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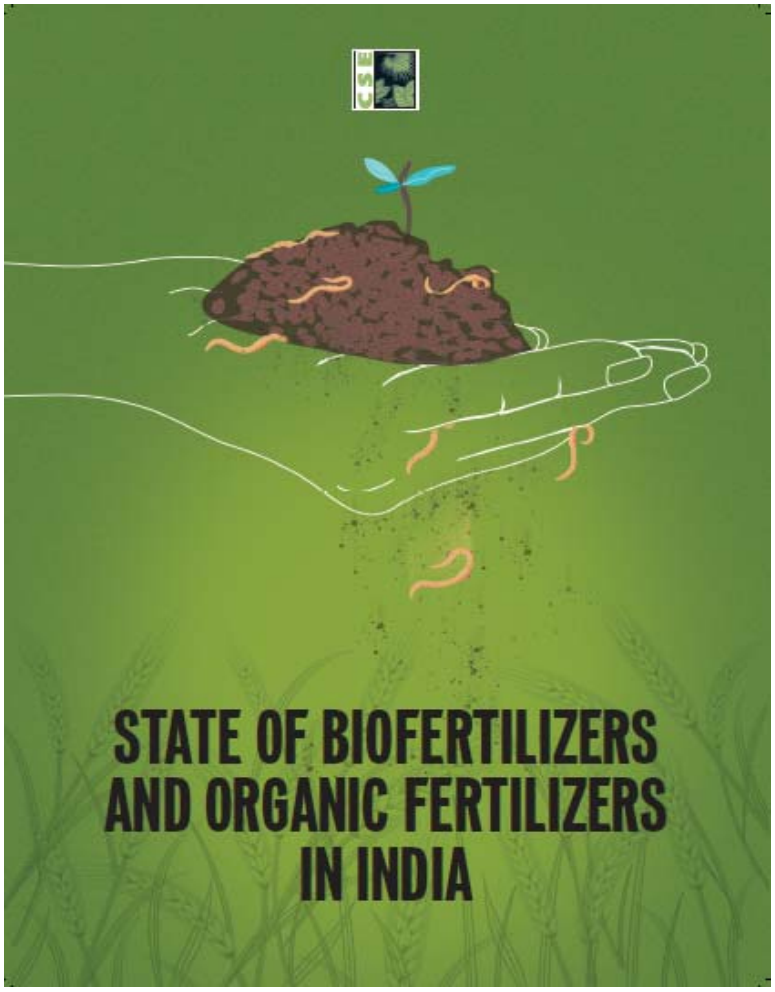
Session 6 - The role of Organic/Bio inputs in non-chemical sustainable agriculture

CSE REPORT

State of Biofertilizers and Organic Fertilizers in India

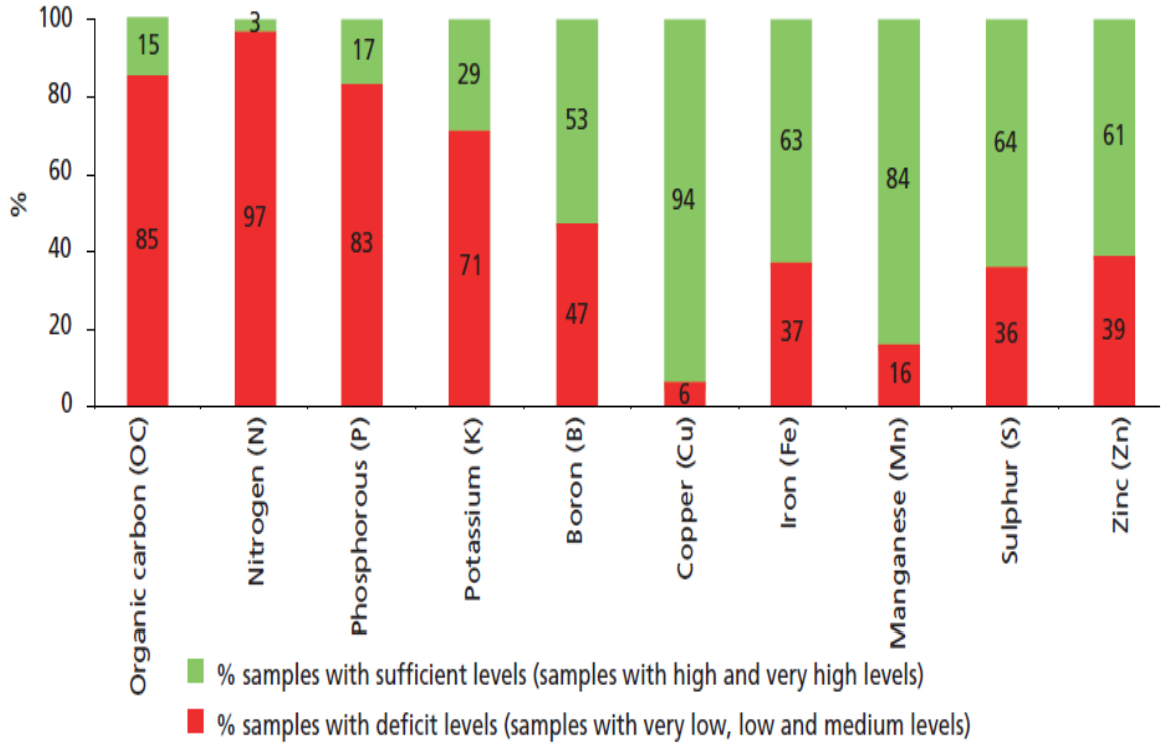


Indian soil health as per soil health cards

5.27 Crore soil samples
(two phases: 2015–16 to 2018–19)

Severe and widespread nutrient deficiencies

Graph 1: How deficient are Indian soils in organic carbon, macronutrients and micronutrients?



