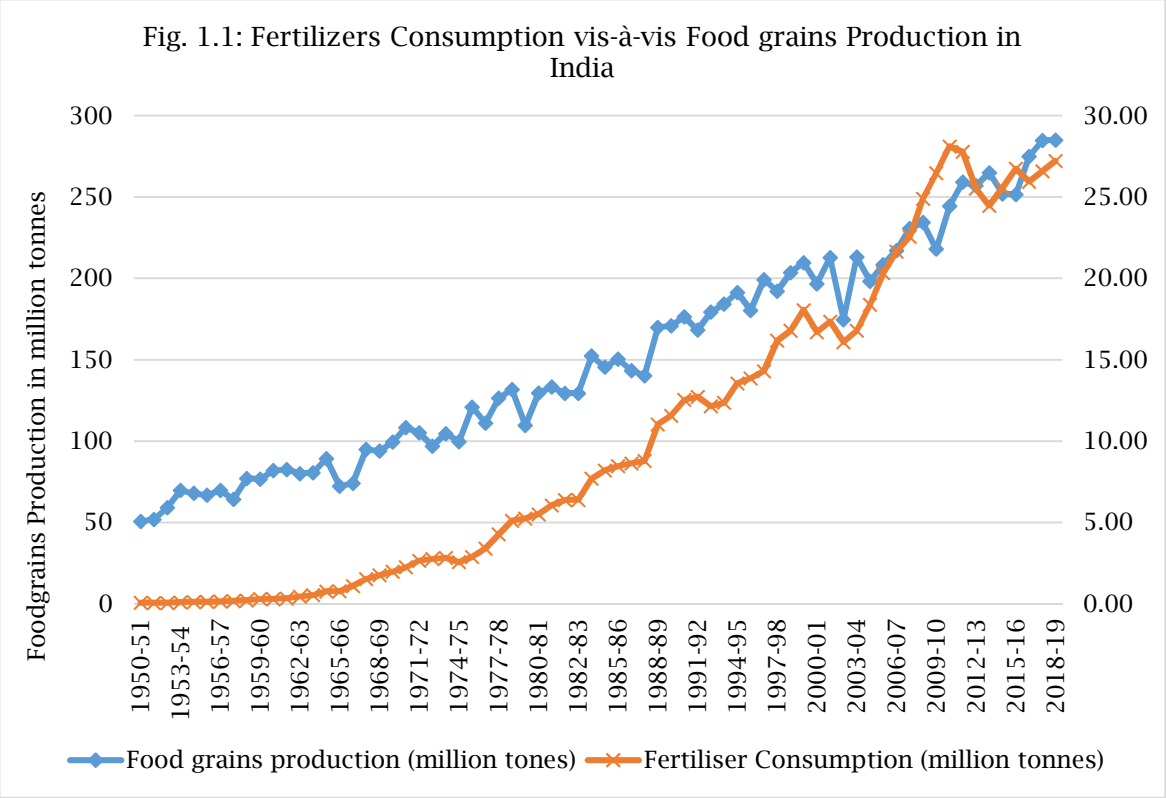
Chemical fertilisers are the important source of nutrients for plant growth. It contains essential nutrients, viz., nitrogen (N), phosphorus (P), and potassium (K) which are needed for the growth and maturity of the plant. India is one of the major producers[1] as well as consumers of chemical fertilisers in the World. The N & P (P_2O_5) fertilizers production in India was reported to be 18.16 million tonnes that accounts for 10.35 per cent of the World's N & P (P_2O_5) fertilizers production in 2017 and rank second position. While India rank second in terms of production and consumption of N, third in terms of production as well as consumption of P_2O_5, while fourth position for K_2O use in the year 2017 (FAI, 2020). The total fertiliser product consumption in India was reported to be 26.59 million tonnes in 2017-18 which accounted for 13.80 per cent of total fertiliser consumption in the World and rank at second position. However, as compared to the most of the countries in the World, average intensity of fertilizer use in India remains much lower which is highly skewed, with wide inter-regional, inter-state, and inter-district variations. The results show that non-price factors such as irrigation, high yielding varieties, were more important than price factors in influencing demand for fertilizers. Of the two price policy instruments, affordable fertilizer prices and higher agricultural commodity prices, the former is more powerful in influencing fertilizer demand[2].

Fertilisers have been considered as an essential input to Indian agriculture for increasing agricultural production so as to meet the food grains requirements of growing population of the country (Swain, et al., 2014). The Green revolution technology adopted during mid-sixties comprised of high yielding variety seeds (HYVs), fertilizer and irrigation

[1] India produces N and P_2O_5, and solely dependent on imports of K_2O.
[2] http://environmentclearance.nic

has brought country out of chronic food shortage stage to food grains surplus country. It has been well established fact that chemical fertilisers bear a direct relationship with food grains production along with a number of supporting factors like HYVs, irrigation, access to credit, tenurial conditions, size of the product market and the prices they face in input and output markets, etc. A very close association is observed between growth in use of fertilisers and crop production and productivity in almost all the states of the country (Chand and Pandey, 2008; Kumar and Indira, 2017)). Therefore, use of chemical fertiliser in India has tremendously grown since the advent of green revolution in late 1960s. The usage of chemical fertilizers with quality seeds and irrigation helped to increase food grains production in the country by almost five and half times during last seven decades' period and achieving the self-sufficiency (Table 1.1 and Fig.1.1). With our rising population and demand of agricultural products and limited land and soil resources, timely and effective use of inputs like fertilizers is of critical importance.

Fig. 1.1: Fertilizers Consumption vis-à-vis Food grains Production in India



Source: FAI, 2019.

Table 1.1: Growth in Fertilizer Consumption and Food grains Production in India

Period	Growth rate in fertilizer consumption (% per annum)		Growth rate in Food grains (% per annum)	
	Total	Per ha.	Prod.	Yield
Pre-green revolution (1950-51 to 1966-67)	19.41	18.11	2.56	1.45
Post-green revolution (1967-68 to 2018-19)	8.75	8.49	2.65	2.53
Phase I (1967-68 -1980-81)	9.90	9.29	2.27	1.87
Phase II (1981-82- 1991-92)	1.39	6.61	2.77	3.13
8th Five Year Plan (1995-97)	4.51	5.63	1.26	1.10
9th Five Year Plan(1997-2002)	1.35	0.43	-2.87	-0.98
10th Five Year Plan (2002-2007)	7.57	7.40	2.52	2.05
11th Five Year Plan (2007-2012)	5.52	12.65	0.25	0.18
12th Five Year Plan (2012-2017)	1.21	1.41	0.83	-0.38
Post-reforms Period (1991-92 to 2018-19)	3.33	4.86*	1.77	1.68

Note: for the year of 2016-17 to 2018-19 GCA was of 2015-16 year.
Source: Computed using data from Fertiliser Association of India (various years, 2019).

1.2 Fertilizer Use in India:

Fertilizer is a kind of substance supplied to the crop to increase its productivity. Fertilizers provide six macro nutrients and eight micro nutrients to the plants for the well balanced growth of plants. The macro nutrients include: Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca),Magnesium (Mg) and Sulphur (S). The major micro nutrients are Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe) and Zinc (Zn). Fertilizers augment water retention capacity of the soil and ultimately lead to enhanced fertility of the crop. Fertilizers has also played a major role in the advanced short duration crop production.

The fertilizers are broadly classified under three types, viz., (a) 'Straight fertilizers' that contain only one primary nutrient (e.g. Urea, ammonium sulphate, potassium chloride and potassium sulphate); (b) 'Complex fertilizers' contains two or three primary nutrients of which two primary nutrients are in chemical combination and are usually produced in granular form (e.g. Di-ammonium phosphate, nitro-phosphates and ammonium phosphate.); and (c) while 'Mixed fertilizers' are physical

mixtures of straight fertilizers. Fertilizers can also be classified based on physical form, i.e solid or liquid form. Fertilizers are available under different grades[3] with different ratios[4]. The amount of fertilizer to be applied per hectare or on a given field is determined through the amount of nutrients needed and the types and grades of fertilizers available. Optimum fertilizer use efficiency requires that balanced fertilization be done. Balanced fertilization means a supply of nitrogen, phosphorus and potassium in line with soil reserves, the requirements and expected yield of the crop, with the addition of magnesium, sulphur and micro-elements where necessary. NPK complex fertilizers are usually more expensive than mixtures/blends. In India, the most commonly accepted NPK ratio is reported to be 4:2:1 (www.niti.gov.in[5]).

With the advent of fertiliser responsive crop varieties, total consumption of nitrogenous (N), phosphatic (P) potassic (K) fertilisers have increased from about 1.1 million tonnes in 1966-67 to 27.23 million tonnes in 2018-19. It was estimated that urea accounts for 82 per cent of total nitrogen consumption and di-ammonium phosphate accounted for 61 per cent of phosphate consumption in 2018-19 (FAI, 2019). The average consumption of fertilisers in India has increased from 6.99 kg per ha of gross cropped area in 1966-67 to 137.40 kg per ha during 2018-19 (FAI, 2019) (Fig. 1.2). However, the level of consumption of fertilisers was highly varied within as well as between the States, i.e. from 223.6 kg/ha in Punjab to 53.4 kg/ha in Rajasthan to 25 kg/ha in Tripura during TE 2018-19 (Fig. 1.3). The variability in consumption of fertilisers can be attributed to different cultivation methods, type of crops and subsidy on fertilisers. Further, the consumption of fertilisers has also varied across farm size groups with the highest amount of consumption recorded among group of small farmers.

[3] Fertilizer grade is weight percent of available nitrogen (N), phosphate (P_2O_5), and potash (K_2O) in the fertilizer, usually expressed as N-P_2O_5-K_2O. For example, 10-20-10 indicates 10 percent N, 20 percent P_2O_5, and 10 percent K_2O by weight.

[4] Fertilizer ratio to the ratio of the percentage of N, P_2O_5 and K_2O in the fertilizer mixture e.g., the fertilizer grade 12-6-6 has a fertilizer ratio of 2:1:1.

[5] https://niti.gov.in/planningcommission.gov.in/docs/aboutus/committee/wrkgrp11/wg11_fertliser.doc.

Fig. 1.2: Trends in Per hectare Fertiliser Consumption (N, P and K) in India

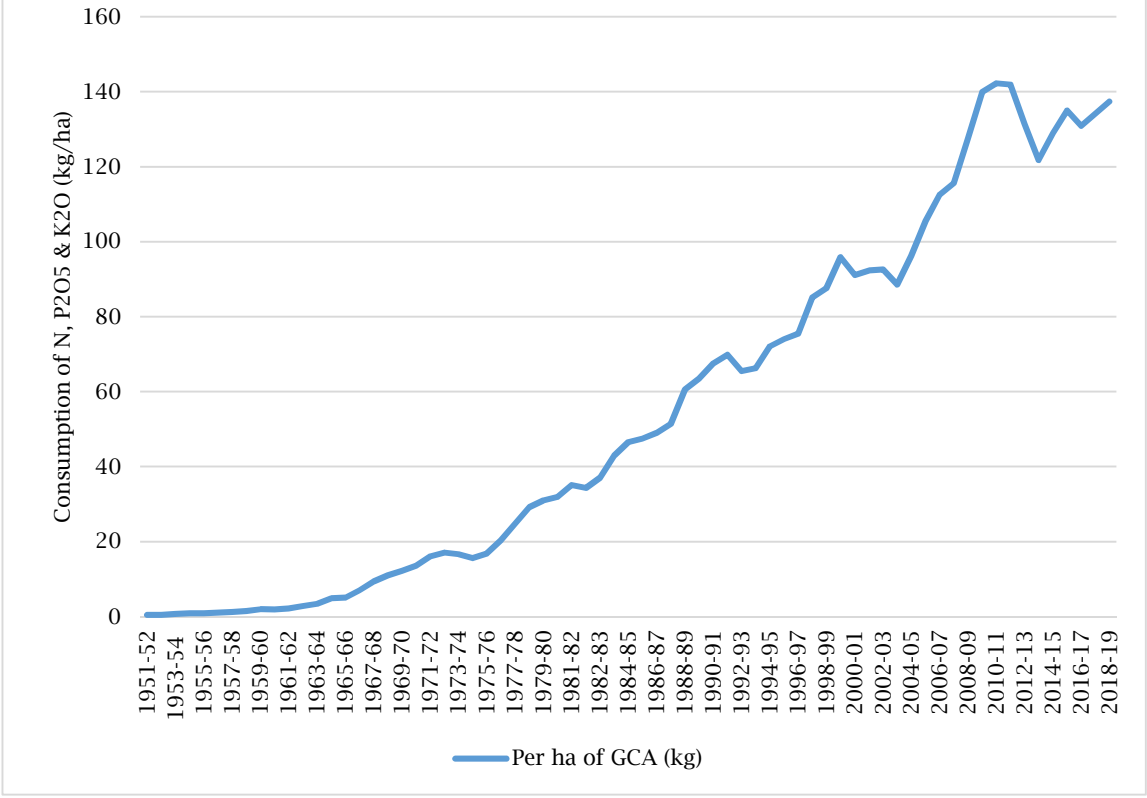
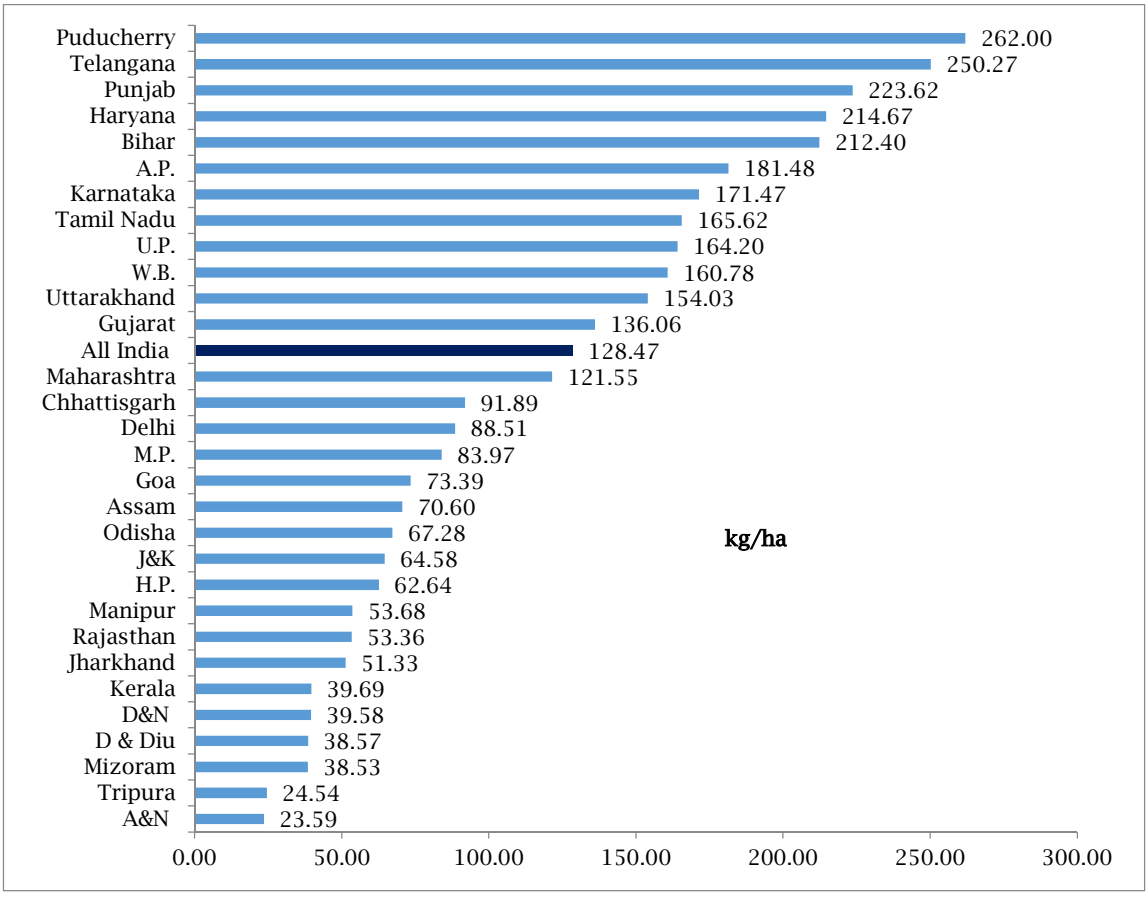


Fig. 1.3: State-wise per hectare use of Fertiliser (TE 2018-19) (kg/GCA ha)



1.3 Production, Import and Consumption of Fertilisers:

As of now, the country has achieved 80 per cent self-sufficiency in production capacity of Urea. As a result, India could manage its substantial requirement of nitrogenous fertilizers through the indigenous industry besides imports. Similarly, 50 per cent indigenous capacity has been developed in respect of phosphatic fertilizers to meet domestic requirements. However, the raw-materials and intermediates for the same are largely imported. For potash (K), since there are no viable sources/reserves in the country, its entire requirement is met through imports. Over the period of time, actual production of N & P fertilisers in India has increased by 460 times during the period from 1951-52 to 2018-19, while total fertiliser production has increased by 212 times during corresponding period (Table 1.2, Fig. 1.4 & 1.5). The actual production of all the fertilizers during the year 2018-19 was 415.64 Lakh MT (Fig. 1.5).

Table 1.2: Details on Fertilisers Production in India

Year	N			P2O5			Total Product (all fertilisers)
	Through straight N	Through complex fertilisers $	Total*	Through straight P2O5	Through complex fertilisers $	Total#	
1951-52	0.3	-	0.3	0.1	-	0.1	2.0
1960-61	1.1	0.0	1.1	0.5	0.0	0.5	8.5
1961-62	1.5	0.0	1.5	0.6	0.0	0.7	11.1
1970-71	7.3	1.1	8.3	1.0	1.3	2.3	32.3
1980-81	17.6	4.1	21.6	2.0	6.4	8.4	78.5
1990-91	61.5	8.5	69.9	5.8	14.7	20.5	222.3
2000-01	92.4	17.1	109.4	4.4	33.0	37.3	329.2
2010-11	102.2	19.6	121.8	5.9	37.8	43.7	386.5
2018-19	111.4	21.9	133.4	6.5	39.4	45.9	415.6

Notes: * Excludes N meant for non-agricultural purpose; $DAP% NP/NPKs, # excludes P2O5 through direct application of phosphate rock.
Source: FAI, 2019.

The rapid build-up of fertilizer production in the country has been achieved as a result of a favourable policy environment facilitating investments in the public, co-operative and private sectors. At present, there are 32 large size urea plants in the country manufacturing urea, 19 units producing DAP and complex fertilizers and 2 units manufacturing Ammonium Sulphate as a by-product (GOI, 2020). While the production of Urea during the year 2018-19 was reported 240.00 LMT and the

production of DAP and Complex fertilizers were 128.97 LMT. The data on sector-wise production of Urea, DAP and Complex fertilizers during 2018-19 indicate that around 58 per cent of total urea production was done by public and cooperative sector together while rest was by private sector (Table 1.3).

Fig. 1.4: Trends in Fertiliser Production (N and P) in India

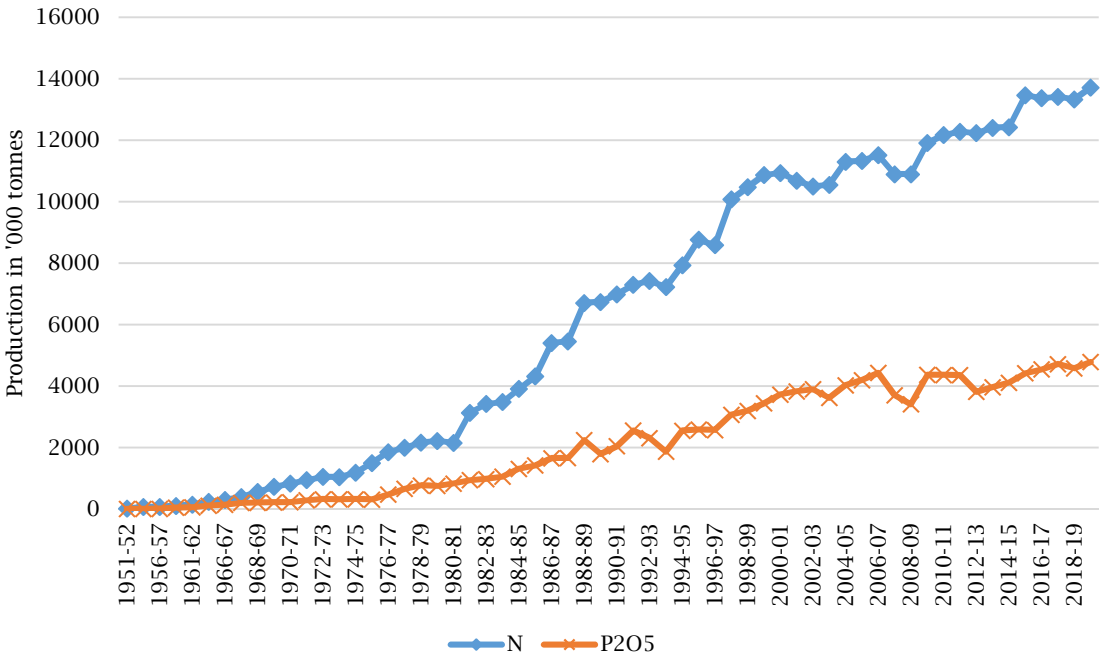


Fig. 1.5: Trends in Total Fertilisers Production in India

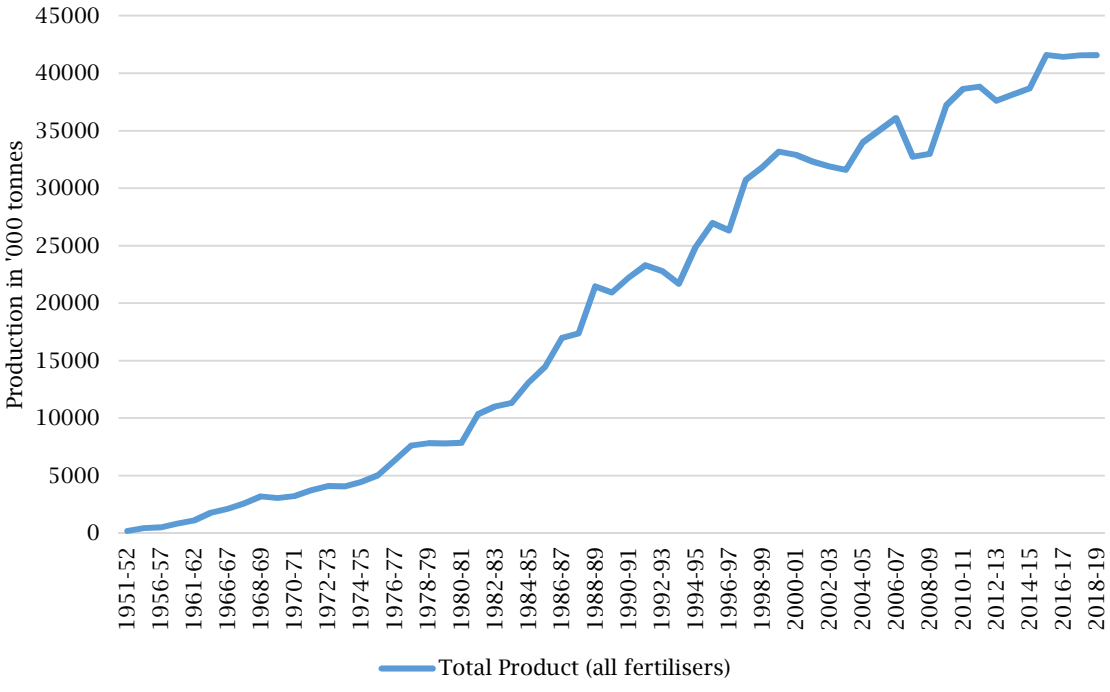


Table 1.3: Sector-wise Production of Fertilisers

Sr. No	Sector	Production of Fertilizers 2018-19 (LMT)		
		Urea	DAP	Complex fertilizers
1.	Public Sector	70.16 (29.23)	0 (0.00)	12.22 (13.58)
2.	Cooperative Sector	69.04 (28.77)	14.19 (36.39)	21.58 (23.98)
3.	Private Sector	100.8 (42.00)	24.8 (63.61)	56.18 (62.44)
Total		240.00 (100.0)	240 (100.0)	38.99 (100.0)

Note: Figures in parenthesis are percentage to total.
Source: FAI, 2019.

During the year 2018-19, total 105.32 lakh tones of fertilizes nutrients were imported, of which 47.17 lakh tones was nitrogen, 31.67 lakh tones was phosphorus and rest of 26.48 lakh tonnes was potassium fertilizers. The quantity of imports of fertilizer has increased from 0.52 lakh tones in 1951-52 to 122.07 lakh tones in 2010-11 and then declined to 105.32 lakh tones in 2018-19 (Table 1.4 and Fig. 1.6). While in case of fertilizer products, total imported product quantity was 189.58 lakh tones in which the largest quantity imported was of DAP, followed by Urea and MOP (Table 1.5 and Fig. 1.7)

Table 1.4: Import of Fertilizer Nutrients

Year	Total Nutrients ('000 tons)			
	N	P	K	Total
1951-52	28.8	15.5	7.7	52
1960-61	399	0	20	419
1973-74	658.8	212.7	370.4	1241.9
1980-81	1510.2	452.1	796.9	2759.2
1990-91	412.3	1015.7	1325.9	2753.9
2000-01	163.6	436.7	1594	2194.3
2010-11	4569.6	3738.7	3899.5	12207.8
2018-19	4716.7	3167.2	2648.4	10532.3

Source: FAI, 2019.

Table 1.5: Import of Fertilizer Products

Year	Fertilizers ('000 tons)							
	Ammonium Sulphate (20.6% N)	Urea 46%N	CAN (26%N)	DAP (18-18-0)	NP/NPKs (TSP 0-46-0	MOP (60% K2O)	SOP (50% k2o)	Total product
1980-81	20.0	2848.0	73.5	982.8	-	1309.8	21.8	5255.9
1990-91	-	-	-	2155.0	-	120.0	59.0	4490.0
2000-01	-	-	-	861.0	-	2646.0	12.8	3597.9
2010-11	26.0	6610.0	-	7411.0	980.6	6357.0	36.0	21706.6
2018-19	76.3	7481.0	-	6602.0	546.0	4214.0	39.2	18958.5

Fig. 1.6: Trends in imports of NPK fertilizers in India

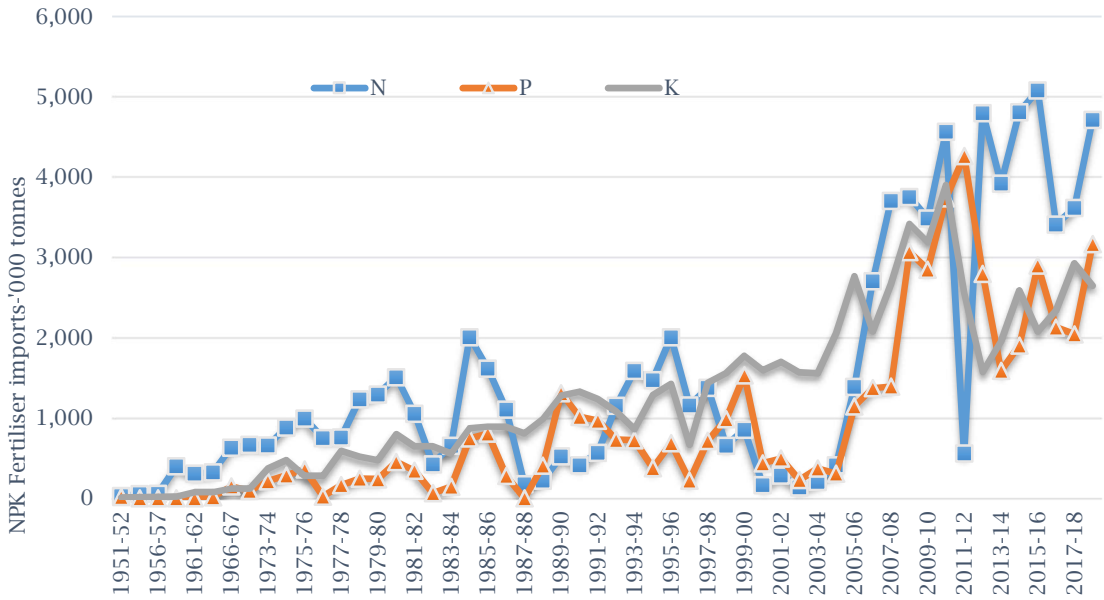
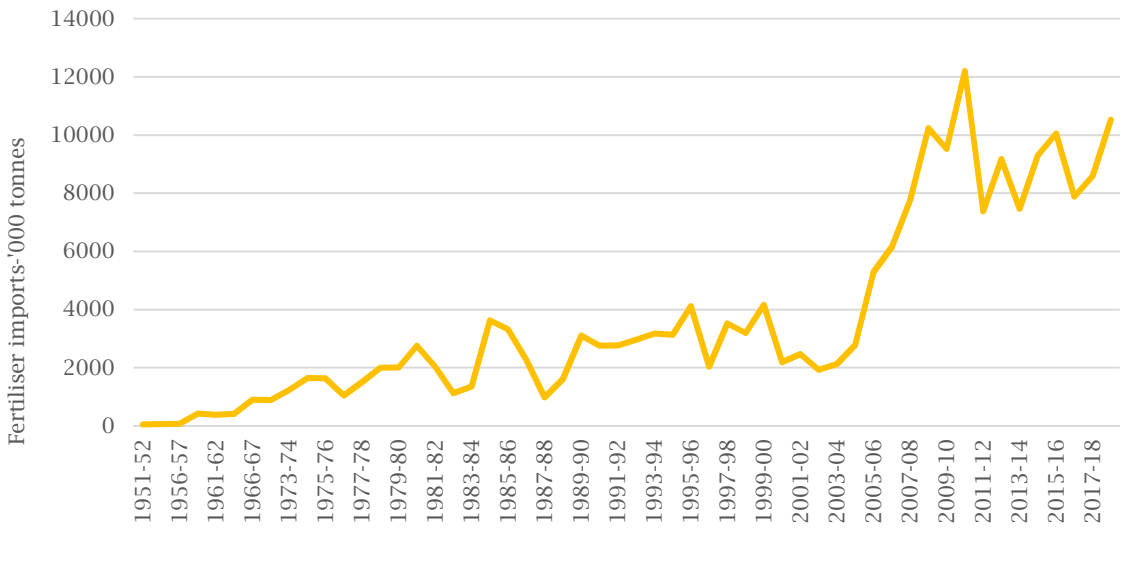


Fig. 1.7: Trends in imports of Total Fertilizers in India



The requirement/ demand for fertilizers for Kharif and Rabi season is assessed in bi-annual Zonal Conferences held by Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) with the representatives of fertilizer companies, Fertilizer Association of India, Ministry of Railways, State Governments, Department of Fertilizers and other concerned agencies (GOI, 2020). It can be seen from Table 1.6 that the availability of urea, DAP, MOP and NPKs remained satisfactory throughout the seasons of Kharif 2019 and Rabi 2019-20 (up to January 2020).

Table 1.6: Requirement, Availability and DBT Sales for Kharif (2018 & 2019) and Rabi (2018-2019 and 2019-20)

Sr. No	Product Group	Requirement (lakh Metric Tonnes)		Availability (lakh Metric Tonnes)		DBT Sales (lakh Metric Tonnes)	
		2018	2019	2018	2019	2018	2019
A	**Kharif**						
1	UREA	148.90	156.22	212.43	212.38	154.39	153.69
2	DAP	49.18	51.22	73.35	89.77	37.75	35.71
3	MOP	20.25	20.39	23.18	27.73	14.15	11.71
4	NPKS	49.73	52.97	86.49	92.97	50.12	46.35
B	**Rabi**						
1	UREA	120.28	146.07	171.60	191.72	131.70	140.49
2	DAP	41.65	43.24	70.97	90.53	44.46	56.10
3	MOP	12.99	13.28	19.23	23.81	9.64	11.43
4	NPKS	35.17	36.92	72.06	82.97	36.68	44.08

Note: * Till Jan 2019 and Jan 2020.
Sources: ifms Dashboard; FAI, 2019.

Based on the recommendations of the Inter-Ministerial Committee, the Government has announced the per kg rates of NBS for the nutrients namely 'N', 'P', 'K' & 'S' from the financial years 2010-2011 to 2019-20. The rate for per kg of nitrogen has been fixed at Rs. 18.9 per kg, Rs. 15.2 per kg for phosphate, Rs. 11.01/kg for Potash and Rs. 2.7/kg for sulphur (Table 1.8). The MRP of urea is statutorily fixed by the Government of India and at present it is Rs. 268 for a 50 Kg bag of urea and Rs. 242 for a 45 kg bag of urea.

Table 1.7: Per kg rates of NBS for the nutrients (Rs. per Kg)

Nutrients	NBS rates (Rs. per Kg)									
	1st Apr - 31stDec 2010 *	1st Jan-31sMar 2011**	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
'N' (Nitrogen)	23.2	23.2	27.2	24.0	20.9	20.9	20.9	15.9	19.0	18.9
'P' (Phosphate)	26.3	25.6	32.3	21.8	18.7	18.7	18.7	13.2	12.0	15.2
'K' (Potash)	24.5	24.0	26.8	24.0	18.8	15.5	15.5	15.5	12.4	11.1
'S' (Sulphur)	1.8	1.8	1.7	1.7	1.7	1.7	1.7	2.0	2.2	2.7

Notes: *Including Rs 300 per MT for secondary freight from rake point to retail points.
** Excluding the secondary freight of Rs 300 PMT.
@ The NBS rates of 2018-19 were continued from 01.04.2019 up to the date of notification of NBS rates for 2019-20. The NBS rates for 2019-20 were notified on 7th August, 2019 and came into effect from 07.08.2019.
Source: FAI, 2019.

The ratio of season wise consumption of fertilisers to total fertiliser consumption has changed over the period from 41 percent in kharif and 59 percent in rabi during 1970-71 to 50 percent each in both seasons of 2018-19 (Table 1.9 and Fig. 1.8). While across the nutrients use, though use of nitrogenous fertilisers is higher than the use of other nutrient in absolute number, increase was more in phosphorous fertilisers in 2018-19 over 1970-71 (Table 1.8 and Fig. 1.9). The summary of production, import and consumption of fertiliser are presented in Table 1.11. The sale of fertilisers was executed through 285966 sale points (FAI, 2019) of which 22 per cent are under cooperatives and other institutional agencies while 78 per cent are with private agencies (Fig. 1.10).

