

## Impact of Transfer of Agro-Technology on Fertilizer Consumption in Gujarat

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### INTRODUCTION

Indian farmers have understood the significance of use of fertilizers in crop production technology. The application of science and technology to agriculture has helped in achieving green revolution. This was possible with the help of high yielding varieties of crops which are efficient in converting solar energy as well as plant food (nutrients) into human and animal food. These high yielding varieties are high responsive to applied fertilizers and

manures which are costlier input. The fertilizer use has progressively increased in India. There is a need to assess the progress achieved so far in fertilizer requirement and consumption. Keeping this in view, an attempt has been made here to throw light on fertilizer requirement and consumption in Gujarat State.

### METHODOLOGY

Districtwise area under different crops and consumption of N, P and K in Gujarat for

**Table 1 : Area '00 ha and productivity, Kg/ha under different crops in Gujarat**

Crop	1970-71		1980-81		1988-89	
	Area	Prod.	Area	Prod.	Area	Prod.
Groundnut	17,776	1.05	21,790	0.74	18,234	1.58
Cotton	17,450	1.03	15,662	1.11	10,909	1.35
Bajra	21,111	0.85	15,017	0.82	13,487	0.94
Jowar	13,046	0.46	10,920	0.63	7,809	0.54
Wheat	6,473	1.50	6,165	2.07	6,488	2.33
Paddy	5,111	1.23	5,749	1.18	5,356	1.62
Maize	2,640	1.63	3,133	1.28	3,372	1.35
Tur	922	0.49	2,870	0.81	3,369	0.74
Sesamum	1,365	0.41	1,213	0.29	1,545	0.57
RapeSeed& Mustard	507	0.46	1,595	1.10	2,416	1.36
Castor	577	1.01	1,810	0.94	1,913	1.51
Gram	744	0.74	763	0.71	1,075	0.61
Tobaco	806	1.28	1,307	1.46	901	1.68
Sugarcane	388	5.87	982	8.05	937	8.44

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the period 1969-70 to 1988-89 were collected from the Directorate of Agriculture, Gujarat State and from various issues of Fertilizer News and Fertilizer Marketing News published by the Fertilizer Association of India, New delhi. The data on research output by the Gujarat Agricultural Univeristy were also collected to support increasing productivity of agriculture in Gujart State.

The area crop method was used to estimate the fertilizer requirements. The area under 14 major crops (Table 1) sharing about 81 percent of the total gross cropped area in Gujarat were considered for the purpose. The area under a given crop was multiplied by the recommended dose of fertilizers to derive fertilizer requirement. Irrigated and unirrigated areas of each crop and corresponding recommendation for fertilizer dose were considered separately. The total fertilizer

requirements for N, P and K were thus based on these 14 crops. Regression analysis was carried out to work out liner growth rates of fetrtilizer requirements, consumption and gap between requirements and consumption.

## RESULTS AND DISCUSSION

The area statistics of 14 crops (Table-1) indicated that area under bajra, jowar, and cotton has been decreasing year after year. In spite of increase in productivity of these crops in Gujarat, farmers are experiencing risk in cultivation of these crops resulting decrease in area under these crops. Steady increase has been noticed in area under wheat and maize crops, whereas castor, rapeseed and mustard, tur, gram and sugarcane were favoured the most by the farmers. The increase in area could be attributed to low risk in cultivation and high return from these crops.

**Table 2 : Number of recommendations made by the Gujarat Agricultural Univeristy for farming community during VIIIth Plan period.**

Discipline	1985	1986	1987	1988	1989	Total
Plant Breeding	5	6	8	9	14	42
Agronomy and Soil Science	31	17	28	51	47	174
Horticulture & Vegetables	2	5	3	6	9	25
Plant Protection	13	17	10	26	24	90
<b>TOTAL</b>	<b>51</b>	<b>45</b>	<b>49</b>	<b>92</b>	<b>94</b>	<b>331</b>

The increase in productivity of agriculture in Gujarat was due to research output by the Gujarat Agricultural Univeristy (Table2), extension efforts by various extension agencies/machinery and receptivity of the farmers of the State.

The yearwise estimates of fertilizers

requirement and consumption of N, P and K are given in Table 3

The results (Table 3) revealed inconsistency in N requirement which might be due to the impact of seasonal variation, particularly of rainfall on crop area.

The P and K requirements showed significant increasing trend. Refinement in agrotechnology and shift in area as well as increase in irrigation facilities might be responsible for significant increase in P and K requirements.