States: Organic carbon and Nitrogen deficiencies

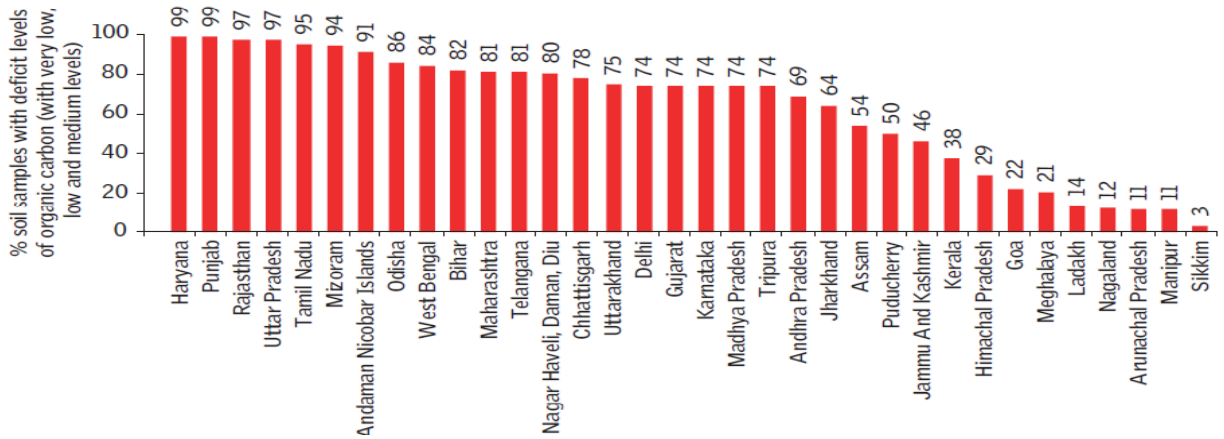
Organic Carbon

- 24 states/UTs: > half samples
- 7 states: > 90% samples

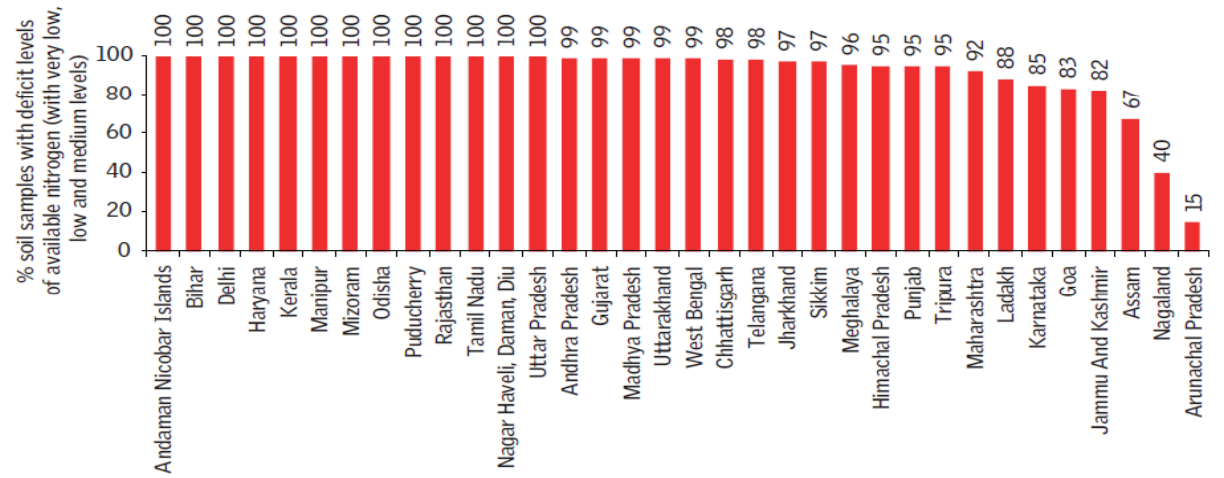
Available Nitrogen

- 32 states/UTs: > half samples
- 27 states/UTs: > 90% samples
- 15 states/UTs: 99-100% samples

Graph 2: Organic carbon deficiency in soils of states and Union territories



Graph 3: Deficiency of available nitrogen in soils of states and Union territories



States: Phosphorus and potassium deficiencies

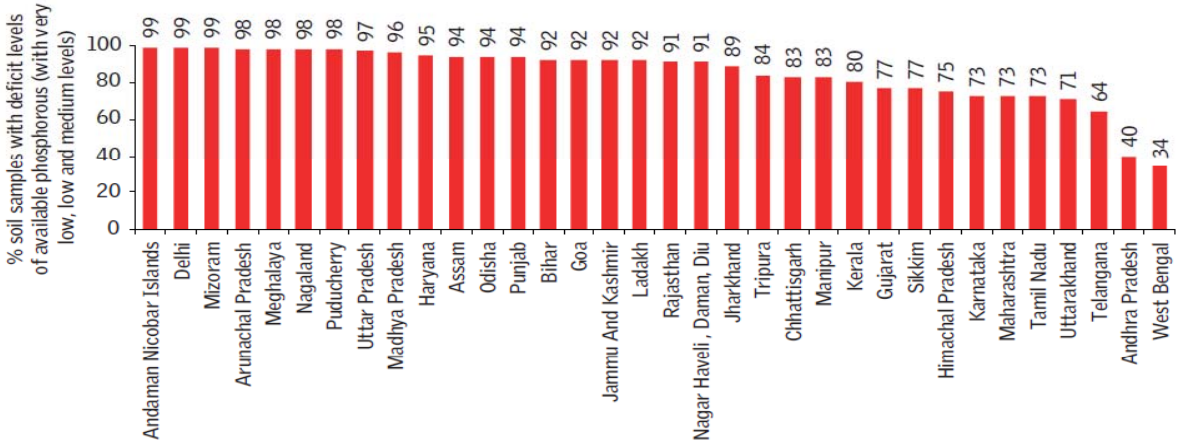
Phosphorus deficiency

- 32 states/UTs: > half samples
- 19 states/UTs: > 90% samples

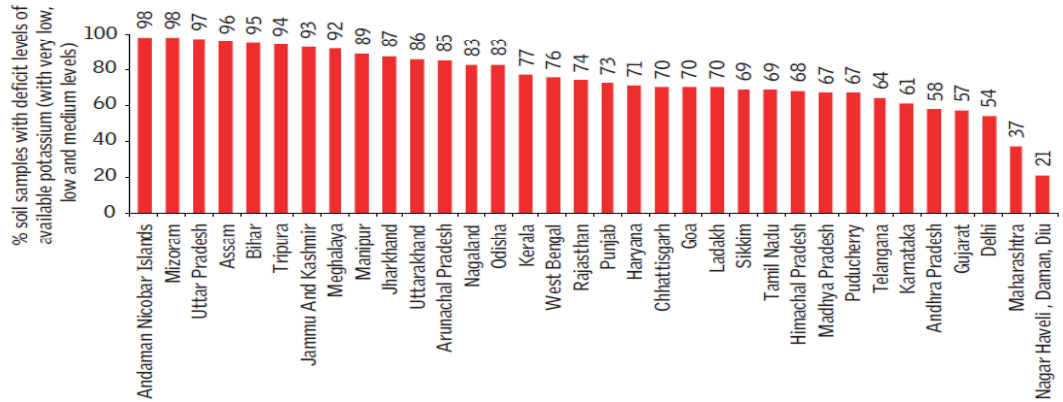
Potassium deficiency

- 32 states/UTs: > half samples
- Eight states: > 90% samples

Graph 4: Deficiency of available phosphorus in soils of states and Union territories