Table 1.8: Season wise consumption of N, P2O5 and K2O ('000 tonnes) in India

Year	Kharif				Rabi				Total Consumption			
	N	P	K	Total	N	P	K	Total	N	P	K	Total
1970-71	7.4	2.4	1.2	10.9	10.6	3.2	1.8	15.7	18.0	5.6	3.0	2656.3
1980-81	14.4	4.2	2.7	21.4	22.3	7.9	3.5	33.8	36.8	12.1	6.2	5515.6
1990-91	36.5	14.2	6.7	57.4	43.5	18.0	6.6	68.1	80.0	32.2	13.3	12546.2
2000-01	54.2	18.8	7.3	80.3	55.0	23.3	8.3	86.7	109.2	42.1	15.7	16702.3
2010-11	77.2	44.2	17.8	139.2	88.4	36.3	17.3	142.0	165.6	80.5	35.1	28122.2
2018-19	86.2	35.4	14.8	136.4	90.1	33.7	12.0	135.9	176.4	69.1	26.8	27228.6

Table 1.9: All India Production, Import and Consumption of Fertiliser Products

(`000 tonnes)

Sl.	Fertiliser	Production		Import		Consumption	
		2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
I.	Straight `N'						
	Ammonium Sulphate (20.6 % N)	688.7	658.4	137.9	76.3	573.6	560.2
	Urea (46% N)	24026.0	23899.2	5975.0	7481.0	29894.4	31418.1
	CAN (25% N)	0.0	0.0	0.0	0.0	0.1	2.0
	Ammonium Chloride (25% N)	43.0	52.2	0.0	0.0	19.3	23.5
II.	Straight `P2O5'						
	Single Superphosphate (16% P_2O_5)	3910.2	4076.3	0.0	0.0	3439.4	3578.9
	Triple Superphosphate (46% P_2O_5)	0.0	0.0	0.0	0.0	3.8	-
	Rock Phosphate (for direct application)	0.0	0.0	0.0	0.0	31.0	27.3
III.	Straight `K2O'						
	1. Murate of Potash (60% K2O)	0.0	0.0	4736.0	4214.0	3158.2	2956.6
	2. Sulphate of Potash (50% K_2O)	0.0	0.0	68.1	39.2	5.2	-
IV	NP/NPK Fertilisers						
	16-20-0-13 (APS)	131.6	248.4	0.0	0.0	119.4	207.9
	20-20-0-13 (APS)	3262.5	3450.9	239.0	23.0	3546.7	
	20-20-0 (ANP)	216.6	197.1	0.0	0.0		3690.1
	15-15-15	478.3	561.1	22.0	32.0	510.2	569.6
	14-35-14	306.8	360.1	0.0	0.0	303.3	326.0
	18-46-0 (DAP)	4654.0	3898.6	4217.0	6602.0	9294.1	9211.1
	24-24-0	197.1	198.4	0.0	0.0	215.6	
	24-24-0-8	29.2	51.5	0.0	0.0		226.9
	11-52-0 (MAP)	0.0	0.0	0.0	0.0	0.0	0.0
	28-28-0	555.8	558.9	0.0	0.0	487.7	497.1
	14-28-14	0.0	0.0	0.0	0.0	6.2	10.4
	19-19-19	65.6	97.7	0.0	0.0	61.4	81.8
	17-17-17	83.1	36.2	0.0	0.0	78.6	41.0
	13-33-0-6(S)	0.0	0.0	0.0	0.0	0.2	0.1
	16-16-16	0.0	0.0	110.0	163.0	78.3	142.5
	12-32-16	1048.9	1289.1	46.0	158.0	1221.3	1361.1
	10-26-26	1863.4	1930.0	82.0	170.0	1970.5	1873.8
I.	Total Product	41560.8	41564.0	15633.0	18958.5	55015.5	56805.9
	Total Complex (Other than DAP/MAP)	8238.9	8989.3	499.0	546.0	8596.4	9028.2
II.	(a) Total (Straight						
	N	11204.6	11142.3	2776.9	3457.0	13874.4	14574.1
	P2O5	625.6	652.2	0.0	0.0	558.2	578.1
	K2O	0.0	0.0	2875.7	2548.0	1897.5	1773.9
	(b) Total (through NP/NPKs						
	N	2218.0	2194.5	841.5	1259.7	3084.9	3063.7
	P2O5	4098.8	3938.3	2044.6	3167.2	6296.2	6332.2
	K2O	0.0	0.0	49.5	100.4	882.2	906.4
	(c) Grand Total [II(a)+II(b)]	13422.6	13336.8	3618.4	4716.7	16959.3	17637.8
		4724.4	4590.0	2044.6	3167.2	6854.4	6910.2
		0.0	0.0	2925.2	2648.4	2779.7	2680.3
		18147.0	17927.3	8588.2	10532.9	26593.4	27228.2

Source: FAI, 2019.

Fig. 1.8: Seasonwise Share of Fertiliser Consumption

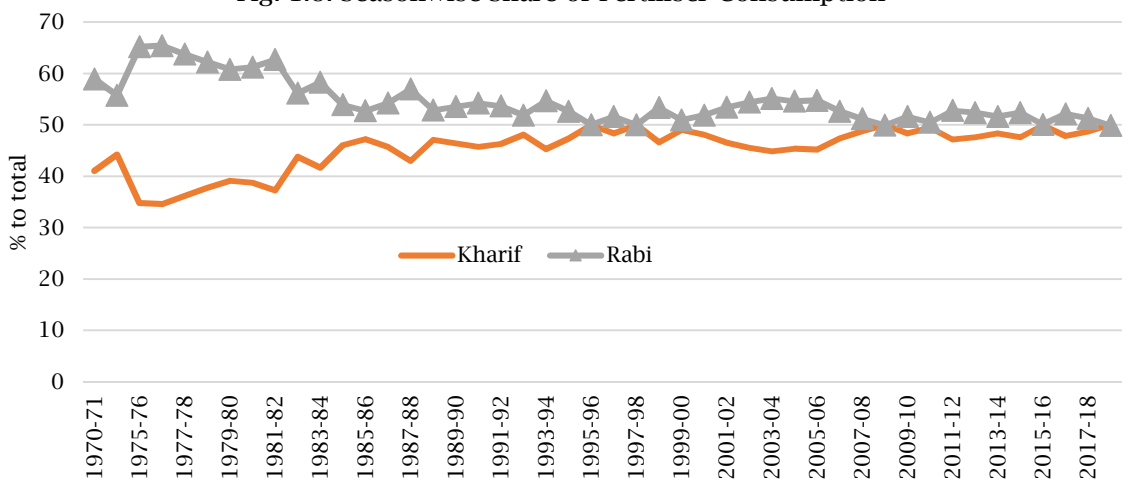


Fig. 1.9: Growth in Consumption of Fertilisers Nutrients

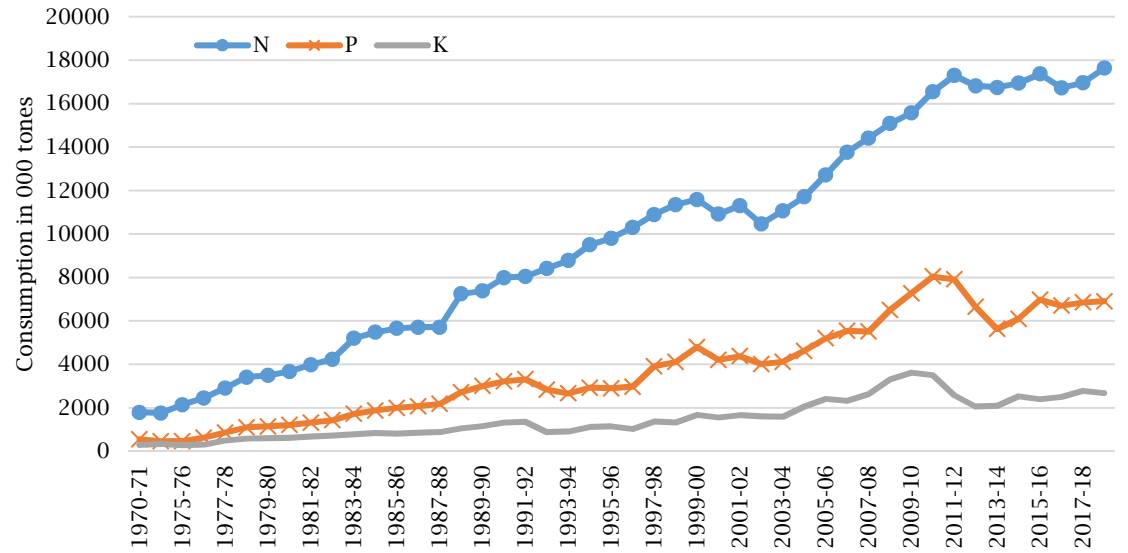
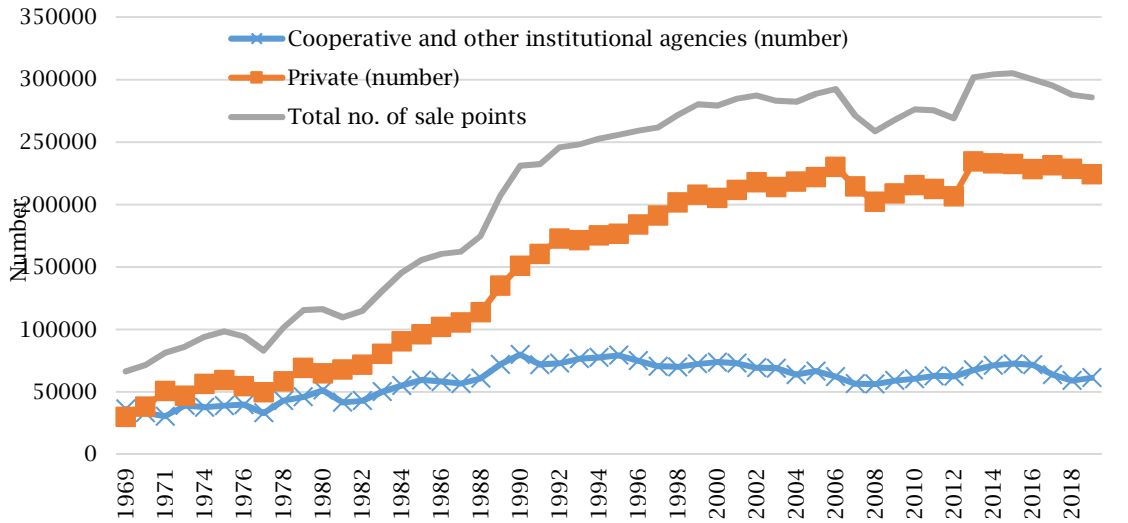


Fig. 1.10: Number of Fertiliser sale Points in india



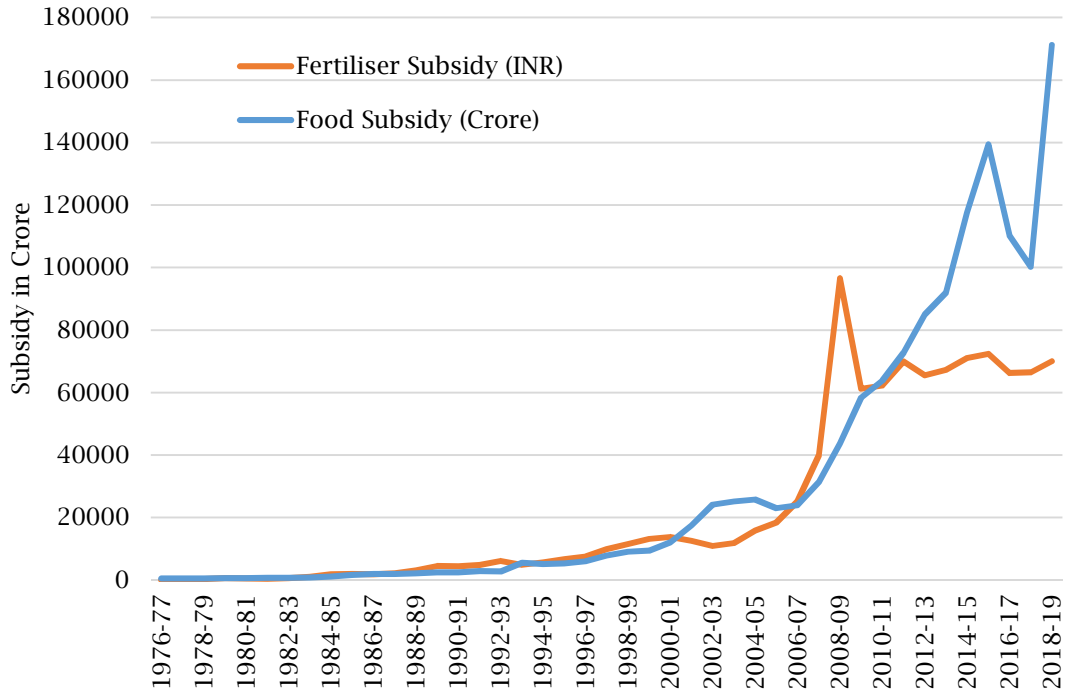
1.4 Fertiliser Subsidy:

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 fertilisers easily accessible to farmers. With this end in view, fertiliser sector in the country is subsidised. Timely availability of fertilizers as input to the farmer at affordable prices is vital for growth of agriculture sector in the country. Subsidy or concession schemes have been an integral part of Government policy to sustain agricultural productivity which in turn plays critical role in ensuring the food security in promoting rural livelihood and employment. The Government of India had established the "Central Fertilizer Pool" in 1944 to ensure equitable distribution of all fertilizers at fair prices all over the country. No subsidy seems to have been paid on fertilizer before 1977 except subsidy on Phosphate due to its high prices in the international market in 1976 (Rs. 1250 per tonnes). Based on the recommendations of the Fertilizer Prices Committee 1977 (Marathe Committee), set up under the Chairmanship of Shri S. S. Marathe, the Chairman of the erstwhile Bureau of Industrial Costs and Prices (BICP), the Government introduced a unit-wise Retention Price Scheme (RPS) from 01.11.1977 for indigenous nitrogenous fertilizer units. Subsequently, this was extended to phosphatic and other complex fertilizers from February 1979 and to Single Super Phosphate from May 1982, which continued up to 1991. Later on, subsidy was also extended to imported phosphatic and potassic fertilizers. Till 30th September, 2000, fertilizers subsidy was being administered by the Department of Agriculture and Cooperation (DAC) and there after it was continued by the Department of Fertilizers with changed parameters from time to time.

Urea is being provided to the farmers at a statutorily notified Maximum Retail Price (MRP). The MRP for urea fixed by the Government of India is Rs. 268 for a 50 Kg bag of urea and Rs. 242 for a 45 kg bag of urea (exclusive of charges towards neem coating and taxes as applicable).

The difference between the delivered cost of urea at farm gate and net market realization by the urea units is given as subsidy to the urea manufacturer/importer by the Government of India. As far as Phosphatic and Potassic (P&K) fertilizers are concerned, Government is implementing Nutrient Based Subsidy (NBS) Scheme w.e.f 1.4.2010. Under the said scheme, a fixed amount of subsidy decided on annual basis, is provided on each grade of subsidized Phosphatic and Potassic (P&K) fertilizers depending upon its nutrient content. This subsidy is given by Government of India to the P & K fertilizer companies which are therefore able to provide P & K fertilizers to the farmers at a subsidized MRP, which is lower than it would have been. Accordingly, farmers across the country who are procuring fertilizers at MRP, is availing the benefit of subsidy.

Fig. 1.11: Yearwise Central Subsidy on Fertilisers in India



Over the period of time, amount of subsidy on fertiliser have increased from Rs. 60 Crore in 1976-77, to Rs. 6136 Crore in 1992-93, Rs. 96603 Crore in 2008-09, then declined to Rs. 62301 Crore in 2010-11 and estimated to be Rs. 79996 Crore in 2018-19 (Fig. 1.11, Tables 1.12 and 1.13). More than two third of total subsidy amount was on Urea while one

third of total subsidy amount was accounted as nutrient based subsidy on P&K.

Table 1.10: Central Subsidy on Fertilisers (Urea and Decentralised)

Rs. Crore

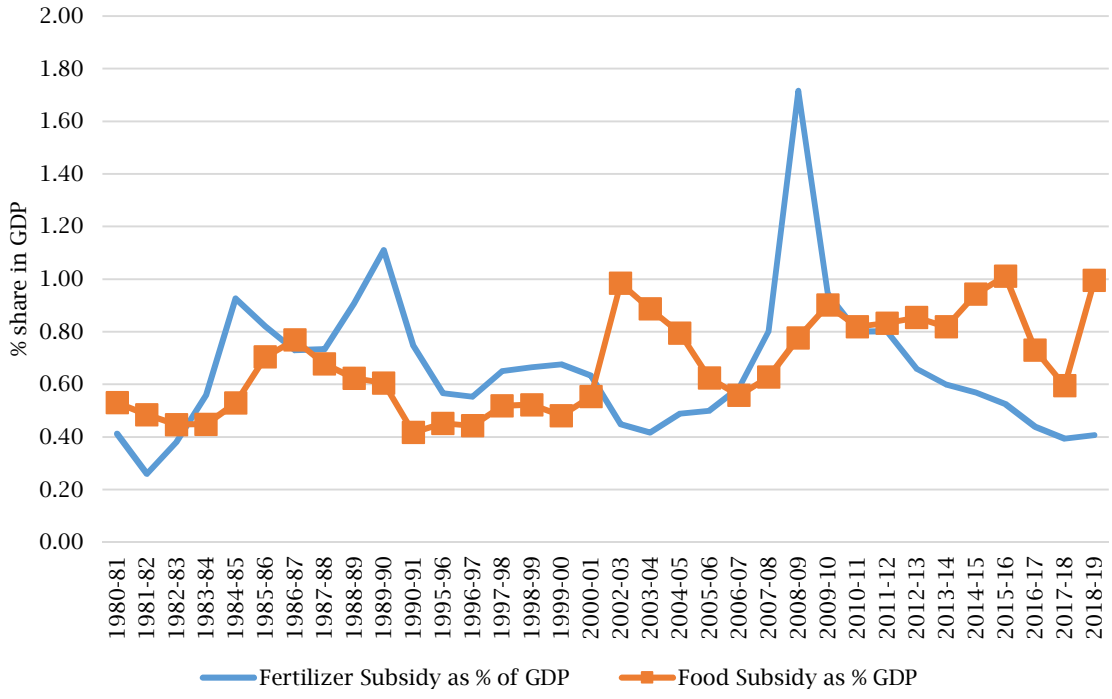
Year	Urea Subsidy			Decentralized P&K	Total subsidy on all fertilizers
	Indigenous	Imported	Total		
1992-93	4800	996	5796	340	6136
2000-01	9480	1	9481	4319	13800
2005-06	10653	1211	11864	6596	18460
2009-10	17580	4603	22163	39081	61264

Table 1.11: Central Subsidy on Fertilisers (Urea, DBT & Nutrient based)

Rs. Crore

Year	Urea Subsidy				DBT	Nutrient Based subsidy				Total subsidy on all fertilizers
	Indigenous	Imported	Freight	Total		Indigenous P&K	Imported P&k	Total P&K	City Compost	
2010-11	15081	6454	0	21535	0			40766		62301
2015-16	36000	12278	2200	50478	0	11969	9969	21938	0	72415
2018-19	43050	10569	0	53619	10	15906	10429	26336	32	79996

Fig. 1.12: Share of Fertiliser and Food Subsidy to GDP (current Prices) in India



As per the provision of the Fertilizer Control Order (FCO), the fertilizers which meet the standard of quality laid down in the Order should only be sold to the farmer. The State Governments are supposed to check the quality of the fertilizers by the manufacturers/importers of fertilizers as prescribed under the FCO and are fully empowered to take action under EC Act 1955, if the fertilizers are found to be non/sub-standard. The penal provision under the EC Act, 1955 for violation of quality standards includes prosecution of offenders and sentence if convicted up to seven years' imprisonment besides cancellation of authorization certificate and other administrative action. The Department of Fertilizers does not pay any subsidy on sale of non-substandard fertilizers and in case it has been paid, a recovery along with penal interest is made. In order to ensure this, Department of Fertilizers obtains quality certificate of all fertilizers on which subsidy is paid.

1.5 Imbalance in Fertiliser Use

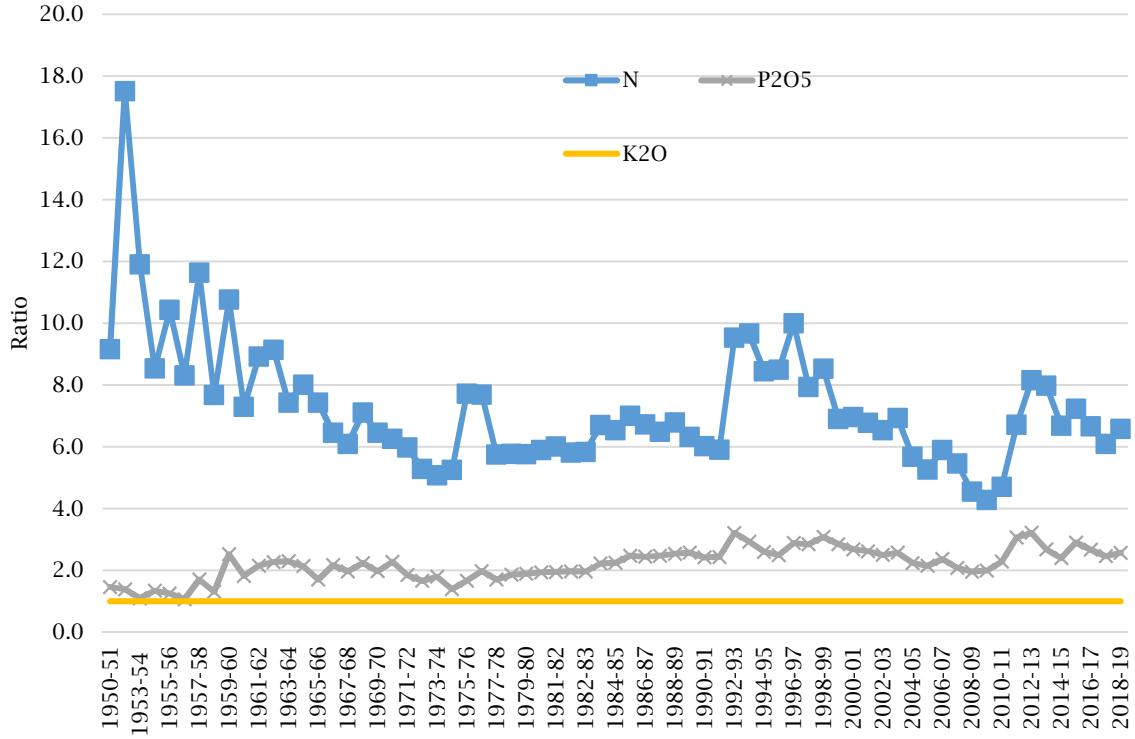
With the improvement in production since green revolution period, India's position has turned from the state of net importer of agricultural products to exporter of certain agricultural commodities like rice, wheat and sugar. At farm household level also, the green revolution technology has helped to improve the livelihood pattern, nutrition and education of children. However, the technology has brought some negative aspects as well. Since it proved successful in irrigated areas, dry land regions and crops grown therein were left out of the process and hence had created regional disparity in rural income (Krishnaji 1975; Vaidyanathan, 1988; Rao 1996). Further, the technology has also altered traditionally followed cropping pattern, which comprised growing multiple crops every season to mono-cropping, for example cultivation of only rice in some parts of south India. This practice put the land and other resources under severe strain resulting in depletion of soil nutrients, decline in water table, build-up of pest and diseases, and micro-nutrient deficiency (Murgai et al 2001; Pingali and Shah 2001). In view of diminishing land for cultivation and in order to maintain the self-sufficiency of food grain production, availability

of fertilizer at reasonable prices in quality time is also becoming most essential on the part of Government.

There are concerns about the indiscriminate use of chemical fertilisers by the farmers with a view to increase the crop yield. This has led to deterioration of soil structure, wastage of nutrients, destruction of soil micro-organisms and scorching of plants at the extreme cases. A combination of factors such as intensive cultivation of crops, differential pricing of fertilisers and subsidy might have contributed to excessive use of fertilisers by the farmers. Due to lack of awareness among the farmers about balanced use of fertiliser, there are wide spread problems related to the indiscriminate use of chemical fertilisers, mismanagement of surface water and over exploitation of ground water. The over use of chemical fertilisers in most parts of India in the last few decades led to several problems affecting soil health, nutrient flow and natural environment.

Fertilizer consumption varies widely between the Agro-Ecological Zones owing to the substantial differences in soil type, fertility status, crop, weather, rainfall, irrigation facilities, etc. (FAO, 2005). Because the deficiency of N is widespread, ratio of use of N: P_2O_5:K_2O has favoured N. This ratio has changed from 17.5:1.4:1 in 1952-53 to 7.0:2.7:1 in 2000-01 which slightly changed in 2018-19 to 7.1:2.8:1. After decontrol of P and K fertilizers in 1992-93 (August 25, 1992), the ratio had widened to 9.7:2.9:1 in 1993-94. Despite of the introduction of a price concession on P and K fertilizers and other measures taken to increase their consumption, the ratio remained wide and in 1996-97, it was 10:2.9:1. Subsequently it has tended to improve, reaching 6.9:2.6:1 in 2003-04 and the further improved to 4.3:2.0:1.00 in 2009-10. But thereafter, the ratio has again unbalanced towards N and reported 8.2:3.2:1 in 2012-13 which estimated to be 6.6:2.6:1.0 in 2018-19. The most important fact in fertilizer is its balance use. As mentioned above, the appropriate ratio of N, P, and K in Indian soil condition should be around 4:2:1 (https://niti.gov.in).

Fig. 1.13: All india Consumption Ratio of N& P2O5 in relation to K2O



The NPK ratio in major States of India is presented in Table 1.11. It can be seen from the table that average consumption ratio in India during the TE 2018-19 was estimated to be 6.4:2.5 :1.0. The imbalance in use of fertilizers may be due to higher subsidy on urea compared to other two components. The imbalance in use of NPK is much higher in some of the states while others have more balanced use. The states like Odisha, Andhra Pradesh, Assam, Karnataka and Himachal Pradesh reported NPK ratio closer to stipulated one while same was reported to be very high in Rajasthan, Punjab, Haryana, Jharkhand, Uttar Pradesh, Madhya Pradesh and Gujarat. The ratio of N to K was reported the highest in Rajasthan (36.4) followed by Punjab (28.3), Haryana (22.9) and above 14 in Jharkhand and Uttar Pradesh. The use of P was also estimated excessive in these states having the ratio of above 13 in Rajasthan and above 6 in comparison to K in all the above states. The use of urea and phosphorus was too low in Kerala, West Bengal, Tamil Nadu, Maharashtra, Himachal Pradesh and Karnataka. The use of NPK was somewhat more balanced in the states of Odisha, Andhra Pradesh, Karnataka and Himachal Pradesh. There is a need for promoting, among others, balanced use of fertilizers

for increasing productivity of crops and for better absorption of nutrients from the applied fertilizers.

Table 1.12: N: P: K Ratio in Major States of India during the TE 2018-19

State	N& P2O5ratio to K2O		
	N	P	K
Andhra Pradesh	4.4	2.0	1.0
Assam	3.7	1.0	1.0
Bihar	7.4	2.4	1.0
Chhattisgarh	5.8	3.2	1.0
Gujarat	9.5	2.9	1.0
Haryana	22.9	6.3	1.0
Himachal Pradesh	3.3	1.0	1.0
India	**6.4**	**2.5**	**1.0**
Jharkhand	14.7	6.6	1.0
Karnataka	3.3	1.9	1.0
Kerala	1.5	0.7	1.0
Madhya Pradesh	13.6	6.9	1.0
Maharashtra	2.9	1.6	1.0
Odisha	4.7	2.0	1.0
Punjab	**28.3**	**6.9**	**1.0**
Rajasthan	**36.4**	**13.2**	**1.0**
Tamil Nadu	2.5	1.1	1.0
Telangana	7.0	2.6	1.0
Uttar Pradesh	14.4	5.1	1.0
West Bengal	2.3	1.3	1.0

Source: FAI, 2019.

The consumption of fertilizer across major continents and countries in the World shows that the highest use of fertilizer was in the zone of Asia and the highest per hectare consumption of NPK was found in New Zealand (1438.1 kg/ha). The East Asian countries namely, Japan, Korea, Malaysia and Vietnam all had higher consumption of NPK compared to India. Among European countries, U.K., Germany, France, Poland, Balarus and Netherlands had higher per hectare consumption of NPK compared to India. Within the subcontinent, India and Pakistan had almost same level of fertilizer consumption per hectare whereas use of fertilizer was higher in Bangladesh consuming much higher amount while Sri Lanka and Nepal were consuming much lower compared to India. In respect of ratio of NPK, the World average ratio of NPK in 2017 was 2.9:1.3:1.0. Among the major countries, the worst NPK ratio was found in Pakistan (77.5: 27.6: 1). The countries which were observed with too much use of nitrogen to other

components were Pakistan, Nepal, Egypt, Turkey, Russian Federation, India, Canada and Australia. It is clear that the utilization of the complex fertilizers, namely N, P, K, varies with each state within India and in every major fertilizer consuming country of the World.

Fig. 1.14: Fertiliser Consumption across Major Countries in the World (kg per ha of Arable and Land under Permanent Crops) Av. of 2016-2017

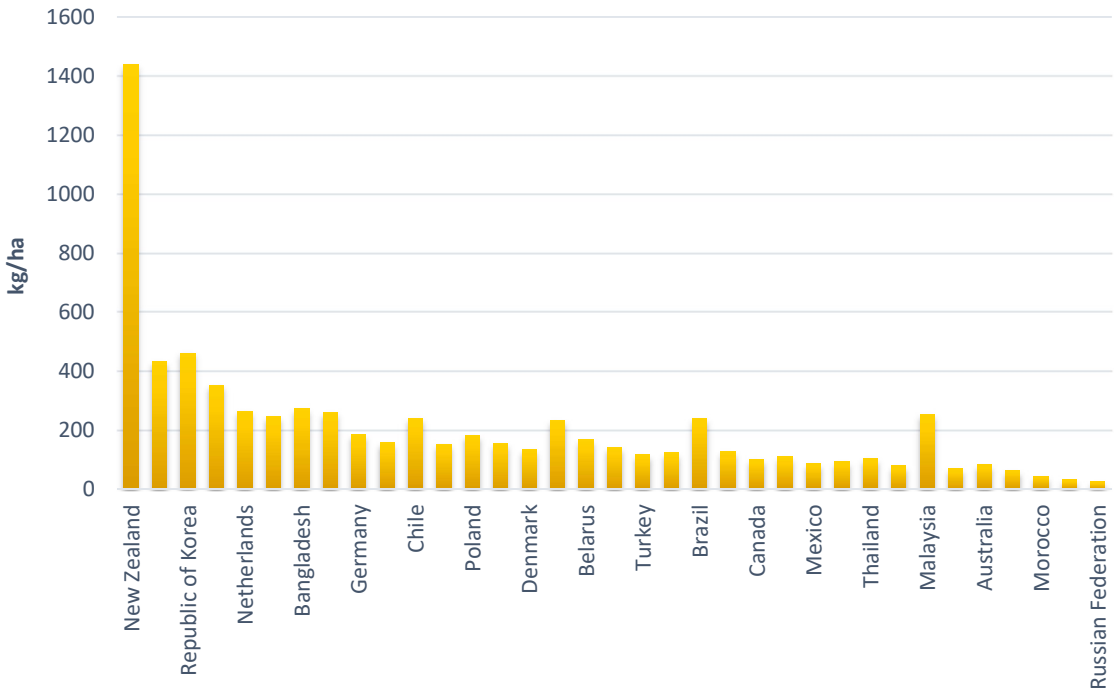
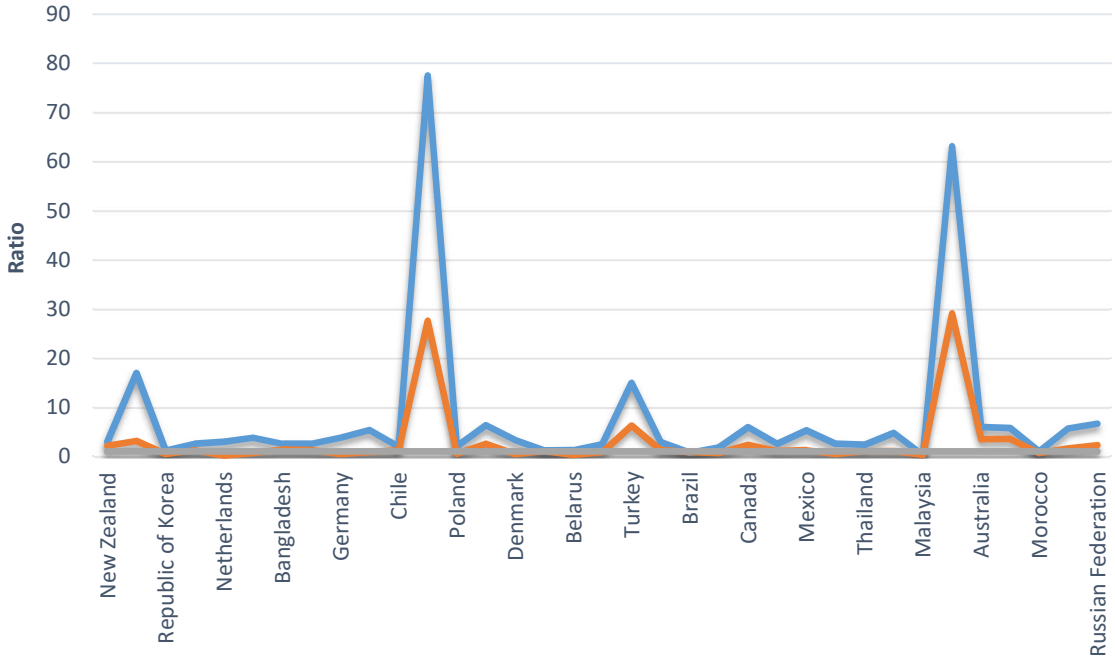


Fig. 1.15: Fertiliser Consumption across Major Countries in the World-Ratio of N&P2O5 to K2O Av. of 2016-2017



1.6 Fertilizer Policy of the Government of India

Both the intensity of fertilizer usage in terms of nutrients per hectare area and the extent of fertilization as measured by the ratio of fertilized area to total cropped area in many developing countries are lower than developed countries. However, fertilizer use has been and will continue to be a major factor in the increasing agricultural production. Typically, very few countries, even advanced ones, have relied entirely on the free market system to set fertilizer prices. It is, therefore, not surprising that governments in developing countries are interested in promoting the use of fertilizers. The fertilizer prices at both producer and farmer levels are determined directly or indirectly by the government in most of the developing countries including India. Such government interventions generally have two basic objectives: (i) to provide fertilizers to farmers at stable and affordable prices in order to increase agricultural production through higher fertilizer use, and (ii) to encourage domestic production by allowing fertilizer producers a reasonable return on their investments.

The fertilizer policy[6] environment in India during 1944 to 2019 can be broadly classified into three periods, (ii) Pre-RPS Regime (1944 to mid-1970s); (ii) Post-RPS Era (mid-1970s to 1980s), and (iii) Post-reforms Period (1991-onwards)[7]. Since independence, Government of India has been regulating sale, price and quality of fertilizers. Until 1977, there was hardly any subsidy amount paid on fertilizer except the case of Potash which was offered a nominal subsidy in the year 1977 (Table 1.13). Product-based subsidy regime was started with the introduction of Retention Pricing Scheme (RPS) for nitrogenous fertilizers in 1977. Later, it was extended to phosphatic and potassic fertilizers including imported fertilizers. Under RPS, the difference between retention price and the statutorily notified sale price was paid as subsidy to each manufacturing unit. The RPS included cost of production as assessed by the government plus 12 per cent post-tax return on the net worth. The product based

[6] For details, see Annexure I.
[7] See, Sharma, Vijay Paul and Hrima Thaker (2010) https://www.iima.ac.in

subsidy scheme resulted in astonishing increase in domestic capacity/production and consumption of fertilizers. However, by the 1990s, the scheme led to a huge subsidy burden on the government. In 1992 a Joint Parliamentary Committee (JPC) was constituted to review the Fertilizer Pricing Policy. The Committee did not favour total decontrolling of fertilizers but recommended decontrol of import based phosphatic and potassic fertilizers. Based on the recommendations, the Government of India decontrolled all phosphatic and potassic (P&K) fertilizers namely DAP, MOP, NPK complex fertilizers and SSP (Single Super Phosphate) in August 1992. However, urea continued to remain under RPS. The implementation of this policy led to rise in prices of phosphatic fertilizers which resulted in enhancement of production and consumption of nitrogenous fertilizers. Consequently, consumption of P&K fertilizers decreased which led to severe imbalance in consumption of nitrogenous, phosphatic and potassic fertilizers. Department of Agriculture & Cooperation (DAC) provided some grants to state governments to provide price concessions to farmers on P&K fertilizers to maintain the balance use in fertilizer. During 1997- 98, Department of Agriculture & Cooperation (DAC) started paying subsidy to the manufacturers/importers for maintaining an all India uniform Maximum Retail Price (MRP) for DAP/NPK/MOP. Till 2000, the issues relating to fertilizer subsidy was being looked after by DAC and thereafter it was continued by Department of Fertilizers (DOF).

In the year 2003, on the recommendations of the Expenditure Reforms Commission, RPS for urea units were replaced by New Pricing Scheme (NPS). NPS was concession scheme for urea units based on the prices of feedstock used and the vintage of plants. It had various phases like NPS-I during 2003-2004, NPS-II during 2004-2006 and NPS-III 2006 onwards. The crux of NPS scheme was difference between the cost of production and the selling price/MRP was paid as subsidy/concession to manufacturers. Under this scheme, urea was the only controlled fertilizer sold at statutory notified uniform sale price. The phosphatic and potassic fertilizes were decontrolled and sold at indicative maximum

retail prices (MRPs). The fixed price of urea led to distortions in the market. The fertilizer companies incurred huge losses due to fixed urea prices and rising cost of inputs such as natural gas and naptha given the fact that 80 per cent of the production of urea in India is gas-based.

