Emerging Aspects of Balanced Fertiliser Use in India

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Fertiliser in Indian Agriculture

- Fertiliser production and consumption started in 1906 (SSP) but not much growth in first 50 years
- Introduction of fertiliser responsive HYVs of rice & wheat in mid sixties was a turning point (ushered green revolution)
- Government implemented a number of policies to improve fertiliser availability, increase indigenous fertiliser production and expand distribution network
- Impressive growth in fertiliser production & use during 1965 – 2000
- The fertiliser played a key role in achieving self sufficiency in foodgrain production
- India emerged 3rd largest producer & user of fertiliser in world

Growth in Fertiliser Production & Consumption

Year	Production ($N+P_2O_5$) (million tonnes)	Consumption ($N+P_2O_5+K_2O$) (million tonnes)	(Kg/ha)
1950-51	0.03	0.07	0.49
1965-66	0.36	0.78	5.05
1979-80	2.98	5.26	30.99
1989-90	8.54	11.57	63.47
1999-00	14.32	18.07	94.90
2006-07	15.97	21.67	113.4
2007-08*	15.10	23.20	121.6

* = Estimated

Contributing Factors for Growth in Fertiliser Use

Particulars	1951-52	1976-77	2006-07
Fertiliser Consumption (kg/ha)	0.6	20	113
Gross irrigated Area (m. ha)	23	44	80
HYVs Coverage(m.ha)	-	34	82
Gross Cropped Area (m. ha)	133	167	191
Rice & Wheat Area (m.ha)	40	59	69
Fertiliser Subsidy (billion Rs.)	-	0.6	260
Fertiliser Sale Points (‘000)	<10	94	293

Promoting Balanced Fertiliser Use in India

- ICAR & SAUs generated valuable information highlighting the importance and benefits of balanced & efficient use of fertilisers
- Government programmes aimed at promoting BFU using 4:2:1 NPK ratio as guideline
- Indian Fertiliser Industry also initiated number of promotional programmes to educate farmers on improved farm technology
- Decontrol of P&K fertilisers in August 1992 came as a severe blow to BFU programme in India.
- NPK ratio distorted to 9.5:3.2:1 in 1992-93 from 5.9:2.4:1 in 1991-92.
- Imbalanced & inefficient use of fertiliser has become a major constraints in improving the soil and crop productivity