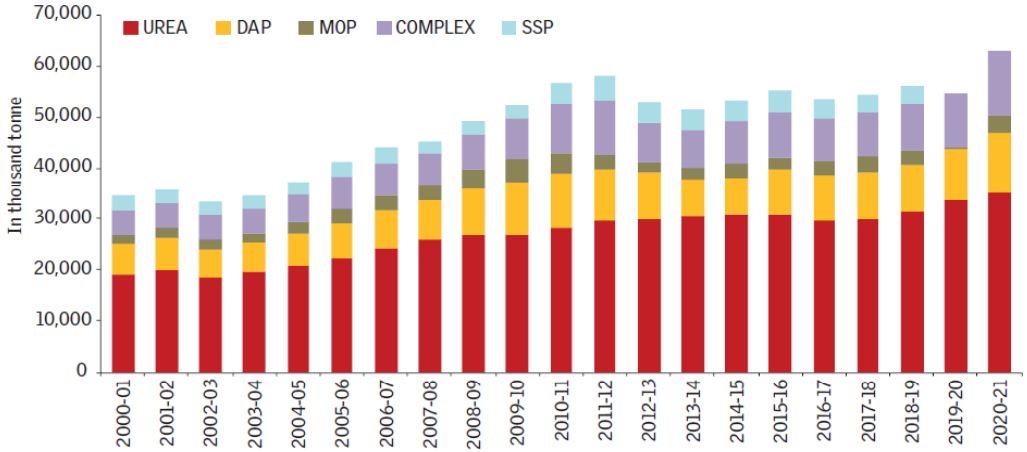
Graph 5: Deficiency of available potassium in soils of states and Union territories



Chemical fertilizer consumption in India

- **India: 2nd highest consumer and producer in the world (**2019)
- **2020-21:** Consumption was **62.98 million tonne;** More than half of it is Urea
- **Growth:** Overall (83% in last two decades)
- Complex fertilizers (163%), DAP (103%), Urea (83%), MOP (92%), SSP (25%)
- **Highest** per ha consumption: Bihar, Puducherry, Punjab, Haryana, Telangana, AP, UP, WB, TN, Karnataka

Graph 6: Growth in annual fertilizer consumption in India between 2000–01 and 2020–21

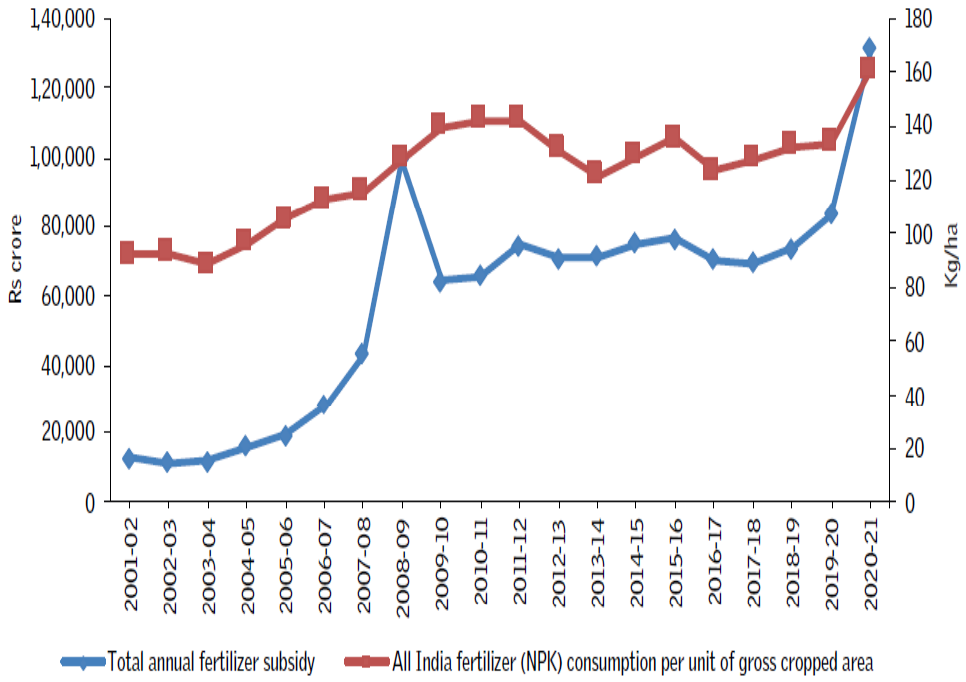


Graph 7: Per hectare fertilizer consumption in states and Union territories in 2019–20

Chemical fertilizer subsidy and consumption

- **Fertilizer subsidy:** growing steeply
- **Rs 1.31 lakh crore** in 2020-21; more than 10 times of Rs 12,908 crore in 2001-02
- Over **two-third of subsidy** is for **Urea**, (2019-20)
- Share of subsidy on **imported fertilizers:** > **25%**
- **Subsidy** increased from **Rs 5,000-6,000** in 2016-20 to **Rs 9,400 per ha** of net sown area in 2020-21.
- **Per ha fertilizer** consumption increased: 92 kg in 2000-01 to **161 Kg in 2020-21**
- **Crops no longer respond to fertilizers as earlier**, fertiliser response ratio decreased from 13.4 in 1970 to 2.7 in 2015

Graph 8: Trends in annual chemical fertilizer subsidy and per hectare fertilizer consumption in India