To overcome this imbalance and to incentivize the fertilizer industry, the Government introduced Nutrient Based Subsidy (NBS) Policy for P&K fertilizers (MOP, DAP etc.) with effect from 2010. Under this new scheme, government fixed subsidy on an annual basis based on weight of different macro/micro nutrients (N, P, K, S etc.) contained in fertilizer while manufacturers are allowed to fix the maximum retail price (MRP) at a reasonable level. However, once again urea remained out of the ambit of this scheme. Due to delay in NBS subsidy payments, fertilizer companies focused more on urea than other fertilizers. The scheme also led to increase in prices of phosphoric and potassic fertilizers which led to overuse of urea by the farmers resulting in imbalance in the NPK ratio. For checking the excessive use of urea and to prevent diversion of urea for industrial uses, government made it mandatory for domestic fertilizer firms from 2015 to "Neem coat" at least 75 per cent of their urea production which earlier was 35 per cent. The government has also allowed manufacturers to charge a small 5 per cent premium on Neem-coated urea. The government started gas pooling policy during this year under which all urea units would get gas at a uniform price. The purpose was to change the industry dynamics in urea sector by levelling gas costs for all players so that urea production plants adopt best technology available and become globally competitive. This would enable timely supply of urea to farmers at the same MRP.

The New Urea Policy-2015 (NUP-2015) has been notified by the Department of Fertilizers on 25th May, 2015, effective from 1st June, 2015 up to 31st March, 2019, with the objective of maximizing indigenous urea production, promoting energy efficiency in urea production and rationalizing subsidy burden on the government. This new urea policy incentivizes domestic manufacturers and free transportation of phosphorus (P) and potassium (K) fertilizers. As per New Urea Policy,

the preset energy norms for the 25 gas based urea units fixed during earlier policies have been mopped up and they are eligible to get the concession rate on the basis of revised energy norms fixed for each group from 1st June, 2015 to 31st March, 2018 which would be the simple average of pre-set energy norms of NPS-III and average actual energy consumption achieved during the years 2011-12, 2012-13 and 2013-14 or the pre-set energy norms of NPS-III, whichever is lower.

Table 1.13: Summary of Major Reforms in the Fertilizer Industry

Scheme Name	Description	Impact
Retention Price Scheme (RPS), (1977)	· The government fixed the fertilizer price and made it uniform across the country. · The government paid the difference between the retention price and the MRP to the manufacturers.	· A significant increase in fertilizer production and consumption. · A significant increase in government's subsidy bill.
Decontrolling fertilizer, (1991)	· To reduce the subsidy burden, the government decontrolled all fertilizers except urea (that is, only urea production was subsidized under RPS) · The government sold non-urea fertilizers at non-subsidized prices	· Urea price became lower than other fertilizers · Increase in consumption of urea and decrease in consumption of other fertilizers due to price differential · Imbalance/disproportionate use of fertilizers, that is, use of urea in higher proportion compared to other fertilizers
Concession Scheme for Other Fertilizers, (1992)	· To encourage a balanced or proportionate use of fertilizers and enhance the ability of farmers to purchase affordable fertilizers other than urea, the government introduced a specific concession scheme for non-urea fertilizers · The difference between the cost of sales and maximum retails price (MRP) formed the concession rates.	· Increase in fertilizer consumption and consequently agriculture production in the country during two decades that is, from 1991 to 2000 · However, the marginal response of agriculture productivity to additional fertilizer usage decreased during the last few years of this period. · A significant increase in subsidy burden of the government
Nutrient-based Subsidy Scheme (NBS), (2010)	· To overcome the drawbacks of the concession scheme, the government introduced NBS for non-urea fertilizers. · The government decides per kg subsidy rates (converted to per metric tonne (MT)) on non-urea fertilizers. Based on the percentage of nutrient(s) in each grade of fertilizer, manufacturers avail a subsidy from the government · Urea remained subsidized under RPS	· Urea price became lower than other fertilizers · Increase in consumption of urea and decrease in consumption of other fertilizers due to price differential · Imbalanced or disproportionate use of fertilizers – that is, use of urea in higher proportion compared to other fertilizers · The marginal response of agricultural productivity to additional fertilizer usage decreased
DBT on pilot basis, 2016	• Fertilizer subsidy will continue to be routed through the industry. • Subsidy continues to be reimbursed to the fertilizer industry.	• Farmers will receive Urea at statutory subsidies prices and P&K at subsidized prices in the market. • tracks actual buyer, reduces black marketing and diversion, reduces overcharging by retailers

Note: for details on all policy reforms, see Annexure I.

As mentioned earlier, though fertilizer consumption has reported significant increase, but many reports have highlighted its uneven, untimely and faulty distribution which had become prone to 'leakages' as well as pro-rich large farmer group. It was estimated that about two third of total fertilizers produced in the country does not reaches the intended beneficiaries viz., small and marginal farmers (GOI, 2016). Besides, some reports have highlighted industry use of fertilizer. Fertilizer subsidies in India currently account for the second-largest government transfer, with estimated outlays of over 700 billion rupees (USD 10 billion) projected for the 2018-19 fiscal year. Because of the vast size of fertilizer subsidies and the subsequent market distortions they introduce, India's fertilizer subsidies have been the subject of much scrutiny for some time. Among other effects, these subsidies introduce arbitrage opportunities whereby subsidized fertilizer supplies from India can be smuggled across porous borders into Nepal and Bangladesh and sold in so-called 'grey markets.' In order to tackle these issues, GOI had taken various initiatives including technological interventions such as Fertilizer Management System in 2007, Neem Coated of Urea in 2008, Mobile Fertilizer Monitoring System in 2012 and Integrated Fertilizer Monitoring System in 2016 which has helped to increase transparency in the fertilizer distribution system and its management. While these initiatives could not fully curb the leakage, excess use as well as misuse of fertilizer.

1.6.1 DBT in Fertilizer

As subsidy on fertilizer is the second largest subsidy after food subsidy provided the by the government, GOI has decided to bring fertilizer subsidy under the Direct Benefit Transfer (DBT) system w.e.f., 1st October 2016 in 17 pilot districts under which government remits a subsidy amount to fertilizer companies after fertilizer retailers have sold fertilizer to farmers through Point of Sale (PoS) machines through biometric authentication. Any farmer can purchase any required quantity of subsidized fertilizer regardless of the land size availed with him at subsidized rate. The different states were put on Go—Live mode w.e.f

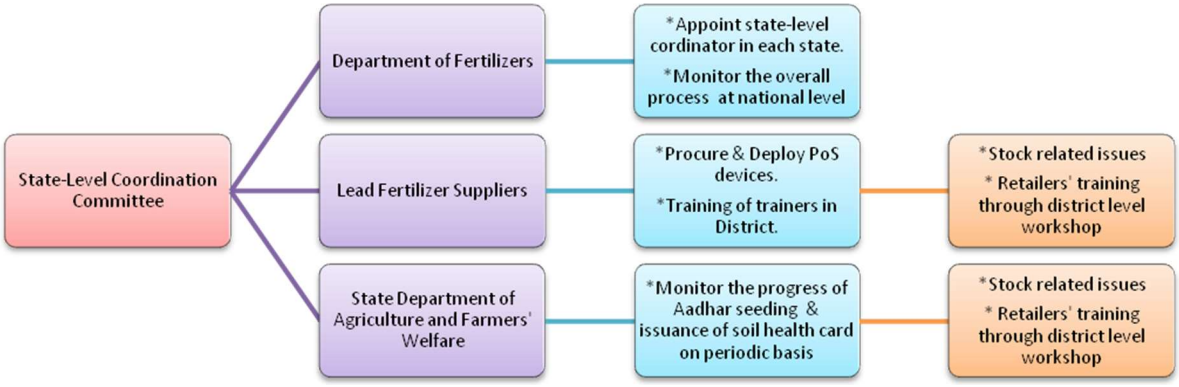
01.09.2017 and Pan India rollout of DBT was completed by March 2018 (Table 1.14). A Project Monitoring Cell was set up at Department of Fertilizers to oversee implementation of DBT exclusively. Total 24 State Coordinators have been appointed across all States to monitor the on-going DBT activities. On 16th September, 2016, it was made mandatory to acknowledge fertilizer receipt through PoS devices, w.e.f., 1st January 2017. Due to delay in installation of PoS machines, date of deployment of PoS machines was extended by one month, i.e., up to 31st January, 2017. As companies even failed to comply with the revised deadline, this deadline was further extended to 31st May, 2017. It was announced that after this deadline subsidy will be paid only on the quantity of fertilizer sold through PoS devices.

Table 1.14: Implementation Schedule of DBT in different states

S. No	Name of States / UT's	GO Live Date
1	NCT of Delhi	1st September, 2017
2	Mizoram, Daman & Diu, Dadra Nagar Haveli, Manipur, Nagaland, Goa, Puducherry,	1st October, 2017
3	Rajasthan, Uttarakhand, Maharashtra, Andaman & Nicobar Islands, Assam, Tripura.	1st November, 2017
4	Andhra Pradesh, Haryana, Punjab, Chhattisgarh and MP	1st December,2017
5	Kerala, Bihar, Karnataka, Jharkhand, Telangana, and TN	1st January, 2018
6	Uttar Pradesh, Gujarat, West Bengal, Odisha and Himachal Pradesh	1st February, 2018
7	Jammu & Kashmir	1st March, 2018

Preparations for this wide scale rollout at the state level included the establishment of state-level committees for the management and implementation of the program and the appointment of a central government recruited state-coordinator to work closely with the State Department of Agriculture (Figure 1.2). The lead fertilizer company in each state was also directed to procure PoS devices such that all retailers had them before the policy was officially ineffect.

Figure 1.16: Pan-India Direct Benefit Transfer system



1.6.1.1 Progress of DBT on Fertilizer

The implementation of the DBT in Fertilizer Scheme required deployment of PoS devices at every retailer shop and training of retailers for operating PoS device. Across the country, Lead Fertilizer Supplier (LFS) have conducted 10878 training sessions. So far 2.26 Lakh PoS devices have been deployed across all States. A total of 1182.04 Lakh Metric Tons Fertilizers have been sold through PoS devices under DBT Scheme till December 2019. Approximately, 2.39 lakh retailers were sensitized during the introductory training sessions conducted by lead fertilizer suppliers (LFS). A dedicated 15-member Multi-lingual Help Desks were set up to provide quick response to the queries of wide range of stakeholders across the country as a preparatory to DBT implementation. Phase-I DBT system in Fertilizers (DBT 1.0) envisaged the release of 100 per cent subsidy on various fertilizer grades to the fertilizer companies on the basis of actual sales made by the retailer to the beneficiaries. The DBT system entails 100 per cent payment of subsidy to the fertilizer manufacturing companies on the basis of actual sales by the retailer to the beneficiary.

The season-wise and month-wise and total DBT sale of major fertiliser Products is presented in Fig. 1.17 and 1.18 respectively while state-wise DBT sale of major fertilizers 2018-19 is presented in Table 1.015. It can be seen from the Figures and Table that Urea and DAP are used in higher quantity during Rabi season than kharif while opposite picture was in case of NPK and MOP fertilizer. Across months, use was

found higher in the months of June, July and August in kharif season while November, December and January in rabi season.

Fig. 1.17: Seasonwise and Total DBT Sale of Major Fertiliser Products (2018-19)

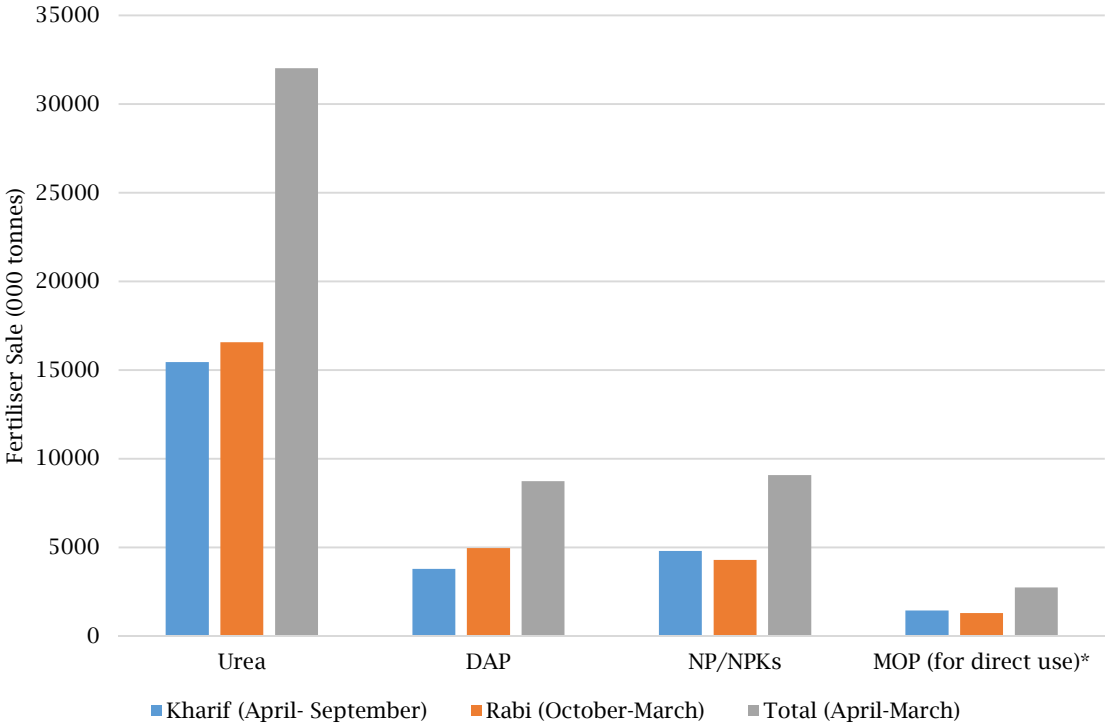


Fig. 1.18: Monthwise DBT Sale of Major Fertiliser Products (2018-19)

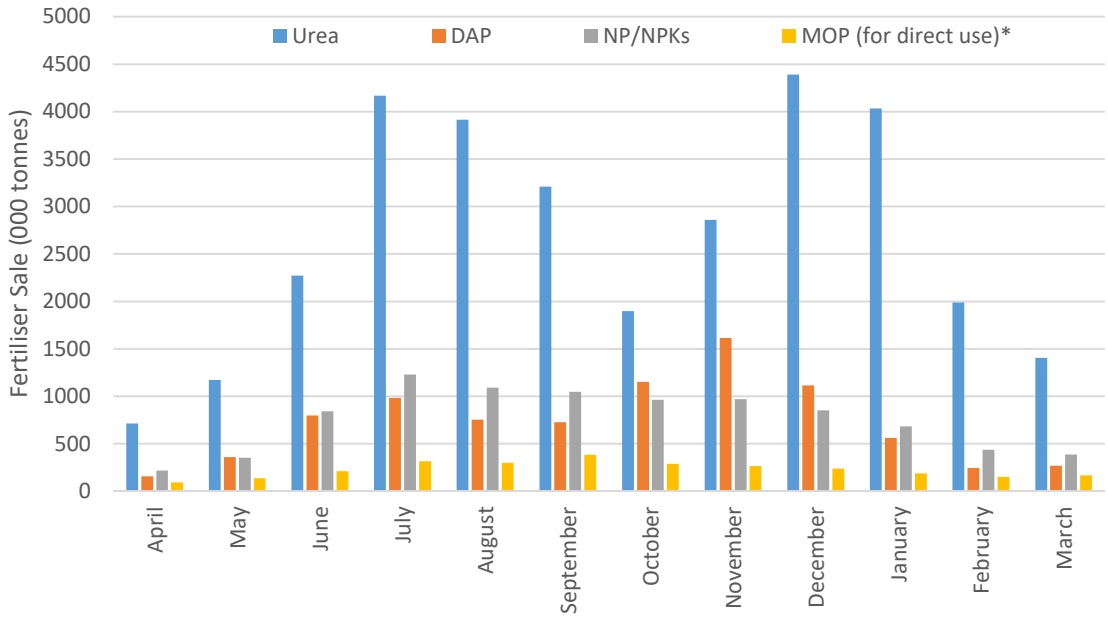


Table 1.15: State-wise DBT Sale of Major Fertilizers 2018-19

	State-wise/Season-wise DBT Sale (000 tonnes)				
State	Urea	DAP	NP/NPKs	SSP	MOP
East	4794.61	1163.66	1438.31	553.41	643.47
Assam	438.84	61.2	14.89	108.64	84.65
Bihar	2233.57	587.03	299.23	75.87	202.59
Jharkhand	238.67	69.9	28.9	2.99	3.88
Odisha	496.21	169.03	223.03	13.62	108.29
West Bengal	1323.3	275.15	871.24	326.75	241.92
Manipur	24.25	0.14	0	2.42	0.18
Mizoram	13.25	0	0	0.57	0.02
Nagaland	0.47	0.03	0	0	0
Tripura	26.05	1.18	1.02	22.55	1.94
North	11867.49	3042.2	749.38	664.67	355.34
Haryana	2165.63	548.41	37.22	171.08	71.33
Himachal Pradesh	72.53	0.83	30.54	4.76	7.19
Jammu and Kashmir	132.33	48.98	1.22	0	25.89
Punjab	2916.58	701.61	48.51	109.01	64.49
Uttar Pradesh	6285.21	1716.75	597.48	369.22	182.22
Uttarakhand	274.68	22.86	34.41	10.41	3.68
Delhi	20.53	2.76	0	0.19	0.54
South	5210.6	1277.45	3961.08	317.21	997.72
Andhra Pradesh	1418.01	313.62	1072.7	163.24	241.39
Karnataka	1390.58	488.03	1242.9	52.81	263.72
Kerala	95.08	21.56	113.68	0.8	83.5
Tamil Nadu	910.62	230.79	503.58	59.68	266.54
Telangana	1382.99	222.8	1024.82	40.26	141.01
Puducherry	13.32	0.65	3.4	0.42	1.56
West	10146.31	3253.8	2930.65	2795.61	739.96
Gujarat	2005.8	430.67	462.15	112.29	132.08
Madhya Pradesh	2950.19	1262.31	377.32	1106.18	108.2
Chhattisgarh	817.94	330.57	93.23	223.52	84.87
Maharashtra	2278.63	557.33	1911.63	916.37	385.01
Rajasthan	2091.28	671.03	83.72	437.24	29.11
Goa	2.26	1.74	2.6	0.01	0.69
D & Nagar hovel	0.21	0.15	0	0	0
All India	32019.01	8737.11	9079.42	4330.9	2736.49

NITI Aayog has conducted four extensive evaluations through an independent agency M/s Microsave in the DBT pilot districts. The highlights of the study areas under:

- Implementation of DBT System has streamlined the Fertilizer distribution. Retailers and farmers in all districts reported “Nil shortage" of urea owing toneem coating.
- There is improved tracking through mFMS Id i.e. Fertiliser companies have on-boarded untraceable retailers and co-operative depots on

mFMS system to avoid delay in subsidy payments.

- Overcharging by retailers has reduced as each fertilizer purchase by farmers is supported by a receipt generated through PoS machines indicating both MRP paid by the farmers and the subsidy component paid by the Government on the quantity of fertilizer purchased by the farmers.
- Cross border sale has also reduced e.g. across border to Nepal and Bangladesh from Kishanganj.
- Preference for Aadhaar based system is increasing among farmers.
- Initiatives such as reducing the size of urea bag and increased retailer margin seems to have positive impact.
- 76.5 per cent farmers are aware that urea comes with neem extract coating.
- 94.9 per cent farmers perceive that neem coated urea is beneficial for crops.
- Farmers prefer DBT in Fertilizer because it tracks actual buyer, reduces black marketing and diversion, reduces overcharging by retailers and induces awareness about quantity and price of fertilizer.

Based on the positive feedback received through M/s Microsave studies, the deployment of PoS devices was extended to all the States/UTs across the country.

Merits of DBT

- DBT reduces the leakages in the fertilizer system due to diversions and cross border pirating or smuggling especially to Nepal and Bangladesh.
- The point of sales machine produces a receipt which gives data about the cash to be paid by the farmer. This shields the farmers from the overcharging by retailers by providing transparency about the price.
- With introduction of the Aadhaar in this area, 97 per cent people have been able to get authentication, transaction receipts have also been received by 85 per cent of the farmers and the grievance

redressal mechanism (one of the major issues previously) has been functioning close to satisfaction of the beneficiaries.

- As soil health cards have now been provided to a good number of farmers across the country, it would be advisable to link the land details of the beneficiaries and soil health recommendations for an appropriate mix of fertilizers which will be compatible with the soil health profile of the particular farm lands.
- DBT scheme allows time-bound transfers. Hence avoids delays in transferring money, which is one of the biggest problems beneficiaries are facing.

Challenges in implementing DBT

- Aadhaar authentication issues as incidents are reported wherein people are facing authentication using Aadhaar card and biometric. It may lead to exclusion errors.
- Burden on the retailers who need to constantly upload the transactions. This will find smaller amount of acceptances from them due to increased burden.
- Various components like point of sales machines, Aadhaar authentication need to work in tandem. Lack of quality digital infrastructure will hinder the smooth working of the system.

Future Prospects

- With the introduction of regional languages in the applications that can be operated from laptops, smart phones and so on, more and more people can be brought within the realm of the DBT. The efficiency is likely to increase further as more authentication systems will be introduced other than the Aadhaar.
- Integrating the sale of fertilizer with the data from soil health cards will provide for better soil health management.
- Reduce the imbalance in the use of fertilizers as the Indian fertilizer usage is heavily tilted towards urea.
- Better data with the government about the fertilizer usage will help in designing of policy interventions.

- It can give a major boost to the Make in India Campaign as subsidized purchase will increase the demand for domestically produced fertilizers. It will decrease imports of fertilizer, especially urea, the import of which is sought to be done away with by 2021.
- The working capital pressure on companies is also likely to reduce with the introduction of the DBT.

Phase-1 envisages release of 100 per cent subsidy on various fertilizer grades to the fertilizer companies on the basis of actual sales made by the retailer to the beneficiaries. The phase-2 of DBT will explore the feasibility of cash transfer to farmer's accounts. An expert committee under NITI Aayog has been constituted on 28.9.2017 as per the request of the Department to suggest a model for the implementation of phase-2. Hon'ble Minister of Chemicals and Fertilizers, Sh. Sadanand Gowda in presence of Hon'ble Minister of State, Sh. Mansukh Mandaviya launched DBT 2.0 initiatives on 10th July, 2019. With the DBT system functioning satisfactorily over the last one year, the Department has been continuously making efforts to improve the system based on the feedback received from various stakeholders. Some of the new initiatives of DBT 2.0 are as under: Under DBT, the fertilizer is sold through the PoS devices installed at retail points across the country. Till now 14 versions of PoS software has been released in the process of improving the PoS operations, latest being PoS 3.0 version with new added features

1.7 Need for the Study

Based on circumstantial evidences, it has been found that the information regarding opening stock, daily/weekly/monthly sales, closing stocks of fertilizers at retail points do not match from various sources, i.e., PoS, physical sale/stock register maintained by the retailer. Further, the daily/weekly/monthly sales as per the physical bill book maintained by retailer do not match with each other. For example, stocks of fertilizers on a particular date at a retail point as shown in the PoS generated records

and the physical registers/books of the retailer do not reconcile. Since the release or the entitlement to subsidy is established through sales recorded in the PoS machine, it is critical that the system of operation of PoS at the retail point is strictly adhered to. Therefore, it is needed to verify such information at the first hand. Additionally, it is essential to check not only at the retail point, but also it is desirable to cross check with the farmers about their purchase of fertilizers; the identification source used by them; their ease of doing business with this new PoS system; and seek their opinion about the functioning of the PoS system. Therefore, present study was undertaken to find out the degree of variation among various sources of data at the retailer level in Gujarat state with specific objectives as follows:

The purpose of the present study was to find out the degree of variation among various sources of data at the retailer level in Gujarat state. The ultimate objective was to see how much reliance can be placed on the PoS data for the purpose of policy planning and movement/supply of fertilizers in the country and what corrective action need to be undertaken to reconcile data across various data sources.

1.8 Objectives of the study

The specific objectives of study were as follows:

1. Compare the PoS generated stocks, with the stocks as recorded in the manual records of the retailer and analyse the difference.
2. Compare the PoS based sales with the receipts issued/ invoices/ bills in the physical books and analyse the difference.
3. Compare the physical stock on the day of visit to the Retail Outlet with the stock shown on the PoS.
4. Examine whether the quantities of fertilizers purchased by top 15-20 buyers (and 10 frequent buyers) from the retailer (as generated from IFMS) are justified by their operational holdings, crops sown, etc.
5. Through a farmer survey, assess administrative/compliance implications of obtaining a declaration regarding operational holding at the time of PoS sale at the retailer level.

1.9 Data and Methodology

The study is conducted in the state of Gujarat and it is based on both primary and secondary data. The secondary data required for the study were compiled from the Central government offices, State government offices including and regional offices and central government and various private as well as state/central government publications. For primary survey, questionnaire was prepared by coordinator ADRTC, ISEC, Bengaluru after consultation with all associated AERCs. The primary data for study in respect of two selected districts were collected by recall method from the selected farmers/retailers through comprehensive field survey by interviewing personally of selected households as per sampling design discussed below. The quantitative/qualitative data were collected in a structured questionnaire; keeping in view the objectives of the study. The data were collected for the agricultural year 2018-19.

Design of the study

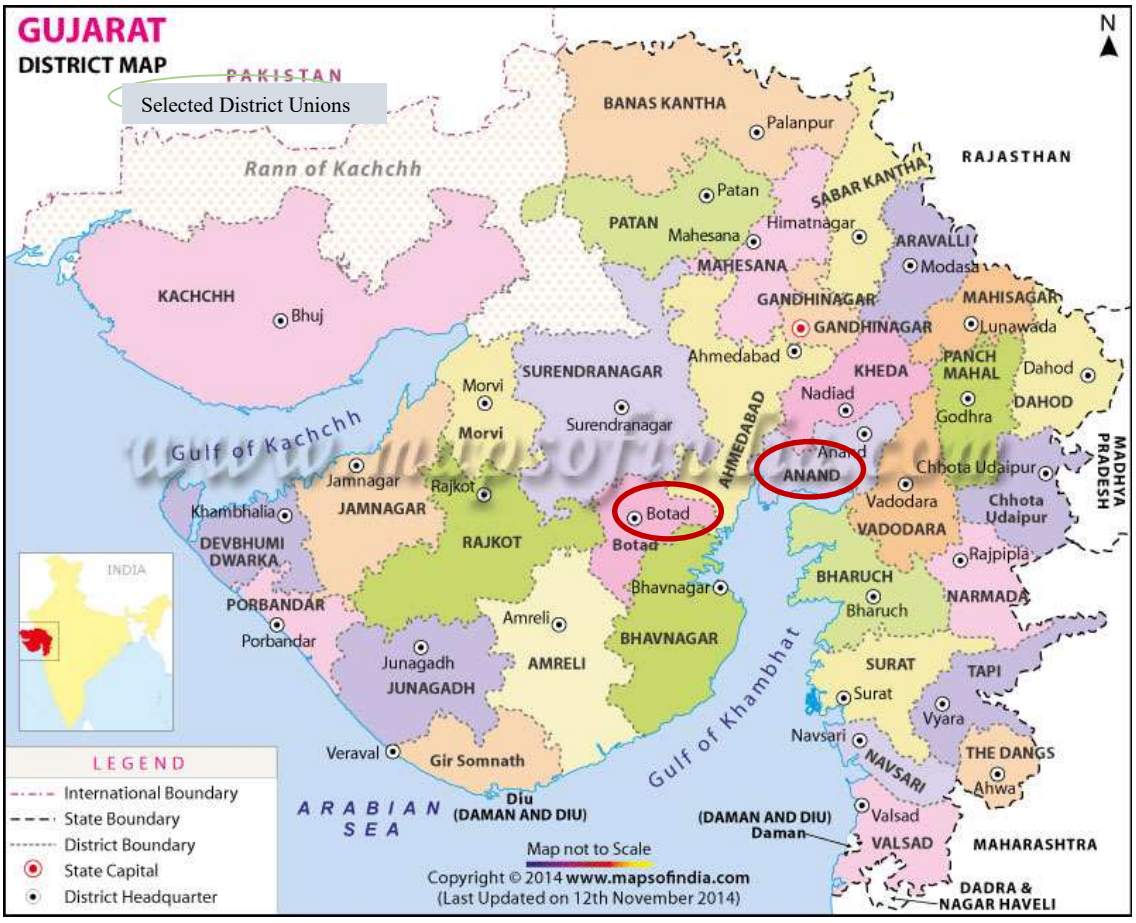
As per the methodology provided by the coordinator, two districts were selected covering different agro climatic zones with one district covering irrigated area and the other one covering rain-fed/dry land area. Accordingly, Anand (irrigated area) and Botad (rainfed/dry land area) district were selected. From each selected district, a total number of 30 retailers were selected for the purpose of investigation which have the representation of private retailers, company owned shops and cooperative societies. In addition, from each selected district, a list of top 20 buyers and frequent 10 buyers were obtained for the last six months (i.e., from January 2019 to June 2019). Thus, from this list of 120 top-twenty buyers and 60 frequent buyers, a total number of 50 top-twenty buyers and 25 frequent buyers/farmers (as generated from IFMS) were selected randomly for detailed investigation and verification for operational holdings, crops sown etc. Further, 50 farmers from each district were selected as random walk for further purchase verification through PoS. Thus, the aggregate sample for Gujarat state was 60 retailers, 100 top-twenty buyers, 50 most

frequent buyers and 100 random walk buyers selected from the same villages where from top and frequent buyers were selected.

Table 1.16: List of Selected Districts & Number of Sample HHs. in Gujarat

Stakeholders	Anand District	Botad District	Gujarat State
Retailers	30	30	60
Top 20 Buyers	50	50	100
Frequent Buyers	25	25	50
Random walkers	50	50	100
Total	155	155	310

Map 1.1: Location Map of Study Area in Gujarat, India



The period of record of sales in the PoS with the retailer is available only for one or two weeks or at the most for only last one month while stock record is available at the point of time of visit. Therefore, for the purpose of this study, the period covered was last one week to last fortnight for the record of sale and the time of visit for stock purpose or as may be available with the retailers. The retailers were categorized as private retailers, company owned shops and cooperative societies. In our pilot visit, it was observed that many retailers were keeping stock and sale record only computerized which was generally not updated regularly. The physical records were also not up-to-date in most of the cases. In some cases, no record was also observed. Therefore, the beginning point of investigation was whether physical stock is maintained or not and if maintained whether the same is up-to-date which will further be tallied with the POS statement.

1.10 Organization of study report:

The report is presented in five chapters. This introductory chapter presented the brief of fertilizer production and consumption in India, implementation of DBT in fertilizer, need and objectives of the study, data and methodology of the study. Chapter II presents the trend in fertilizer consumption in Gujarat. The functioning of DBT at retailers' end presented and discussed in Chapter III which includes description of selected retailers, details of PoS machine, various issues faced by retailers in handling the PoS machine and redressal of problems faced by the retailers. Besides, it present comparison of the stock and sale records of PoS obtained at the retailers' end with the manual records maintained by retailers and physical records verified by the research team at the time of field survey. Chapter IV presents functioning of DBT at farmers' end covering demographic characteristics of the sample, size of holdings and operational area, cropping pattern, fertilizer requirements by different variants. It also presents the purchase of fertilizer by the selected buyers through PoS and various problems faced by them, estimates of fertilizer purchased by the selected farmers during the reference year and month

as well as quantity of fertilizer used by various variants per acre for the crops grown during the reference year. Last chapter presents concluding remarks and policy suggestions for the further improvement in implementation of DBT in the State.

The next chapter presents trends in fertilizer consumption in Gujarat.

Chapter II

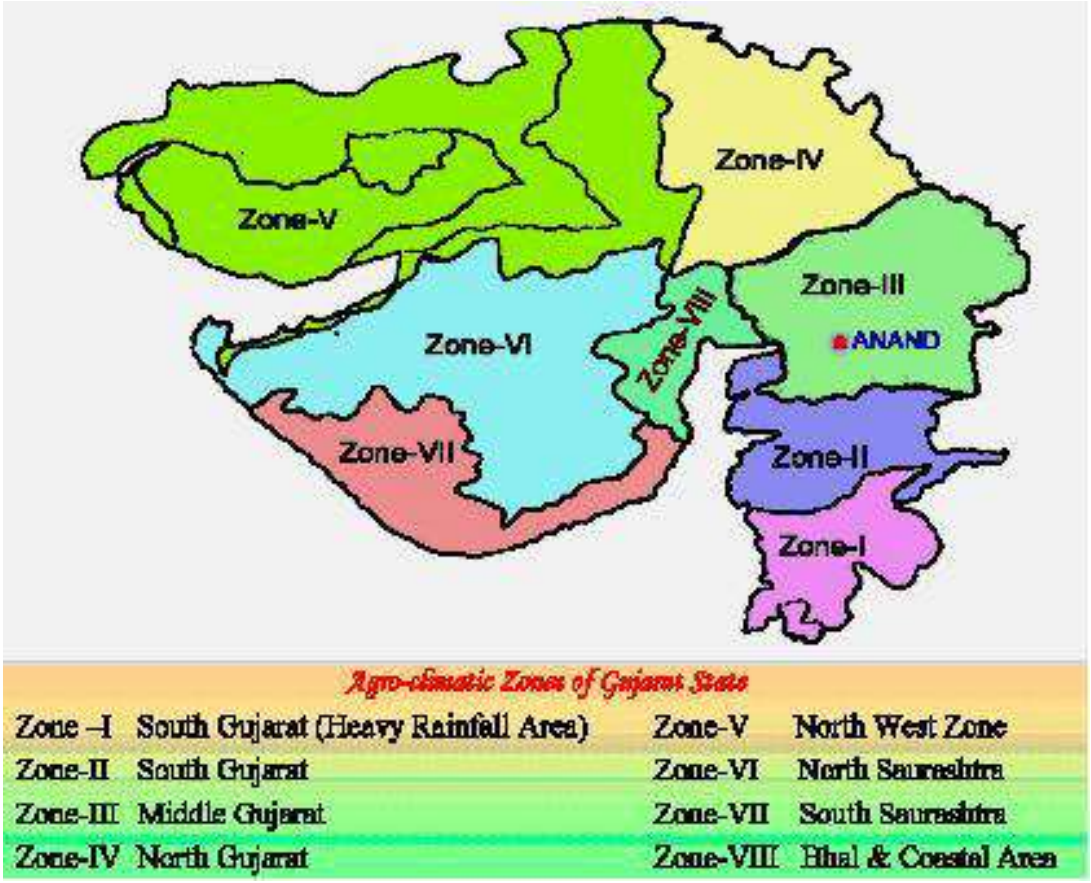
Fertiliser Consumption in Gujarat

2.1 Introduction:

Gujarat is not only the fastest growing states of India but also one of those states where economy has always performed better than the national average. Agriculture and allied sector plays major role in the growth of State economy as activities of agriculture and allied sectors are the primary source of occupation for the majority of the rural people in the State. Gujarat has been consistently clocking impressive agricultural growth rates. This has been possible because the government has focused on improving not only irrigation, quality of seeds and power but also subsidiary sectors like animal husbandry. The growth of the animal husbandry sector has resulted not only in increased milk production but has also provided a boost to the overall agro-economy of the state.

Gujarat accounts for 6.19 per cent of total geographical area of India. Gujarat has the longest coastline of 1600 kilometres which is about 20 per cent of country's total coastline. It falls in 13th Agro climatic zone of India which is further divided into eight sub-zones (see, Map 1.1 and Table 2.1). Gujarat has varying topographic features though a major part of the state was dominated by parched and dry region. The average rainfall in the state varies widely from 250 mm to 1500 mm across various zones. Based on soil characterization, rainfall and temperature, eight agro climatic zones in Gujarat have been identified as in the state. Out of 8 agro-climatic zones, five are arid to semi-arid in nature, while remaining three are dry sub-humid in nature. Deep black to medium black soils dominate the soil types in the state. Gujarat is a leading state in India in streamlining the Soil Health Card (SHC) Programme. This is an only one of its kind information project prepared and initiated by the Government of Gujarat for the benefit of farmers at the grass-root level since 2004-05 which has helped in proper and judicious use of the fertilisers.