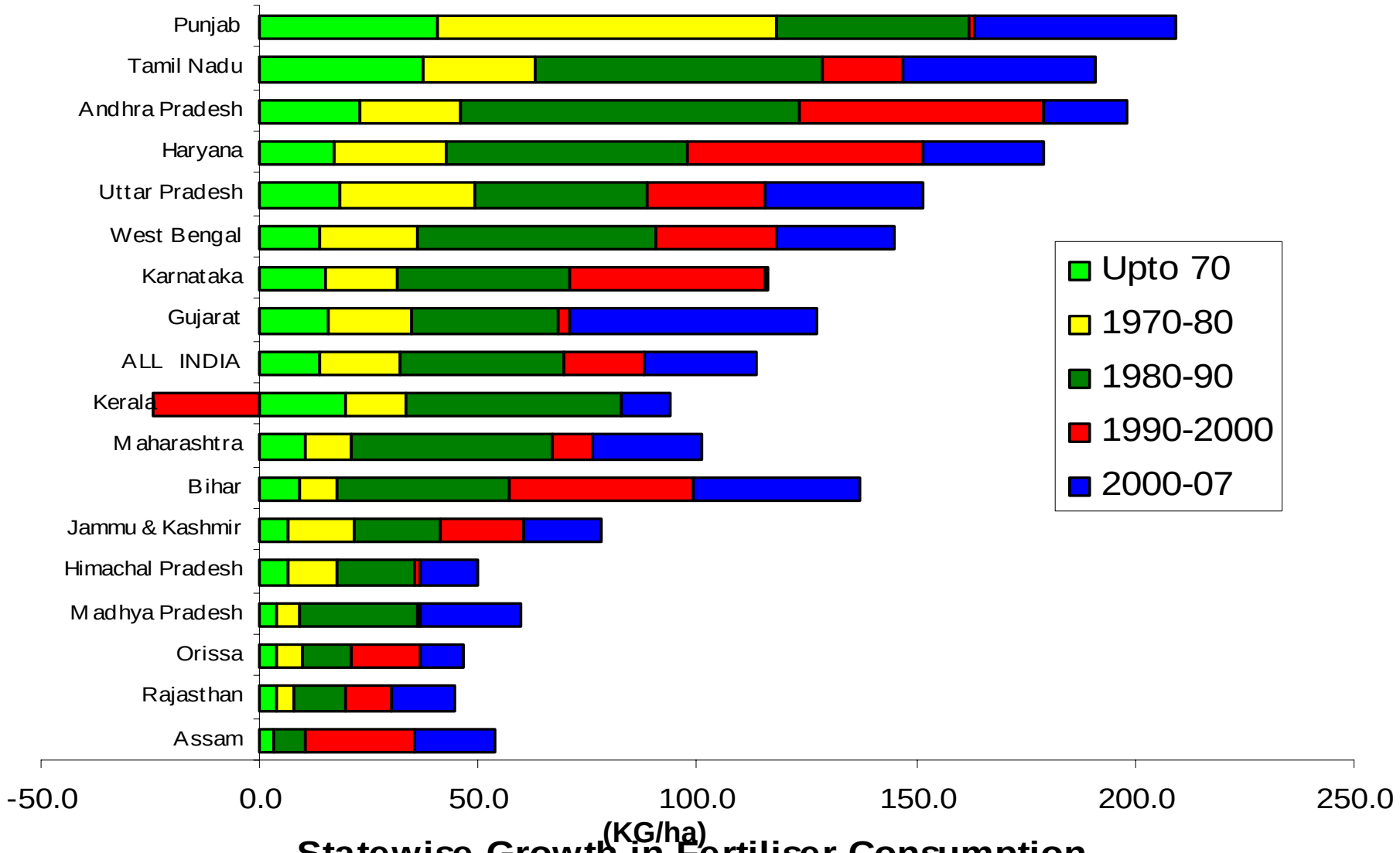
Benefits of Balanced Fertilisation in Wheat

No. of Trials	Nutrients added (kg/ha)			Yield increase (kg/ha)
	N	P_2O_5	K_2O	
10133	**120**	0	0	**+890** (over control)
	120	**60**	0	**+590** (over N)
	120	60	**60**	**+290** (over NP)
5172	**25kg** ZnSo4. $7H_2O$ over NPK			**+208** (over NPK)

Tandon (2004); Singh (2006)