Regulation: Biofertilizers and Organic fertilizers

- **Fertilizer (Inorganic, Organic or Mixed) (Control) Order (FCO) of 1985**, MoAFW
- **States responsible for FCO implementation:** registration, authorization, quality control
- **At Centre:** National Centre for Organic and Natural Farming, 7 regional centres involved in quality control
- **11 Biofertilizers approved:** Rhizobium, Azotobacter, Azospirillum, Phosphate-solubilizing bacteria, Mycorrhizal, Pottasium-mobilizing, Zinc-solubilizing bacteria, Acetobacter, Carrier-based consortia, Liquid consortia, Phosphate-solubilizing fungal
- **10 Organic fertilizers approved:** City compost, Vermicompost, Phosphate-rich organic manure (PROM), Organic manure, Bio-enriched organic manure, Raw bone meal, Steamed bone meal, Potash derived from Rhodophytes, Fermented organic manure, Liquid fermented organic manure.
- **Guidelines for Bio-stimulants** introduced, standards under process
- **On-farm input** formulations like panchgavya, jeevaamrit etc not covered
- **New Bill** - Draft Integrated Plant Nutrition Management Bill, 2022 for stakeholder consultation

Programmes to promote biofertilizers and organic fertilizers

Aimed at farmers as part of larger schemes:

- **Paramparagat Krishi Vikas Yojana:** Rs 31,000/ ha for 3 years for on-farm , off-farm inputs
- **Bhartiya Prakritik Krishi Padhati -** Rs 12,200 / ha for 3 years for capacity building
- **Mission Organic Value Chain Development for North Eastern Region**: Rs 32,500 /ha for 3 years for on-farm, off-farm inputs
- **National Food Security Mission**: Rs 300 /ha for biofertilizers
- **National Mission on Oilseeds and Oil Palm:** Rs 300 /ha for biofertilizers

Aimed at supporting manufacturers and marketers:

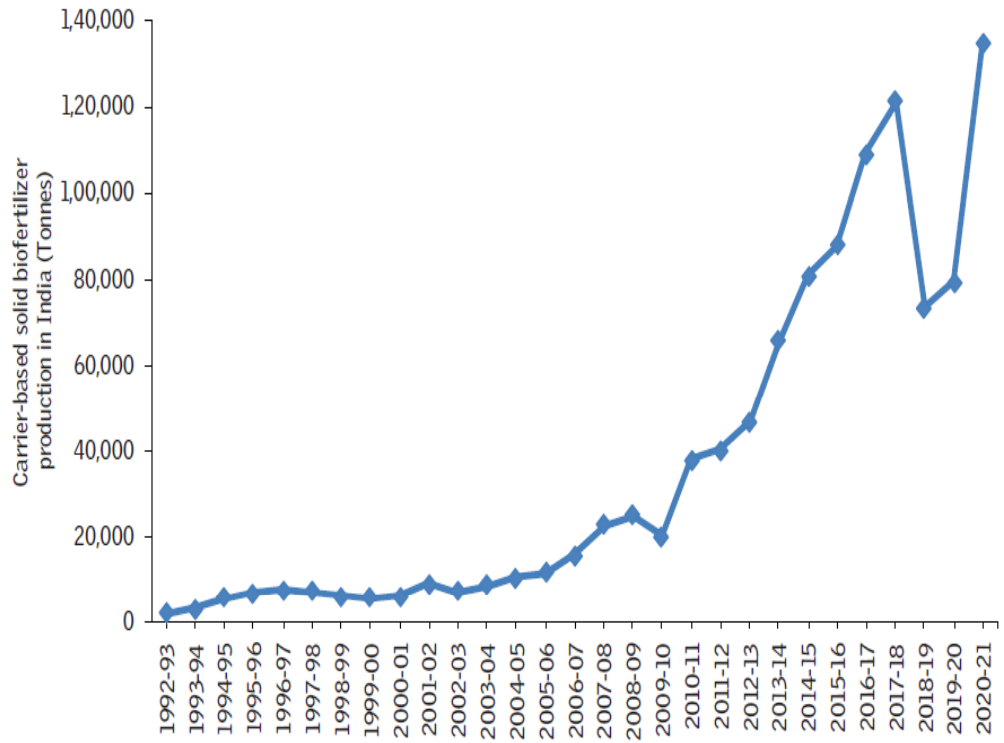
- **Capital Investment Subsidy Scheme:** for manufacturing units run by individuals, private agencies, government agencies for compost, Biofertilizers (subsidy up to Rs 0.63 -1.9 crore per unit) **- only Rs 18.9 crore released in last 17 years**
- **Soil Health Management:** subsidy of Rs 1.6 crore for biofertilizer manufacturing unit (**only Rs 8.67 crore released**)
- **Policy on promotion of city compost** – MDA of Rs 1500 per tonne; stopped w.e.t. Oct '21
- **New National Biogas and Organic Manure Programme** (assistance of Rs 1,600- 35,000 per plant)

Production of carrier-based solid biofertilizers in India

Total production:
1.34 lakh tonne (2020-21)

Growth:
- 6600% (from 1992-93)
- 83% (from 2018-19)

Graph 9: Growth in carrier-based solid biofertilizer production in India from 1992–93 to 2020–21