Map 2.1: Agro-Climatic Zones in Gujarat



2.2 Implementation of Soil Health Card Programme

The programme was implemented in a phased manner. During the initial phases (2004-05 to 2011-12), 38.43 lakhs farmers (out of total of 46.61 lakhs in Gujarat) were provided Soil Health Cards (SHCs), covering about 85.5 per cent of total farmers in Gujarat. The Second phase was started from 2012-13, aiming to cover 25% farm holding (11.50 Lakh) every year. During 2012-13 and 2013-14, about 15.26 lakh farmers have been provided the SHCs. Thus, since the inception, a total of 53.69 lakh soil health cards have been given to farmers by the end of 2013-14. The programme has generated alternative crop planning and recommendations for 229 talukas and 24324 villages and generated all Taluka and Village Model Action Plans (GoG, 2013). The fertiliser consumption was reported lower only during 2012-13 and 2013-14, while as like at all India level, it keeps increasing year after another, may be due deficiency of nutrients in the soil as per crop requirement.

Table 2.1: Salient Features of Agro Climatic Zones of Gujarat State

Zone	Climate	Districts Covered	Rainfall (mm)	Major Crops	Soil
South Gujarat (Heavy Rain Area.)	Semi-arid to dry sub-humid	Navsari, Dang, Valsad and Valod, Vyara, songadh and Mahuva taluks of Surat.	1500 and more	Rice, Sorghum, Ragi, Kodra, Seasamum, Pigeonpea, Cotton, Groundnut, Sugarcane, Chillies, Wheat, Gram	Deep black with few patches of coastal alluvial, laterite and medium black
South Gujarat	Semi-arid to dry sub-humid	Surat and Amod, Ankleshwar, Broach, Dekdopada, Honsot, Jhagadia, Nanded, Sagbara and Valia talukas of Bharuch.	1000-1500	Rice, Wheat, Gram, Perlmillets, Sorghum, Maize, Kodra, Ragi, Pigeonpea, groundnut, Sesamum, Castor, Cotton, Sugarcane, Chillies,	Deep black clayey
Middle Gujarat	Semi-arid	Panchmahals, Baroda and Anand, Balasinor, Borsad, Kapadvanj, Kheda, Matar, Ahmedabad, Nadiad, Petlad and Thasara and taluks of Kheda.	800-1000	Rice, Wheat, Gram, Perlmillets, Sorghum, Maize, Kodra, Ragi, Pigeonpea, groundnut, Sesamum, Castor, Cotton, Sugarcane, Potato, Rapeseed & Mustard.	Deep black, medium black to loamy sand
North Gujarat	Arid to semi-arid	Sabarkantha, Dehgam, Gandhinagar, Daskroi, Sanand talukas of Ahmedabad, Deesa, Dhenera, Palanpur, Dandta, Wadgam taluks of Banaskantha and Chanasma, Kadi, Kalol, Kheralu, Mehsana, Patan, Sidhpur, Visnagar, Vijapur and Mehsana.	625-875	Rice, Wheat, Gram, Perlmillets, Sorghum, Maize, groundnut, Sesamum, Castor, Cotton, Sugarcane, Cumin, Rapeseed & Mustard.	Sandy loam to sandy
Bhal & Coastal Area	Dry sub-humid	Bhavnagar (Vallabhipur, Bhavnagar talukas), Ahmedabad (Dholka, Dhanduka talukas), and Vagra, Jambusa-Bharuch.	625-1000	Rice, Pearl millets.	Medium black, poorly drained and saline
South Saurashtra	Dry sub-humid	Junagadh, Ghodha, Talaja, Mahava taloukas of Bhavnagar Kodinar, Rajula and Jafrabad talukas of Amerli and Dhoraji, Jetpur, Upleta-Rajkot.	625-750	Rice, Maize, Sugarcane Wheat, Gram Pearl millets , Sorghum, Groundnut, Seasamum,Cotton, Pulses, rapeseed & mustard	Shallow medium black calcareous
North Saurashtra	Dry sub-humid	Jamnagar, Rajkot, Chotila, Limdi, Lakhtar, Muli, Sayla, Wadhwan talukas of Surendranagar and Gadheda, Umrala, Botad, Kundla, Dihor, Garidhar, Palitana talukas of Bhavnagar and Amreli, Babra, Lathi, Lalia, Kunkavav, Khamba, Dhari taluks of Amreli.	400-700	Pearl millets, Sorghum, Groundnut, Seasamum, Castor, Cotton, Pulses.	Shallow medium black
North West Zone	Arid to semi-arid	Kutch, Rajkot, Malia Halvad, Dhrangdhra, Dasada-Surendranagar, Sami and Harij taluks of Mahsana, Santhalpur, Radhanpur, Kankrej, Deodar, Vav, Tharad taluks of Banaskantha and Viramgam-Ahmedabad.	250	Rice, Wheat, Gram, Perlmillets, Sorghum, Maize, Pigeon pea, groundnut, Sesamum, Castor, Cotton, Rapeseed & Mustard, barley.	Sandy and saline

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Govt. of Gujarat, Gandhinagar

2.3 Districtwide Fertility Status

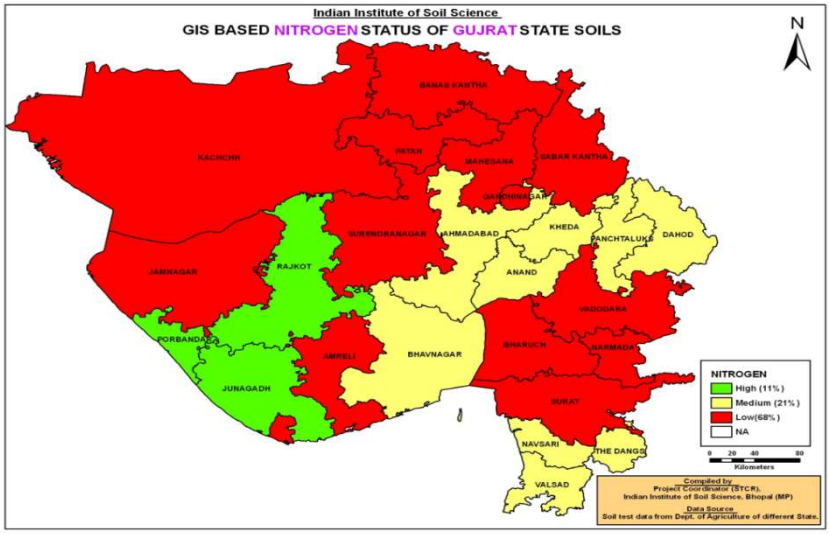
The district wise soil fertility status in Gujarat has been presented in Table 2.2 (also see Maps 2.2 to 2.4). About 15 districts out of 26 districts in the state were found to have low soil fertility in terms of nitrogenous fertilisers. Only three districts (Rajkot, Porbandar and Junagadh) were having high nitrogen status. The phosphorous status was found to be low in 11 districts and medium in the rest of the districts. The potassium status was found be very high in the state. It was found to be high in about 22 districts. The medium status of potassium was found in only 4 districts. No districts in the state recorded low fertility status in terms of potassium.

Table 2.2: District wise Fertility Status in Gujarat

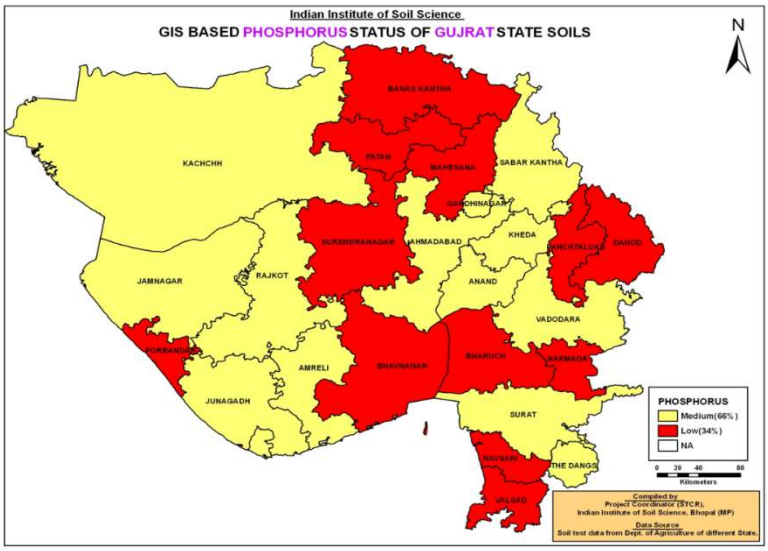
Sr. No.	Name of the districts	Nutrient Status		
		N	P	K
1	Ahmedabad	M	M	H
2	Amreli	L	M	H
3	Anand	M	M	H
4	Banaskantha	L	L	M
5	Bharuch	L	L	H
6	Bhavnagar	M	L	H
7	Dahod	M	L	H
8	Dang	M	M	H
9	Gandhinagar	L	M	H
10	Jamnagar	L	M	H
11	Junagadh	H	M	H
12	Kheda	M	M	H
13	Kutch	L	M	M
14	Mahsana	L	L	H
15	Narmada	L	L	H
16	Navsari	M	L	H
17	Panchmahal	M	L	H
18	Patan	L	L	H
19	Porbandar	H	L	H
20	Rajkot	H	M	H
21	Sabarkantha	L	M	M
22	Surat	L	M	H
23	Surendranagar	L	L	H
24	Vadodara	L	M	M
25	Valsad	M	L	H

Note: 'M' denotes Medium, 'H' denotes High and 'L' denotes Low level of nutrients
Source: http://www.iiss.nic.in/showmapD.asp?state=Gujarat&level=District

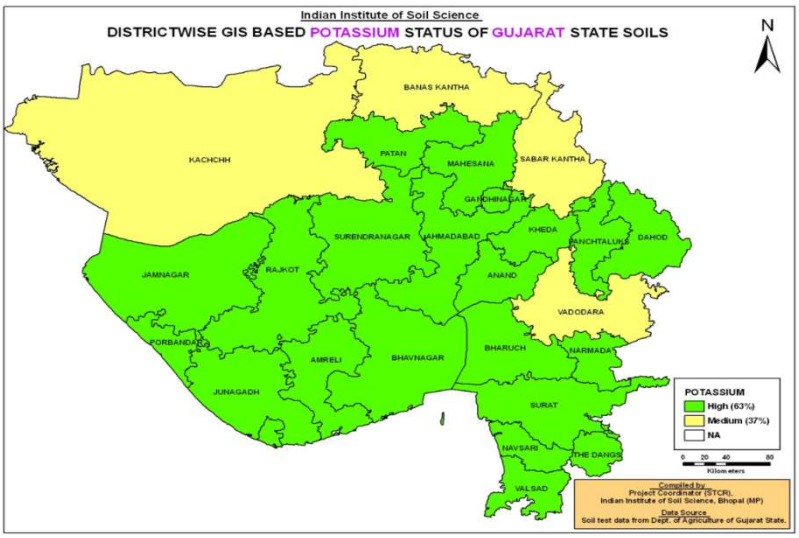
Map 2.2: Nitrogen Status of Soils in Gujarat



Map 2.3: Phosphorous Status of Soils in Gujarat



Map 2.4: Potassium Status of Soils in Gujarat



2.4 Fertilizers Consumption in Gujarat

Gujarat has seen intensification in agricultural practices during the last two decades with increase in the consumption of chemical fertilisers (see, Fig. 2.1 and 2.2, Table 2.3). Total fertiliser consumption in Gujarat has increased from 17.2 thousand tonnes in TE 1962-63 to 538.5 thousand tonnes in TE 12002-03 and then to 1681.5 thousand tonnes in TE 2018-19. Gujarat has reported the per hectare consumption of fertilizer (133.7 kg/ha) close to national average of 134.18 kg/ha in TE 2018-19, which was the highest in across the states in Western Zone of India.

Table 2.3: Growth in Fertiliser Consumption in Gujarat

Period	Fertiliser Consumption (In 000' tonnes)				Per ha Consumption (Kg/Ha)			
	N	P2O5	K2O	Total	N	P2O5	K2O	Total
TE 1962-63	11.2	5.5	0.4	17.2	1.1	0.6	0.0	1.7
TE 1972-73	111.2	56.0	8.2	175.4	10.6	5.4	0.8	16.8
TE 1982-83	228.6	115.9	25.2	369.7	21.0	10.6	2.3	34.0
TE 1992-93	461.2	205.1	52.5	718.7	43.2	19.2	4.9	67.3
TE 2002-03	538.5	214.3	65.7	818.4	50.6	20.1	6.2	76.9
TE 2012-13	1144.1	397.6	129.7	1671.4	90.1	31.3	10.2	131.6
TE 2018-19	1189.2	367.1	125.2	1681.5	94.5	29.2	10.0	133.7

Source: FAI, 2020.

During the period from 1960-61 to 2018-19, total fertiliser consumption in Gujarat has increased at the rate of 7.32 per cent per annum. Among the nutrients, rate of growth was highest in case of K (8.4 per cent p.a.) followed by use of N (7.3 per cent p.a.) and P (6.7 per cent p.a.). Increase in consumption of fertiliser has also increased the intensity of fertiliser use over the period of time. The per hectare use of total fertiliser has increased from 1.7 kg/ha in TE 1962-63 to 76.9 kg/ha in TE 2002-03 and 133.7 kg/ha in TE 2018-19 (Fig. 2.3).

Fig. 2.1: Trends in Consumption of Total Fertilizers in Gujarat

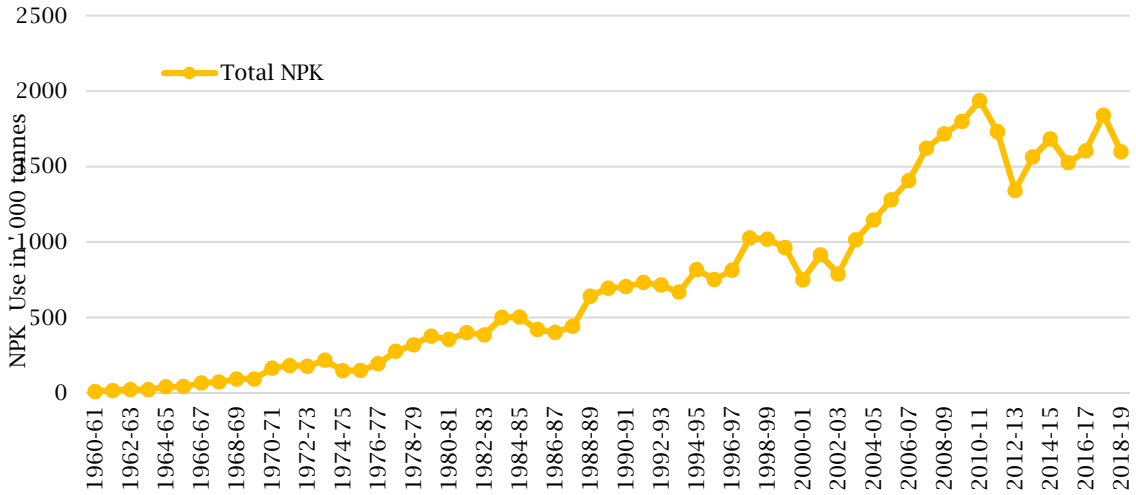


Fig. 2.2: Trends in Consumption of NPK Fertilizers in Gujarat

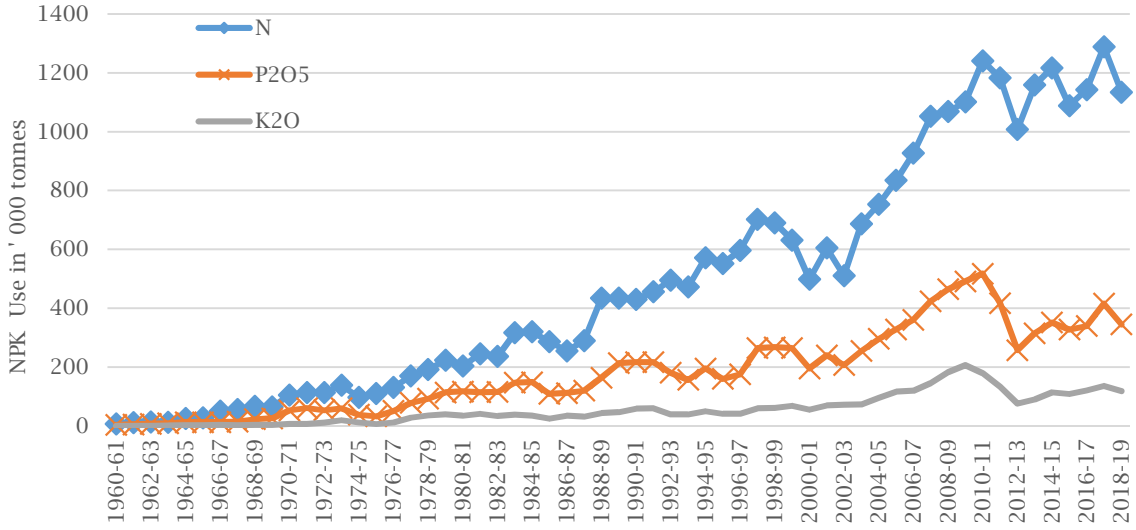
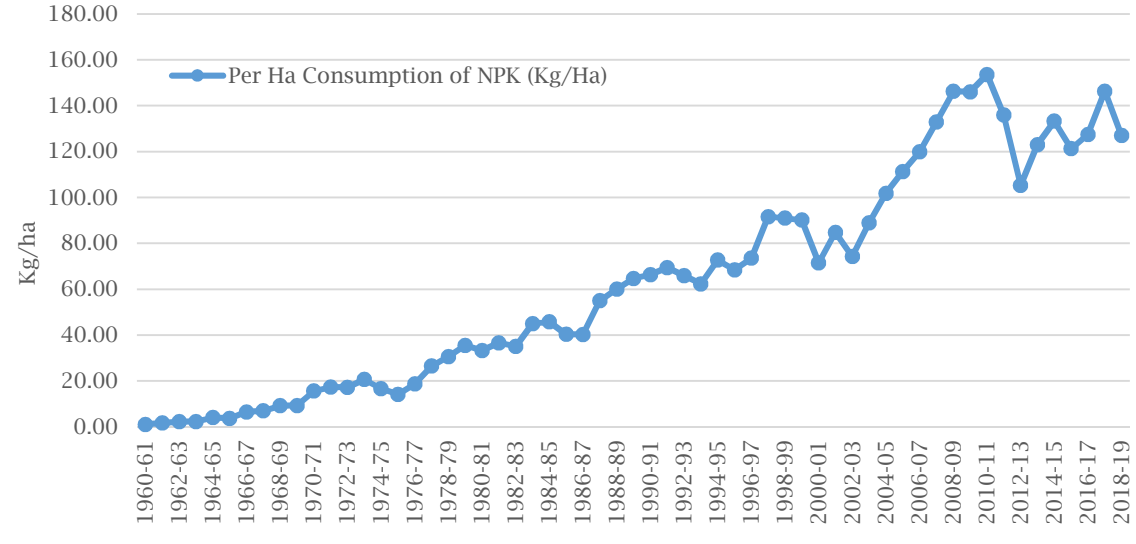


Fig. 2.3: Trends in Per Hectare Consumption of Fertilizers in Gujarat



The consumption ratio of N& P to K was estimated to be very wrost during TE 1962-63 (25.9:12.7:1), which has lower done and balanced as 13.6:6.9:1 in TE 1972-73 and got closer to stiplauted one(4:2:1) in TE 1982-83, i.e 6.2:3.1:1. While then after again, ratio of fertliers nutrients have got in favor of N since then till date and estimated as 9.5:2.9:1 in TE 2019-20 (Table 2.4 and Figure 2.4)..

Table 2.4: Consumption Ratio of N & P to K in Gujarat

Period	Ratio of N& P to K		
	N	P2O5	K2O
TE 1962-63	25.9	12.7	1
TE 1972-73	13.6	6.9	1
TE 1982-83	6.2	3.1	1
TE 1992-93	8.8	3.9	1
TE 2002-03	8.2	3.3	1
TE 2012-13	8.8	3.1	1
TE 2018-19	9.5	2.9	1

Source: FAI, 2020.

Fig. 2.4: Fertiliser Consmption Ratio of N & P2O5 to K2O in Gujarat

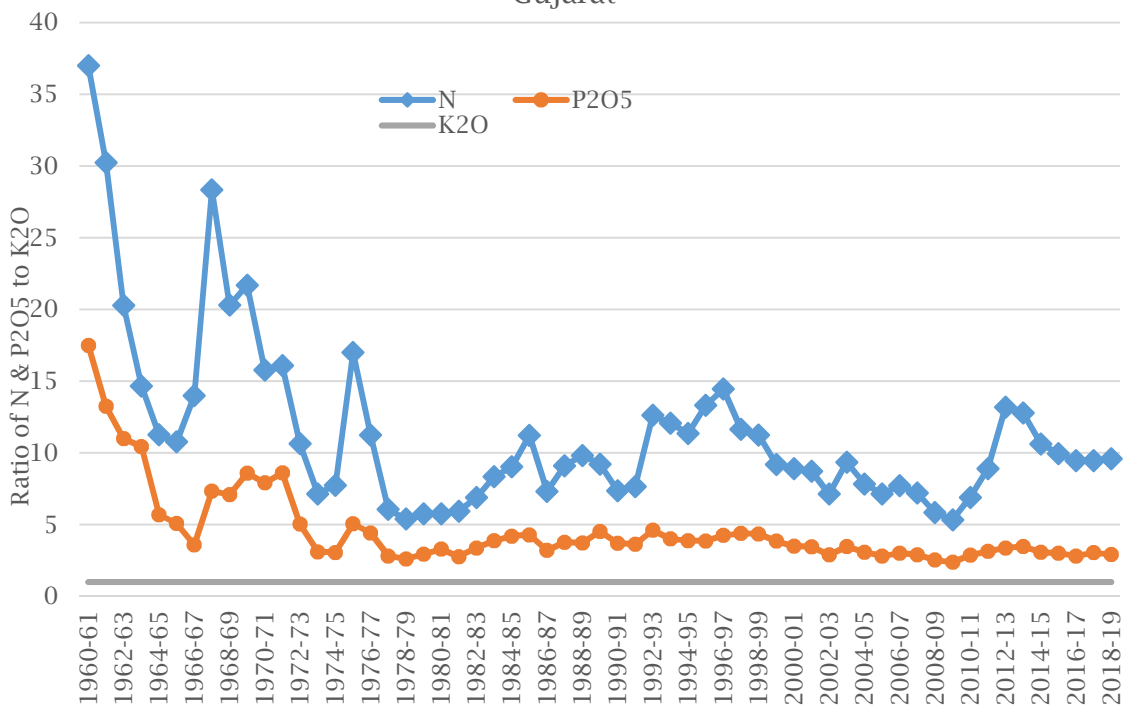


Table 2.5: District-wise Season-wise Fertilizers Consumption in Gujarat

District	Kharif				Rabi				Total			
	N	P_2O_5	K_2O	Total	N	P_2O_5	K_2O	Total	N	P_2O_5	K_2O	Total
Ahmedabad	21.7	5.1	0.3	27.1	34.5	7.4	1.6	43.5	56.2	12.5	1.9	70.6
Amreli	29.5	14.8	2.2	46.5	7.6	4.4	0.6	12.6	37.1	19.2	2.8	59.1
Anand	23.3	3.6	1.8	28.7	35.7	3.4	2.7	41.8	59.0	6.9	4.5	70.5
Arvalli	13.0	4.1	3.0	20.0	15.7	3.9	3.1	22.7	28.7	7.9	6.1	42.7
Banaskantha	48.5	13.8	3.3	65.5	67.6	19.6	9.1	96.3	116.1	33.4	12.3	161.8
Bharuch	17.1	3.2	2.6	22.9	11.5	2.6	2.5	16.6	28.6	5.8	5.1	39.5
Bhavnagar	27.7	14.2	2.5	44.5	10.9	4.1	1.4	16.5	38.7	18.4	3.9	61.0
Botad	11.7	6.9	0.9	19.5	4.3	2.1	0.2	6.6	16.0	9.0	1.1	26.1
Chhota Udepur	18.8	3.6	1.8	24.2	13.1	1.9	1.4	16.3	31.8	5.5	3.2	40.5
Dahod	13.7	1.2	0.0	15.0	11.0	1.8	0.1	12.9	24.8	3.0	0.1	27.9
Devbhoomi Dwarka	4.3	4.2	0.7	9.2	1.6	1.0	0.2	2.8	5.9	5.1	0.8	11.9
Gandhinagar	12.2	3.6	2.0	17.9	15.2	3.3	1.7	20.2	27.5	6.9	3.7	38.1
Gir Somnath	7.4	3.2	1.2	11.8	10.9	2.9	0.9	14.6	18.3	6.0	2.0	26.4
Jamnagar	17.2	11.0	1.8	30.1	5.1	3.3	0.5	8.9	22.3	14.3	2.3	38.9
Junagadh	14.0	10.3	2.3	26.5	14.2	7.7	1.3	23.3	28.2	18.0	3.6	49.8
Kheda	27.3	3.5	1.2	32.0	34.5	3.8	1.5	39.7	61.7	7.3	2.7	71.7
Kutch	18.4	6.8	0.9	26.1	27.9	9.1	0.6	37.6	46.3	15.8	1.6	63.7
Mahisagar	12.3	1.2	0.2	13.7	11.9	1.0	0.4	13.2	24.2	2.1	0.6	26.9
Mehsana	13.1	3.5	1.0	17.5	31.2	5.6	1.5	38.3	44.3	9.1	2.5	55.9
Morbi	18.2	7.6	1.6	27.4	15.9	6.4	0.9	23.1	34.1	13.9	2.5	50.5
Narmada	10.0	0.1	1.2	11.4	3.9	0.6	1.2	5.7	13.9	0.8	2.4	17.1
Navsari	11.7	3.6	2.9	18.1	8.0	2.4	2.2	12.5	19.7	5.9	5.0	30.6
Panchmahal	17.3	1.9	0.3	19.6	14.9	1.3	0.3	16.4	32.2	3.2	0.6	36.0
Patan	6.6	1.7	0.2	8.5	22.7	5.4	0.4	28.4	29.2	7.1	0.5	36.9
Porbandar	2.6	2.0	0.3	4.8	2.0	0.9	0.1	3.0	4.6	2.9	0.4	7.8
Rajkot	38.6	21.7	5.9	66.1	17.6	8.5	2.5	28.6	56.2	30.2	8.4	94.7
Sabarkantha	17.3	6.9	3.4	27.6	25.4	6.9	4.4	36.6	42.7	13.7	7.7	64.2
Surat	30.3	9.2	9.7	49.2	23.9	10.5	9.0	43.4	54.2	19.7	18.7	92.6
Surendranagar	28.5	12.8	1.0	42.3	27.3	12.0	1.2	40.5	55.9	24.7	2.2	82.8
Tapi	13.0	2.3	1.9	17.2	6.1	1.8	1.2	9.1	19.1	4.1	3.1	26.3
The Dang	0.8	0.1	0.0	0.9	0.1	0.0	0.0	0.1	0.8	0.1	0.1	1.0
Vadodara	19.7	4.3	1.8	25.8	26.2	3.1	2.0	31.3	45.9	7.4	3.7	57.1
Valsad	7.4	2.9	1.5	11.8	3.2	1.1	1.0	5.2	10.6	3.9	2.5	17.0
Gujarat	573.3	194.6	61.4	829.4	561.6	149.5	57.0	768.1	1135.0	344.1	118.4	1597.4

Across the districts, the highest quantity of fertiliser use is reported in Banaskantha district followed by Rajkot, Surat, Surendranagar, Kheda, Ahmedabad, Anand, Sabarkantha, Kutch and Bhavnagar. These top ten selected districts together accounted for 52 per cent of total fertiliser

consumption in the State during 2018-19 (Table 2.3). Out to total fertiliser use across the districts of Gujarat, 52 per cent was used in Kharif season and rest was used in Rabi season (Table 2.5). Most of the districts in Saurashtra region (viz. Amreli, Bhavnagar, Botad, Devbhoomi Dwarka, Jamnagar) and tribal district of Dang have reported around three fourth of total fertiliser use in kharif season. While use of fertiliser was higher in Rabi season than kharif season in the districts of Ahmedabad, Anand, Vadodara, Mehsana, Banaskantha and Sabarkantha. The consumption of N&P ratio to K use was estimated to be the highest and extra orbitant towards N in Dahod district (317.7:38.8:1), followed by Patan (55.4:13.5:1) and the lowest was in Surat (2.9:1.1:1) (Table 2.6). Except Surat and Vasari districts, all other district has higher use of N as compared to stipulated one (4:2:1). While out of total 33, 19 districts have higher use of N as compared to State average (9.6:2.9:1).

Fig. 2.5: Districtwise Fertiliser Consumption Ratio- N&P to K in Gujarat 2018-19

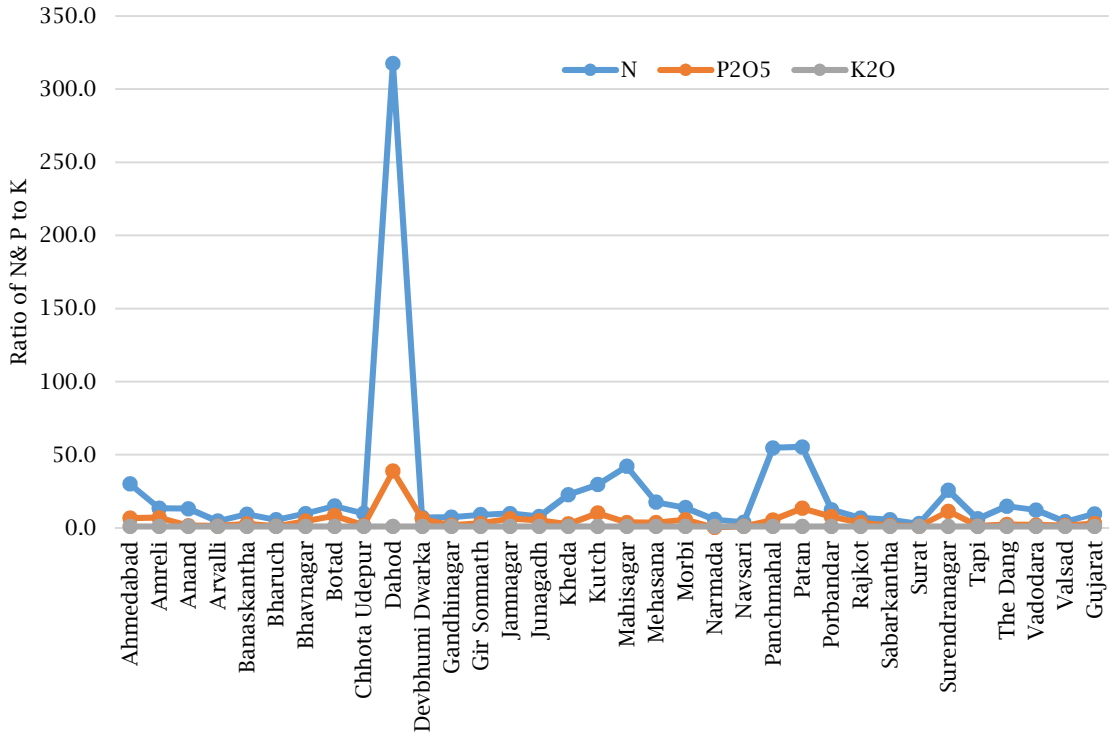
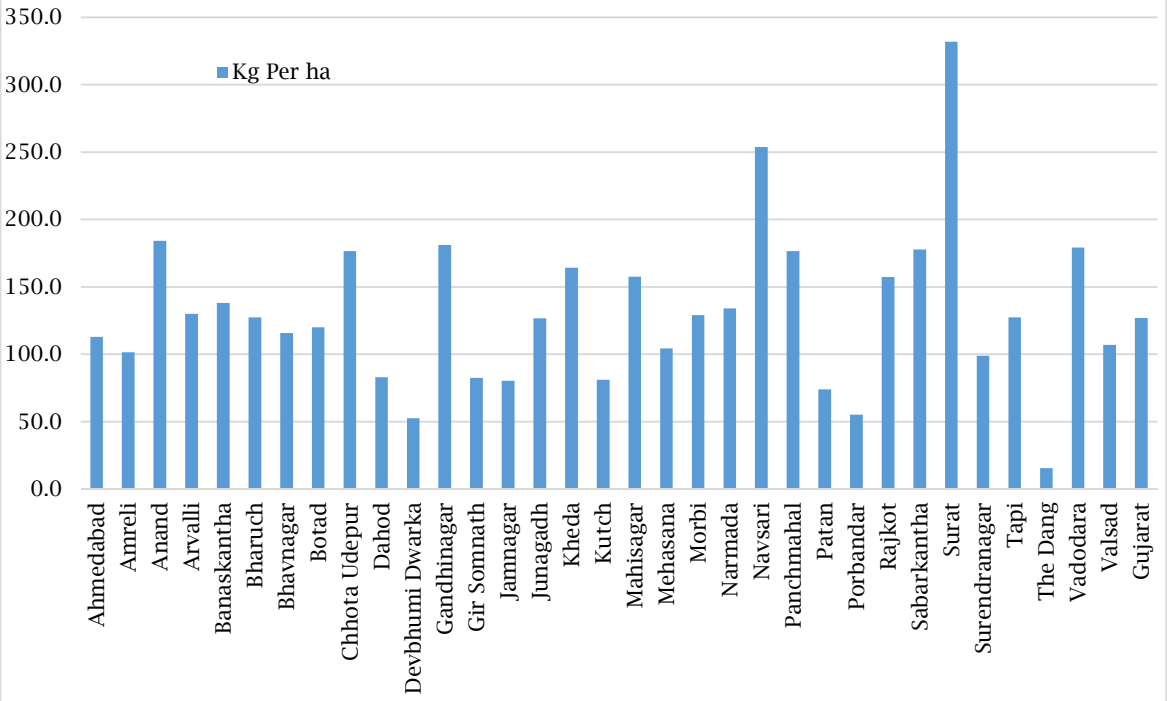


Table 2.6: District-wise Season-wise Share and Ratio of N& P to K in Gujarat

District	Ratio-kharif and Rabi		N & P ratio to K		
	K	R	N	P	K
Ahmedabad	38.4	61.6	30.1	6.7	1
Amreli	78.7	21.3	13.5	7	1
Anand	40.7	59.3	13.1	1.5	1
Arvalli	46.9	53.1	4.7	1.3	1
Banaskantha	40.5	59.5	9.4	2.7	1
Bharuch	58	42	5.6	1.1	1
Bhavnagar	72.9	27.1	9.8	4.7	1
Botad	74.9	25.1	15	8.5	1
Chhota Udepur	59.8	40.2	9.9	1.7	1
Dahod	53.7	46.3	317.7	38.8	1
Devbhoomi Dwarka	76.9	23.1	7.1	6.2	1
Gandhinagar	47	53	7.4	1.8	1
Gir Somnath	44.7	55.3	9.1	3	1
Jamnagar	77.3	22.7	9.8	6.3	1
Junagadh	53.3	46.7	7.8	5	1
Kheda	44.7	55.3	22.8	2.7	1
Kutch	41	59	29.7	10.2	1
Mahisagar	50.8	49.2	42.1	3.7	1
Mehsana	31.4	68.6	17.6	3.6	1
Morbi	54.2	45.8	13.8	5.7	1
Narmada	66.8	33.2	5.8	0.3	1
Navsari	59.1	40.9	3.9	1.2	1
Panchmahal	54.5	45.5	54.7	5.4	1
Patan	23	77	55.4	13.5	1
Porbandar	62	38	12.5	7.8	1
Rajkot	69.8	30.2	6.7	3.6	1
Sabarkantha	43.	57.0	5.5	1.8	1
Surat	53.1	46.9	2.9	1.1	1
Surendranagar	51.1	48.9	25.7	11.4	1
Tapi	65.4	34.6	6.2	1.3	1
The Dang	87.4	12.6	14.9	2.2	1
Vadodara	45.2	54.8	12.3	2	1
Valsad	69.2	30.8	4.3	1.6	1
Gujarat	**51.9**	**48.1**	9.6	2.9	1

The intensity of use of fertiliser across districts of Gujarat was found the highest in Surat district (332 kg/ha) and the lowest was in Dang district (16 kg/ha). Other top fertiliser user districts having higher use of fertiliser that State average were Navsari, Anand, Gandhinagar, Vadodara, Sabarkantha, Chhota Udepur, Panchmahal, Kheda, Mahisagar, Rajkot, Banaskantha, Narmada, Arvalli, Morbi, Tapi and Bharuch (Fig. 2.6).