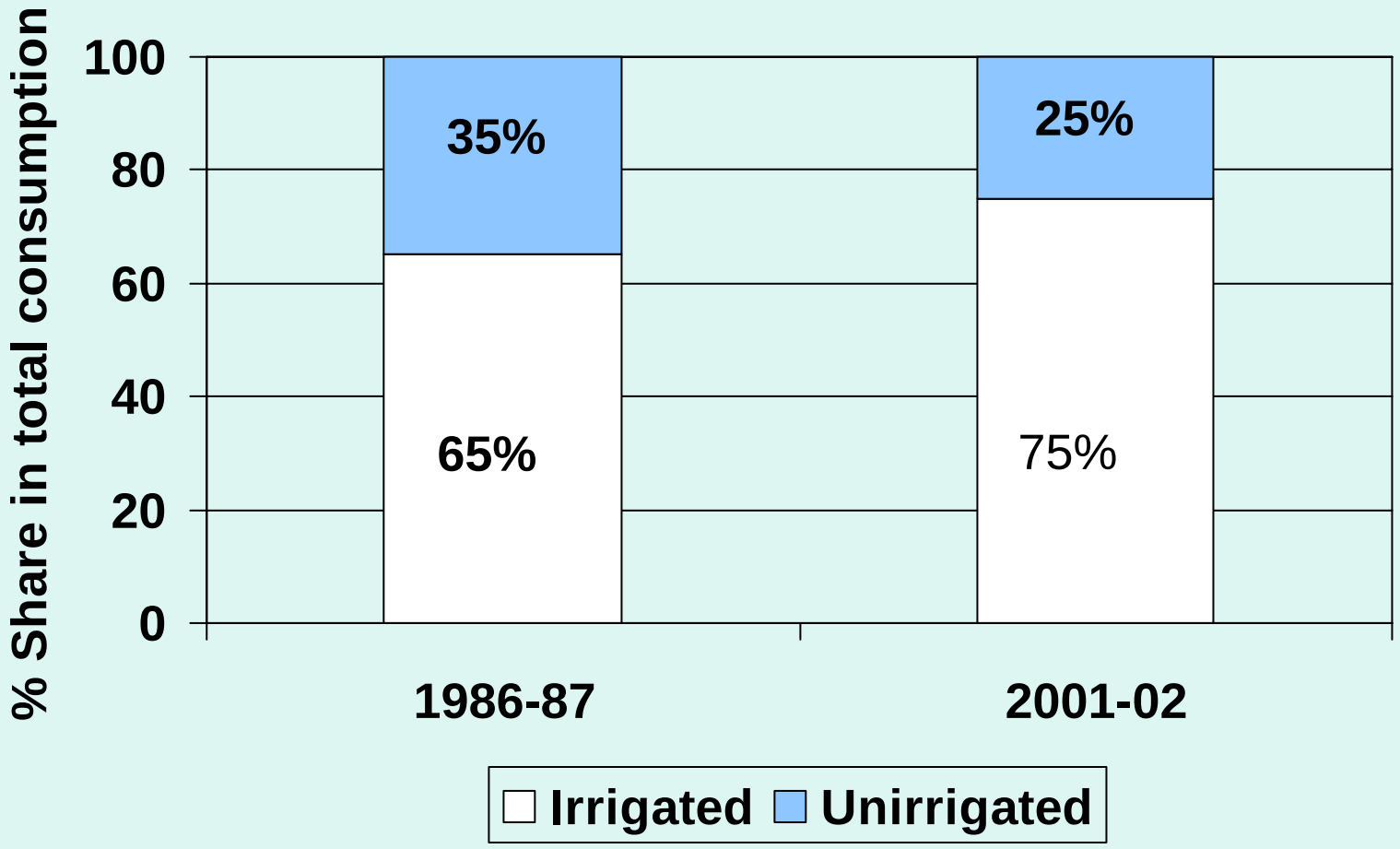
Emerging Aspects

- **Uneven growth** in fertiliser consumption resulting in vast statewise, cropwise and farm holding-wise variation in consumption.
- **Mining of nutrients** from soil at alarming rate (soil fertility depletion)
- **Expanding multinutrient deficiency** particularly secondary and micronutrients
- **Decline in crop response** to fertiliser
- **Weakening relationship** between fertiliser use and foodgrain production
- **Decline in fertiliser production**, increasing imports and sky rocketing prices leading tight availability of fertilisers
- **Environment of uncertainty** due to ad-hoc and sudden changes in fertiliser policies affected health of Indian fertiliser industry