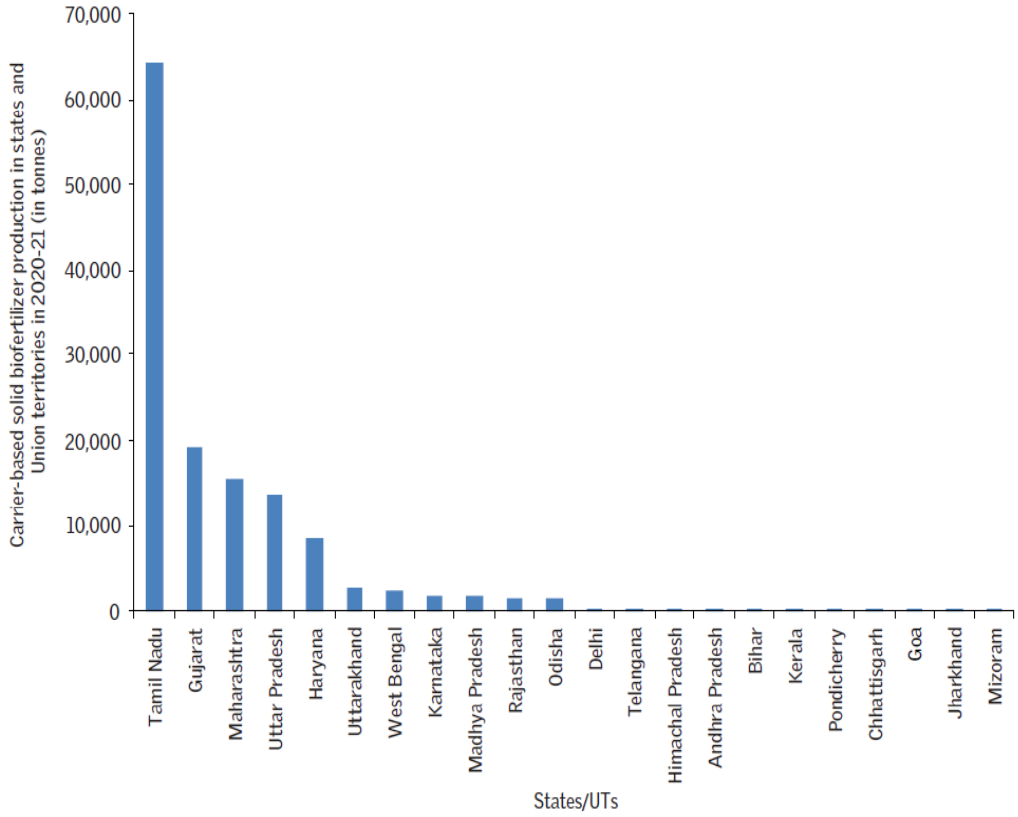


Production of carrier-based solid biofertilizers in India

In 2020-21, % out of India's total:
Tamil Nadu: nearly half, Gujarat (14%), Maharashtra (12%), Uttar Pradesh (10%), Haryana (6%) – together (>90%)

B/w 2018–19 and 2020–21, states with maximum production growth:
Tamil Nadu (1,438 %), Uttar Pradesh (460 %), Haryana (300%), Rajasthan (98%), Gujarat (80%)

Graph 11: Carrier-based solid biofertilizer production in states and Union territories in 2020-21

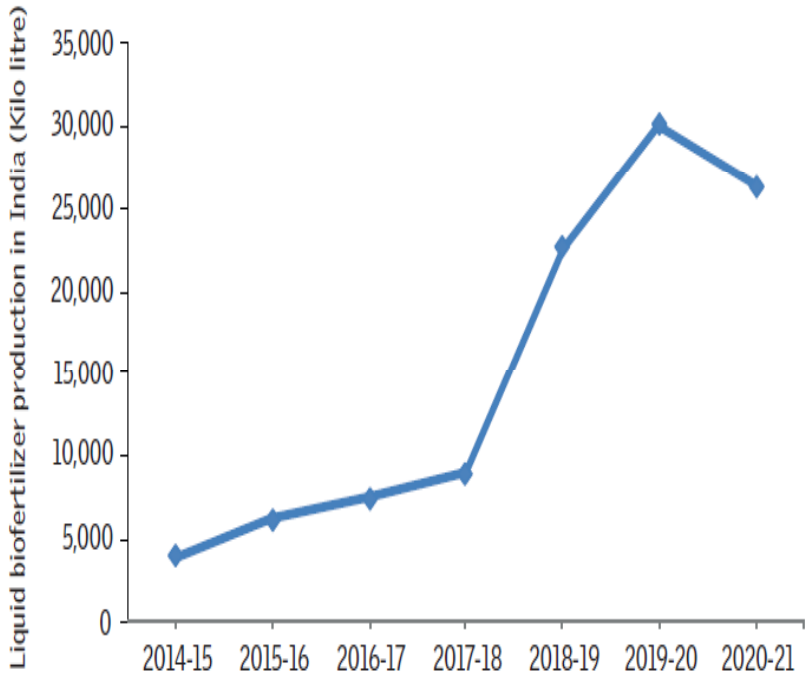


Production of liquid biofertilizers in India

India produced 26,442 kilolitre liquid biofertilizers in 2020-21

Growth: 552 % from 2014–15

Graph 12: Liquid biofertilizer production in India between 2014-15 and 2020-21

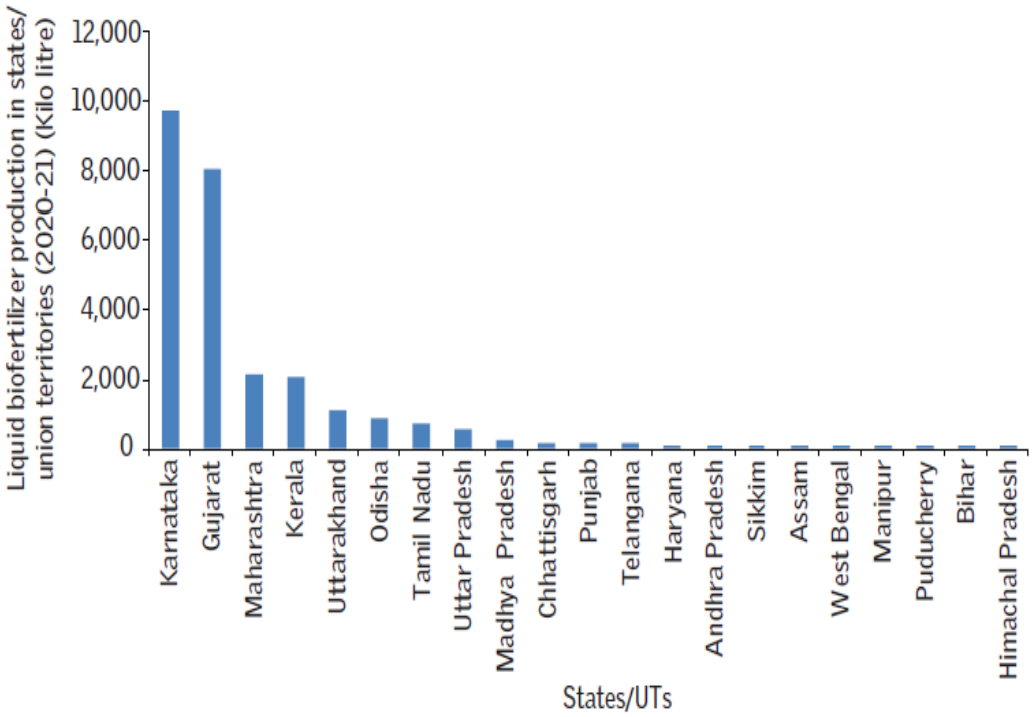


Production of liquid biofertilizers in India

Top liquid Biofertilizer producing states in 2021,
% of India's total
Karnataka (37%), Gujarat (31%)
Maharashtra (8%), Kerala (8%),
Uttarakhand (4%). Together (88 %)