**Table 3 : Requirement and consumption of fertilizers ('000 tonnes) in Gujarat**

Year	Requirement			Consumption		
	N	P	K	N	P	K
1969-70	539	190	5.9	65	26	3.0
1970-71	421	191	4.7	106	53	6.7
1971-72	534	187	4.6	114	61	7.1
1972-73	485	169	4.8	114	54	10.7
1973-74	512	175	5.6	139	60	19.4
1974-75	457	166	6.6	98	39	12.6
1975-76	547	197	6.0	111	33	6.5
1976-77	509	192	8.3	132	52	11.7
1977-78	514	194	10.2	170	79	28.1
1978-79	497	188	7.2	192	93	35.1
1979-80	532	204	10.2	224	114	39.0
1980-81	533	216	12.3	204	117	35.5
1981-82	516	210	10.5	245	115	41.4
1982-83	509	212	11.9	236	116	34.3
1983-84	521	220	12.8	317	147	38.0
1984-85	497	215	12.9	320	149	35.5
1985-86	462	197	11.4	287	109	25.5
1986-87	443	190	8.7	256	112	34.9
1987-88	300	134	10.2	290	120	31.8
1988-89	511	215	11.7	435	164	44.0
<b>b</b>	-0.47	1.85**	0.45**	15.72**	6.54**	2.10**
<b>R<sup>2</sup></b>	0.01	0.45	0.72	0.87	0.80	0.73

The consumption of N, P, and K had increased significantly at a rate of 15.72, 6.54 and 2.10 thousand tonnes per year, respectively. The consumption of nitrogen increased from 65000 tonnes (t) in 1969-70 to 4,35,000 t in 1988-89, while consumption of P and K increased from 26,000 t to 1,64,000 t and from 3,000 t to 44,000

t during same period. The transfer of improved agrotechnology including high yielding varieties responsive to nutrients application (Table 3) to the farmers field, awareness about economic return due to fertilizer use, and availability of inputs like seeds, fertilizers etc. at the village site or within the reach of farmers as well as

banking facilities, remunerative prices of the commodities and ever growing market demand for agricultural products and by-products are the major causes for the increase in fertilizers consumption.

**Table 4 : Per hectare fertilizer consumption, its growth among districts of Gujarat.**

Districts	Average consumption (Kg. of nutrients/ha)		
	1979-80 to 1981-82	1983-84 to 1985-86	1986-87 to 1988-89
Ahmedabad	22.36 *	44.7 *	50.7 *
Kheda	62.24	83.8	89.7
Baroda	47.95	62.4	54.8
Panchmahal	12.65 *	23.0 *	23.2 *
Bharuch	18.96 *	21.7 *	26.0 *
Surat	72.59	115.5	148.3
Valsad	29.66 *	64.9	69.1
Dang	NA	NA	NA
Gandhinagar	43.73	48.5	47.2 *
Mehsana	23.43 *	42.0 *	43.6 *
Sabarkantha	63.51	80.0	64.2
Banaskantha	10.36 *	21.4 *	25.3 *
Rajkot	69.52	64.7	53.7
Surendranagar	11.63 *	17.2 *	17.9 *
Bhavnagar	41.60	52.2	40.7 *
Jamnagar	37.92	29.7 *	25.8 *
Amreli	55.91	49.6	33.7 *
Junagadh	57.01	58.8	45.6 *
Kutch	5.66 *	9.8 *	13.7 *
State Average	36.50	46.6	51.2

\* Indicates consumption below state average.

The results presented in Table 3 and Figures 1 to 3 also showed decreasing trend in the gap between requirements and consumption of N and P fertilizers. The decrease in gap was linear and Significant. The rate of decrease was 15.77 and 4.75 thousand tonnes of N and P respectively per year with  $R^2 = 0.79$  N and

0.73 for P. In case of potashic fertilizer, the over use has been observed which is a national wastage. The increase in consumption of N and P fertilizers has disproved the myth that farmers are not receptive to change. Gujarat farmers have shown that if new technologies recommended to them are economically sound,

they will take to them immediately. The risk and return structure of new technologies determine farmer's response.

The further analysis at district level (Table 4) showed positive as well as negative trends in fertilizer use per unit area in different districts. This variation was primarily due to weather (rainfall) factors and availability of irrigation facilities. The disparity in fertilizers use in different districts could be minimized by demonstrating the effect of fertilizers application on crop productivity, particularly in dry farming areas, hilly areas and other inaccessible areas and making fertilizers readily available when required by the farmers.

### **CONCLUSIONS**

The results presented in this paper reveal that Gujarat has successfully imple

mented its transfer of agro-technology programme in the State, particularly for fertilizer aspects. The fertilizer, NPK, requirements estimated for the period from 1969-70 to 1988-89 on the basis area under crop and recommended fertilizer dose showed significant increase only in P and K, while the requirement of N fertilizer remained almost static. The consumption of N, P, K fertilizers showed significant increasing trend suggesting that the gap between fertilizer requirements and consumption decreased year after year. The gap estimates showed negative significant trend for N and P fertilizers. The over use has been observed for potashic fertilizer. The analysis for district showed large variation in fertilizer consumption.