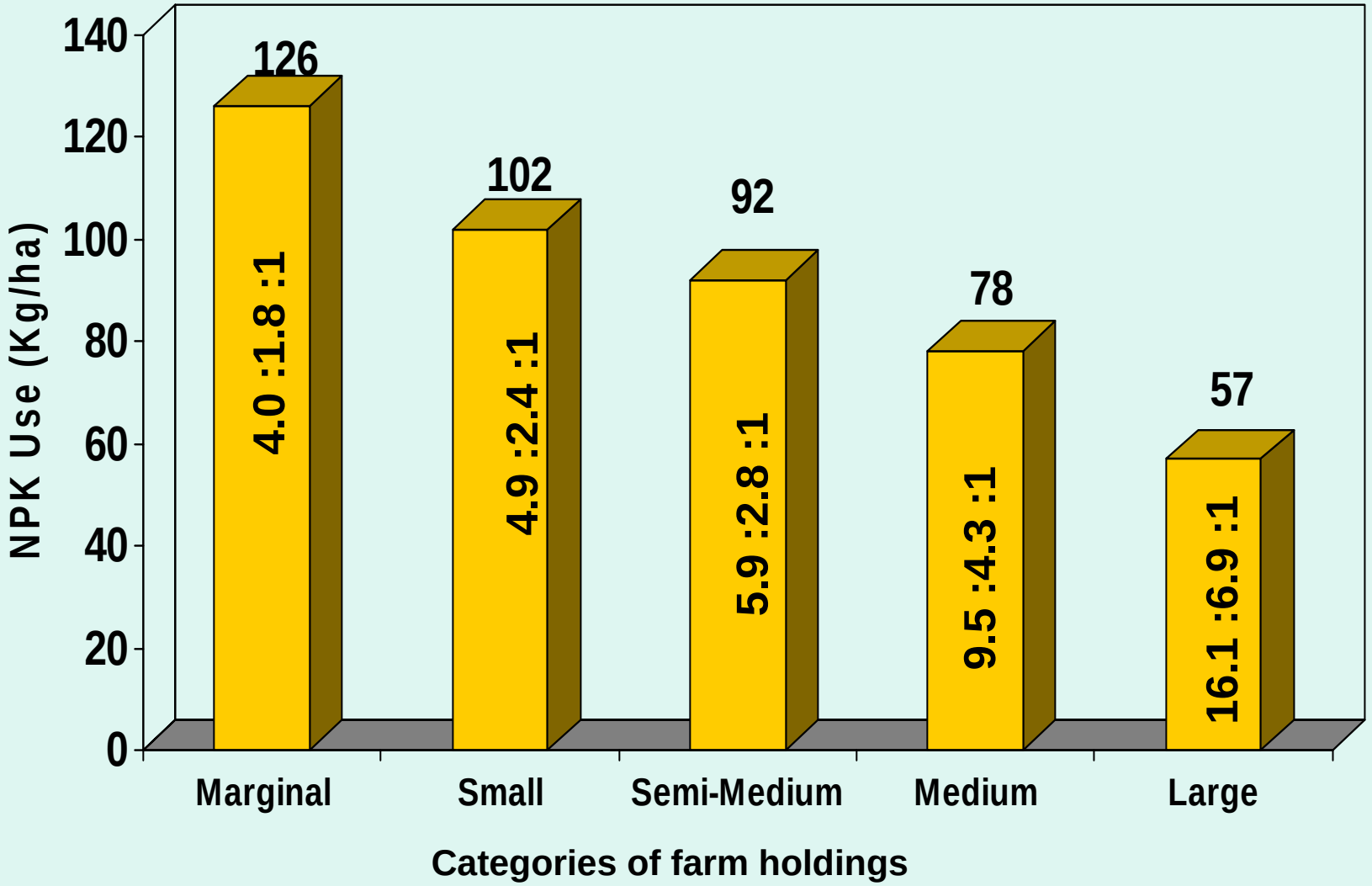


Statewise Growth in Fertiliser Consumption

Decreasing Share of Fertiliser Consumption in Un-irrigated Areas



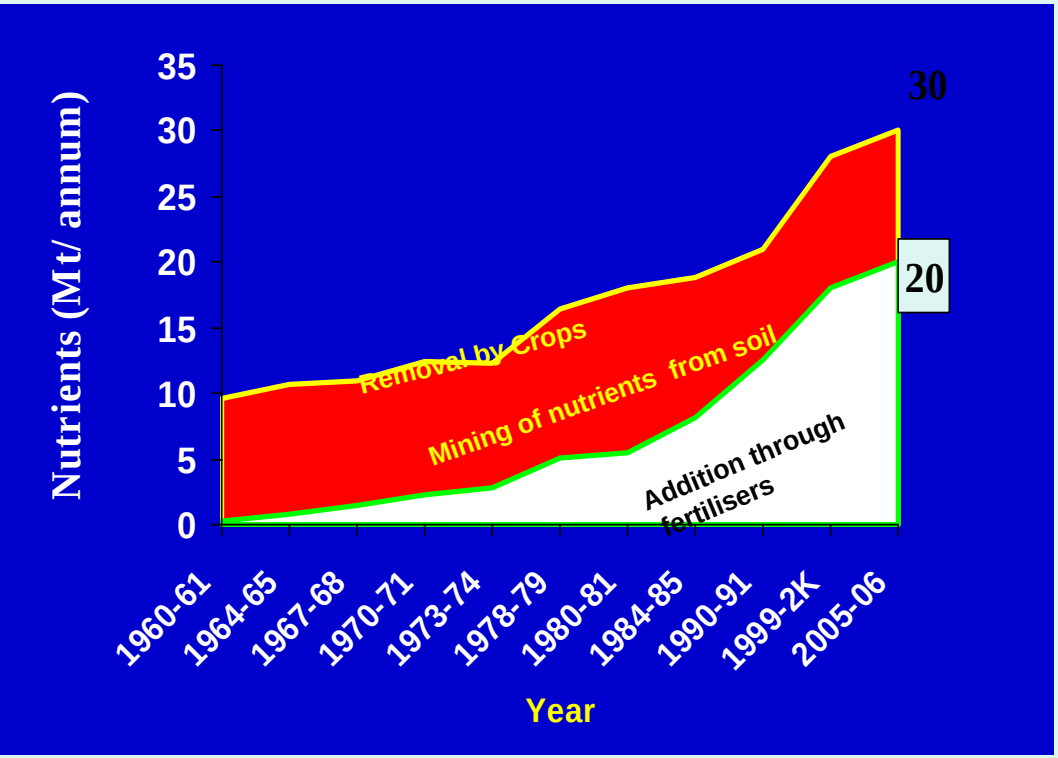
Land Holding-wise Variation in Fertiliser Use