Between 2014–15 and 2020–21, states with maximum growth:
Karnataka: 421 times, Kerala: 201 times
Tamil Nadu: 65 times: Maharashtra: 6.6 times

Graph 14: Liquid biofertilizer production in states and Union territories in 2020-21



Biofertilizer manufacturing capacity

- Total biofertilizer manufacturing units: **532** (2017)
- Solid biofertilizer units: **424** in 28 states/UTs,
- Liquid biofertilizer units: **108** units in 17 states/UTs
- Eight states/UTs: no unit
- Presently, around 600-650 units (as per interaction with stakeholders); not much details available with the centre
- Capacity under-utilised (specially for solid fertilizers)

Quality of biofertilizers: laboratories

26 labs notified under FCO, 4 non-notified
Centre – 7, States – 19
Total capacity in 30 labs in 13 states – 14,050 samples/year

Maharashtra - 6 laboratories, Uttar Pradesh -4 laboratories, have highest testing capacities

New practice of sample collection, testing since July, 2020 – sample defaced, coded, some states yet to initiate, send to NCOF and then to RCOFs

Only 483 samples of biofertilizers, 477 samples of organic fertilizers tested in 2019–20, which is just 28% of testing capacity of RCOF labs

Table 5: Biofertilizer and organic fertilizer quality control laboratories and their capacity

State	Government of India		State		Total	
	Number of laboratories	Capacity (samples per year)	Number of laboratories	Capacity (samples per year)	Number of laboratories	Capacity (samples per year)
Rajasthan	-	-	1	500	1	500
Uttar Pradesh	1	500	3	3,000	4	3,500
Karnataka	1	500	3	1,500	4	2,000
Tamil Nadu	-	-	2	1,000	2	1,000
Kerala	-	-	1	1,000	1	1,000
Haryana	1	500	1	NA	2	500
Himachal Pradesh	-	-	2	NA	2	NA
Madhya Pradesh	1	500	-	-	1	500
Maharashtra	1	500	5	3,000	6	3,500
Manipur	1	400	-	-	1	400
Assam	-	-	1	NA	1	NA
Odisha	1	500	1	500	2	1,000
West Bengal	-	-	3	150	3	150
Total	7	3,400	23	10,650	30	14,050

Quality of biofertilizers: test results

Test results from 7 RCOF laboratories

Proportion of samples failing quality tests rising - from 1% in 2013–14, to 44 % in 2019–20

At least 29% samples failing in 2019–20, At Nagpur lab – 74% sample failed

Number of samples tested decreasing – from 654 in 2013–14, to 483 samples in 2019–20.
High samples failing - in line with inputs from ground – easy, widespread availability of poor quality, spurious, irregularities in local enforcement machinery

Table 6: Percentage of biofertilizer samples failing quality tests at regional laboratories

Year	Number of samples tested	Percentage of samples failing quality tests							
		All Regional Centres of Organic Farming (RCOF)	RCOF, Panchkula	RCOF, Bengaluru	RCOF, Jabalpur	RCOF, Bhubaneshwar	RCOF, Ghaziabad	RCOF, Imphal	RCOF, Nagpur
2013-14	654	1	-	0	4	0	-	0	0
2014-15	904	6	-	3	21	4	-	1	0
2015-16	563	4	0	0.6	8	46	-	0	0
2016-17	552	4	0	0.8	21	6	-	0	0
2017-18	472	22	28	2	23	17	42	6	17
2018-19	415	14	19	0	15	50	8	0	56
2019-20	483	44	39	29	44	29	44	-	74

Note: (-) indicates data not available or samples not tested; there are some variations in data received through RTI responses from different departments. Compilation of test results conducted at state-owned laboratories is not available

Mystery of non-FCO products

Non-FCO: Until 2019-20, NCOF reported non-FCO sample test results – Why ?
What parameters used ?
Whether states approved such products ? But on what basis ?
How these products widely available in market ?

In 2016-17, 2018-19, 2019-20 – not a single non-FCO sample failed ?
In 2017-18 – results not made available – except two centres

Tenders: Procurement despite provision of DBT, procurement data by states/UTs under central schemes– not available in public domain

Tender process – low selling price, inferior quality products procured, unlawful financial means in approval process, corruption, not helping farmers

Table 8: Results of non-FCO approved biofertilizer sample quality testing

Testing laboratory	2016-17		2017-18	
	Samples tested	Samples found non-standard (per cent)	Samples tested	Samples found non-standard (per cent)
RCOF, Ghaziabad	116	0	338	-
RCOF, Panchkula	100	0	9	-
RCOF, Jabalpur	32	0	12	83
RCOF, Bhubaneswar	0	0	100	43
RCOF, Imphal	89	0	8	-
RCOF, Nagpur	0	0	-	-
RCOF, Bengaluru	246	0	175	-
Total	583	0	642	47

Organic fertilizers production in India

India's organic fertilizer production:

Grew by 33 per cent between 2015–16 and 2017–18 to reach 3,387 lakh tonne,

Then - nosediving to 411 lakh tonne in 2018-19, sharp decline to 38.8 lakh tonne in 2020–21.

Reasons behind sudden drop - not clear ?