Fig. 2.6: Districtwise Per Ha use of Fertiliser in Gujarat



2.5 Chapter Summary

This chapter presented the details on trends in fertilisers use in Gujarat. The total fertiliser consumption in Gujarat has increased from 17.2 thousand tonnes in TE 1962-63 to 1681.5 thousand tonnes in TE 2018-19. Gujarat has reported the per hectare consumption of fertilizer (133.7 kg/ha) close to national average of 134.18 kg/ha in TE 2018-19, which was the highest in across the states in Western Zone of India. The consumption ratio of N& P to K has got in favor of N and estimated as 9.5:2.9:1 in TE 2019-20. Across the districts, the highest quantity of fertiliser use is reported in Banaskantha district followed by Rajkot, Surat, Surendranagar, Kheda, Ahmedabad, Anand, Sabarkantha, Kutch and Bhavnagar. Out to total fertiliser use across the districts of Gujarat, 52 per cent was used in Kharif season and rest was used in Rabi season. The intensity of use of fertiliser across districts of Gujarat was found the highest in Surat district (332 kg/ha) and the lowest was in Dang district (16 kg/ha).

The next chapter presents details on functioning of DBT in fertiliser at retailer's end.

Chapter III

Functioning of DBT in Fertiliser at Retailers' End

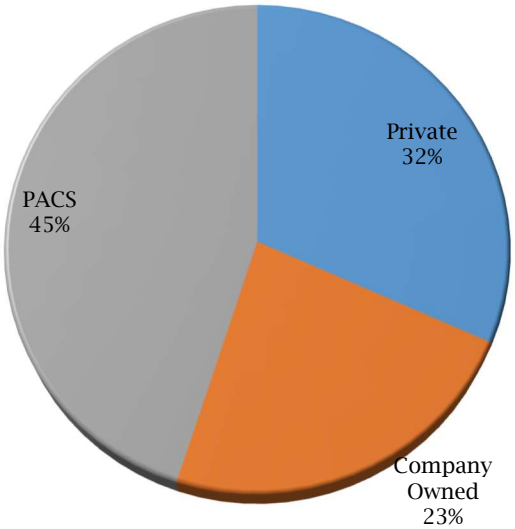
3.1 Introduction

This chapter presents the information on functioning of DBT in fertilizer at retailer's end having focus on profile of retailers, categorization of retailers', characteristics of PoS machine and the detailed issues in PoS machine faced by retailers are conferred. The comparison of PoS generated stocks, with the stocks as recorded in the manual records of the retailers also discussed. The comparison of PoS based sales, with the receipts issued/ invoices/bills in physical books, trainings attended by retailers on application of PoS has been presented and discussed.

3.2 Retailers' Profile

As mentioned in the introductory chapter, total 60 retailers were selected and data were collected through personal interview method. Out of the selected retailers, 31.6 per cent were private retailers, 23.3 per cent were company owned depot/retailers and remaining 45 per cent were cooperatives-PACS (Fig. 3.1). Besides sale of fertilisers, cooperatives were involved in additional activities, such as farm produce sale, agriculture input procurement, agriculture credit, and other banking services.

Fig. 3.1: Retailer's Profile (n=60)



The details on use of Point of Sale (POS) machine are presented in Table 3.1. It can be seen from the table that all retailers have the PoS Machine for entry of purchase and sell of the fertilizers at their outlets. Majority of the retailers (98.3 per cent) have the 'Oasis company' machine for the purchase sale entry operation while very few have Analogic company machine. All the retailers had gone through the training about the operation of the PoS machine. Though all the retailers have undergone training on use of POS, but in most of the cases, retailers are not technically very well versed about the PoS Operated sale in Fertilizers management. Either they are too old or very less technologically sound in most of the cases of cooperative society secretary or others. In majority of the cases, retailer along with his helper had participated in training of PoS machine (as in some cases, more than one training was attended from each retail shop). Around 95 per cent of total retailers had started raising invoices w.e.f February, 2018. All the retailers have emphasized on the Aadhaar based authentication via PoS machines.

Table 3.1. Detail of Retailers

Sr No	Particulars	Unit	Private (n=19)		Company Owned (n=14)		PACS (n=27)		Total (n=60)	
			N	%	N	%	N	%	N	%
a	Having POS machine-Y	%	19	100	14	100	27	100	60	100
b	Company of machine									
	Vision Tech	%	0	0	0	0	0	0	0	0
	Analogic	%	0	0	0	0	1	3.7	1	1.7
	Oasis	%	19	100	14	100	26	96.3	59	98.3
c	Training for using POS		19	100	14	100	27	100	60	100
d	Underwent training									
	Yourself	%	7	36.8	6	42.9	14	51.9	27	45.0
	Yourself, Family member	%	2	10.5	0	0.0	1	3.7	3	5.0
	Yourself, Family member, Helper	%	1	5.3	0	0.0	0	0.0	1	1.7
	Yourself, Helper	%	9	47.4	8	57.1	12	44.44	29	48.3
e	Started invoices in POS									
	February, 2018	%	18	94.7	14	100	25	92.6	57	95.0
	March, 2018	%	1	5.3	0	0	1	3.7	2	3.3
	August, 2018	%	0	0.0	0	0	1	3.7	1	1.7
f	The Authentication Sources at the POS									
	Aadhaar	%	19	100	14	100	27	100	60	100

3.3 Issues in POS and Its Redressal

To ascertain the functioning of PoS machines and to find out problems faced by retailers and possible solutions to be provided, desired

information was collected and presented in Table 3.2. It can be seen from the table that all the retailers have faced problems in handling the PoS machine. Around 90 per cent of total retailers had faced some issues in PoS machine related to software and authentication issues, while one third of total retailers have faced hardware issues and around 38 per cent retailers have faced stock issues. Network problem was the another biggest issue faced by almost 82 per cent retailers at the aggregate. Among the software issues, 98.1 per cent retailers have faced the problem of frequent logout/Session expired/took more time for up-dation issues in new version while rest of them had experienced non-acceptance of finger print of retailer as well as of farmer. In case of hardware issues, about two third of retailers have faced issues related print issue/non-availability of print roll/print ink fade away while rest have faced problem of early drain-out of battery /more time for charging/Screen not display properly. All the retailers have reported problem related to figure print authentication while 52 per cent of retailers have reported problem of authentication of farmer's thumb. Retailers have also faced the issues related to the slowdown of server, late receiving of dispatch ID acknowledgement, slow processing of updating PoS new version, updating the present stock, Aadhaar authentication, and small screen size on the PoS.

In the context of the stock related issues, it arises during the peak season period when there was heavy rush of farmers for fertilizer purchase and thus it was difficult to match the stock at that time. Besides, farmers had demanded fertilizers on the credit basis for which no credit bill can be generated and thus matching the stock was very difficult. One of the pertinent problem reported by retailers was that after receiving the stock from the fertilizer company, they need to update the stock in the stock invoice to generate online receipt records. However, updating of stock is not possible until the company stock number is entered into the PoS. But, fertilizer companies have not been updating the Demand Draft number for the stock provided and thus it was always difficult for the retailer to sell the same stock through PoS until that entry was made.

This was one of the biggest issues faced by retailers for not updating PoS at the time of current fertilizer sale.

Table 3.2. Detail of Issues in POS & their redressal

Sr. No	Particulars	Private		Company Owned		PACS		Total	
		N	%	N	%	N	%	N	%
1	**Issues in using POS- YES**	19	100	14	100	27	100	60	100
a	**Software Issues**	17		12		25		54	
	Finger print does not accepted for retailer as well farmers	1	5.9	0	0	0	0	1	1.9
	Frequently logout/Session expired/took more time for updation issues in new version	16	94.1	12	100	25	100	53	98.1
b	**Hardware Issues**	6		5		9		20	
	Battery drained early/to charge it take more time/Screen not display proper	2	33.33	2	40	3	33.33	7	35
	print issue, print roll was not easily available, print ink fade away	4	66.67	3	60	6	66.67	13	65
c	**Authentication Issues**	18		11		25		54	
	Authentication of farmers thumb (Muddy/disappeared fate line), Farmers scared to present the Aadhaar in front of and Authentication of retailers	9	50	5	45.45	14	56	28	51.85
	fingerprint authentication does not identified, take more times	9	50	6	54.55	11	44	26	100
d	**Stock Issues**	11		3		9		23	
	During the peak season difficult to match stock	3	27.27	1	33.33	2	22.22	6	26.09
	Figure entered but not showing in PoS	4	36.36	1	33.33	1	11.11	6	26.09
	Farmers purchase fertilizers on credit basis, that is why bill were pending	4	36.36	1	33.33	6	66.67	11	47.83
e	**Network Issues**	15		12		22		49	
	Poor network connectivity/ server down	15	100.0	12	100.0	22	100.0	49	100.0
2	**Redressal of Issue**								
	Report POS issues to								
	Fertilizer company representatives	2	10.5	1	7.1	4	14.8	7	11.7
	State DBT coordinator	7	36.8	4	28.6	12	44.4	23	38.3
	Department officials, Fertilizer company representatives	3	15.8	2	14.3	2	7.4	7	11.7
	Department officials, Fertilizer company representatives, POS company representatives	2	10.5	3	21.4	6	22.2	11	18.3
	Department officials, Fertilizer company representatives, POS company representatives, State DBT coordinator		0.0	1	7.1		0.0	1	1.7
	Fertilizer company representatives, POS company representatives	4	21.1	2	14.3	3	11.1	9	15.0
	Fertilizer company representatives, State DBT coordinator	1	5.3	1	7.1		0.0	2	3.3
3	**Frequency these issues are addressed**								
	Immediately	15	78.9	12	85.7	23	85.2	50	83.3
	Within a week	3	15.8	1	7.1	4	14.8	8	13.3
	Within a fortnight	0	0.0	1	7.1	0	0.0	1	1.7
	Within a month	0	0.0	0	0.0	0	0.0	0	0.0
	long period in months	1	5.3	0	0.0	0	0.0	1	1.7
4	**Rating the services offered by the POS staff**								
	Good	15	78.9	11	78.6	22	81.5	48	80.0
	Satisfactory	3	15.8	3	21.4	5	18.5	11	18.3
	Dissatisfactory	1	5.3	0	0.0	0	0.0	1	1.7

The issues faced by the retailers were reported to State DBT coordinator, fertilizer company representatives and department officials. All the issues were raised by the retailers were rectified by the Fertilizer company representatives and POS company representatives. Majority of the retailers have reported that issues were addressed immediately and services offered by the POS staff was reported satisfactory.

3.4 Stock Maintenance

Table 3.3 presents the issues related to stock updation and maintenance in PoS machine. Majority of retailers have used multiple sources of stock records wherein manual book keeping and computer system /PoS for record keeping of fertilizers are major one. While few of them had computer operated management system in Talley or such softwares. The management of stock and sale information through multiple system of book keeping/computer operated systems/POS by retailers have increased their workload enormously. Many retailers have been maintaining two systems (the first was a PoS to record sale transactions and the second was system generated as well as /or manual record). Retailers have reported that increase in workload consumed their productive time and they felt burden of record keeping. The receipts generated through the PoS devices get fade away very early and thus it was very difficult to maintain record for long time. Retailers have suggested that the government should link the PoS application with the tally/any such system software at their end. More than half of the retailers have reported that updation of the stock was delayed by more than a day. Most of the retailers faced issues of stock mismatched of the PoS and physical stock received which had happened because of the gaps in the back-end stock updation process. Even though the physical stock reached to the retail point but same was not reflected in their PoS machine. Retailers could not sell the stock unless it was updated in the PoS. Thus, as per practice adopted, retailer sold their old stock manually and after that same was adjusted in the new stock. Retailers have reported that due

to slower internet network connectivity at village level, they couldn't perform updation of PoS on daily basis.

Table 3.3 Details related to Stock Maintenance

SN	Particulars	Private		Company Owned		PACS		Total	
		N	%	N	%	N	%	N	%
a	Maintain physical stock records	19	100	14	100	27	100	60	100
b	**Sources of stock records**								
	Manual book	1	5.3	0	0.0	0	0.0	1	1.7
	Manual book, System (Tally / computer), POS	10	52.6	12	85.7	11	40.7	33	55.0
	Manual book, POS	8	42.1	2	14.3	16	59.3	26	43.3
c	**Frequency of records up-dation**								
	Daily	8	42.1	9	64.3	13	48.1	30	50.0
	Twice a week	8	42.1	3	21.4	7	25.9	18	30.0
	Weekly	1	5.3	2	14.3	3	11.1	6	10.0
	Once in fortnight	1	5.3	0	0.0	1	3.7	2	3.3
	Monthly	1	5.3	0	0.0	3	11.1	4	6.7
d	Stock in POS match with the Physical stock at any point of time	9	47.4	10	71.4	11	40.7	30	50.0
Reasons for mismatch in the POS stock vis-à-vis Physical stock									
i	Farmer did not bring Aadhaar card always	9	23.08	4	33.33	16	26.67	29	26.13
ii	Gumastadhara license is basically a legal obligation governed by Municipality, and as per the rules they cannot open the shop on Sunday, but the retailers can open the shop, sale the fertilizers, but making the bills on the next day or Monday, that's why some time stock was not matched	1	2.56	0	0.00	0	0.00	1	0.90
iii	Authentication were not proper due to muddy hand/fade away	12	30.77	3	25.00	17	28.33	32	28.83
iv	Low network availability	1	2.56	0	0.00	1	1.67	2	1.80
v	Heavy rush of farmers during the seasons/Hurriedness of the farmers/Time consuming	15	38.46	5	41.67	24	40.00	44	39.64
vi	DD number received delayed	0	0.00	0	0.00	2	3.33	2	1.80
vii	Farmers demand on credit basis, so bill not prepared at the time of sell	1	2.56	0	0.00	0	0.00	1	0.90

The major three reasons reported by the retailers for the mismatch for the POS stock with physical stock were heavy rush of farmers during the seasons/hurriedness of the farmers/it is time consuming process (by 40 per cent of retailers), followed by authentication were not proper due to muddy hand (by 29 per cent of retailers) and farmer did not bring Aadhaar card always (by 26 per cent retailers).

Table 3.4. Details of Sale of fertilizers

Sr No	Particulars	Private		Company Owned		PACS		Total	
		N	%	N	%	N	%	N	%
a	Source of receive fertilizers	19		14		27		60	
	Wholesalers	7	36.8	0	0.0	5	18.5	12	20.0
	Directly from the Companies	4	21.1	12	85.7	15	55.6	31	51.7
	Both	8	42.1	2	14.3	7	25.9	17	28.3
b	**Frequency of raising invoices in POS**								
	Daily	9	47.4	9	64.3	17	63.0	35	58.3
	Once in a week	10	52.6	5	35.7	10	37.0	25	41.7
c	**Reasons for not raising all invoices in POS daily or as and when sale occurs**								
i	Farmer did not bring Aadhar card always	7	20.59	3	16.67	6	18.75	16	19.05
ii	Network problem	2	5.88	3	16.67	1	3.13	6	7.14
iii	Printing issues	2	5.88	2	11.11	4	12.50	8	9.52
iv	Time consuming	11	32.35	5	27.78	8	25.00	24	28.57
v	Authentication issues	12	35.29	5	27.78	12	37.50	29	34.52
vi	Lack of Technical knowledge	0	0.00	0	0.00	1	3.13	1	1.19

The sale of fertilizers and sources of fertilizers for retailers are given in Table 3.4. It can be seen from this table that more than half of the retailers had purchased fertilizers directly from fertiliser company followed by one fifth of total retailers had purchased from Wholesale, while more than 28 per cent of retailers had purchased fertiliser from both the sources, i.e wholesalers as well as Companies. More than half of the retailers have reported the raising of invoices in POS on the daily

basis. While rest of them had generated invoices in PoS once in a week basis due to various reasons such as difficulty in authentication of purchases (34.52 per cent), followed by difficulty in multiple records keeping (28.57 per cent), farmers did not bring Aadhaar card at the time of purchasing fertilizers (19.1 per cent). The transaction receipts getting fade away within a month that is way there were not able to use that receipt after a month and therefore they had avoided raising invoices in POS. The retailers also reported that network problem was another hurdle along with technical problem. Besides, short battery life was also a major issue. The majority of retailers faced problem in managing transactions during peak agriculture season.

Table 3.5 explored the details of PoS machine, requirements of documents, issues related to linking of the Aadhaar card, implications of land holding and cropping pattern as well as administrative compliances declaration. None of the retailer had reported that PoS required too many documents for the selling of fertilizers as only Aadhaar card was required for the authentication. Almost two third of retailers have reported that problem of authentication by thumb impression (due to muddy hand & fate line disappeared due to heavy work done by hand on the farm) and linking of Aadhaar card at the time of sale was the major issue. While almost one third of the total retailers have reported that farmers did not keep Aadhaar card with them while purchasing the fertilisers. More than half of the total retailers have reported that they have checked details on land holding and cropping pattern status while selling fertilizer in large quantity to buyers. Almost half of the retailers agreed for the implications of obtaining the declaration from farmer regarding operational holding at the time of PoS.

Table 3.5. Detail of POS Machine

Sr. No.	Particulars	Private		Company Owned		PACS		Total	
		N	%	N	%	N	%	N	%
1	POS require too many documents and create hassles in selling fertilizer	0		0		0		0	
2	Issues in linking Aadhaar/ Voter Identity Cards with fertilizer sales to the farmers								
a	Authentication by thumb impression due to muddy hand & Fate line disappear due to heavy work done by hand on the farm	10	76.9	5	50.0	14	66.7	29	65.9
b	farmers are not keeping Aadhaar card with him, not possible to linking the system	3	23.1	4	40.0	7	33.3	14	31.8
c	Other person may purchase fertilizer on behalf of the farmers the bill was generated on the name of other person/auto rickshaw drivers, computer version is must be needed	0	0.0	1	10.0	0	0.0	1	2.3
3	Check land holding and cropping pattern status while selling fertilizer to large quantity buyers	9	64.3	11	78.6	12	44.4	32	53.3
4	Administrative/compliance implications of obtaining a declaration from farmer regarding operational holding at the time of PoS	9	64.3	10	71.4	10	37.0	29	48.3
5	**Suggestions for improvement in the POS device to create a better delivery of fertilizer subsidy**								
i	computer or desktop version should be preferred or adopted	5	35.71	4	36.36	8	44.44	17	39.53
ii	create awareness among the farmers	1	7.14	4	36.36	0	0.00	5	11.63
iii	acknowledgement receipt should be given timely,	1	7.14	0	0.00	0	0.00	1	2.33
iv	improve the infrastructure facilities in the village level,	4	28.57	2	18.18	9	50.00	15	34.88
v	service issues will be addressed properly/timely	3	21.43	1	9.09	1	5.56	5	11.63

3.4.1 POS Stock and Sale Records

In order to check the functioning of the PoS System, it was compulsory to check the PoS records printed through the print machine at the retailer's end and verify the same with the physical book records

maintained by retailers. Once the retailers obtain stock from fertilizer companies / wholesalers they are supposed to make entry in the PoS machine by each variant of fertilizer. Out team tried to further check the stock available in the godown of the retailer for each variant at the day/time of survey and cross verify with the PoS record of closing stock at that very point of time. In addition to stock verification, they also tried to verify the sales occurred during the time of survey. Unlike closing stock record which is available at the point of time of checking the record, sale is a flow variable which is linked to a time period. Through the PoS past records, we tried to print out daily sales by the retailer for the last one fortnight and then verify through the physical records maintained by the retailers either through stock and sales register or through computerized record. However, it was not possible to physically verify the sales for the fortnight from fertilizer godown.

Table 3.6.1 presents the details on stock reports as per PoS devices, physical stock and manual records at the time of visit to retailers. It was observed that in case of the all types of the retailers, mis-match between stock as per PoS and physical verification, as well as manual records was observed. There was a difference in closing stock as per PoS and physical verification as well as manual record maintained. In case of private retailers, the highest difference in closing stock as per PoS and physical verification was observed in case of entry of Urea (452 Qtls.) while difference in stock as per PoS and Manual record was the highest in case of SSP fertilizers (438 Qtls.) with Private retailers. In case of Company owned depot as well as PACS, same situation was found wherein the highest difference in stock as per PoS and physical verification, as well as manual records was found in case of Urea and DAP, respectively. In fact, difference was more than 10000 quintals in case of PACS data entry, i.e POS stock, physical verification and as per manual record. At overall level, the highest mismatch across various types of fertiliser was estimated in case of DAP.

Table 3.6: Details about Stock Report (from all sources i.e., as per POS Device, Physical Stock and Manual Records (at the time of visit) - Private Retailers

Name of the product	Opening stock	Received	Sale	Closing Stock as per POS	Stock as per physical verification	Difference of closing stock as per PoS & Physical verification	Stock as per Manual Record	Difference of closing stock as per PoS & Manual record
APS	2272	0	110	2162	2167	-5	2128	34
AS	1343	0	190	1153	1174	-22	805	348
City Compost	184	0	0	184	194	-10	199	-16
DAP	2848	0	145	2708	2675	29	2657	47
MOP	1164	50	48	1166	1042	124	1247	-81
Narmada Phosh	1215	0	110	1110	931	173	931	173
Nitro phosphate	1025	0	3	1023	1024	-2	1009	14
NPK	859	0	75	828	692	93	665	120
SSP	616	0	1	616	409	207	178	438
SSP (P)	231	0	93	227	227	-89	223	-85
SSP(G)	817	0	114	703	710	-7	710	-7
Urea	3872	1323	2005	3190	2737	452	2837	353
Grand Total	16443	1373	2891	15066	13979	946	13586	1339

Table 3.7: Details about Stock Report (from all sources i.e., as per POS Device, Physical Stock and Manual Records (at the time of visit) - Company Owned Retailers

Name of the product	Opening stock	Received	Sale	Closing Stock as per POS	Stock as per physical verification	Difference of closing stock as per PoS & Physical verification	Stock as per Manual Record	Difference of closing stock as per PoS & Manual record
APS	924	0	64	859	852	8	915	-55
AS	1295	0	81	1215	1203	11	1218	-4
City Compost	548	0	3	546	496	50	496	50
DAP	2320	0	69	2260	2180	71	2325	-74
MOP	438	0	3	435	341	95	470	-35
Narmada Phosh	274	0	0	274	273	1	274	1
Nitro phosphate	0	0	0	0	0	0	0	0
NPK	1360	0	28	1332	1316	17	1209	124
SSP	868	0	1	867	910	-44	863	4
SSP (P)	0	0	0	0	0	0	0	0
SSP(G)	0	0	0	0	0	0	0	0
Urea	1581	605	667	1518	1641	**-122**	1814	**-296**
Grand Total	**9607**	**605**	**915**	**9306**	**9211**	86	**9582**	-285

Table 3.8: Details about Stock Report (from all sources i.e., as per POS Device, Physical Stock and Manual Records (at the time of visit) – PACS Retailers

Name of the product	Opening stock	Received	Sale	Closing Stock as per POS	Stock as per physical verification	Difference of closing stock as per PoS & Physical verification	Stock as per Manual Record	Difference of closing stock as per PoS & Manual record
APS	443	0	3	440	427	14	838	-398
AS	1802	0	145	1665	1330	328	1167	491
City Compost	415	0	0	415	355	59	355	59
DAP	13512	0	56	13456	3332	10124	3031	10425
MOP	585	0	5	580	534	46	479	101
Narmada Phosh	1060	50	64	726	706	340	757	289
Nitro phosphate	8	0	0	8	8	0	8	0
NPK	1191	0	273	1148	1248	-330	1168	-250
SSP	503	0	34	469	438	31	321	148
SSP (P)	0	0	0	0	0	0	0	0
SSP(G)	315	0	12	303	364	-62	364	-62
Urea	9290	150	1529	8200	8233	**-322**	6876	**1035**
Grand Total	**29121**	**200**	**2120**	**27408**	**16973**	10229	**15363**	11840

Table 3.9: Details about Stock Report (from all sources i.e., as per POS Device, Physical Stock and Manual Records (at the time of visit) – All Retailers

Name of the product	Opening stock	Received	Sale	Closing Stock as per POS	Stock as per physical verification	Difference of closing stock as per PoS & Physical verification	Stock as per Manual Record	Difference of closing stock as per PoS & Manual record
APS	3638	0	176	3461	3445	16	3880	-419
AS	4440	0	416	4032	3707	317	3190	835
City Compost	1146	0	3	1144	1044	99	1050	94
DAP	18680	0	270	18424	8186	**10224**	8012	**10399**
MOP	2187	50	56	2181	1916	265	2195	-15
Narmada Phosh	2548	50	174	2109	1910	514	1962	463
Nitro phosphate	1033	0	3	1031	1032	-2	1017	14
NPK	3410	0	375	3308	3256	-221	3041	-6
SSP	1987	0	36	1951	1757	194	1361	590
SSP (P)	231	0	93	227	227	-89	223	-85
SSP(G)	1131	0	126	1006	1074	-68	1074	-68
Urea	14742	2078	4201	12908	12611	8	11527	1092
Grand Total	**55171**	**2178**	**5926**	**51780**	**40163**	11260	**38530**	12893

There are various reasons behind the stock mismatches between PoS and physical as well as manual records, such as stocks are not getting updated on a real time basis; there are irrational changes and numerous glitches in the PoS machine/software; sale of fertilizers by the retailers without PoS machines; poor internet connectivity in rural areas; problem of authentication of Aadhaar number of the farmers; poor maintenance of PoS machines; farmer did not possess Aadhaar card at the time of purchasing of fertilizers (farmers generally directly come from the farm); auto driver purchases fertilizer on behalf of the farmers and the auto driver uses his own Aadhaar number to authenticate the transaction. Some time, transactions are made by representatives of farmers as relative or friend who happens to visit the town for his work (buys fertilizer/seeds on behalf of the farmer). During the peak season, if retailers are not able to cater to the large number of farmers coming to shop, his sales may decrease because of limitations of the PoS machine (therefore they switch to manual transactions which are later 'adjusted) and the horridness of the purchasers. Therefore, the issue of mismatch of physical stock with PoS stock continues to persist.

3.4.2 Sale Report

Details on retailer's sale report for last fortnight on the day of survey for all three categories of retailers are presented in Table 3.10 3.13. It can be seen from these tables that the difference of sales as per PoS and manual record was the highest in case of data entry of Urea fertilizers for all three types of selected retailers. Thus, at overall level, sale of urea fertilisers was the highest and also the highest difference of sales as per PoS and manual record was observed.

Table 3.10: Detail of Retailer sale report for last fortnight on the day of survey –Private Retailers

Name of the product	Private				
	Sold amount (Rs)	% Share in total sold amount	Sales as per POS (Qtls.)	Sale in manual records (Qtls.)	Difference of sales as per PoS & manual records
APS	674675	(6.75)	338	359	-22
AS	1458944	(14.60)	1112	1445	-333
City Compost	4975	(0.05)	3	4	-1
DAP	708500	(7.09)	273	294	-21
MOP	390450	(3.91)	206	237	-31
Narmada Phosh	1542250	(15.43)	774	788	-14
Neem Urea	0	(0.00)	0	0	0
Nitro phosphate	83064	(0.83)	88	88	0
NPK	467460	(4.68)	186	189	-4
SSP	55272	(0.55)	51	85	-35
SSP (P)	3920	(0.04)	5	5	0
SSP(G)	108976	(1.09)	139	139	0
Urea	4496702	(44.99)	7595	7195	400
Grand Total	**9995188**	**(100.00)**	**10767**	**10826**	**-60**

Table 3.11: Detail of Retailer sale report for last fortnight on the day of survey – Company owned Retailers

Name of the product	Company owned				
	Sold amount (Rs)	% Share in total sold amount	Sales as per POS (Qtls.)	Sale in manual records (Qtls.)	Difference of sales as per PoS & manual records
APS	891000	(16.51)	446	430	16
AS	1089616	(20.19)	831	762	69
City Compost	3240	(0.06)	9	9	0
DAP	866400	(16.05)	327	352	-25
MOP	172900	(3.20)	82	84	-2
Narmada Phosh	41790	(0.77)	21	21	0
Neem Urea	0	(0.00)	0	0	0
Nitro phosphate	0	(0.00)	0	0	0
NPK	405470	(7.51)	161	267	-106
SSP	37632	(0.70)	48	50	-2
SSP (P)	0	(0.00)	0	0	0
SSP(G)	0	(0.00)	0	0	0
Urea	1890006	(35.01)	3192	3066	126
Grand Total	**5398054**	**(100.00)**	**5115**	**5039**	**76**

Table 3.12: Detail of Retailer sale report for last fortnight on the day of survey – PACS Retailers

Name of the product	PACS				
	Sold amount (Rs)	% Share in total sold amount	Sales as per POS (Qtls.)	Sale in manual records (Qtls.)	Difference of sales as per PoS & manual records
APS	100925	(0.81)	51	39	12
AS	2555120	(20.48)	1948	1430	518
City Compost	5760	(0.05)	16	16	0
DAP	2577310	(20.66)	937	844	94
MOP	399950	(3.21)	184	155	30
Narmada Phosh	384110	(3.08)	143	174	-31
Neem Urea	1147239	(9.20)	1937	1937	0
Nitro phosphate	0	(0.00)	0	0	0
NPK	615540	(4.93)	225	203	23
SSP	141904	(1.14)	181	179	3
SSP (P)	0	(0.00)	0	0	0
SSP(G)	57232	(0.46)	73	73	0
Urea	4491677	(36.00)	7584	7091	493
Grand Total	12476768	(100.00)	13278	12138	1140

Table 3.13: Detail of Retailer sale report for last fortnight on the day of survey –All Retailers

Name of the product	All				
	Sold amount (Rs)	% Share in total sold amount	Sales as per POS (Qtls.)	Sale in manual records (Qtls.)	Difference of sales as per PoS & manual records
APS	1666600	(5.98)	834	828	6
AS	5103680	(18.31)	3890	3637	254
City Compost	13975	(0.05)	28	29	-1
DAP	4152210	(14.90)	1536	1489	48
MOP	963300	(3.46)	472	475	-4
Narmada Phosh	1968150	(7.06)	938	983	-45
Neem Urea	1147239	(4.12)	1937	1937	0
Nitro phosphate	83064	(0.30)	88	88	0
NPK	1488470	(5.34)	572	659	-87
SSP	234808	(0.84)	280	313	-34
SSP (P)	3920	(0.01)	5	5	0
SSP(G)	166208	(0.60)	212	212	0
Urea	10878386	(39.03)	18370	17352	1018
Grand Total	27870010	(100.00)	29159	28004	1155

3.5 Training on application of PoS device

Implementation of the DBT Scheme requires deployment of PoS devices at every retailer shop and training of retailers and wholesalers for operating PoS device. PoS device play an important role in implementation of the DBT project and the sale of fertilizers has to be done by retailers to farmers only through PoS devices. Across the country, various training sessions were conducted till date, as a part of ongoing PoS deployment and as a precursor to nation-wide rollout of DBT. Across the country, the Lead Fertilizer Supplier/Company (LFS) has conducted various training sessions. The details about training on application of PoS devices at the selected districts of Gujarat state is presented in Table 3.14. All the retailers were sensitized during the introductory training sessions conducted by LFS. During the field it is observed that average duration of training 1-2 days. A dedicated 15-member Multi-lingual Help Desks were set up to provide quick response to the queries of wide range of stakeholders across the country as a preparatory to DBT implementation

Table 3.14: Detail about training on application of POS device

Sr No	Particulars	Unit	Frequency	Result
Training	Attended training on application of POS device	%	60	100
Category	Name of the Training Programme	Department organized	Year and month of attending	Duration of training
Private	DBT-POS	State Agricultural University	February/March/August	0.00
	DBT-POS	ARCOGOL	February/March/August	1.56
	DBT-POS	DOA, GOG	February/March/August	1.90
	DBT-POS	Petlad taluka sangh	February/March/August	0.00
Company owned	DBT-POS	State Agricultural University	February/March/August	0.00
	DBT-POS	ARCOGOL	February/March/August	1.20
	DBT-POS	DOA, GOG	February/March/August	1.89
	DBT-POS	Petlad taluka sangh	February/March/August	0.00
PACS	DBT-POS	State Agricultural University	February/March/August	1.00
	DBT-POS	ARCOGOL	February/March/August	1.64
	DBT-POS	DOA, GOG	February/March/August	1.55
	DBT-POS	Petlad taluka sangh	February/March/August	1.00

3.6 Suggestions of Retailers to improve the DBT System

The perusal of the Table 3.15 shows retailers' opinion on sale of fertilizer through PoS machine. On the supply side of AeFDS (Aadhaar enabled Fertilizer Distribution System), retailers stated that PoS doesn't require too many documents neither create hassles in selling fertilizers.

More than two third of the retailers have expressed the problems of linking Aadhaar with sale, while more than half of the retailers have opined about checking land holding or cropping pattern of the purchaser. Administrative compliance implication was opined to be needed by more than half of the retailers. The recommendations given by the retailers for better implementation of DBT in fertiliser were as follows:

Table 3.15: Retailers' opinion on sale of fertilizer through POS machines –

Sr. No.	Characteristics		% of total retailers
1	Hassel due to too many documents	Yes	0.00
		No	100.00
2	Any issues in linking Aadhar with sale	Yes	66.67
		No	33.33
3	Checking land holding/cropping pattern	Yes	54.84
		No	45.16
4	Administrative compliance implications	Needed	52.00
		Not Needed	48.00

- The measurement of quantity should be in terms of per bag in the PoS instead of per tonne or per quintal that is easily understood both by retailers as well as farmers.
- Desktop version / Computer system instead of PoS machine is preferable and more suitable.
- Software and service issues should be addressed immediately.
- Provide improved version and best service system set-up. Poor network issues need solution.
- Frequent trainings, user friendly version and prompt services at the doorstep of retailers will help the system work more efficiently.
- Acknowledgement receipt if given at the time of delivery it will enable provision of prompt services.
- Frequent rebooting of PoS delays the service and need a permanent solution.
- Improve infrastructure facilities and provide service centres at village level.

3.7 Chapter Summary:

The information on functioning of DBT in fertilizer at retailer's end is presented and discussed. Out of the selected retailers, 31.6 per cent

were private retailers, 23.3 per cent were company owned depot/retailers and remaining 45 per cent were cooperatives-PACS. All retailers have the PoS Machine for entry of purchase and sell of the fertilizers at their outlets and majority of them have the 'Oasis company' machine. All the retailers had gone through the training about the operation of the PoS machine. Around 95 per cent of total retailers had started raising invoices w.e.f February, 2018. All the retailers have emphasized on the Aadhaar based authentication via PoS machines. All the retailers have faced problems in handling the PoS machine. Around 90 per cent of total retailers had faced some issues in PoS machine related to software and authentication issues, while one third of total retailers have faced hardware issues and around 38 per cent retailers have faced stock issues. Majority of retailers have used multiple sources of stock records wherein manual book keeping and computer system /PoS for record keeping of fertilizers are major one. While few of them had computer operated management system in Talley or such softwares. The management of stock and sale information through multiple system of book keeping/computer operated systems/POS by retailers have increased their workload enormously. The major three reasons reported by the retailers for the mismatch for the POS stock with physical stock were heavy rush of farmers during the seasons/hurriedness of the farmers/it is time consuming process (by 40 per cent of retailers), followed by authentication were not proper due to muddy hand (by 29 per cent of retailers) and farmer did not bring Aadhaar card always (by 26 per cent retailers). At overall level, the highest mismatch across various types of fertilizer was estimated in case of DAP. The difference of sales as per PoS and manual record was the highest in case of data entry of Urea fertilizers for all three types of selected retailers. Thus, at overall level, sale of urea fertilizers was the highest and also the highest difference of sales as per PoS and manual record was observed.

The next chapter presents the information on functioning of DBT in fertilizer's at farmer's level.

Chapter IV

Functioning of DBT in fertilizer at Farmers' Level

4.1 Introduction:

This chapter present the details on functioning of fertilisers at farmers' level. It includes the sample size of farmer respondents, their socio-economic profile, cropping pattern, land holdings, and their pattern of purchase of fertilizer and usage of fertilizer for various crops and their suggestions relating to implementation of DBT system. As mentioned in introductory chapter, two districts were selected covering different agro-climatic zones with one district covering irrigated area and the other one covering rain-fed/dry land area. From each selected district, a list of top 20 buyers and frequent 10 buyers were obtained for the last six months (i.e., from January 2019 to June 2019). Thus, from this list of 120 top-twenty buyers and 60 frequent buyers, a total number of 50 top-twenty buyers and 25 frequent buyers/farmers (as generated from IFMS) were selected randomly for detailed investigation and verification for operational holdings, crops sown, etc. Further, 50 farmers from each district were selected as random walk for further purchase verification through PoS. Thus, the aggregate sample for State was 100 top-twenty buyers, 50 most frequent buyers and 100 random walk buyers selected from the same villages where from top and frequent buyers were selected.