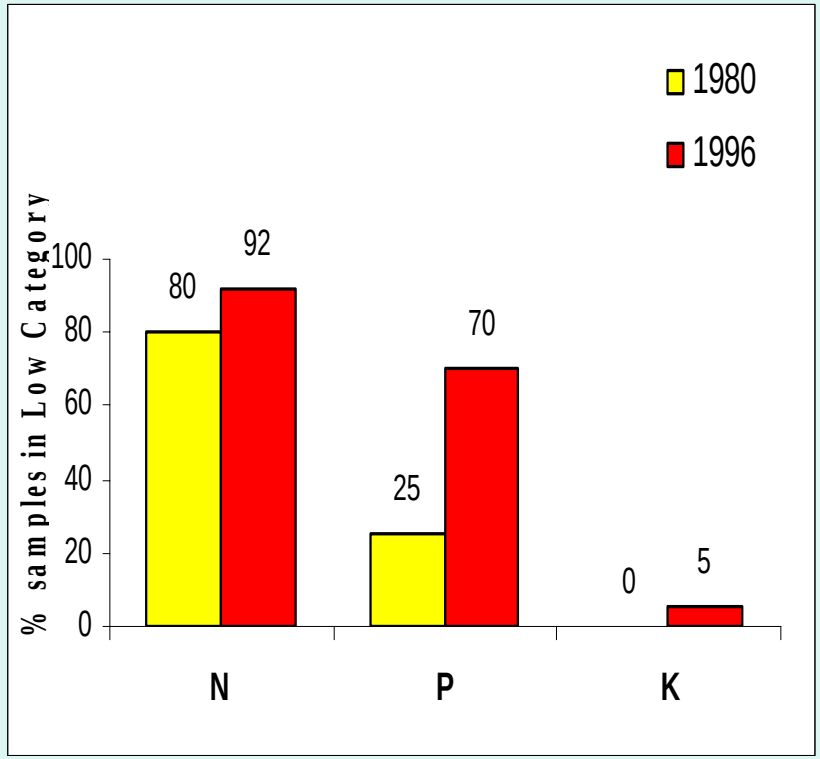
Continuous Nutrient Mining & Soil Fertility Depletion

- Nutrient removal by the crops far exceeds the replenishment
- Estimated gap of about 8-10 mt NPK between removal and addition which is compounded year after year
- Soil Fertility depletion emerged as most important soil health problem.

Nutrient Mining in Indian Soils



Soil fertility depletion in Haryana



Weakening Relationship between Fertiliser Use & Foodgrain Production

Million tonnes

Crop	1999-00	2001-02	2002-03	2004-05	2005-06	2006-07	2007-08*
Rice	89.7	**93.3**	71.8	83.1	91.8	93.4	**94.1**
Wheat	**76.4**	72.8	65.8	68.6	69.4	75.8	**74.8**
Cereals	196.4	**199.5**	163.6	185.2	195.2	203.1	**205.0**
Pulses	13.4	13.4	11.1	13.1	13.4	14.2	**14.3**
Food-Grains	209.8	**212.9**	174.8	198.4	208.6	217.3	**219.3**
Fertiliser Use	18.1	**17.4**	16.1	18.4	20.3	21.7	**23.2**