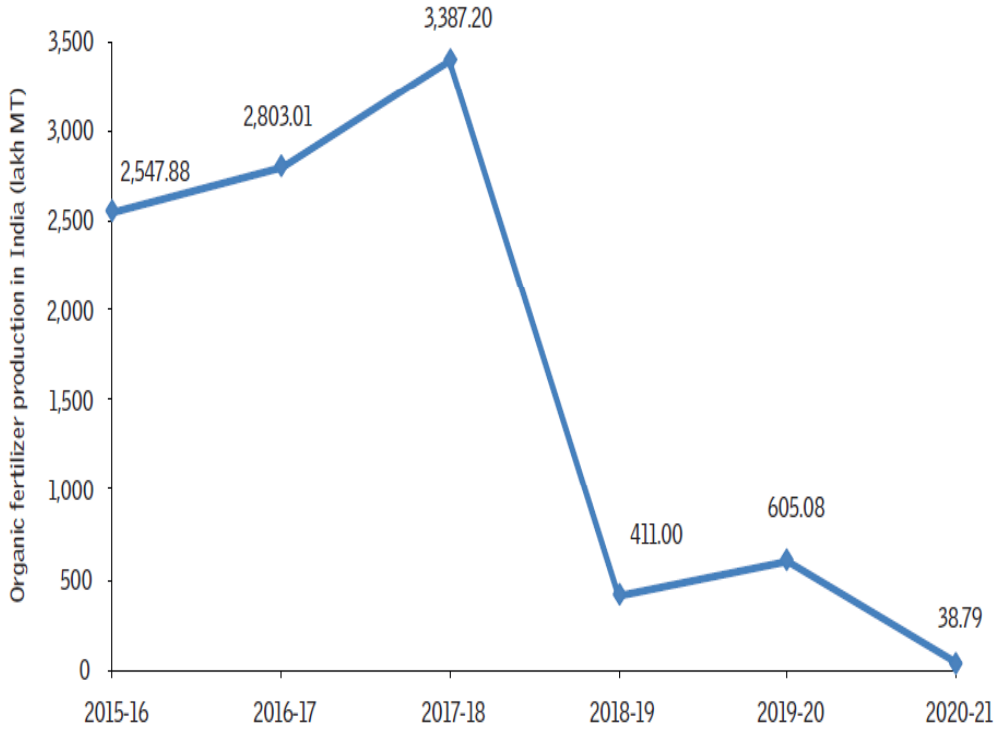
Change in method of calculation or regional discrepancies, not reflect ground situation

If real decline – matter of serious concern ?

All states/UTs - widespread decline, drastic change in scale of numbers

In 2017-18, Farm yard manure – 56%, vermi-compost – 23%, Organic manure – 11%, City compost – 3% of total production.

Graph 15: Sharp decline in organic fertilizer production in India



Organic fertilizers production in India

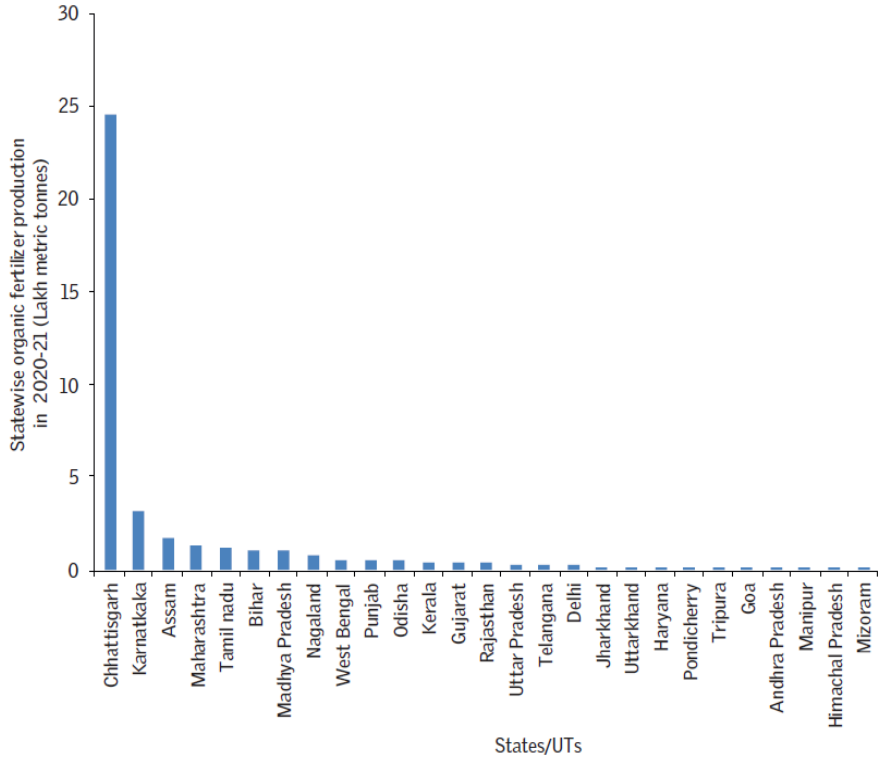
In 2017–18, Bihar had a share of 30% of India's production, followed by Gujarat - 15% share, Jharkhand - 12% share

In 2018–19, the scenario changed completely, Karnataka **had a share of 94% of India's production,** followed by Tamil Nadu, Telangana – 1 % share each

In 2019–20, Karnataka – 64% share in India's production, followed by Andhra Pradesh – 13% and other 7 states with more than 1%

In 2020-21, Chhattisgarh became leading producer with 63% share, followed by Karnataka – 8%, other 12 states with more than 1%

Graph 16: Organic fertilizer production in states and Union territories in 2020–21



Quality of organic fertilizers

Proportion of samples failing quality tests **rising,** from 9% in 2013–14, to 46% in 2019–20.

Trend reflected in almost all RCOF labs - more than one-third samples failed, 2019-20

RCOF Bhubneshwar – 78% failed
RCOF Nagpur – 68% failed

Number of samples tested increased from 191 in 2013-14 to 477 in 2019-20.

Stakeholders point out – **easy, widespread availability of poor quality, spurious products, irregularities** in local enforcement machinery

State-wise breakup suggest similar trends, relatively more samples failed in Gujarat,Karnataka, MP, Maharashtra, Odisha, Punjab,Tamil Nadu

Table 10: Percentage of organic fertilizer samples failing quality tests at regional laboratories

Year	Number of samples tested	Percentage of samples failing quality tests							
		All RCOF	RCOF, Panchkula	RCOF, Bengaluru	RCOF, Jabalpur	RCOF, Bhubaneshwar	RCOF, Ghaziabad	RCOF, Imphal	RCOF, Nagpur
2013-14	191	9	0	0	21	16	-	60	3
2014-15	445	7	0	0	44	71	-	15	0
2015-16	252	12	0	2	39	62	-	3	0
2016-17	295	16	0	13	30	62	-	0	0
2017-18	430	21	0	7	22	63	19	0	7
2018-19	438	27	0	9	22	68	16	31	63
2019-20	477	46	0	33	41	78	45	0	68

Mystery of non-FCO product testing

Non-approved product samples of organic fertilizers tested by NCOF/RCOFs

In 2016-17, 2019-20 – not a single non-FCO sample failed ?