4.2 Socio-Economic Profile

The socio-economic status of farmers can be assessed or quantified through various parameters like age-wise distribution of farmers, their educational status, their size of land holding, their farming experience etc. The socio-economic factors furnish a base for further planning and development of agriculture sector. The standard of living of people basically depends upon their socio-economic status. Table 4.1 presents the brief overview of the demographic profile of the respondents.

The socio-economic characteristics attempted here are based upon combine data of 250 sample households selected from two sample districts viz., Anand and Botad of the state. It can be seen from the Table that average age of selected respondent was 44.2 years in which random walk respondents were older (49.3 years) than frequent buyers (41.6 years) and top 20 buyers (40.5 years). Thus, top 20 buyers were from the younger generation in the agriculture. All the sample respondents were male which indicate dominance of male culture in Indian society. Education level of decision maker of household plays an important role in adoption of recommendation of fertilizers doses enhancing crop productivity. With this is in view, educational status of buyer's sample households is examined here. The data shows that an average year of schooling of top 20 buyers and frequent buyers was around 9 years while same was 8.4 years for random walk buyers. As it was expected that younger generation of top 20 buyers may be educated till graduation, same was not found at ground level. The average level of education of all the respondents was estimated to be around 9 years only. The average family size of sample households was estimated to be 6.6 persons at overall level, which was relatively small in case of top 20 and random walk group respondent than frequent buyers group which had family size of 7 persons.

Majority of buyers belongs to General category (60.8 per cent) followed by 34.4 per cent from Other Backward Classes social group while rest of them belongs to SC and ST categories. Agriculture was the main occupation of the selected 83 per cent of respondents while 10.8 per cent respondents were salaried persons. The subsidiary occupation of the selected respondents was reported to be self-employed in household industry followed by agriculture labour and activities related agriculture and allied sectors. The total farming experience of the all types of buyers was estimated to be about 22 years, in which random walk respondents were more experienced (28.33 years) followed by top 20 buyers (15.56 years) and the lowest experienced was reported by frequent buyers (15.06 years).

Table 4.1: Socio-Economic Information of Selected Farmers

Sr No	Particulars		Top 20 Buyer (100)		Frequent Buyer		Random walk		All	
		Unit	Nos	%	Nos	%	Nos	%	Nos	%
1	Age	Av	100	40.5	50	41.6	100	49.3	250	44.2
2	Gender									
	Male	%	100	100.0	50	100.0	100	100.0	250	100.0
	Female	%	0	0.0	0	0.0	0	0.0		
3	Buyer's education	years	100	8.9	50	9.1	100	8.4	250	8.7
4	Buyer's caste									
	SC	%	3	3.0	0	0.0	6	6.0	9	3.6
	ST	%	2	2.0	1	2.0	0	0.0	3	1.2
	OBC	%	32	32.0	28	56.0	26	26.0	86	34.4
	General	%	63	63.0	21	42.0	68	68.0	152	60.8
5	Number of family members									
	Male	Av	329	3.3	177	3.5	344	3.4	850	3.4
	Female	Av	320	3.2	173	3.5	306	3.1	799	3.2
	Total	Av	649	6.5	350	7.0	650	6.5	1649	6.6
6	Buyer's occupation									
	Main									
	Agriculture & allied	%	76	76.0	33	66.0	98	98.0	207	82.8
	Agricultural labour	%	1	1.0	2	4.0	1	1.0	4	1.6
	Self-employed in household industry-	%	2	2.0	2	4.0	0	0.0	4	1.6
	Self-employed in services	%	2	2.0	2	4.0	0	0.0	4	1.6
	Non-agricultural casual labour	%	0	0.0	1	2.0	0	0.0	1	0.4
	Salaried work	%	17	17.0	9	18.0	1	1.0	27	10.8
	Auto driver	%	2	2.0	1	2.0	0	0.0	3	1.2
7	Subsidiary									
	Agriculture & allied		20	20.0	14	28.0	8	8.0	42	16.8
	Agricultural labour		14	14.0	1	2.0	34	34.0	49	19.6
	Self-employed in household industry-		24	24.0	7	14.0	19	19.0	50	20.0
	Self-employed in services		6	6.0	2	4.0	1	1.0	9	3.6
	Non-agricultural casual labour		2	2.0	2	4.0	0	0.0	4	1.6
	Salaried work		6	6.0	5	10.0	3	3.0	14	5.6
	Household work		1	1.0	1	2.0	1	1.0	3	1.2
	Auto driver		0	0.0	9	18.0	2	2.0	11	4.4
8	No of family members engaged in farming	Av	100	2.39	50	2.18	100	2.33	250	2.32
9	No. of years of farming experience	Av.	18.56		15.06		28.33		21.77	

4.3 Holding Size and Cropping Pattern

Apart from other factors, size of operational land holding is impacting mainly on the consumption of fertilizers, decision to allocate area to different crops and optimum use of fertilizers under the different crop pattern, also capital investment in agriculture. In this context, size of operational land holding of sample households has been examined here. The details of the average size of land holdings of the respondents are presented in Table 4.2. It can be seen from the table that on an average, owned area of the sampled household was estimated to be 9.30 acres, in which top 20 buyers had the highest size of owned area (12.24 acres) and the lowest was with frequent buyers (5.46 acres). On aggregate net operated area was slightly higher (13.1 acres) than the owned area indicating net lease-in exceeding the net lease-out area by the selected households. Almost 97 per cent area reported was irrigated. Cropping intensity was around 138 per cent at overall level, which was highest in case of frequent buyers and the lowest was in case of random walk buyers. The average annual income from agriculture of selected buyers was highest in case of top twenty buyers (Rs. 400530/-) and the lowest was for random walk buyers (Rs. 194180/-). At overall level, average income from agriculture was reported to be Rs. 277922 followed by income from non-agriculture sources (Rs, 100318) and the lowest was from allied activities (Rs. 16060/-).

Table 4.2: Average Size of Operational Holding

Sr No	Particulars	Unit	Top 20 Buyer	Frequent Buyer	Random walk	Total
1	**Buyers Land Holdings**					
a	Owned area in 2018-19 (acres)	Av	12.24	5.46	8.27	9.30
b	Operated area in 2018-19 (acres)	Av	18.74	8.77	9.62	13.1
c	GCA in 2018-19 (acres)	Av	26.19	12.75	12.48	18.02
d	Net operated area irrigated (acres)	Av	17.74	8.77	9.55	12.67
2	**Annual income (Rs)**					
	Agriculture	Av	400530	200190	194180	277922
	Allied activities	Av	10300	7400	26150	16060
	Non-agriculture	Av	140220	93150	64000	100318

The cropping pattern is a function of several variables such as prevailing price of crop, consumption requirement of family, suitability of soil and climatic conditions, resources availabilities like fertilizers, seeds etc. As our main objective of the study was to know fertilizers consumption pattern in selected area and assessment of availability, use of fertilizers in major crops, it was pertinent to examine crop-pattern followed by sample households. The cropping pattern of selected respondents is presented in Tables 4.3 to 4.6. It can be seen from the table that at overall level, the Cotton was the main crop being grown by the selected households (39.10 percent) followed by paddy (17.65 per cent), Tobacco (13.10 per cent) and Wheat (10.33 per cent). These four crops together accounted for 80 per cent of gross cropped area of the selected household. Thus, at overall level, hardly 38 per cent area was under food grain crops, 3 per cent was under oilseed crops, 52 percent was under cash crops (Cotton and Tobacco) and rest was under horticultural and perennial crops (Table 11.1). Same kind of trend was observed in all three categories of respondents.

Table 4.3: Cropping Pattern during Kharif-2018 and rabi and summer 2019- Top 20 Buyer (Area in acre)

Crop Name	Irrigated	% to GCA	Rainfed	% to GCA	All	% to GCA
Paddy	524.9	20.84	0	0.00	524.9	20.05
Jowar	34.4	1.37	0	0.00	34.4	1.31
Bajra	133.23	5.29	0	0.00	133.23	5.09
Maize	5.99	0.24	0	0.00	5.99	0.23
Wheat	333.46	13.24	0	0.00	333.46	12.73
Cereals	**1031.98**	**40.98**	**0**	**0.00**	**1031.98**	**39.41**
Moong	7.18	0.29	0	0.00	7.18	0.27
Gram	56.12	2.23	0	0.00	56.12	2.14
Urad	2	0.08	0	0.00	2	0.08
Pulses	**65.3**	**2.59**	**0**	**0.00**	**65.3**	**2.49**
Food grains	**1097.28**	**43.57**	**0.00**	**0.00**	**1097.28**	**41.90**
Castor	20.79	0.83	0	0.00	20.79	0.79
Mustard	4.79	0.19	0	0.00	4.79	0.18
Groundnut	4	0.16	0	0.00	4	0.15
Sesamum	26.19	1.04	0	0.00	26.19	1.00
Oilseeds	**55.77**	**2.21**	**0**	**0.00**	**55.77**	**2.13**
Cotton	896.97	35.61	100	100.00	996.97	38.07
Tobacco	249.42	9.90	0	0.00	249.42	9.53
Turmeric	0	0.00	0	0.00	0	0.00
Vegetables	72.21	2.87	0	0.00	72.21	2.76
Chicory	8.98	0.36	0	0.00	8.98	0.34
Cumin	18.4	0.73	0	0.00	18.4	0.70
Horticultural crops	119.52	4.75	0	0.00	119.52	4.56
GCA	**2518.54**	100.00	**100**	100.00	**2618.54**	100.00

Table 4.4: Cropping Pattern of Frequent Buyers during 2018-2019 (Area in acre)

Crop Name	Irrigated	% to GCA	Rainfed	% to GCA	All	% to GCA
Paddy	115.6	18.14	0	#DIV/0!	115.6	18.14
Jowar	10	1.57	0	#DIV/0!	10	1.57
Bajra	76.28	11.97	0	#DIV/0!	76.28	11.97
Maize	2.4	0.38	0	#DIV/0!	2.4	0.38
Wheat	72.85	11.43	0	#DIV/0!	72.85	11.43
Cereals	**277.13**	**43.48**	**0**	**#DIV/0!**	**277.13**	**43.48**
Moong	6.39	1.00	0	#DIV/0!	6.39	1.00
Gram	13.98	2.19	0	#DIV/0!	13.98	2.19
Urad	0	0.00	0	#DIV/0!	0	0.00
Pulses	**20.37**	**3.20**	**0**	**#DIV/0!**	**20.37**	**3.20**
Food grains	**297.50**	**46.68**	**0**	**#DIV/0!**	**297.50**	**46.68**
Castor	6	0.94	0	#DIV/0!	6	0.94
Mustard	10.18	1.60	0	#DIV/0!	10.18	1.60
Groundnut	8	1.26	0	#DIV/0!	8	1.26
Sesamum	6.6	1.04	0	#DIV/0!	6.6	1.04
Oilseeds	**30.78**	**4.83**	**0**	**#DIV/0!**	**30.78**	**4.83**
Cotton	166.37	26.10	0	#DIV/0!	166.37	26.10
Tobacco	100.88	15.83	0	#DIV/0!	100.88	15.83
Turmeric	1.8	0.28	0	#DIV/0!	1.8	0.28
Vegetables	17.19	2.70	0	#DIV/0!	17.19	2.70
Chicory	0	0.00	0	#DIV/0!	0	0.00
Cumin	3.2	0.50	0	#DIV/0!	3.2	0.50
Horticultural crops	19.66	3.08	0	#DIV/0!	19.66	3.08
GCA	637.38	100.00	0	#DIV/0!	637.38	100.00

Table 4.5: Cropping Pattern of Random Walk Buyer during 2018-2019 (Area in acre)

Crop Name	Irrigated	% to GCA	Rainfed	% to GCA	All	% to GCA
Paddy	154.37	12.45	0	0.00	154.37	12.37
Jowar	24	1.93	2	25.00	26	2.08
Bajra	65.77	5.30	0	0.00	65.77	5.27
Maize	4.99	0.40	0	0.00	4.99	0.40
Wheat	58.91	4.75	0	0.00	58.91	4.72
Cereals	**308.04**	**24.84**	**2**	**25.00**	**310.04**	**24.84**
Moong	1	0.08	0	0.00	1	0.08
Gram	0	0.00	0	0.00	0	0.00
Urad	3	0.24	0	0.00	3	0.24
Pulses	**4**	**0.32**	**0**	**0.00**	**4**	**0.32**
Food grains	**312.04**	**25.16**	**2.00**	**25.00**	**314.04**	**25.16**
Castor	5.6	0.45	0	0.00	5.6	0.45
Mustard	7.19	0.58	0	0.00	7.19	0.58
Groundnut	4	0.32	0	0.00	4	0.32
Sesamum	22.4	1.81	0	0.00	22.4	1.79
Oilseeds	**39.19**	**3.16**	**0**	**0.00**	**39.19**	**3.14**
Cotton	591.7	47.70	6	75.00	597.7	47.88
Tobacco	239.64	19.32	0	0.00	239.64	19.20
Turmeric	0.6	0.05	0	0.00	0.6	0.05
Vegetables	24.19	1.95	0	0.00	24.19	1.94
Chicory	2.99	0.24	0	0.00	2.99	0.24
Cumin	6.8	0.55	0	0.00	6.8	0.54
Horticultural crops	23.19	1.87	0	0.00	23.19	1.86
GCA	1240.34	100.00	8	100.00	1248.34	100.00

Table 4.6: Cropping Pattern of all Buyers during 2018-2019 (Area in acre)

Crop Name	Irrigated	% to GCA	Rainfed	% to GCA	All	% to GCA
Paddy	794.87	18.08	0	0.00	794.87	17.65
Jowar	68.4	1.56	2	1.85	70.4	1.56
Bajra	275.28	6.26	0	0.00	275.28	6.11
Maize	13.38	0.30	0	0.00	13.38	0.30
Wheat	465.22	10.58	0	0.00	465.22	10.33
Cereals	1617.15	36.78	2	1.85	1619.15	35.95
Moong	14.57	0.33	0	0.00	14.57	0.32
Gram	70.1	1.59	0	0.00	70.1	1.56
Urad	5	0.11	0	0.00	5	0.11
Pulses	89.67	2.04	0	0.00	89.67	1.99
Food grains	1706.82	38.82	2.00	1.85	1708.82	37.94
Castor	32.39	0.74	0	0.00	32.39	0.72
Mustard	22.16	0.50	0	0.00	22.16	0.49
Groundnut	16	0.36	0	0.00	16	0.36
Sesamum	55.19	1.26	0	0.00	55.19	1.23
Oilseeds		0.00		0.00		0.00
Cotton	1655.04	37.65	106	98.15	1761.04	39.10
Tobacco	589.94	13.42	0	0.00	589.94	13.10
Turmeric	2.4	0.05	0	0.00	2.4	0.05
Vegetables	113.59	2.58	0	0.00	113.59	2.52
Chicory	11.97	0.27	0	0.00	11.97	0.27
Cumin	28.4	0.65	0	0.00	28.4	0.63
Horticultural crops	162.37	3.69	0	0.00	162.37	3.60
GCA	4396.26	100.00	108	100.00	4504.26	100.00

4.4 Farmers Transactions of Fertilizer Purchases through PoS System

The main objective of DBT is to bring the fertiliser subsidy under the Direct Benefit Transfer (DBT) programme. Under DBT, the government releases 100 per cent subsidy on various grades of fertiliser-to-fertiliser manufacturers. This is based on actual sales made by the retailers to the beneficiaries through PoS devices. Retailers authorize the sales through successful Aadhaar based authentication of the farmers on PoS devices. The sales and purchase of all categories of the buyers are presented in Table 4.7. Among the all categories of the buyers, the highest percent of buyers (40.8 per cent) purchased fertilizers from cooperative societies may be due to availability of PACS at village level and easy access for respective buyers. About 19 per cent of households had purchased fertilisers from private dealers followed by 3.2 percent respondents from company owned shops. The 37.2 per cent of buyers had purchased fertilisers from all these three sources. At overall level, almost three fourth of respondents had purchased fertilisers themselves while very

meagre share of respondents had send someone to purchase the same for them. One fourth of respondents have used both the options, i.e self-purchase or through someone. Almost same trend was observed in case of use of purchased fertilizer. More than two third of respondents had purchased fertilisers for their own use, while almost 5 per cent have purchased it for neighbours' use. Some buyers have reported that they had purchased fertilizers for others and they had charged around Rs. 37 per quintal extra and across the groups, the lowest extra charges were in case of random walk buyers and the highest was in case of top 20 buyers. None of them had purchased fertilisers from others. Almost 93 percent buyers have reported that they had received receipt for their purchase. However, around 80 per cent of them had received manual hand written receipt. Hardly 6.03 per cent of buyers have reported receipt of POS generated receipt which is main aim of the whole DBT in fertiliser scheme.

More than 98 per cent of all categories of buyers have reported that price/sale amount mentioned had matched with the payment made by them, and around 45 per cent have understood that how much subsidy is provided on purchase. About 96 percent of respondents have reported that price as well as sale amount mentioned matches with the payment made by them. However, only 45 percent were aware about how much subsidy is provided on purchase made by them. It is clearly indicates that sensitization among the farmers is needed towards what proportion subsidy could make available to farmers towards the purchasing of fertilizers. Almost 96 per cent of buyers have reported that retailers have insisted on Aadhaar card or Voter ID submission for the sale of fertilisers. Most of the farmers did not carry Aadhaar Card when they visit retailers to buy fertiliser. Therefore, there is a need for carrying out a communication campaign to increase farmers' awareness so that they bring their Aadhaar to buy fertiliser.

Table 4.7: Purchase details of Fertilizers

Sr. No	Particulars		Top 20 Buyer		Frequent Buyer		Random walk		All	
			Nos	%	Nos	%	Nos	%	Nos	%
1	Place of purchase of fertilizers									
a	a. Private Dealers	%	20	20.0	11	22.0	16	16.0	47	18.8
b	b. Company Owned Shops	%	8	8.0	0	0.0	0	0.0	8	3.2
c	c. Coop Societies	%	34	34.0	19	38.0	49	49.0	102	40.8
d	d. All the above	%	38	38.0	20	40.0	35	35.0	93	37.2
2	Who go and purchase fertilizers									
a	Yourself	%	80	80.0	28	56.0	75	75.0	183	73.2
b	Purchased by someone else	%	1	1.0	0	0.0	3	3.0	4	1.6
c	Both	%	19	19.0	22	44.0	22	22.0	63	25.2
3	Purchase fertilizers for									
a	Yourself	%	72	72.0	25	50.0	73	73.0	170	68.0
b	Neighbor farmers	%	7	7.0	5	10.0	0	0.0	12	4.8
c	Both	%	21	21.0	20	40.0	27	27.0	68	27.2
3.1	If you purchase fertilizers for others as well, how much extra you charge Rs/Qtls	Av		41.07		44.00		28.85		37.04
3.2	If you purchase fertilizers from others, how much extra you pay Rs/Qtls	Av		0		0		0		0
4	**Did they give receipts for the purchase you made**	**%**	**92**	**92.00**	**45**	**90.00**	**95**	**95.00**	**232**	**92.80**
4.1	If, Yes, what type of receipt you get									
a	Manual written	%	75	81.52	29	64.44	82	86.32	186	80.17
b	Computer	%	1	1.09	0	0.00	0	0.00	1	0.43
c	POS Generated	%	8	8.70	5	11.11	1	1.05	14	6.03
d	Manual written/Computer	%	6	6.52	4	8.89	9	9.47	19	8.19
e	All of the above	%	2	2.17	7	15.56	3	3.16	12	5.17
5	Did you understand the details mentioned in the receipt	%	75	8.15	35	77.78	68	71.58	178	80.60
5.1	Whether the price / sale amount mentioned matches with the payment you made	%	88	95.65	45	100.0	95	100.0	228	98.28
5.2	From the receipt, do you understand how much subsidy is provided on purchase		41	44.57	20	44.44	43	45.26	104	44.83
6	Did they insist on Aadhaar / Voter ID for the sale of fertilizers		97	97	47	94	95	95	239	95.60
6.1	If Yes, what type of authentication ID you gave									
a	Aadhaar		100	100	50	100	100	100	250	100
b	Voter ID		-		-		-		-	
7	Do you have any problem in producing Aadhaar / Voter ID while purchasing fertilizers		43	43	26	52	70	70	139	55.60
8	**Did you know about DBT in fertilizers and sale of fertilizers through POS is mandatory**		**43**	**43**	**22**	**44**	**55**	**55**	**120**	**48.00**
9	**Did you insist on Receipts for the purchase you made**		**34**	**34**	**25**	**50**	**47**	**47**	**106**	**42.40**
9.1	If Yes, what are the reasons given by retailers for not giving the receipt									
	Device not functioning		0	0.0	0	0.0	2	4.3	2	1.9
	Mandatory authentication through Aadhaar or any other identity not provided		0	0.0	0	0.0	2	4.3	2	1.9
	Both		34	100.0	25	100.0	43	91.5	102	96.2
10	Do you buy only at the time of use of fertilizer or stock it in advance									
	Instant		99	99.0	48	96.0	87	87.0	234	93.6
	Instant & Advance- Both		1	1.0	2	4.0	13	13.0	16	6.4
	If Advance, how many numbers of days before usage		-	30.0	-	37.5	-	29.6	-	30.6

Almost 56 per cent of respondents have reported that they had some problem in producing Aadhaar/Voter ID while purchasing fertilisers as they could not carry same at the time of purchase of fertilisers. While 48 per cent of respondents were aware about the fact that DBT in fertiliser and sale of fertiliser through POS is mandatory. Around 42 per cent of respondents had insisted for the receipt of transaction through POS but due to either no identity was provided or failure of authentication through Aadhaar as it was mandatory or could not authenticate or both were the major reasons behind the same. Almost 94 per cent of respondents reported that they purchased fertilisers as and when required while remaining purchased sometime in advance or sometime instant. Thus, purchase of fertiliser by the farmers was as per requirement on time and majority of them did not make any advance purchase and stock of fertilisers.

The details on the recent purchase of fertilisers through POS by selected buyers are presented in Table 4.8. It can be seen from the table that about 94 percent of buyers had purchased fertilisers recently through POS device at the retail point. Across the buyers, percentage of buyers was highest in case of group of top twenty and frequent buyers (96 per cent) while same was 91 per cent in case of random walk buyers. Around 98 per cent of total fertilisers purchased by top 20 and frequent buyers was through POS. As it was expected, random walk buyers' had partially purchased fertilizers through PoS machine. All of those who had purchased fertiliser have reported that POS device was in operation at the shop. The fertiliser purchase data of by top 20 buyers and frequent buyers was for last two years but in case of random walk buyers, it was for the current year. None of the buyers have carried forward stock from previous year. When respondents were asked about their opinion on acceptability for compulsory declaration regarding operational holdings and sale of fertilizer as per farming requirement at the time of PoS, around 39 per cent of total respondents have agreed for same and around 36 per cent were opined that it is workable proposition and it is possible to fix the requirement looking at size of operational holdings, cropping

pattern and soil test report. While they also reported that all the farmers could not understand the soil health card report and the recommendations given on the same. The selected buyers were asked to give their suggestions to make fertiliser use equal to the desired level. More than half of the buyers have suggested that there is a need to create awareness among the farmers, while about 32 per cent of buyers suggested need to create awareness about organic farming and 12 per cent suggested that fertilisers should be provided to farmer as per demand and requirement of soil.

Further probing why it is not workable preposition for operational holdings declaration and sale of fertilizers as per farming requirements at the time of buying fertilizer through PoS, the farmers opinion is presented in Table 4.9. There were many reasons expressed by the surveyed farmers. Mainly the crux of their opinion against fixing up such a requirement was in many cases almost one third of total buyers were not willing to reveal details of land holdings in order to buy fertilisers followed by around 32 per cent of buyers were not be the actual cultivators as many of respondents were either purely tenants or owner cum tenants. Therefore, farmers are not sure whether they would be cultivating the same land during the next year or in some cases even next season. Therefore, fixing up requirement may not be feasible on long term basis. In addition, there are some cases of multiple or joint ownership of land as well as disputed ownership which may create problem in provision of documentation for such fixation of requirement. Many farmers do not have ownership proof of their land which could be additional problem.

Table 4.8: Recent Purchase of fertilizers made by selected Buyers

Sr. No.	Particulars	Top 20 Buyer		Frequent Buyer		Random walk		All	
		Nos	%	Nos	%	Nos	%	Nos	%
1	Your recent purchase -did you buy through POS device at the retail	96	96.0	48	96.0	91	91.0	235	94.0
1	If yes did you buy all fertilizers through POS or only part of it								
	All	95	99.0	47	97.9	54	59.3	196	83.4
	Part	1	1.0	1	2.1	37	40.7	39	16.6
	if part give %		25.0		50.0		24.3		25.0
1	If yes did you buy only during current year or last year as well								
	Current year	37.0	38.54	9.0	18.75	80.0	87.91	126.0	53.62
	Last two years	59.0	61.46	39.0	81.25	11.0	12.09	109.0	46.38
1	If not bought through POS was this device operating at the shop	4	100.0	2	100.0	9	100.0	15	100.0
1	If you bought manually (not through POS) did retailer provide you a manual receipt	1	25.0	0	0.0	2	22.2	3	20.0
2	Did you carry forward stock from previous year (Rabi 2017 to kharif 2018)	0	0.0	0	0.0	0	0.0	0	0.0
	If yes mention the quantity of each variant of fertilizer carried forward	-	-	-	-	-	-	-	-
2	If it is made compulsory to obtain a declaration regarding operational holdings and sale of fertilizer as per farming requirement at the time of PoS will it be acceptable to you	39	39.0	22	44.0	36	36.0	97	38.8
1.6.1	Do you think it would be workable proposition	36.0	36.0	19.0	38.0	35.0	35.0	90.0	36.0
	Provide your opinion why								
i	less use of fertilizer	0	0.0	2	4.0	0	0.0	2	0.8
ii	know our soils requirement	3	3.0	0	0.0	0	0.0	3	1.2
iii	Create infrastructure Facilities	68	68.0	28	56.0	70	70.0	167	66.8
iv	Device not working properly	20	20.0	16	32.0	29	29.0	65	26.0
v	Farming on rent	9	9.0	4	8.0	1	1.0	13	5.2
1.6.1	Do you think it is possible to fix the requirement looking at size of operational holdings, cropping pattern and soil test report	34	34.00	19	38.0	35	35.0	88	35.20
	If not, why? Provide your opinion why								
i	Land is not distributed among the family members	0	0.00	2	4.00	0	0.00	2	0.80
ii	It is not possible all the farmers does not have soil test report understanding	92	92.00	44	88.00	97	97.00	233	93.20
iii	Soil health card is not proper	8	8.00	4	8.00	3	3.00	15	6.00
	Suggest alternate to make fertilizer use equal to the desired level								
i	Create Awareness among Farmers	30	50.00	11	36.67	32	61.54	73	50.69
ii	Establish Infrastructure	0	0.00	0	0.00	4	7.69	4	2.78
iii	Implementation of this policy is very Strictly	0	0.00	1	3.33	3	5.77	4	2.78
iv	Create awareness about organic farming	22	36.67	15	50.00	9	17.31	46	31.94
v	As per farmers demand and soils requirement	8	13.33	4	13.33	5	9.62	17	11.81

Table 4.9: Farmers' perception about declaration of buying fertilizers as per farming requirements at the time of PoS

Sr. No.	Perception why it is not feasible opinion	Response %
1	Actual cultivators and owners could be different	32.0
2	Fixing requirement at the time of PoS may be time consuming process	8.0
3	of land holdings (fear) in order to buy fertilizers Not willing to reveal details	36.0
4	Farmers use fertilizers as per crop growth process so cannot guess it in advance	16.0
5	Crop depends on weather, so sometimes require more fertilizers some time less	8.0
6	Multiple ownership of land or Disputed land	0.0

Table 4.10 presents the farmers' insight on why it is not possible to fix the requirement of fertilizers looking at size of operational holdings, cropping pattern and soil test report. Like to the previous question a large number of respondents were of the opinion that cropping pattern changes or weather condition changes may obstruct fixing up such a requirement. However, a significant number of respondents (44 per cent) pointed out that either they do not have any soil health card made available to them or even if they do have a soil health card, they do not rely on soil health card results. Therefore, fixing up requirement based on soil health card may not work. Another significant numbers (almost one fourth) pointed out that they would rather like to continue their traditional pattern of fertilizer usage. Farmers also pointed out that it won't be a workable proposition as every year/season farmers tend to change crops or its varieties as per weather condition.

Table 4.10: Farmers' perception about fixing requirement as per size of operationalholdings, cropping pattern and soil test report (%)

Sr. No.	**Perception why it is not feasible -farmers' opinion**	Response %
1	Do not rely on soil health card results/ Non availability of SHC	44.44
2	Crops depend on weather, so usage may differ	22.22
3	Like to follow their old traditional system	33.33
4	Leased-in land holder change every year	0
5	Changeable cropping pattern, crop varieties	0
6	Ground reality of farming is different from any government policy making	
7	Time consuming process	0

4.5 Different Variants of Fertilizers Purchased during the year

After having detailed discussion about the operations of PoS machine and farmers' perception about the fertilizer requirement through their holding size, cropping pattern and soil test report, this section explores farmer's fertilizer buying pattern and their per acre usage of fertilizer in different crops grown by them during the reference year. The basic idea is to see differences in various variants of fertilizer bought by our selected farmers and also to compare their prices as well as real time information about what percentage of fertilizer is bought through the point of sale (PoS) machine transactions. The information relating to fertilizer purchases by respondents for the reference year 2018-19, i.e., for the season of kharif and rabi and summer 2019 2018 (July 2018 to June 2019) were collected. In addition, details of fertilizer purchased by respondent farmers during the latest month relating to the point of survey (June 2019) was collected.

Table 4.11: Details on fertilizers purchased by Top 20 Buyers during reference year

Fertilizer type	Av. Qtl (Kg)	Av. Value (Rs)	Av. Price Rs/Kg	Through POS = 1 (No)	Percent
AS	2475.3	31028.1	12.8	39	100.0
ASP	4160.0	62400.0	15.0	5	100.0
City Compost	11262.5	290677.8	25.0	4	100.0
DAP	1929.5	55708.2	29.1	73	92.4
MOP	2232.8	44638.4	20.2	34	94.4
Multi Micronutrient	100.0	3375.0	32.5	0	0.0
Narmada Phos	2262.5	48536.1	21.6	4	100.0
NPK	2103.6	50358.8	22.7	14	100.0
SSP	2714.3	22018.8	8.3	33	94.3
Urea	4079.6	25482.5	6.4	89	92.7

The latest month purchase was collected in order to capture any memory loss in the annual data and also to cross check fertilizer usage, prices as well as percentage of sale through MoS system. The details are presented in Table 4.11. Various variants/types of fertilizers had purchased by the selected buyers during the reference year. The average quantity purchased by farmers, average value of fertilizers as well as average price of fertilizers are shown in Table 4.11 to 4.14. The highest

quantity of fertilizers purchased during the reference year/month was ASP and Urea and out of total transactions, more than 90 percent (except random walk buyers) was done through PoS machine.

Table 4.12: Details on fertilizers purchased by Frequent Buyers during reference year

Fertilizer type	Av. Qty. (Kg)	Av. Value (Rs)	Av. Price Rs/Kg	Through POS = 1 (No)	Percent
AS	2802.9	34164.9	12.4	17	100.0
APS	800.0	12000.0	15.0	1	100.0
City Compost	0.0	0.0	0.0	0	0.0
DAP	1430.3	42244.4	29.4	29	87.9
MOP	1200.0	23569.9	20.0	16	94.1
Multi Micronutrient	0.0	0.0	0.0	0	0.0
Narmada Phos	3000.0	59700.0	19.9	1	100.0
NPK	1400.0	35000.0	25.0	4	100.0
SSP	681.3	5581.3	8.2	8	100.0
Urea	3357.9	20758.0	6.4	42	93.3

Table 4.13: Details on Fertilizers purchased by Random Walk Buyers during reference year

Fertilizer type	Av. Qty. (Kg)	Av. Value (Rs)	Av. Price (Rs/Kg)	Through POS = 1 (No)	Percent
AS	1008.3	12881.9	13.6	42	100.0
APS	1250.0	18750.0	15.0	1	100.0
City Compost	50000.0	1300000.0	26.0	1	50.0
DAP	703.4	21029.8	29.5	60	81.1
MOP	779.0	15795.0	20.5	21	67.7
Multi Micronutrient	2525.0	56000.0	31.0	1	50.0
Narmada Phos	450.0	10000.0	22.2	0	0.0
NPK	830.0	18902.6	18.2	10	100.0
SSP	754.2	6499.0	8.6	10	76.9
Urea	1528.2	9486.0	6.3	85	86.7

Table 4.14: Details on Fertilizers purchased by All Buyers during reference year

Fertilizer type	Av. Qty (Kg)	Av. Value (Rs)	Av. Price (Rs/Kg)	Through POS = 1 (No)	Percent
AS	1903.4	23795.3	13.1	98	100.0
APS	3264.3	48964.3	15.0	7	100.0
City Compost	19010.0	492542.2	25.2	5	83.3
DAP	1356.6	39622.7	29.3	162	87.1
MOP	1487.3	29729.9	20.3	71	84.5
Multi Micronutrient	1312.5	29687.5	31.8	1	25.0
Narmada Phos	2083.3	43974.1	21.4	5	83.3
NPK	1548.2	36930.3	21.4	28	100.0
SSP	1990.9	16241.8	8.4	51	91.1
Urea	2897.5	18033.7	6.4	216	90.4

The details about the fertilizers consumption during the reference month or survey month of various types of fertilizers purchased. During the reference month average quantity purchased by farmers through PoS or not, average value of fertilizers as well as average price of fertilizers were shown in Tables 4.15 to 4.18. All most all types of fertilizers were purchased through PoS machine by top twenty buyers and frequent buyers but in the case of random walk buyers, unavailability of Aadhaar card with them at the time of purchasing restricted entry through POS.

Table 4.15: Details on Fertilizers purchased by Top 20 buyers during reference month

Fertilizer type	Av. Qty (Kg)	Av. Value (Rs)	Av. Price Rs/Kg	Through POS = 1 (No)	Percent
AS	1101.8	16370.5	13.3	28	100.00
APS	1962.5	31694.4	16.8	4	100.00
City Compost	4290.0	87422.2	21.4	5	100.00
DAP	1595.0	45084.8	28.2	70	100.00
MOP	1600.7	32527.1	20.3	29	100.00
Narmada Phos	1387.5	29850.0	21.6	4	100.00
NPK	1900.0	46592.9	23.9	10	100.00
SSP	1296.7	11390.0	8.8	30	100.00
Urea	1990.3	12023.2	7.0	98	100.00

Table 4.16: Details on Fertilizers purchased by Frequent Buyers during reference month

Fertilizer type	Av. Qty (Kg)	Av. Value (Rs)	Av. Price Rs/Kg	Through POS = 1 (No)	Percent
AS	1460.0	19169.8	13.3	10	100.00
APS	50.0	749.5	15.0	1	100.00
City Compost	1000.0	22222.2	22.2	1	100.00
DAP	1532.8	43437.8	28.2	31	96.88
MOP	1058.3	22258.6	20.9	24	100.00
Narmada Phos	1500.0	29850.0	19.9	1	100.00
NPK	750.0	18750.0	25.0	2	100.00
SSP ybhnn	1050.0	9706.3	9.8	11	100.00
Urea	1877.0	12039.6	6.8	42	97.67

Table 4.17: Details on Fertilizers purchased by Random Walk Buyers during reference month

Fertilizer type	Av. Qty (Kg)	Av. Value (Rs)	Av. Price Rs/Kg	Through POS = 1 (No)	Percent
AS	357.5	4788.8	13.5	20	100.00
APS	-	-	-	-	0.00
City Compost	500.0	4444.4	20.0	-	0.00
DAP	686.0	19741.4	28.2	45	84.91
MOP	695.2	13088.6	19.9	18	75.00
Narmada Phos	375.0	7902.8	20.6	2	100.00
NPK	200.0	2352.0	11.8	2	100.00
SSP	595.0	5091.6	8.5	11	91.67
Urea	851.7	5063.2	6.2	69	88.46

Table 4.18: Details on Fertilizers purchased by All Buyers during reference month

Fertilizer type	Av. Qty (Kg)	Av. Value (Rs)	Av. Price Rs/Kg	Through POS = 1 (No)	Percent
AS	906.9	12797.8	13.4	58	100.00
ASP	1580.0	25505.5	16.4	5	100.00
City Compost	3278.6	66254.0	21.3	6	85.71
DAP	1282.9	36401.4	28.2	146	94.19
MOP	1167.8	23680.5	20.4	71	92.21
Narmada Phos	1114.3	23579.4	21.0	7	100.00
NPK	1492.9	36295.2	22.3	14	100.00
SSP	1105.9	9791.9	9.0	52	98.11
Urea	1562.5	9547.5	6.7	209	95.43

4.6 Crop & Season wise fertilizer consumption

As mentioned in introductory chapter, major fertilizers are usually of three types viz. nitrogenous fertilizes (N) the phosphoric fertilizer (P), potassic fertilizers (K). With the introduction of high-yielding variety (HYV) seeds, there was acceleration in the growth of fertilizer consumption. Before the 1950s, fertilizers use was very low and was confined to plantation crops. The introduction of fertilizer-responsive HYVs and expansion in the irrigated area led to a sharp increase in fertilizer application on field crops. Therefore, it is important to study the purchasing pattern of fertilizer of selected buyers which can be verified through the use of fertilizer in different crops grown by the selected households. The use of different variants of fertilizers by the selected farmers for the crops grown during the reference year of 2018-19 is

presented in tables 4.19 to 4.24. It can be seen from the tables that Cotton, tobacco, paddy and wheat were the major crops grown by the selected farmers. It was observed that the increase in consumption of urea and decrease in consumption of other fertilizers due to price differential. Both prices and subsidies of fertilizers are important determinants of consumption level per hectare. It is observed that there are marked crop wise variations in the consumption of fertilizers. As expected, among these variants, the most intensive use was that of urea in almost all crops grown by the selected farmers. It is visible from figure that intensive use of urea was followed by DAP, MOP and SSP in the descending order.

