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## REGIONAL VARIATIONS IN YIELD PER ACRE OF MAJOR CROPS IN INDIA (1950-51 TO 1959-60)\*

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The object of this paper is to study regional variations in yield per acre of principal crops in India during the decade 1950-51 to 1959-60. The main feature is a comparative study of regional disparities. The units of regions have been taken as the political States as they exist now (Nagaland and NEFA have not been considered separately and also Maharashtra and Gujarat have been considered together under the former name of Bombay, because of non-availability of data). The investigation is based on a ten-year series data on yield per acre of the major items of agricultural production. The crops that we have covered are (i) rice, (ii) wheat, (iii) other cereals, (iv) total cereals, (v) total pulses, (vi) total foodgrains, (vii) sugarcane, (viii) total oilseeds, (ix) cotton and (x) jute.

### II

We may analyse the yield per acre data on the lines stated earlier. A linear trend  $y=a+bt$  ( $y$  = index<sup>1</sup> of yield per acre,  $a$ ,  $b$ , are constants,  $t$ =time in years varying from 1 to 10) was fitted to the index of yield per acre. (1950-51=100) for each crop and each State. Table I gives the constants and final year computed values for the trend fitted to the series of indices of yield per acre. It may be noted from this table that there are no figures against some crops and States. This means that either there were no data or the data apparently were unsatisfactory for the purpose of fitting a trend. Here it is not the purpose to compare the rates of growth ("b") of different States for a particular crop since it is evident from Table I.

We now compare the initial and final year computed values of yield per acre obtained from the fitted trends for each crop over the States. For each crop, we have arranged in two columns, the initial and final year computed yield figures for all the States as well as the all-India figure. Then figures for each State have been expressed in terms of the all-India figure of that year (taking all-India=100).

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1. The absolute figures were converted into indices with base 1950-51 = 100.

All the data have been obtained from "Area, Production and Average Yield per Acre of Principal Crops in India 1949-50 to 1957-58," and *Agricultural Situation in India*, 1960, both issued by the Economic and Statistical Adviser to the Government of India, Ministry of Food and Agriculture.

TABLE I—CONSTANTS AND FINAL YEAR EXPECTED VALUE OF THE LINEAR TREND FITTED TO YIELD/ACRE  
DATA BY STATES AND CROPS

	Andhra	Assam	Bihar	Bombay	Jammu & Kashmir	Kerala	Madhya Pradesh	Madras
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Rice	a 97.94 3.08 128.74	b 105.97 0.56 11.57	115.69 7.27 188.39	93.31 7.13 164.61	100.18 2.08 120.98	86.46 5.19 138.36	138.89 7.24 211.29	93.35 6.17 155.05
Wheat	a a+10b b 2.88	118.80 1.37 0.53	100.34 0.53 105.64	89.28 -2.45 64.78	85.97	85.97	85.97	85.97
Cereals	a b 128.59	99.79 -3.56 61.21	96.81 1.06 108.61	98.01 5.06 150.82	100.22 2.74 131.03	103.63 9.83 173.23	107.17 8.38 190.97	102.94 2.08 123.74
Total Cereals	a b a+10b	95.11 3.72 132.31	105.75 0.57 111.43	112.44 5.23 164.74	99.13 4.69 146.03	101.61 1.08 112.41	85.96 5.34 139.36	94.38 5.19 146.28
Total Pulses	a b a+10b	108.73 -1.02 98.53	110.27 1.20 122.27	119.40 -1.78 101.60	103.35 -1.30 90.35	103.35 -1.30 90.35	94.54 1.97 114.24	112.69 4.28 155.49
Total Foodgrains	a b a+10b	96.95 3.87 135.65	106.37 2.44 110.77	113.42 3.77 151.12	99.49 3.74 136.89	101.46 1.05 112.26	86.67 4.87 135.37	107.67 5.43 161.97
Sugarcane	a b a+10b	92.25 2.85 120.75	85.99 2.14 107.39	59.47 11.02 169.67	93.37 0.87 102.07	100.31 1.11 111.41	102.35 0.79 110.25	102.35 0.79 110.25
Total Oilsseed	a b a+10b	95.63 1.44 110.03	94.62 0.79 102.52	120.16 -0.24 117.76	82.40 3.75 119.90	104.07 -5.76 46.47	83.01 5.17 134.71	94.95 3.25 127.45
Cotton	a b a+10b	100.85 1.32 114.05	118.22 -7.23 45.92	98.13 -0.79 90.23	98.13 -0.79 90.23	116.49 3.02 146.69	98.47 1.17 110.17	98.47 1.17 110.17
Jute	a b a+10b	88.56 1.26 100.76	84.58 3.13 115.88	84.58 3.13 115.88	84.58 3.13 115.88	84.58 3.13 115.88	84.58 3.13 115.88	84.58 3.13 115.88

(Contd.)