* = Estimated

Declining Crop Response to Fertiliser

Period	kg food grains per kg nutrients (NPK)
5th Plan (1974 -79)	**15.0**
8th Plan (1992 -97)	7.5
9th Plan (1997 -02)	7.0
10th Plan (2002 -07)	6.5
11th Plan (2007 -12)	**6.0**

Reasons:

- Inadequate and imbalanced fertiliser use
- Increasing multinutrient deficiency
- Lack of farmers awareness about balanced plant nutrition
- Lack of varietal breakthrough
- Poor crop management (Excess fertiliser dose not be the substitute of poor management)

Inadequate & Imbalanced Fertiliser Use

- Per hectare fertiliser use in India is low compared to developed and neighboring countries

- The fertiliser use is skewed in favour nitrogen (imbalanced)

Fert. Cons. in selected countries

Country	Cons. (kg/ha)	Country	Cons. (kg/ha)
Netherlands	510	Bangladesh	198
Korea	407	Pakistan	146
Japan	363	Sri Lanka	135
NZ land	307	USA	114
UK	305	India	108
China	289	World	101

NPK Consumption ratio

Year	N	P_2O_5	K_2O
1957-58	16.6	1.7	1.0
1991-92	5.9	2.4	1.0
1992-93	9.5	3.2	1.0
2003-04	6.9	2.6	1.0
2006-07	5.9	2.4	1.0
Zone			
East	4.0	1.5	1.0
North	20.9	6.2	1.0
South	3.1	1.5	1.0
West	6.1	2.9	1.0

Increasing Multinutrient Deficiency

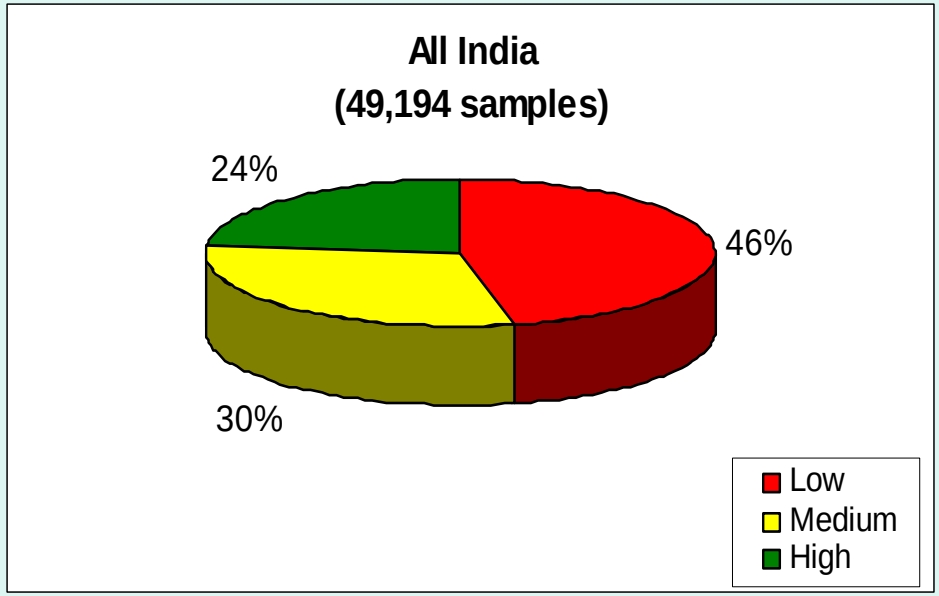
- Deficiency of at least 6 nutrients (N, P, K , S, Zn & B) is quite widespread in Indian soils.