Table 4.19: Crop wise Use of fertilizer by **Top 20 buyers during** Kharif-2018
(Area in acre, Fertilizer Amount in kgs/acre)

Crops	Area	AS	ASP	City Compost	DAP	MOP	Multi Micronutrient	Narmada Phos	NPK	SSP	Urea	Zinc
Bajra	39.52	2.61	0.00	0.00	15.69	2.61	0.00	0.00	0.00	5.23	21.50	0.00
Castor seed	20.79	9.91	0.00	0.00	5.95	13.87	0.00	0.00	4.95	4.96	13.77	0.00
Cotton	996.97	0.39	0.05	0.08	2.91	0.24	0.00	0.11	0.26	0.79	6.65	0.00
Groundnut	4.00	15.43	0.00	0.00	15.43	1.54	0.00	0.00	7.72	0.00	7.72	0.00
Horti.crops	115.93	15.21	0.83	3.59	11.64	7.35	0.00	0.00	3.01	4.95	12.23	0.36
Jowar	33.60	0.00	0.00	0.00	5.64	0.00	0.00	0.00	0.00	0.00	24.55	0.00
Paddy	482.98	2.58	0.38	3.21	1.58	0.05	0.09	0.09	0.89	0.98	8.59	0.00
Sesamum	26.19	2.76	0.00	0.00	4.31	1.20	0.00	0.00	2.36	1.18	12.71	0.00
Urad	2.00	0.00	0.00	0.00	0.00	6.17	0.00	0.00	0.00	0.00	27.78	0.00
Vegetables	10.00	4.94	0.00	0.00	6.17	1.23	0.00	0.00	12.35	0.00	13.33	0.00

Table 4.20: Crop wise Use of fertilizer by **Top 20 buyers during** Rabi and summer 2019

(Area in acre, Fertilizer Amount in kgs/acre)

Crops	Area	AS	ASP	City Compost	DAP	MOP	Multi Micronutrient	Narmada Phos	NPK	SSP	Urea
Bajra	94.0	12.1	4.4	11.0	7.7	3.3	0.0	4.4	0.0	2.2	21.4
Chicory	9.0	12.2	12.2	12.2	11.5	0.0	0.0	0.0	0.0	0.0	11.0
cumin	18.4	0.0	0.0	0.0	7.8	2.0	0.0	0.0	0.0	6.4	25.4
Gram	56.1	0.0	0.0	0.0	4.5	0.1	0.0	0.0	0.0	0.7	1.7
Horti.crops	3.6	38.4	28.8	0.0	28.8	19.2	0.0	0.0	19.2	19.2	38.4
Jowar	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.3
Maize	6.0	10.3	6.9	17.2	6.9	0.0	0.0	0.0	0.0	0.0	12.4
Moong	7.2	5.8	5.8	143.9	5.8	0.0	0.0	0.0	0.0	7.1	8.0
Mustard	4.8	0.0	0.0	0.0	10.8	0.0	0.0	0.0	0.0	0.0	19.4
Paddy	41.9	1.0	1.0	12.3	2.2	0.0	0.0	0.0	0.0	1.2	9.3
Tobacco	249.4	4.9	0.8	1.2	4.5	0.6	0.2	0.0	1.7	2.1	13.8
Vegetables	62.2	5.0	1.1	0.0	4.9	1.4	0.0	0.0	3.3	0.9	7.4
Wheat	333.5	0.6	0.5	0.2	3.2	0.1	0.1	0.2	1.1	1.4	12.7

Table 4.21: Crop wise Use of fertilizer by **Frequent buyers** during Kharif-2018

(Area in acre, Fertilizer Amount in kgs/acre)

Crops	Area	AS	ASP	DAP	MOP	Narmada Phos	NPK	SSP	Urea
Bajra	3.8	18.0	0.0	0.0	0.0	0.0	0.0	0.0	30.8
Castor seed	6.0	0.0	0.0	17.0	0.0	0.0	0.0	17.0	36.8
Cotton	166.4	0.7	0.0	8.7	0.6	0.0	0.8	0.6	28.1
Groundnut	8.0	0.0	0.0	9.6	1.0	0.0	0.0	3.9	3.9
Horti crops	3.6	38.4	0.0	28.8	9.6	0.0	28.8	19.2	43.2
Jowar	7.6	0.0	0.0	6.7	0.0	0.0	0.0	0.0	46.1
Maize	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.3
Paddy	112.6	4.1	0.4	1.2	0.1	0.5	1.1	0.4	14.8
Sesamum	6.6	0.0	0.0	22.8	1.9	0.0	0.0	4.7	19.4
Turmeric	1.8	19.0	0.0	38.1	7.6	0.0	0.0	0.0	34.2
Vegetables	11.2	52.1	0.0	30.6	13.0	0.0	21.4	18.4	47.0

Table 4.22: Crop wise Use of fertilizer by **Frequent buyers during** Rabi and summer 2019

(Area in acre, Fertilizer Amount in kgs/acre)

Crops	**Area**	**AS**	**ASP**	**DAP**	**MOP**	**Narmada Phos**	**NPK**	**SSP**	**Urea**
Bajra	72.5	14.5	0.0	4.6	4.6	5.7	1.8	0.0	23.8
cumin	3.2	12.0	0.0	24.0	0.0	0.0	0.0	0.0	21.6
Gram	14.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0	5.4
Horticultural crops	16.1	21.5	0.0	17.8	12.4	0.0	14.6	7.3	21.5
Jowar	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.3
Moong	6.4	3.2	0.0	6.4	1.0	0.0	3.2	0.0	15.6
Mustard	10.2	8.1	0.0	4.0	0.0	0.0	0.0	0.0	20.0
Paddy	3.0	13.8	0.0	13.8	2.8	0.0	41.5	0.0	49.8
Tobacco	100.9	3.5	0.0	2.0	0.3	0.0	0.0	0.3	10.3
Vegetables	6.0	6.9	0.0	10.3	1.7	0.0	0.0	0.0	21.6
Wheat	72.9	4.0	0.6	3.6	0.2	0.7	1.4	0.6	20.6

Table 4.23: Crop wise Use of fertilizer by **Random walk buyers** duringKharif-2018

(Area in acre, Fertilizer Amount in kgs/acre)

Crops	Area	AS	ASP	DAP	MOP	Narmada Phos	NPK	SSP	Urea	Zinc
Bajra	16.2	31.6	0.0	3.2	6.4	0.0	0.0	0.0	41.8	0.0
Castor seed	5.6	36.4	0.0	29.2	11.7	0.0	18.2	18.2	37.3	0.0
Cotton	597.7	0.5	0.0	4.9	0.4	0.2	0.0	1.4	10.2	0.0
Groundnut	4.0	15.4	0.0	7.7	0.0	0.0	0.0	0.0	7.7	0.0
Horti crops	23.2	17.8	0.0	23.6	7.4	0.0	0.0	5.2	23.0	0.0
Jowar	20.4	3.8	0.0	12.8	0.0	0.0	0.0	0.0	29.2	0.0
Maize	3.0	0.0	0.0	13.8	1.4	0.0	0.0	0.0	24.9	0.0
Moong	1.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	25.0	0.0
Paddy	154.4	7.0	0.2	2.5	0.2	0.0	1.6	0.4	32.5	0.0
Sesamum	22.4	3.4	0.0	7.1	0.6	0.0	0.0	3.1	15.1	0.0
Turmeric	0.6	0.0	0.0	34.7	0.0	0.0	0.0	0.0	0.0	0.0
Urad	3.0	0.0	0.0	20.8	0.0	0.0	0.0	0.0	37.3	0.0
Vegetables	5.8	17.6	8.8	47.2	8.8	0.0	0.0	17.6	45.4	0.0

Table 4.24: Crop wise Use of fertilizer by **Random walk buyers** during Rabi and summer 2019

(Area in acre, Fertilizer Amount in kgs/acre)

Crops	Area	AS	ASP	City Compost	DAP	MOP	Multi Micronutrient	NPK	SSP	Urea
Bajra	49.54	17.2	8.1	0.0	13.1	0.0	0.0	0.0	0.5	54.5
Chicory	2.99	0.0	0.0	0.0	50.2	50.2	0.0	0.0	0.0	75.3
cumin	6.80	7.4	0.0	0.0	22.1	0.0	0.0	0.0	0.0	46.3
Jowar	5.60	0.0	0.0	0.0	13.4	0.0	0.0	0.0	8.9	24.1
Maize	2.00	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	22.5
Mustard	7.19	20.9	0.0	0.0	13.9	0.0	0.0	0.0	0.0	41.7
Tobacco	239.64	15.4	0.0	10.4	7.5	0.0	10.4	2.4	0.1	51.8
Vegetables	18.39	19.0	2.7	0.0	21.8	10.9	0.0	0.0	5.4	41.6
Wheat	58.91	2.5	0.8	0.0	17.7	0.3	0.0	0.4	0.8	51.3

4.7 Training Attended by the farmers

In our previous section, we have noticed that a large number of farmers indicated that there is a need for awareness campaign on PoS system among farmers. Table 4.25 presents the details on trainings organized for farmers' awareness about PoS. The overall picture shows that more than 98 per cent farmers didn't attend any training organized by any government officials or fertilizer companies. Out of total trained farmers, 60 percent had attended training of 2-7 days duration while rests were trained for 1-2 days. Agriculture department officials had conducted all trainings during 2017 and 2018.

Table 4.25: Trainings attended by farmers on awareness about PoS

Details		Response (%)
Training attended (%)	Yes	1.98
	No	98.02
Duration of training	1-2 days	40.00
	2-7 days	60.00
Department organized	Department of Agriculture	100.0
	Fertilizer company	0.00
	Any other	0.00
Year of training (%)	2016	0.00
	2017	40.00
	2018	60.00
	2019	0.00

4.8 Constraints faced and Suggestions by the Buyers

DBT-F is one of the most successful direct benefit programs implemented in the country. When the farmer or buyer purchases fertilizers from a dealer, he/she presses his or her thumb at a point-of-sale (PoS) device and an authenticated receipt comes out giving details of the purchase and subsidy to be paid by the government directly to the manufacturer. DBT in fertilizers has had its challenges and constraints. The constraints faced by the buyers and suggestions are given in Table 4.26.

Table 4.26: Constraints faced by the Buyers and suggestions

Sr. No	Particulars	Top 20 Buyer		Frequent Buyer		Random walk		All	
		N	%	N	%	N	%	N	%
1	Give details of problems faced in buying fertilizer through POS device								
i	Biometric authentication related issues	7	7.0	9	18.0	29	29.0	45	18.0
ii	Network related issues	36	36.0	19	38.0	26	26.0	81	32.4
iii	Farmers awareness	8	8.0	1	2.0	4	4.0	13	5.2
iv	No problem	49	49.0	21	42.0	41	41.0	111	44.4
2	Does mandatory authentication through Aadhaar/ Voter ID in purchase of fertilizers create hassles in buying fertilizer/s	50	50.0	28	56.0	51	51.0	129	51.6
3	Do you support subsidy amount to be directly deposited to your bank account	5	5.0	7	14.0	10	10.0	22	8.8
4	What are your suggestions for improvements in present fertilizer delivery system								
i	Create awareness amongst the farmers & proper implementations of the scheme	52	81.3	33	84.6	56	93.3	141	86.5
ii	Existing Scheme of DBT in Fertilizers is very good	12	18.8	6	15.4	4	6.7	22	13.5

Major problems faced by buyers during the fertilizer purchasing through POS device were biometric authentication related issues like failure of authentication, lower Aadhaar authentication strike rate, network related issues, poor farmers' awareness. This would need to be addressed on priority, if necessary, by applying proper policy. Almost, half of the buyers in all the categories, revealed that the mandatory authentication through Aadhaar in purchase of fertilizers create hassles in buying fertilizers during the peak season. While Aadhaar is the preferred form of identification of buyers, other forms of identification may also be used. The major suggestions for improvements in present fertilizer delivery system were that there is a need to create awareness amongst the farmers and proper implementation of the scheme and existing Scheme of DBT in Fertilizers is very good. The opinions of farmers regarding the improvement of PoS sale mechanism are as below:

- Single window system so that all fertilisers are available at a single retail point.
- Credit facility should be made available to farmers to buy fertilizer if they fall short ofcash.
- Create awareness towards organic farming.

Interestingly, despite of these challenges and constraints faced by the buyers, farmers (and buyers) prefer the DBT system.

4.9 Chapter Summary

The functioning of fertilisers at farmers' level is presented and discussed in this chapter. It was observed from field that that average age of selected respondent was 44.2 years, all the sample respondents were male with average years of schooling of 8.7 years and family size of 6.6 person farming experience of 22 years at overall level. On an average, owned area of the sampled household was estimated to be 9.30 acres and almost 97 per cent area reported was irrigated having cropping intensity of 138 per cent at overall level. The cropping pattern of selected respondents indicate that the Cotton was the main crop being grown by

the selected households (39.10 percent) followed by paddy (17.65 per cent), Tobacco (13.10 per cent) and Wheat (10.33 per cent). These four crops together accounted for 80 per cent of gross cropped area of the selected household. Among the all categories of the buyers, the highest percent of buyers (40.8 per cent) purchased fertilizers from cooperative societies may be due to availability 19 per cent from private dealers followed by 3.2 percent respondents from company owned shops. The 37.2 per cent of buyers had purchased fertilisers from all these three sources. More than 98 per cent of all categories of buyers have reported that price/sale amount mentioned had matched with the payment made by them, and around 45 per cent have understood that how much subsidy is provided on purchase. About 96 percent of respondents have reported that price as well as sale amount mentioned matches with the payment made by them. However, only 45 percent were aware about how much subsidy is provided on purchase made by them. It is clearly indicates that sensitization among the farmers is needed towards what proportion subsidy could make available to farmers towards the purchasing of fertilizers. Almost 96 per cent of buyers have reported that retailers have insisted on Aadhaar card or Voter ID submission for the sale of fertilisers.

Almost 56 per cent of respondents have reported that they had some problem in producing Aadhaar/Voter ID while purchasing fertilisers while 48 per cent of respondents were aware about the fact that DBT in fertiliser and sale of fertiliser through POS is mandatory. Around 42 per cent of respondents had insisted for the receipt of transaction through POS. About 94 percent of buyers had purchased fertilisers recently through POS device at the retail point. More than half of the buyers have suggested that there is a need to create awareness among the farmers, while about 32 per cent of buyers suggested need to create awareness about organic farming and 12 per cent suggested that fertilisers should be provided to farmer as per demand and requirement of soil. Various variants/types of fertilizers had purchased by the selected buyers during the reference year. The highest quantity of fertilizers purchased during the reference year/month was ASP and Urea and out of total transactions,

more than 90 percent (except random walk buyers) was done through PoS machine. Cotton, tobacco, paddy and wheat were the major crops grown by the selected farmers. It was observed that the increase in consumption of urea and decrease in consumption of other fertilizers due to price differential. Both prices and subsidies of fertilizers are important determinants of consumption level per hectare. It is observed that there are marked crop wise variations in the consumption of fertilizers. As expected, among these variants, the most intensive use was that of urea in almost all crops grown by the selected farmers. It is visible from figure that intensive use of urea was followed by DAP, MOP and SSP in the descending order.

More than 98 per cent farmers didn't attend any training organized by any government officials or fertilizer companies. Major problems faced by buyers during the fertilizer purchasing through POS device were biometric authentication related issues like failure of authentication, lower Aadhaar authentication strike rate, network related issues, poor farmers' awareness. This would need to be addressed on priority, if necessary, by applying proper policy. Almost, half of the buyers in all the categories, revealed that the mandatory authentication through Aadhaar in purchase of fertilizers create hassles in buying fertilizers during the peak season. While Aadhaar is the preferred form of identification of buyers, other forms of identification may also be used. The major suggestions for improvements in present fertilizer delivery system were that there is a need to create awareness amongst the farmers and proper implementation of the scheme and existing Scheme of DBT in Fertilizers is very good. Interestingly, despite of these challenges and constraints faced by the buyers, farmers (and buyers) prefer the DBT system.

The next chapter presents the summary and conclusions of the report.

Chapter V

Summary, Conclusions and Policy Implications

5.1 Backdrop

India is one of the major producers as well as consumers of chemical fertilisers in the World. The N & P (P_2O_5) fertilizers production in India was reported to be 18.16 million tonnes that accounts for 10.35 per cent of the World's N & P (P_2O_5) fertilizers production in 2017 and rank second position. The total fertiliser product consumption in India was reported to be 26.59 million tonnes in 2017-18 which accounted for 13.80 per cent of total fertiliser consumption in the World and rank at second position. However, as compared to the most of the countries in the World, average intensity of fertilizer use in India remains much lower which is highly skewed, with wide inter-regional, inter-state, and inter-district variations. In India, the most commonly accepted NPK ratio is reported to be 4:2:1, while it was estimated 6.6:2.6:1.0 in 2018-19.

Fertilisers have been considered as an essential input to Indian agriculture for increasing agricultural production so as to meet the food grains requirements of growing population of the country. A very close association is observed between growth in use of fertilisers and crop production and productivity in almost all the states of the country. The Green revolution technology adopted during mid-sixties comprised of high yielding variety seeds (HYVs), fertilizer and irrigation has brought country out of chronic food shortage stage to food grains surplus country. With the advent of fertiliser responsive crop varieties, total consumption of fertilisers have increased from about 1.1 million tonnes in 1966-67 to 27.23 million tonnes in 2018-19. It was estimated that urea accounts for 82 per cent of total nitrogen consumption and di-ammonium phosphate accounted for 61 per cent of phosphate consumption in 2018-19. The intensity of use of fertilisers in India has increased from 6.99 kg per ha of gross cropped area in 1966-67 to 137.40 kg per ha during 2018-19. However, the level of consumption of fertilisers was highly varied within

as well as between the States, i.e. from 223.6 kg/ha in Punjab to 53.4 kg/ha in Rajasthan to 25 kg/ha in Tripura during TE 2018-19. The variability in consumption of fertilisers can be attributed to different cultivation methods, type of crops and subsidy on fertilisers. Further, the consumption of fertilisers has also varied across farm size groups with the highest amount of consumption recorded among group of small farmers. Besides, there are concerns about the indiscriminate use of chemical fertilisers by the farmers with a view to increase the crop yield. This has led to deterioration of soil structure, wastage of nutrients, destruction of soil micro-organisms and scorching of plants at the extreme cases.

Though fertilizer consumption has reported significant increase, but many reports have highlighted its uneven, untimely and faulty distribution which had become prone to 'leakages' as well as pro-rich large farmer group. It was estimated that about two third of total fertilizers produced in the country does not reaches the intended beneficiaries viz., small and marginal farmers. Besides, some reports have highlighted industry use of fertilizer. Fertilizer subsidies in India currently account for the second-largest government transfer, with estimated outlays of over 700 billion rupees (USD 10 billion) projected for the 2018-19 fiscal year. Because of the vast size of fertilizer subsidies and the subsequent market distortions they introduce, India's fertilizer subsidies have been the subject of much scrutiny for some time. Among other effects, these subsidies introduce arbitrage opportunities whereby subsidized fertilizer supplies from India can be smuggled across porous borders into Nepal and Bangladesh and sold in so-called 'grey markets.' In order to tackle these issues, GOI had taken various initiatives including technological interventions such as Fertilizer Management System in 2007, Neem Coated of Urea in 2008, Mobile Fertilizer Monitoring System in 2012 and Integrated Fertilizer Monitoring System in 2016 which has helped to increase transparency in the fertilizer distribution system and its management. While these initiatives could not fully curb the leakage, excess use as well as misuse of fertilizer.

As subsidy on fertilizer is the second largest subsidy after food subsidy provided the by the government, GOI has decided to bring fertilizer subsidy under the Direct Benefit Transfer (DBT) system w.e.f., 1st October 2016 in 17 pilot districts under which government remits a subsidy amount to fertilizer companies after fertilizer retailers have sold fertilizer to farmers through Point of Sale (PoS) machines through biometric authentication. Any farmer can purchase any required quantity of subsidized fertilizer regardless of the land size availed with him at subsidized rate. The different states were put on Go—Live mode w.e.f 01.09.2017 and Pan India rollout of DBT was completed by March 2018. The implementation of the DBT in Fertilizer Scheme required deployment of PoS devices at every retailer shop and training of retailers for operating PoS device. Across the country, Lead Fertilizer Supplier have conducted 10878 training sessions. So far 2.26 Lakh PoS devices have been deployed across all States. A total of 1182.04 Lakh Metric Tons Fertilizers have been sold through PoS devices under DBT Scheme till December 2019. Approximately, 2.39 lakh retailers were sensitized during the introductory training sessions conducted by lead fertilizer suppliers (LFS). The DBT system entails 100 per cent payment of subsidy to the fertilizer manufacturing companies on the basis of actual sales by the retailer to the beneficiary. NITI Aayog has conducted four extensive evaluations through an independent agency M/s Microsave in the DBT pilot and received positive feedback after which the deployment of PoS devices was extended to all the States/UTs across the country.

Based on circumstantial evidences, it has been found that the information regarding opening stock, daily/weekly/monthly sales, closing stocks of fertilizers at retail points do not match from various sources, i.e., PoS, physical sale/stock register maintained by the retailer. Further, the daily/weekly/monthly sales as per the physical bill book maintained by retailer do not match with each other. For example, stocks of fertilizers on a particular date at a retail point as shown in the PoS generated records and the physical registers/books of the retailer do not reconcile. Since the release or the entitlement to subsidy is established through sales recorded

in the PoS machine, it is critical that the system of operation of PoS at the retail point is strictly adhered to. Therefore, it is needed to verify such information at the first hand. Additionally, it is essential to check not only at the retail point, but also it is desirable to cross check with the farmers about their purchase of fertilizers; the identification source used by them; their ease of doing business with this new PoS system; and seek their opinion about the functioning of the PoS system. Therefore, present study was undertaken to find out the degree of variation among various sources of data at the retailer level in Gujarat state with specific objectives as follows:

1. Compare the PoS generated stocks, with the stocks as recorded in the manual records of the retailer and analyse the difference.
2. Compare the PoS based sales with the receipts issued/ invoices/ bills in the physical books and analyse the difference.
3. Compare the physical stock on the day of visit to the Retail Outlet with the stock shown on the PoS.
4. Examine whether the quantities of fertilizers purchased by top 15-20 buyers (and 10 frequent buyers) from the retailer (as generated from IFMS) are justified by their operational holdings, crops sown, etc.
5. Through a farmer survey, assess administrative/compliance implications of obtaining a declaration regarding operational holding at the time of PoS sale at the retailer level.

The study is based on both primary and secondary level data. The secondary data required for the study were compiled from published sources. The primary data for the study were collected by interviewing personally the retailers and fertiliser buyers from two selected districts by recall method. The quantitative/qualitative data were collected in a structured questionnaire; keeping in view the objectives of the study. As per the methodology provided by the coordinator, two districts were selected covering different agro climatic zones with one district covering irrigated area and the other one covering rain-fed/dry land area.

Accordingly, Anand (irrigated area) and Botad (rainfed/dry land area) district were selected. From each selected district, a total number of 30 retailers were selected for the purpose of investigation which have the representation of private retailers, company owned shops and cooperative societies. In addition, from each selected district, a list of top 20 buyers and frequent 10 buyers were obtained for the last six months (i.e., from January 2019 to June 2019). Thus, from this list of 120 top-twenty buyers and 60 frequent buyers, a total number of 50 top-twenty buyers and 25 frequent buyers/farmers (as generated from IFMS) were selected randomly for detailed investigation and verification for operational holdings, crops sown etc. Further, 50 farmers from each district were selected as random walk for further purchase verification through PoS. Thus, the aggregate sample for Gujarat state was 60 retailers, 100 top-twenty buyers, 50 most frequent buyers and 100 random walk buyers selected from the same villages where from top and frequent buyers were selected. The data were collected for the agricultural year 2018-19.

5.2 Fertiliser Consumption in Gujarat

Gujarat is not only the fastest growing states of India but also one of those states where economy has always performed better than the national average. Agriculture and allied sector plays major role in the growth of State economy as activities of agriculture and allied sectors are the primary source of occupation for the majority of the rural people in the State. Gujarat has been consistently clocking impressive agricultural growth rates. This has been possible because the government has focused on improving not only irrigation, quality of seeds and power but also subsidiary sectors like animal husbandry. Gujarat has seen intensification in agricultural practices during the last two decades with increase in the consumption of chemical fertilisers. The major highlights of fertiliser use in Gujarat are as follows:

- Total fertiliser consumption in Gujarat has increased from 17.2 thousand tonnes in TE 1962-63 to 538.5 thousand tonnes in TE 12002-03 and then to 1681.5 thousand tonnes in TE 2018-19.

Gujarat has reported the per hectare consumption of fertilizer (133.7 kg/ha) close to national average of 134.18 kg/ha in TE 2018-19, which was the highest in across the states in Western Zone of India.

- During the period from 1960-61 to 2018-19, total fertiliser consumption in Gujarat has increased at the rate of 7.32 per cent per annum. Among the nutrients, rate of growth was highest in case of K (8.4 per cent p.a.) followed by use of N (7.3 per cent p.a.) and P (6.7 per cent p.a.). Increase in consumption of fertiliser has also increased the intensity of fertiliser use over the period of time. The per hectare use of total fertiliser has increased from 1.7 kg/ha in TE 1962-63 to 76.9 kg/ha in TE 2002-03 and 133.7 kg/ha in TE 2018-19.
- The consumption ratio of N& P to K in Gujarat was estimated to be very wrost during TE 1962-63 (25.9:12.7:1), which has lower done and balanced as 13.6:6.9:1 in TE 1972-73 and got closer to stipulated one (4:2:1) in TE 1982-83, i.e 6.2:3.1:1. While then after again, ratio of fertliers nutrients have got in favor of N till date and it was estimated as 9.5:2.9:1 in TE 2019-20.
- Across the districts, the highest quantity of fertiliser use is reported in Banaskantha district followed by Rajkot, Surat, Surendranagar, Kheda, Ahmedabad, Anand, Sabarkantha, Kutch and Bhavnagar. These top ten selected districts together accounted for 52 per cent of total fertiliser consumption in the State during 2018-19.
- Out to total fertiliser use across the districts of Gujarat, 52 per cent was used in Kharif season and rest was used in Rabi season.
- Most of the districts in Saurashtra region (viz. Amreli, Bhavnagar, Botad, Devbhoomi Dwarka, Jamnagar) and tribal district of Dang have reported around three fourth of total fertiliser use in kharif season. While use of fertiliser was higher in Rabi season than kharif season in the districts of Ahmedabad, Anand, Vadodara, Mehsana, Banaskantha and Sabarkantha.

- The consumption of N&P ratio to K use was estimated to be the highest and extra orbitant towards N in Dahod district (317.7:38.8:1), followed by Patan (55.4:13.5:1) and the lowest was in Surat (2.9:1.1:1). Except Surat and Vasari districts, all other district has higher use of N as compared to stipulated one (4:2:1). While out of total 33, 19 districts have higher use of N as compared to State average (9.6:2.9:1).
- The intensity of use of fertiliser across districts of Gujarat was found the highest in Surat district (332 kg/ha) and the lowest was in Dang district (16 kg/ha). Other top fertiliser user districts having higher use of fertiliser that State average were Navsari, Anand, Gandhinagar, Vadodara, Sabarkantha, Chhota Udepur, Panchmahal, Kheda, Mahisagar, Rajkot, Banaskantha, Narmada, Arvalli, Morbi, Tapi and Bharuch.

5.3 Functioning of DBT in Fertiliser at Retailers' End

- Out of the selected retailers, 31.6 per cent were private retailers, 23.3 per cent were company owned depot/retailers and remaining 45 per cent were cooperatives-PACS.
- All the retailers have the PoS Machine for entry of purchase and sell of the fertilizers at their outlets. Majority of the retailers (98.3 per cent) have the 'Oasis company' machine for the purchase sale entry operation while very few have Analogic company machine. All the retailers had gone through the training about the operation of the PoS machine.
- In majority of the cases, retailer along with his helper had participated in training of PoS machine (as in some cases, more than one training was attended from each retail shop).
- Around 95 per cent of total retailers had started raising invoices w.e.f February, 2018. All the retailers have emphasized on the Aadhaar based authentication via PoS machines.
- All the retailers have faced problems in handling the PoS machine. Around 90 per cent of total retailers had faced some issues in PoS

machine related to software and authentication issues, while one third of total retailers have faced hardware issues and around 38 per cent retailers have faced stock issues. Network problem was the another biggest issue faced by almost 82 per cent retailers at the aggregate.

- Among the software issues, 98.1 per cent retailers have faced the problem of frequent logout/Session expired/took more time for up-dation issues in new version while rest of them had experienced non-acceptance of finger print of retailer as well as of farmer.
- In case of hardware issues, about two third of retailers have faced issues related print issue/non-availability of print roll/print ink fade away while rest have faced problem of early drain-out of battery /more time for charging/Screen not display properly.
- All the retailers have reported problem related to figure print authentication while 52 per cent of retailers have reported problem of authentication of farmer's thumb.
- Retailers have also faced the issues related to the slowdown of server, late receiving of dispatch ID acknowledgement, slow processing of updating PoS new version, updating the present stock, Aadhaar authentication, and small screen size on the PoS.
- In the context of the stock related issues, it arises during the peak season period when there was heavy rush of farmers for fertilizer purchase and thus it was difficult to match the stock at that time. Besides, farmers had demanded fertilizers on the credit basis for which no credit bill can be generated and thus matching the stock was very difficult.
- One of the pertinent problem reported by retailers was that after receiving the stock from the fertilizer company, they need to update the stock in the stock invoice to generate online receipt records. However, updating of stock is not possible until the company stock number is entered into the PoS. But, fertilizer companies have not been updating the Demand Draft number for the stock provided and thus it was always difficult for the retailer to

sell the same stock through PoS until that entry was made. This was one of the biggest issues faced by retailers for not updating PoS at the time of current fertilizer sale.

- The issues faced by the retailers were reported to State DBT coordinator, fertilizer company representatives and department officials. All the issues were raised by the retailers were rectified by the Fertilizer company representatives and POS company representatives. Majority of the retailers have reported that issues were addressed immediately and services offered by the POS staff was reported satisfactory.
- Majority of retailers have used multiple sources of stock records wherein manual book keeping and computer system /PoS for record keeping of fertilizers are major one. While few of them had computer operated management system in Talley or such softwares. The management of stock and sale information through multiple system of book keeping/computer operated systems/POS by retailers have increased their workload enormously. Many retailers have been maintaining two systems (the first was a PoS to record sale transactions and the second was system generated as well as /or manual record). Retailers have reported that increase in workload consumed their productive time and they felt burden of record keeping.
- The receipts generated through the PoS devices get fade away very early and thus it was very difficult to maintain record for long time. Retailers have suggested that the government should link the PoS application with the tally/any such system software at their end.
- More than half of the retailers have reported that updation of the stock was delayed by more than a day. Most of the retailers faced issues of stock mismatched of the PoS and physical stock received which had happened because of the gaps in the back-end stock updation process. Even though the physical stock reached to the retail point but same was not reflected in their PoS machine. Retailers could not sell the stock unless it was updated in the PoS.

Thus, as per practice adopted, retailer sold their old stock manually and after that same was adjusted in the new stock. Retailers have reported that due to slower internet network connectivity at village level, they couldn't perform updation of PoS on daily basis.

- The major three reasons reported by the retailers for the mismatch for the POS stock with physical stock were heavy rush of farmers during the seasons/hurriedness of the farmers/it is time consuming process (by 40 per cent of retailers), followed by authentication were not proper due to muddy hand (by 29 per cent of retailers) and farmer did not bring Aadhaar card always (by 26 per cent retailers).
- More than half of the retailers had purchased fertilizers directly from fertiliser company followed by one fifth of total retailers had purchased from Wholesaler, while more than 28 per cent of retailers had purchased fertiliser from both the sources, i.e wholesalers as well as Companies.
- More than half of the retailers have reported the raising of invoices in POS on the daily basis. While rest of them had generated invoices in PoS once in a week basis due to various reasons such as difficulty in authentication of purchases (34.52 per cent), followed by difficulty in multiple records keeping (28.57 per cent), farmers did not bring Aadhaar card at the time of purchasing fertilizers (19.1 per cent). The transaction receipts getting fade away within a month that is way there were not able to use that receipt after a month and therefore they had avoided raising invoices in POS.
- The retailers also reported that network connectivity problem was another hurdle along with technical problem. Besides, short battery life was also a major issue. The majority of retailers faced problem in managing transactions during peak agriculture season.
- None of the retailer had reported that PoS required too many documents for the selling of fertilizers as only Aadhaar card was required for the authentication.
- Almost two third of retailers have reported that problem of authentication by thumb impression (due to muddy hand & fate line

disappeared due to heavy work done by hand on the farm) and linking of Aadhaar card at the time of sale was the major issue. While almost one third of the total retailers have reported that farmers did not keep Aadhaar card with them while purchasing the fertilisers.

- More than half of the total retailers have reported that they have checked details on land holding and cropping pattern status while selling fertilizer in large quantity to buyers. Almost half of the retailers agreed for the implications of obtaining the declaration from farmer regarding operational holding at the time of PoS.
- The details on stock reports as per PoS devices, physical stock and manual records at the time of visit to retailers indicate that in case of the all types of the retailers, mis-match between stock as per PoS and physical verification, as well as manual records was observed. There was a difference in closing stock as per PoS and physical verification as well as manual record maintained. In case of private retailers, the highest difference in closing stock as per PoS and physical verification was observed in case of entry of Urea (452 Qtls.) while difference in stock as per PoS and Manual record was the highest in case of SSP fertilizers (438 Qtls.) with Private retailers. In case of Company owned depot as well as PACS, same situation was found wherein the highest difference in stock as per PoS and physical verification, as well as manual records was found in case of Urea and DAP, respectively. In fact, difference was more than 10000 quintals in case of PACS data entry, i.e POS stock, physical verification and as per manual record. At overall level, the highest mismatch across various types of fertiliser was estimated in case of DAP.
- There are various reasons behind the stock mismatches between PoS and physical as well as manual records, such as stocks are not getting updated on a real time basis; there are irrational changes and numerous glitches in the PoS machine/software; sale of fertilizers by the retailers without PoS machines; poor internet

connectivity in rural areas; problem of authentication of Aadhaar number of the farmers; poor maintenance of PoS machines; farmer did not possess Aadhaar card at the time of purchasing of fertilizers (farmers generally directly come from the farm); auto driver purchases fertilizer on behalf of the farmers and the auto driver uses his own Aadhaar number to authenticate the transaction. Some time, transactions are made by representatives of farmers as relative or friend who happens to visit the town for his work (buys fertilizer/seeds on behalf of the farmer). During the peak season, if retailers are not able to cater to the large number of farmers coming to shop, his sales may decrease because of limitations of the PoS machine (therefore they switch to manual transactions which are later 'adjusted) and the horridness of the purchasers. Therefore, the issue of mismatch of physical stock with PoS stock continues to persist.