In 2017-18 – results not made available – except two centres (same as in BF), RCOF Jabalpur – 100% failed.

In 2018-19 – 5% sample out of 176 samples failed

Table 12: Results of non-FCO approved organic fertilizer sample quality testing

Testing laboratory	2016-17		2017-18	
	Samples tested	Samples found non-standard (per cent)	Samples tested	Samples found non-standard (per cent)
RCOF, Ghaziabad	64	0	50	-
RCOF, Panchkula	0	0	-	-
RCOF, Jabalpur	36	0	7	100
RCOF, Bhubaneswar	0	0	58	76
RCOF, Imphal	64	0	14	-
RCOF, Nagpur	16	0	-	-
RCOF, Bengaluru	100	0	115	-
Total	280	0	244	21

Mass media flagged quality issues in dfferent states!

Mass media highlights spurious products - numerous news reports in local media in Bihar, Chhattisgarh, Haryana, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh between 2018 and 2020

Related to companies – Fake companies selling fake organic fertilizers; illegal manufacturing units; unapproved organic fertilizers, biofertilizers with fake labels; companies with dubious names

Related to state agriculture departments - Involvement of local agriculture department officials in sale of spurious, sub-standard, fake organic fertilizers and biofertilizers, corruption allegations; inaction by officials against illegal practices, court cases

Related to laboratory results: Samples failing quality tests in one laboratory passing in another

Related to farmer complaints: Crops destroyed due to fake products

Massive potential of organic fertilizer – not utilized

- **Only few comprehensive estimates** to quantify availability, potential of organic sources – use NPK approaches and not holistic approach, ICAR models – upto 90% on-farm inputs
- A 2020 paper by **ICAR-Indian Institute of Soil Science (IISS)** - actually available organic material is 365.37 million tonne, 35 per cent of potential availability
- A 2010 estimate by **National Academy of Agriculture Sciences (NAAS)** - available organic material is 1,566 million tonne – potential NPK nutrient supply is 47.3 million tonne – which is more than 34 million tonne current nutrient consumption in crop production in India
- Nutrients utilized from organic sources - 12.86 million tonne, i.e., 27% of potential (NAAS)
- **ICAR- IIFSR** estimates - 1,440 million tonne of organic waste needed to substitute 50% of inorganic fertilizers (if biological nitrogen fixation used and utilization efficiency improved to 50%)
- Only **5% crop residue** recycled, only **one-third of produced dung** is recycled back to agriculture
- Not even **5% city organic waste** is used, food waste, agro-industry wastes not utilised, every year **67 million tonne of food waste** not used
- **Approaches** – by individuals and by states – Andhra Pradesh, Chhattisgarh, Sikkim, Himachal

Barriers in the growth of biofertilizers and organic fertilizers

A. Related to governments at Centre/ states

Funds, subsidies and support for promotion – budget very low; no level-playing field; funds underutilized; neglected R&D; inadequate support for extension and trainings; inputs production concentrated in handful of states, low production capacity utilization, limited demand, mostly states initiatives limited to central schemes

Quality control – local-level FCO implementation lack credibility and trust; sample collection inadequate, bias in sample collection; few states have notified labs; samples increasingly failing; low credibility of testing process; non-FCO products availability and testing

State procurement of inputs through problematic tender process; limited legal action against defaulters and violators: Inadequate training of lab and inspecting personnel, stakeholders and media highlighted serious issues

Data collection and reporting - Production related credible data not available, national compilation of test results not available in public domain, often state test results not disclosed in public domain

Barriers in the growth of biofertilizers and organic fertilizers

B. Related to manufacturers of biofertilizers and organic fertilizers - Low and uncertain demand hamper investment, farmers, dealers not much interested, availability of spurious, fake products leads loss of trust, corruption in securing license, authorisations for manufacturing, selling and testing

Limited government support, technology transfer from labs to industry is slow, good quality and suitable strains for different agro-environments not easily available, limited involvement of state agriculture universities,Krishi Vigyan Kendras in production

C. Related to farmers

Lack of awareness regarding optimum practices related to organic, natural farming, limited confidence in crop yield, lack of motivation and trust among farmers, Quality and adequate quantity not available at local level, Use of biofertilizers, organic fertilizers,on-farm inputs labour-intensive in comparison to chemical fertilizers

Lack of awareness among farmers regarding usage, storage conditions of biofertilizers, Lack of motivation and trust among farmers - linked with poor results from use of inferior quality and substandard non-chemical fertilizer products distributed by local authorities, available in market

Recommendations and way ahead

A targeted, ambitious and well-funded nation-wide programme must be developed to drive the change towards organic and natural farming

Strong political commitment and will at centre and state level, bring together different ministries, several programmes, outlining the Centre–state relationship in terms of funds, accountability and coordination, establish strong drivers such as a vibrant market

Quality of biofertilizers and organic fertilizers must be ensured by developing and institutionalizing a robust monitoring and enforcement mechanism in collaboration with Centre and states across the country

Greater sampling frequency, more testing, enhanced laboratory network, disclosure of results in public domain, testing of products strictly in line with FCO, Audit and inspection of manufacturing, distribution and selling entities, tracking all sales digitally

Legal and fiscal deterrent action against defaulters, violators, strictly address local level corruption of officials, States procure and distribute only good quality inputs to farmers, tested as per FCO

Recommendations and way ahead

Production and availability of biofertilizers and organic fertilizers must be ensured and their use must be promoted through multiple approaches by Centre and states

Corrective measures to have more uptake, non-chemical fertilizer sector must be provided support to move to better options, timely leveraging of public research, Transferring subsidies and incentives to non-chemical input sector, Existing supply chains of big fertilizer cooperatives to use for non-chemical inputs,Market development assistance expansion to all organic and bio-inputs

Incentivise farmers to save natural resources, prevent ecological damage, mitigate climate change, mainstream payments for ecosystem services

Specific to organic fertilizers
Involve community, local institutes, rural cooperatives, farmer organizations, self-help groups, gaushalas and local small-scale entrepreneurs, investment in building capacity and training small-scale manufacturers and entrepreneurs

Capacity building of agriculture extension officials through modification in educational curriculum and professional on-the-job trainings to train and assist farmers, mobilise farmers to produce on-farm inputs, develop and upscale structured programmatic interventions to use existing unutilized organic sources, Invest in developing newer and cost-effective technologies

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