TABLE I (Contd.)

	Mysore	Orissa	Punjab	Rajasthan	Uttar Pradesh	West Bengal	All-India
	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Rice	a b a+10b	95.21 4.20 137.21	108.08 -0.37 104.31	108.90 2.89 137.80	79.12 5.15 130.62	94.25 3.63 130.55	102.67 -0.27 99.97
Wheat	a b a+10b	100.85 0.67 107.55	108.11 1.13 121.41	128.33 2.86 157.33	100.33 -0.39 97.33	103.01 -3.30 70.01	103.63 1.02 113.83
Cereals	a b a+10b	101.05 2.84 129.45	100.46 -1.89 81.36	108.17 4.29 151.07	120.72 6.49 185.62	101.69 -1.22 89.49	107.81 -1.46 93.21
Total Cereals	a b a+10b	98.03 3.59 133.93	107.54 -0.42 103.34	109.58 3.21 141.68	117.96 6.31 181.06	100.32 0.13 101.62	102.60 -0.34 99.20
Total Pulses	a b a+10b	107.01 -0.79 99.11	113.65 0.06 114.25	121.38 4.22 163.58	86.07 7.01 154.17	95.05 1.11 106.15	108.65 -3.68 71.85
Total Foodgrains	a b a+10b	99.20 3.22 131.40	107.31 -0.42 103.11	114.24 3.17 145.94	111.71 6.10 172.71	99.07 0.39 102.97	102.64 -0.63 96.34
Sugarcane	a b a+10b	87.78 3.14 119.18	102.04 -2.28 79.24	90.18 2.72 117.38	176.64 4.69 223.54	94.70 -0.01 94.60	118.87 -0.22 109.67
Total Oilseed	a b a+10b	75.64 0.91 84.74	102.50 -0.18 100.70	88.16 3.06 118.76	96.16 1.69 113.06	115.51 -1.95 96.01	106.20 -4.12 65.00
Cotton	a b a+10b	95.51 4.42 139.71	109.60 1.48 124.40	86.56 -0.20 84.56	86.90 -2.71 59.80		101.20 1.32 114.40
Jute	a b a+10b		102.78 -0.26 97.18		75.61 6.09 136.51	111.08 113.18	99.52 1.15 111.02

*Rice*TABLE II—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF RICE  
(yield in lbs. per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
1	2	3	4	5
Andhra Pradesh .. .. ..	897	139	1143	138
Assam .. .. ..	834	130	874	105
Bihar .. .. ..	452	70	693	83
Bombay .. .. ..	598	93	979	118
Jammu & Kashmir .. .. ..	884	137	1045	126
Kerala .. .. ..	773	120	1166	140
Madhya Pradesh .. .. ..	501	78	725	87
Madras .. .. ..	883	137	1375	165
Mysore .. .. ..	874	136	1206	145
Orissa .. .. ..	505	78	489	59
Punjab .. .. ..	723	112	892	107
Rajasthan .. .. ..	622	97	964	116
Uttar Pradesh .. .. ..	453	70	604	73
West Bengal .. .. ..	910	141	889	107
All-India .. .. ..	644	100	831	100

From Table II it appears that in all States except Orissa and West Bengal yield of rice has increased. Bombay which was below all-India average has gone up above the all-India average position. Bihar and Madhya Pradesh have moved near to all-India average. The position of Uttar Pradesh has remained practically unchanged. Amongst the States already in the above all-India average position Kerala and Madras have moved considerably further up.