- The difference of sales as per PoS and manual record was the highest in case of data entry of Urea fertilizers for all three types of selected retailers. Thus, at overall level, sale of urea fertilisers was the highest and also the highest difference of sales as per PoS and manual record was observed.
- The details about training on application of PoS devices at the selected districts of Gujarat state indicate that all the retailers were sensitized during the introductory training sessions conducted by LFS. During the field it is observed that average duration of training 1-2 days. A dedicated 15-member Multi-lingual Help Desks were set up to provide quick response to the queries of wide range of stakeholders across the country as a preparatory to DBT implementation.
- On the supply side of AeFDS (Aadhaar enabled Fertilizer Distribution System), retailers stated that PoS doesn't require too many documents neither create hassles in selling fertilizers. More than two third of the retailers have expressed the problems of linking Aadhaar with sale, while more than half of the retailers have

opined about checking land holding or cropping pattern of the purchaser. Administrative compliance implication was opined to be needed by more than half of the retailers.

- The retailers have given suggestions to improve the DBT system as follows:
  - The measurement of quantity should be in terms of per bag in the PoS instead of per tonne or per quintal that is easily understood both by retailers as well as farmers.
  - Desktop version / Computer system instead of PoS machine is preferable and more suitable.
  - Software and service issues should be addressed immediately.
  - Provide improved version and best service system set-up. Poor network issues need solution.
  - Frequent trainings, user friendly version and prompt services at the doorstep of retailers will help the system work more efficiently.
  - Acknowledgement receipt if given at the time of delivery it will enable provision of prompt services.
  - Frequent rebooting of PoS delays the service and need a permanent solution.
  - Improve infrastructure facilities and provide service centres at village level.

5.4 Functioning of DBT in fertilizer at Farmers' Level

- The average age of selected respondent was 44.2 years in which random walk respondents were older (49.3 years) than frequent buyers (41.6 years) and top 20 buyers (40.5 years). Thus, top 20 buyers were from the younger generation in the agriculture.
- All the sample respondents were male which indicate dominance of male culture in Indian society.
- The average level of education of all the respondents was estimated to be around 9 years only. The Average year of schooling of top 20

buyers and frequent buyers was around 9 years while same was 8.4 years for random walk buyers. As it was expected that younger generation of top 20 buyers may be educated till graduation, same was not found at ground level.

- The average family size of sample households was estimated to be 6.6 persons at overall level, which was relatively small in case of top 20 and random walk group respondent than frequent buyers group which had family size of 7 persons.
- Majority of buyers belongs to General category (60.8 per cent) followed by 34.4 per cent from Other Backward Classes social group while rest of them belongs to SC and ST categories.
- Agriculture was the main occupation of the selected 83 per cent of respondents while 10.8 per cent respondents were salaried persons. The subsidiary occupation of the selected respondents was reported to be self-employed in household industry followed by agriculture labour and activities related agriculture and allied sectors.
- The total farming experience of the all types of buyers was estimated to be about 22 years, in which random walk respondents were more experienced (28.33 years) followed by top 20 buyers (15.56 years) and the lowest experienced was reported by frequent buyers (15.06 years).
- On an average, owned area of the sampled household was estimated to be 9.30 acres, in which top 20 buyers had the highest size of owned area (12.24 acres) and the lowest was with frequent buyers (5.46 acres). On aggregate net operated area was slightly higher (13.1 acres) than the owned area indicating net lease-in exceeding the net lease-out area by the selected households. Almost 97 per cent area reported was irrigated. Cropping intensity was around 138 per cent at overall level, which was highest in case of frequent buyers and the lowest was in case of random walk buyers.
- The average annual income from agriculture of selected buyers was highest in case of top twenty buyers (Rs. 400530/-) and the lowest was for random walk buyers (Rs. 194180/-). At overall level, average

income from agriculture was reported to be Rs. 277922 followed by income from non-agriculture sources (Rs, 100318) and the lowest was from allied activities (Rs. 16060/-).

- Cotton was the main crop being grown by the selected households (39.10 percent) followed by paddy (17.65 per cent), Tobacco (13.10 per cent) and Wheat (10.33 per cent). These four crops together accounted for 80 per cent of gross cropped area of the selected household. Thus, at overall level, hardly 38 per cent area was under food grain crops, 3 per cent was under oilseed crops, 52 percent was under cash crops (Cotton and Tobacco) and rest was under horticultural and perennial crops. Same kind of trend was observed in all three categories of respondents.
- Among the all categories of the buyers, the highest percent of buyers (40.8 per cent) purchased fertilizers from cooperative societies may be due to availability of PACS at village level and easy access for respective buyers. About 19 per cent of households had purchased fertilisers from private dealers followed by 3.2 percent respondents from company owned shops. The 37.2 per cent of buyers had purchased fertilisers from all these three sources.
- At overall level, almost three fourth of respondents had purchased fertilisers themselves while very meagre share of respondents had send someone to purchase the same for them. One fourth of respondents have used both the options, i.e self-purchase or through someone. Almost same trend was observed in case of use of purchased fertilizer. More than two third of respondents had purchased fertilisers for their own use, while almost 5 per cent have purchased it for neighbours' use. Some buyers have reported that they had purchased fertilizers for others and they had charged around Rs. 37 per quintal extra and across the groups, the lowest extra charges were in case of random walk buyers and the highest was in case of top 20 buyers. None of them had purchased fertilisers from others.

- Almost 93 percent buyers have reported that they had received receipt for their purchase. However, around 80 per cent of them had received manual hand written receipt. Hardly 6.03 per cent of buyers have reported receipt of POS generated receipt which is main aim of the whole DBT in fertiliser scheme.
- More than 98 per cent of all categories of buyers have reported that price/sale amount mentioned had matched with the payment made by them, and around 45 per cent have understood that how much subsidy is provided on purchase.
- About 96 percent of respondents have reported that price as well as sale amount mentioned matches with the payment made by them. However, only 45 percent were aware about how much subsidy is provided on purchase made by them. It is clearly indicates that sensitization among the farmers is needed towards what proportion subsidy could make available to farmers towards the purchasing of fertilizers.
- Almost 96 per cent of buyers have reported that retailers have insisted on Aadhaar card or Voter ID submission for the sale of fertilisers. Most of the farmers did not carry Aadhaar Card when they visit retailers to buy fertiliser. Therefore, there is a need for carrying out a communication campaign to increase farmers' awareness so that they bring their Aadhaar to buy fertiliser.
- Almost 56 per cent of respondents have reported that they had some problem in producing Aadhaar/Voter ID while purchasing fertilisers as they could not carry same at the time of purchase of fertilisers.
- While 48 per cent of respondents were aware about the fact that DBT in fertiliser and sale of fertiliser through POS is mandatory.
- Around 42 per cent of respondents had insisted for the receipt of transaction through POS but due to either no identity was provided or failure of authentication through Aadhaar as it was mandatory or could not authenticate or both were the major reasons behind the same.

- Almost 94 per cent of respondents reported that they purchased fertilisers as and when required while remaining purchased sometime in advance or sometime instant. Thus, purchase of fertiliser by the farmers was as per requirement on time and majority of them did not make any advance purchase and stock of fertilisers.
- About 94 percent of buyers had purchased fertilisers recently through POS device at the retail point. Across the buyers, percentage of buyers was highest in case of group of top twenty and frequent buyers (96 per cent) while same was 91 per cent in case of random walk buyers.
- Around 98 per cent of total fertilisers purchased by top 20 and frequent buyers was through POS. As it was expected, random walk buyers' had partially purchased fertilizers through PoS machine. All of those who had purchased fertiliser have reported that POS device was in operation at the shop.
- The fertiliser purchase data of by top 20 buyers and frequent buyers was for last two years but in case of random walk buyers, it was for the current year. None of the buyers have carried forward stock from previous year.
- When respondents were asked about their opinion on acceptability for compulsory declaration regarding operational holdings and sale of fertilizer as per farming requirement at the time of PoS, around 39 per cent of total respondents have agreed for same and around 36 per cent were opined that it is workable proposition and it is possible to fix the requirement looking at size of operational holdings, cropping pattern and soil test report. While they also reported that all the farmers could not understand the soil health card report and the recommendations given on the same.
- The selected buyers were asked to give their suggestions to make fertiliser use equal to the desired level. More than half of the buyers have suggested that there is a need to create awareness among the farmers, while about 32 per cent of buyers suggested need to create

awareness about organic farming and 12 per cent suggested that fertilisers should be provided to farmer as per demand and requirement of soil.

- There were many reasons expressed by the surveyed farmers as it is not workable preposition for operational holdings declaration and sale of fertilizers as per farming requirements at the time of buying fertilizer through PoS. Mainly the crux of their opinion against fixing up such a requirement was in many cases almost one third of total buyers were not willing to reveal details of land holdings in order to buy fertilisers followed by around 32 per cent of buyers were not be the actual cultivators as many of respondents were either purely tenants or owner cum tenants. Therefore, farmers are not sure whether they would be cultivating the same land during the next year or in some cases even next season. Therefore, fixing up requirement may not be feasible on long term basis. In addition, there are some cases of multiple or joint ownership of land as well as disputed ownership which may create problem in provision of documentation for such fixation of requirement. Many farmers do not have ownership proof of their land which could be additional problem.
- The farmers' insight on why it is not possible to fix the requirement of fertilizers looking at size of operational holdings, cropping pattern and soil test report. Like to the previous question a large number of respondents were of the opinion that cropping pattern changes or weather condition changes may obstruct fixing up such a requirement. However, a significant number of respondents (44 per cent) pointed out that either they do not have any soil health card made available to them or even if they do have a soil health card, they do not rely on soil health card results. Therefore, fixing up requirement based on soil health card may not work. Another significant numbers (almost one fourth) pointed out that they would rather like to continue their traditional pattern of fertilizer usage. Farmers also pointed out that it won't be a workable proposition as

every year/season farmers tend to change crops or its varieties as per weather condition.

- The information relating to fertilizer purchases by respondents for the reference year 2018-19, i.e., for the season of kharif and rabi and summer 2019 2018 (July 2018 to June 2019) indicate that various variants/types of fertilizers had purchased by the selected buyers during the reference year. The highest quantity of fertilizers purchased during the reference year/month was ASP and Urea and out of total transactions, more than 90 percent (except random walk buyers) was done through PoS machine.
- Almost all types of fertilizers were purchased through PoS machine by top twenty buyers and frequent buyers but in the case of random walk buyers, unavailability of Aadhaar card with them at the time of purchasing restricted entry through POS.
- The use of different variants of fertilizers by the selected farmers for the crops grown during the reference year of 2018-19 indicate that Cotton, tobacco, paddy and wheat were the major crops grown by the selected farmers. It was observed that the increase in consumption of urea and decrease in consumption of other fertilizers due to price differential. Both prices and subsidies of fertilizers are important determinants of consumption level per hectare. It is observed that there are marked crop wise variations in the consumption of fertilizers. As expected, among these variants, the most intensive use was that of urea in almost all crops grown by the selected farmers. It is visible from figure that intensive use of urea was followed by DAP, MOP and SSP in the descending order.
- More than 98 per cent farmers didn't attend any training organized by any government officials or fertilizer companies. Out of total trained farmers, 60 percent had attended training of 2-7 days duration while rests were trained for 1-2 days. Agriculture department officials had conducted all trainings during 2017 and 2018.

- Major problems faced by buyers during the fertilizer purchasing through POS device were biometric authentication related issues like failure of authentication, lower Aadhaar authentication strike rate, network related issues, poor farmers' awareness. This would need to be addressed on priority, if necessary, by applying proper policy. Almost, half of the buyers in all the categories, revealed that the mandatory authentication through Aadhaar in purchase of fertilizers create hassles in buying fertilizers during the peak season. While Aadhaar is the preferred form of identification of buyers, other forms of identification may also be used. The major suggestions for improvements in present fertilizer delivery system were that there is a need to create awareness amongst the farmers and proper implementation of the scheme and existing Scheme of DBT in Fertilizers is very good.
- Interestingly, despite of these challenges and constraints faced by the buyers, farmers (and buyers) prefer the DBT system.

5.5 Conclusions and Policy Implications

On the basis of above discussion, conclusions and policy implications are drawn and presented below:

- All the retailers have faced problems in handling the PoS machine. Around 90 per cent of total retailers had faced some issues in PoS machine related to software and authentication issues, while one third of total retailers have faced hardware issues and around 38 per cent retailers have faced stock issues. Therefore, there is topmost need to address the operational problems in the PoS machine. Retailers are complained that the screen on the device is too small. They find it difficult to make entries into the PoS while carrying out transactions, receiving/updating stocks, etc. As suggested by the retailers, PoS should be made compatible with the desktop or laptop maintained by the retailers/wholesalers.

- Though all the retailers have undergone training on use of POS, but in most of the cases, retailers were not technically very well versed about the PoS Operated sale in Fertilizers management. Either they are too old or very less technologically sound in most of the cases of cooperative society secretary or others.
- Poor Network connectivity was the biggest issue faced by almost 82 per cent retailers at the aggregate level. This problem becomes acute during the peak season when there are long queues of buyers. Therefore, there is a need to provide them speedy internet connection facility or any other suitable system can be provided.
- Retailers have also reported problem of frequent server down, failure server down, failure of Aadhaar authentication of farmers, frequently session log out after some time, short battery charge status, battery do not get charge during the operational/working time/way, updated version of PoS are not user friendly, roll of print out is not easily available in the market, ink of the print out receipt are not long durable. Sale receipt and reports are printed on thermal paper that does not last long. Ink on thermal paper fades over a period of time. These problems need to be addressed through appropriate actions by the Department of Fertilizers.
- The devices from Analogics are of very poor quality. Among other issues, they suffer from short battery life, the devices may shutdown anytime.
- One of the pertinent problem reported by retailers was that after receiving the stock from the fertilizer company, they need to update the stock in the stock invoice to generate online receipt records. However, updating of stock is not possible until the company stock number is entered into the PoS. But, fertilizer companies have not been updating the Demand Draft number for the stock provided and thus it was always difficult for the retailer to sell the same stock through PoS until that entry was made. This was one of the biggest issues faced by retailers for not updating PoS at the time of current fertilizer sale. Therefore, there should be

automatic updation to be done by Company once the delivery of the stock is dispatched which can be confirmed by the retailers on receipt of same.

- There was a huge difference in closing stock as per PoS and physical verification as well as manual record maintained. As the subsidy is attached with real time PoS transactions, it is beyond understanding who bears the brunt in case there is difference between fertilizer issued by fertilizer companies to retailers and the amount displayed in the PoS sale at retailers' end. Thus, there is a need of appropriate step at each stakeholder level to rectify the same.
- In term of farmers, it was observed that most of the top 20 buyer and frequent were retailers itself and some of them were auto/tempo drivers, only few were actual farmers. The entire system of top and frequent buyers need streamlining and a proper punishment system need to be put in place on the retailers if they generate any fake identity of top and frequent buyers.
- Most of the farmers were with very low level education and they could not understand the receipt of sales transaction which is in English language. The POS device should also have option of local/State language. Also the measurement of quantity should be in terms of per bag in the PoS instead of per tonne or per quintal that is easily understood both by retailers as well as farmers.
- More than 98 per cent farmers didn't attend any training organized by any government officials or fertilizer companies while 48 per cent of respondents were aware about the fact that DBT in fertilizer and sale of fertilizer through POS is mandatory. As suggested by the more than half of the buyers, there is a need to create awareness among the farmers. There is need to organize village training camps on the same line as that of retailers training camps have been organized by fertilizer companies.
- Farmers have reported that availability of fertilizers on the basis of operational holding, cropping pattern and soil health card is not favorable for farmers. As like Anand district has number of NRI who

have leased out their land to laborer/tenant and tenet is unable to produce the land record or other document behalf of land lords. Besides, the reasons towards non-workable preposition for operational holdings declaration and sale of fertilizers as per farming requirements at the time of buying fertilizer through PoS includes mentioned by buyers were buyers were not willing to reveal details of land holdings in order to buy fertilizers; buyers were not be the actual cultivators as many of respondents were either purely tenants or owner cum tenants (therefore, farmers are not sure whether they would be cultivating the same land during the next year or in some cases even next season. Therefore, fixing up requirement may not be feasible on long term basis); In addition, there are some cases of multiple or joint ownership of land as well as disputed ownership which may create problem in provision of documentation for such fixation of requirement; many farmers do not have ownership proof of their land which could be additional problem. On the question of soil test report, a significant number of respondents pointed out that either they do not have any soil health card made available to them or even if they do have a soil health card, they do not rely on soil health card results. Therefore, fixing up requirement based on soil health card may not work. Therefore, robust methodology need to be develop to deliver the fertilizers as per crop requirements.

- Majority of the buyers have disagreed to full payment towards purchase of fertilizer and later subsidy amount deposition in bank by the government. Farmers' have pointed out that most of farmers are not economically sound to pay first and wait for subsidy for month or more. They cannot pay full amount initially as most of the time either they are in crunch of working capital to or they buy it on credit basis. Besides, tenant will not get benefit of subsidy was it will go of land holder's account. It would be acceptable to all farmers if the implementation of direct transfer of subsidy is done in such a way that the fertilizer subsidy amount is transferred to

the farmer's account at the time of entry of purchase details in the PoS system through Aadhar linked bank account. As soon as the purchase details are entered in the PoS, subsidy transfer takes place simultaneously so that farmer has to pay only the balance amount to the retailer as he is paying at present. Such a system will save all hassles for the fertilizer companies as well as retailers and farmers.

- Despite of the challenges, the new system has increased the overall accountability of stakeholders, including wholesalers and retailers, besides enhancing the transparency with improved tracking of physical movement of fertilizer in the district or state.

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Fertiliser Policies in India

Year	Policy	Highlights
1944	Central Fertilizer Pool	To ensure equitable distribution of all fertilisers at fair prices all over the country
1957	Fertiliser (Control) Order	To regulate the sale, price and the quality of fertilisers
1965	Committee on Fertilisers (Sivaraman committee)	To examine the problems distribution, pricing of fertilisers, role of cooperatives in marketing and role of extension services in the promotion and popularisation of the use of fertilisers
1966	Liberalisation of Fertiliser Marketing	Fertiliser marketing liberalised
1969		Domestic manufactures were given complete freedom in marketing
1972	Half-yearly Zonal Conferences	All the fertilisers were distributed by the manufacturers according to their ECA allocation
1973	Fertiliser Movement Control Order	Fertilisers distribution and inter-state movement under government control
1976	Fixed Subsidy per tonne on P2O5	To meet partially the increasing cost of production/import
1977	Fertilizer Prices Committee (Marathe Committee) Report Part I	To resolve the dilemma of how to keep farm gate prices of fertilisers at an affordable level in the face of rising production/ import costs
	RPS for Nitrogenous fertilisers introduced in 1977	RPS for Nitrogenous fertilisers introduced in 1977
1978	Fertilizer Prices Committee (Marathe Committee) Report Part II	Covered pricing of complex fertilisers, equated freight and distribution of fertiliser
1979	RPS for Complex fritters introduced	RPS for Complex fritters introduced
1980-81	Decontrol of Ammonium sulphate (A/S), and Calcium Ammonium Nitrate (CAN)	Decontrol of Ammonium sulphate (A/S), and Calcium Ammonium Nitrate (CAN)
	Block Delivery Scheme	To promote the use of fertilisers in the remote and inaccessible area
1982	SSP brought under RPS	Per tonne fixed subsidy on SSP withdrawn and replaced with RPS
1984	A/S and CAN brought under price control	A/S and CAN brought under statutory price control
1985	Ammonium Chloride was brought under RPS during 1985	Ammonium Chloride was brought under RPS during 1985
1986	High Powered Committee of Secretaries (B. B. Singh Committee	To conduct an a depth study of the Retention Price Scheme, covering the cost of production, the capital cost of fertilisers plants, the cost of inputs, an analysis of the factors contributing to suggest remedial measures to contain the subsidies
1987	High Powered Committee on Fertilizer Consumer prices (G. V. K. Rao Committee)	Recommended the systematic development of dry lands, improvement of soil testing laboratories, creation of more soil testing capacities
1991	Dual Pricing	The government experiment with dual pricing of fertilisers on a limited scale by exempting small & marginal farmers from the hike
1992	BICP Report on Normative Retention Price of Fertilizers	To access the feasibility of a group retention price for new gas based fertiliser plant along the HBJ pipeline
	Joint (Parliamentary) Committee on Fertilizer Pricing	To review the method of computation of Retention Prices for different manufacturers of fertilisers

1993	Decanalisation of MOP	Import of MOP was decanalised
1994	Decontrol of A/S, CAN and Ammonium Chloride	Prices of A/S, CAN and Ammonium Chloride were Decontrol
1998	High Powered Fertilizer Pricing policy review Committee (HPC) (Hanumantha Rao Committee)	To review the existing system of subsidization of urea
2000	Expenditure Reform Commission (ERC)	Rationalizing fertilizer subsidies
2001	Expert Committee on Reassessment of Production capacity (Alag Committee)	To reassess the production capacity of urea manufacturing units
	Cost Price Study of Complex Fertilizers (tariff Commission)	To decide the rates of concession of decontrolled complex fertilisers covered under the Concession Scheme
2003	Committee on cost Price Study of Diammonium Phosphate (indigenous and Imported) and Muriate of Potash (Imported)	Recommended the normated industry price for indigenous DAP based on the prices of the group of units using imported phosphoric acids and imported ammonia
	Committee on Efficient Energy level, etc. for Urea Units (Gokak Committee)	To suggest energy consumption norms for urea units
	New Pricing Scheme for Urea units (NPS) (Stage I and II)	A new pricing policy for urea units was approved
2004	Cost price Study of Single Super Phosphate (CAB Report)	To undertake cost study of Single Super Phosphate industry in India
2005	Working Group on review of Stage I & II of New Pricing Scheme (NPS) and formulation of Policy for Stage III for Urea units (Alagh Committee)	The New Pricing Scheme for Urea in force and to br implemented in three stages
	Expert Group on Phosphatic Fertilizer policy (Abhijit Sen Committee)	To review the current phosphatic fertiliser environment, examine international and Indian phosphatic fertiliser scenario and examine alternatives to the existing methodology of phosphatic fertilizer pricing and costing
	Task Force on Balanced Use of Fertilisers	To relook at the policy on use of fertilisers
2006	Fertilizer Monitoring System	The underlying objective was to monitor movement of various fertilisers at various stages in their value chain
2007	New Pricing Scheme for Urea units (NPS) (Stage III)	The policy aims at greater efficiency in urea production and its distribution in the country
	MAP brought under concession scheme	For decontrolled phosphatic and potassic fertilisers
	Cost Pricing Study of DAP, Complex Fertilisers & MOP by Tariff Commission	Cost Pricing Study of DAP, Complex Ferttilisers & MOP by Tariff Commission
2008	Guidelines for production and use of Customised Fertilisers	To enable interested companies to initiate the process f developing different grades of customized fertilisers
	Revised concession scheme for SSP for 2008-09	Made provision for fixation of uniform MRP
	Policy for encouraging production and availability of fortified and coated fertilisers	To promote use of secondary and micro nutrient and to improve fertiliser use efficiency
	Nutrient based pricing of subsidized fertilisers	To promote balanced fertilisation
	Indigenous and imported concession scheme	Indigenous and imported concession scheme
	Indigenous Amm. Sulphate under concession scheme	Indigenous Amm. Sulphate under concession scheme
	Policy on P & K fertilisers	Concession scheme on decontrolled P & K fertilisers

	Policy for uniform freight subsidy on all fertilisers	Inland freight for transportation of fertilizers will be reimbursed to the fertiliser companies
	Policy related to Sulphur Ammonia from Urea units	Applicable to all urea producing units covered under NPS
	Policy for new investments in urea sector and long term offtake of urea joint ventures abroad	A departure has been made from cost based approach and benchmarking has been made to imports
2009	Revised Policy for ad hoc concession for SSP	The government has decided to leave the selling price of SSP open
2010	NBS policy for P & K fertilisers	To ensure balanced application of fertilisers
	NBS policy for SSP	To bridge the supplies in underserved area
	Inclusion of NPK 16-16-16 complex fertiliser under NBS	Inclusion of NPK 16-16-16 complex fertiliser under NBS
	IPP 2009-10 policy for Stage III of NPS for urea	For new investment in urea sector
	Modification in NBS policy for P & K fertilisers for 2010-11	Modification in NBS policy for P & K fertilisers for 2010-11
	Recognition of Boron (B) included under NBS for additional subsidy	Recognition of Boron (B) included under NBS for additional subsidy
	Inclusion of 15-15-15-09 and 24-24-0-0	Inclusion of 15-15-15-09 and 24-24-0-0
2011	Task Force on Direct Benefit Transfer (DBT)	To work out the modalities for the proposed system of direct transfer of subsidy
	35% of indigenous Neem coated Urea allowed for production	35% of indigenous Neem coated Urea allowed for production
	MRP of Boronated SSP	MRP of Boronated SSP
	Inclusion of 16-44-0-0 (DAP lite) under NBS	Inclusion of 16-44-0-0 (DAP lite) under NBS
	Central Excise and Customs Duty on fertilisers	Central Excise and Customs Duty on fertilisers
	NBS policy for P & K fertilisers - 2011-12	NBS policy for P & K fertilisers - 2011-12
	Inclusion of 13-33-0-6, MAP lite 11-44-0-0 and DAP lite grade II 14-46-0-0 under NBS	Inclusion of 13-33-0-6, MAP lite 11-44-0-0 and DAP lite grade II 14-46-0-0 under NBS
2012	Mobile based fertilizer management system (mFMS)	To provide end-to-end information on the movement of fertilisers from manufacturers to the retail level
	NBS policy for P & K fertilisers - 2012-13	NBS policy for P & K fertilisers - 2012-13
	Policy for reimbursement of freight subsidy for P & K fertilisers under NBS	Policy for reimbursement of freight subsidy for P & K fertilisers under NBS
2013	New Investment Policy 2012	To facilitate fresh investment in urea sectors
	NBS policy for P & K fertilisers - 2013-14	NBS policy for P & K fertilisers - 2013-14
2014	NBS policy for P & K fertilisers - 2014-15	NBS policy for P & K fertilisers - 2014-15
	Modified NPS III for existing urea units	Additional fixed cost, Minimum fixed cost, Special compensation to urea, production from high cost naphtha based units
	Amendment to New Investment policy - 2012	To support only those companies who are serious about setting up new urea projects
2015	Cap/restriction to produce Neem Coated Urea removed	To remove the cap/restriction to produce Neem Coated Urea
	Mandatory production of Neem Coated urea	Mandatory production of Neem Coated urea
	Pooling of gas in fertilizer (Urea) sector	To supply gas at uniform delivered price to all fertiliser plants
	New urea policy 2015	New urea policy 2015
	NBS policy for P & K fertilisers for 2015-16	NBS policy for P & K fertilisers for 2015-16
2016	DBT on Pilot basis	DBT would be introduced on pilot basis for

		fertilizer in few districts across the country to provide quality service delivery to farmers
	Promotion on Policy of City Compost	Promotion on Policy of City Compost
	Removal of the minimum capacity utilisation criteria for SSP manufacturing units to be eligible for subsidy under NBS scheme	Removal of the minimum capacity utilisation criteria for SSP manufacturing units to be eligible for subsidy under NBS scheme
	Revision in the NBS rates for 2016-17	Revision in the NBS rates for 2016-17
	Revised rates for the direct movement of fertilizers by road from Plant/Port up to 500 kms	Revised rates for the direct movement of fertilizers by road from Plant/Port up to 500 kms
	Road Freight rates Urea manufacturing/importing units under the uniform freight subsidy scheme	Road Freight rates Urea manufacturing/importing units under the uniform freight subsidy scheme
	Incentives to the retailers for acknowledging the receipt of fertilizer in m-FMS regarding	Incentives to the retailers for acknowledging the receipt of fertilizer in m-FMS regarding
	Coastal Shipping/ Inland waterways included under policy for reimbursement of freight	Coastal Shipping/ Inland waterways included under policy for reimbursement of freight
2017	Revision in the NBS rates for 2017-18	Revision in the NBS rates for 2017-18
	Goods and services tax (GST) introduced w.e.f 1st July, 2017	Which replaced multiple cascading taxes levied by the central and state government
	Withdrawal of Additional VAT on input in Gujarat	Withdrawal of Additional VAT on input in Gujarat
	Rationalizing the size of urea bag	Introduce 45 kg bag
2018	Notification of MRP of 45 kg urea bag	Notification of MRP of 45 kg urea bag
	Reduction in GST rates on phosphoric acid and drip irrigation system	Reduction in GST rates on phosphoric acid and drip irrigation system
	Revision of energy norms under new urea policy - 2015	Revision of energy norms under new urea policy - 2015
	Revision of dealer/distribution margin of urea sale w.e.f. 1st April, 2018	Revision of dealer/distribution margin of urea sale w.e.f. 1st April, 2018
	Revision in the NBS rates for 2018-19	Revision in the NBS rates for 2018-19
2019	Relaxation in Export Policy of fertilisers	Relaxation in Export Policy of fertilisers
	Withdrawal of Additional VAT on Input in Uttar Pradesh	Withdrawal of Additional VAT on Input in Uttar Pradesh
	NBS rates for 2019-20	NBS rates for 2019-20
	Policy for reimbursement of freight subsidy for distribution of subsidized fertilizers through coastal shipping or / and inland waterways	Policy for reimbursement of freight subsidy for distribution of subsidized fertilizers through coastal shipping or / and inland waterways
	Clarification on Policy for reimbursement of freight subsidy for distribution of subsidized fertilizers through coastal shipping or / and inland waterways	Clarification on Policy for reimbursement of freight subsidy for distribution of subsidized fertilizers through coastal shipping or / and inland waterways
	DBT 2.0	This is an advanced multi-lingual desktop version of Point of Sale software as an alternative or added facility of POS device.

सत्यमेव जयते

Dharam Pal, IAS(AGMUT:88)
Additional Secretary (Fertilizers)
(Tel: 23386800)

भारत सरकार
GOVERNMENT OF INDIA
रसायन और उर्वरक मंत्रालय
MINISTRY OF CHEMICALS & FERTILIZERS
उर्वरक विभाग
DEPARTMENT OF FERTILIZERS
नई दिल्ली - ११०००१
NEW DELHI-110001

D.O. No. F. 15011/04/2019-DBT

Dated, the 26th June, 2019

Dear Principal Secretary,

I would like to draw your attention to the implementation of DBT in fertilizers across the country w.e.f March 2018. The DBT system has been functioning satisfactorily over the last one year and the Department is continuously making efforts to improve the system based on the feedback received from various stakeholders.

2. As a part of ongoing implementation of DBT, the department has taken the initiative to conduct a study on the functioning of DBT at retail points. D/o Agriculture, Cooperation and Farmer's Welfare, has assigned this task to Prof.Pramod Kumar, Institute of Social and Economic Change (ISEC), Bengaluru.

3. The broad terms of reference for the study are as under:

i. Compare the PoS generated stocks, with the stocks as recorded in the manual records of the retailer and analyse the difference.
ii. Compare the PoS based sales with the receipts issued/ invoices/ bills in the physical books and analyse the difference.
iii. Compare the physical stock on the day of visit to the Retail Outlet with the stock shown on the PoS.
iv. Examine whether the quantities of fertilizers purchased by top 15-20 buyers (and 10 frequent buyers) from the retailer (as generated from IFMS) are justified by their operational holdings, crops sown, etc.
v. Through a farmer survey, assess administrative/compliance implications of obtaining a declaration regarding operational holding at the time of PoS sale at the retailer level.

4. A total of 13 states will be covered during the study as per the details at Annexure-I. The ISEC units will be approaching the State Agriculture Departments, Retailers while conducting the study.

5. It is requested to instruct the concerned officials and designate a nodal officer to extend all cooperation for the smooth conduct of the study at retail points in your State. The Lead Fertilizer Suppliers (LFS) of the state and the State DBT Coordinators will support the conduct of the study, wherever required.

6. May I request you to extend all cooperation for the successful conduct of the study on functioning of DBT in your State?

With regards,

Yours sincerely,
Sd/-
(Dharam Pal)

To: Principal Secretary(Agriculture) of all States/UTs

Copy to:

1. Chief Secretaries of All States/UTs
2. LFS and State DBT Coordinator of all 13 States.

(Dharam Pal)

Annexure I

List of States to be covered for the study:

States	AERC Conducting the study
Andhra Pradesh	AERC Waltare
Assam	AERC Guwahati
Bihar	AERC Bhagalpur
Gujarat	AERC Vidyanagar
Haryana	AERC Delhi
Himachal Pradesh	AERC Shimla
Tamil Nadu	AERC Chennai
Madhya Pradesh	AERC Jabalpur
Maharashtra	AERC Pune
Punjab	AERC Ludhiana
Uttar Pradesh	AERC Allahabad
West Bengal	AERC Shantiniketan
Karnataka	ADRTC Bangalore

AERC - Agro Economic Research Centre

ADRTC – Agriculture Development and Rural Transformation Centre

અગત્યનું/ ટોચ અગ્રતા

જાનં: આઇ.ક્યુ./ખાતર-૨ /ફા.નં:૫ /૫૩૨૭-૩૬ /૨૦૧૯
ખેતી નિયામકશ્રીની કચેરી, કૃષિ ભવન, સેકટર ૧૦-એ, ગાંધીનગર
તા.૩૧/૦૭/૨૦૧૯

પ્રતિ
નાયબ ખેતી નિયામકશ્રી(વિ)
આણંદ/બોટાદ

વિષય: Study of Functioning of DBT at Retail point માટે AERC,VVNAGARને કામગીરીમાં સહકાર આપવા બાબત

સંદર્ભ :૧. ભારત સરકારશ્રીનો તા.૨૬.૬૧૯નો પત્ર ક્રમાંક F.No.15011/04/2019-DBT
૨. ડાયરેકટર, AERC, VVNAGAR-Anandનો તા.૨૪.૦૭.૨૦૧૯નો ઈમેલ

ઉપર્યુક્ત વિષય અન્વયે જણાવવાનું કે, ભારત સરકારશ્રી દ્વારા સબસીડાઈઝ ખાતર વિતરણમાં રાજ્યમાં તા.૧લી ફેબ્રુઆરીથી DBT યોજના અમલી કરેલ છે. ભારત સરકાર દ્વાર સંદર્ભ-૧(નકલ સામેલ) મુજબના પત્રથી ગુજરાત રાજ્યમાં DBT યોજનાના અમલીકરણ અંગે સમીક્ષા અને અભ્યાસ કરવા AGRO-ECONOMIC RESEARCH CENTRE(AERC) VVNAGAR-Anandને નિયુકત કરેલ છે. સદર અભ્યાસ માટે આણંદ અને બોટાદ જિલ્લાની પસંદગી કરવામા આવેલ છે. તેમજ AERC, VVNAGAR-Anand દ્વારા ટુંક સમયમાં અભ્યાસ હાથ ધરવામાં આવનાર છે.

જે ધ્યાને લઈ આપના જિલ્લામાં અભ્યાસ માટે આવનાર AERC, VVNAGAR-Anandની રીસર્ચ ટીમને જરુરી વિગતો પુરી પાડવા તેમજ અભ્યાસ દરમ્યાન સાથ સહકાર આપવા વિનંતી છે. તેમજ સદર કામગીરી માટે જિલ્લામાંથી એક નોડલ ઓફિસરની નિમણુક કરી અત્રે જાણ કરવા વિનંતી છે. તેઓના સંદર્ભ -૨ મુજબના ઈ-મેલ માં જણાવ્યા મુજબ DBT યોજનાના અભ્યાસ દરમ્યાન સંબંધિત તાલુકાના ખેતીવાડી અધિકારીઓને જરુરી વિગતો પુરી પાડવા તથા જરુરી સાથ સહકાર આપવા સુચના આપવા સારૂ

સામેલ: ઉપર મુજબ

નોંધ: મુસદ્દો માન.સંયુકત ખેતી નિયામકશ્રી(સીડ)એ મંજુર કરેલ છે.

ખેતી નિયામક
ગુ.રા., ગાંધીનગરવતી,

નકલ રવાના :

ડાયરેકટર, એગ્રો ઈકોનોમિક રીસર્ચ સેન્ટર, સરદાર પટેલ યુનિવર્સીટી, વલ્લભ વિધ્યાનગર(આણંદ)તરફ આપના ઈમેલ પરત્વે જાણ તેમજ આ સાથે સામેલ આણંદ/બોટાદ જિલ્લાના ના.ખે.નિ.શ્રી(વિ)ના સંપર્કની વિગતો ધ્યાને લઈ યોગ્ય ઘટતુ થવા સારૂ