- Increasing deficiency of secondary and micronutrient have started limiting crop response to NPK application

Extent of Multinutrient Deficiency

Nutrient	% deficient samples
Nitrogen	89
Phosphorous	80
Potassium	50
Sulphur	40
Zinc	48
Boron	33
Iron	12
Manganese	5

Extent of Sulphur Deficiency (TSI-FAI-IFA Project)



Stagnation in Fertiliser Production & Increasing Gap

Million tonnes

Year	Urea			DAP		
	Cons.	Prodn.	Gap	Cons.	Prodn.	Gap
2000-01	19.18	19.62	-0.44	5.88	4.88	1.00
2001-02	19.92	19.00	0.92	6.18	5.09	1.09
2002-03	**18.49**	**18.62**	**-0.13**	**5.47**	**5.24**	**0.24**
2003-04	19.77	19.04	0.73	5.62	4.71	0.91
2004-05	20.67	20.24	0.43	6.26	5.17	1.08
2005-06	22.30	20.09	2.21	6.76	4.55	2.21
2006-07	24.71	20.27	4.44	7.25	4.71	2.54
2007-08*	**25.70**	**19.97**	**5.73**	**7.70**	**4.50**	**3.20**

*** = Estimated**

Increasing Dependence on Fertiliser Imports

(million tonnes)

Year	Urea	DAP	MOP
1990-91	-	2.2 (51)	2.1
1995-96	3.8 (21)	1.5 (29)	2.4
1999-00	0.5 (3)	3.3 (48)	3.0
2000-01	-	0.9 (15)	2.6
2005-06	2.1 (7)	2.4 (36)	4.6
2006-07	4.7 (19)	2.9(40)	3.4
2007-08*	**7.0**	**3.0****	**3.5**

•= Estimated, ** = Includes MAP, ( ) = Per cent of total consumption

Increasing Prices in International Market

			FOB (US $/tonne)
Year	Urea	DAP	MOP
1993	72-145	119-170	50-125
1995	162-232	140-260	60-120
2001	**72-147**	**133-173**	**87-131**
2003	98-175	147-212	87-129
2004	112-275	200-265	80-160
2005	168-290	220-270	122-195
2006	190-270	250-276	145-195
2007	240-410	269-610	160-325
2008 (March)	**375-380**	**950-1000**	**325-500**

Increasing Fertiliser Subsidy Burden

(Rs. billion)

Year	Subsidy on Urea	Concession on P&K	Total subsidy
1992-93	**57.96**	**3.40**	**61.36**
1995-96	62.35	5.00	67.35
1998-99	75.97	37.90	113.87
2000-01	94.81	43.19	138.00
2003-04	85.21	33.26	118.47
2004-05	107.37	51.42	158.79
2005-06	118.64	65.96	184.60
2006-07	153.54	105.98	259.52
2007-08 (RE)	**n.a.**	**n.a.**	**365.01**

Estimated Subsidy Requirement for 2008-09 is about 800 billion rupees

Conclusions

- Despite Govt. and industry efforts, Farmers' knowledge regarding balanced fertiliser use i.e. right product, doses, time and method of application is poor.
- Soil fertility depletion due to inadequate and imbalanced fertiliser use is one of the major factors of stagnation in crop productivity
- The lack of adoption of soil test based recommendations among farmers has aggravated the problem of imbalanced fertiliser use.
- Nutrients needs of Indian agriculture are now bigger and more varied (balanced fertiliser beyond NPK)
- In addition to secondary and micronutrients, India would require 45 million tonnes of primary nutrients (NPK) to produce 300 Mt of foodgrains to feed the estimated population of 1.4 billion by 2025.
- The present fertiliser pricing policy has created inter-nutrient / product distortion resulting in imbalanced nutrient use (skewed in favour Nitrogen).

Recommendations

- Policy which encourages investment in fertiliser industry is the need of hour to increase domestic fertiliser production and thereby improving overall fertiliser availability in the country.

- Combined use of fertilisers, organic manures and biofertilisers should be encouraged to check nutrient mining and correct multinutrient deficiency

- Products and practices like fertigation, laser land leveling, fortified / speciality / customised fertilisers need special encouragement

- Revival of agriculture extension system is urgently needed to transfer the fertiliser best management practices at farmers level.

- Of late, there is increasing realisation regarding the need of balanced plant nutrition and following measures are under consideration of government

  - Nutrient based fertiliser subsidy
  - Expanding soil testing infrastructure (static & mobile labs.)
  - Promoting development of soil, crop and area specific customised fertilisers
  - Liberalising registration process of inclusion of new fertilisers in FCO to expand the product basket for Indian farmers


Thank you