*Wheat*TABLE III—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF WHEAT  
(yield in lbs. per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	(4)	(5)
Bihar .. .. ..	454	73	501	74
Bombay .. .. ..	420	68	439	65
Jammu & Kashmir .. .. ..	730	118	545	81
Madhya Pradesh .. .. ..	408	66	579	86
Mysore .. .. ..	199	32	211	31
Punjab .. .. ..	848	137	941	140
Rajasthan .. .. ..	695	112	834	124
Uttar Pradesh .. .. ..	732	118	712	106
West Bengal .. .. ..	711	115	499	74
All-India .. .. ..	620	100	674	100

Jammu & Kashmir, Uttar Pradesh and West Bengal have recorded a decrease in yield per acre. Other States have in general retained their relative position except in case of Madhya Pradesh which from a position of far below the all-India average has moved near to the all-India average.

### *Other Cereals*

TABLE IV—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF OTHER CEREALS  
(yield in lbs. per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	(4)	(5)
Andhra Pradesh .. .. ..	378	98	473	102
Assam .. .. ..	552	144	362	78
Bihar .. .. ..	432	112	474	102
Bombay .. .. ..	285	74	409	88
Jammu & Kashmir .. .. ..	614	160	756	163
Kerala .. .. ..	426	111	871	188
Madhya Pradesh .. .. ..	289	75	477	103
Madras .. .. ..	579	151	682	147
Mysore .. .. ..	333	87	416	90
Orissa .. .. ..	435	113	360	78
Punjab .. .. ..	419	109	563	121
Rajasthan .. .. ..	256	67	373	80
Uttar Pradesh .. .. ..	648	169	577	124
West Bengal .. .. ..	604	157	529	114
All-India .. .. ..	384	100	464	100

Assam, Orissa, Uttar Pradesh and West Bengal show a decrease in yield. Andhra and Madhya Pradesh have moved from below all-India average to all-India level. Rajasthan has improved its position though still below all-India level. Others have maintained their position except of course Kerala which shows a remarkable increase in yield from a position of almost all-India average level it has gone ahead to take the leading position.

### *Total Cereals*

TABLE V—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF TOTAL CEREALS  
(yield in lbs. per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	(4)	(5)
Andhra Pradesh .. .. ..	546	107	730	116
Assam .. .. ..	829	163	869	138
Bihar .. .. ..	448	88	628	100
Bombay .. .. ..	332	65	467	74
Jammu & Kashmir .. .. ..	737	145	807	128
Kerala .. .. ..	761	150	1162	184
Madhya Pradesh .. .. ..	385	76	595	94
Madras .. .. ..	709	139	1042	165
Mysore .. .. ..	405	80	534	85
Orissa .. .. ..	501	98	484	77
Punjab .. .. ..	620	122	779	124
Rajasthan .. .. ..	313	62	456	72
Uttar Pradesh .. .. ..	616	121	623	99
West Bengal .. .. ..	899	177	872	138
All-India .. .. ..	509	100	630	100

All States except Orissa and West Bengal show increase in yield. All the States below all-India level have improved their position. Bihar has come to the all-India level. Uttar Pradesh from above all-India level has come to all-India level. Kerala shows a spectacular increase in yield. From already a very much above all-India level, it shows almost double the all-India figure of yield.

### Total Pulses

TABLE VI—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF TOTAL PULSES  
(yield in lbs. per acre)

States		Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)		(2)	(3)	(4)	(5)
Andhra Pradesh	.. .. ..	198	49	181	41
Assam	.. .. ..	328	81	359	81
Bihar	.. .. ..	408	101	353	80
Bombay	.. .. ..	361	89	320	73
Madhya Pradesh	.. .. ..	351	87	416	94
Madras	.. .. ..	171	42	227	51
Mysore	.. .. ..	253	62	236	54
Orissa	.. .. ..	478	118	480	109
Punjab	.. .. ..	528	130	687	156
Rajasthan	.. .. ..	213	53	361	82
Uttar Pradesh	.. .. ..	597	147	659	149
West Bengal	.. .. ..	583	144	399	90
All-India	.. .. ..	405	100	441	100

There has not been much increase in the yield of total pulses. All-India average has increased from 405 lbs. per acre to 441 lbs. Andhra, Bihar, Bombay, Mysore and West Bengal have recorded decrease in yield. Others have shown slight increase in yield and more or less maintained their relative position except Rajasthan which has substantially improved its position.

### Total Foodgrains

TABLE VII—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF TOTAL FOODGRAINS  
(yield in lbs. per acre)

States		Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)		(2)	(3)	(4)	(5)
Andhra Pradesh	.. .. ..	482	99	648	110
Assam	.. .. ..	677	138	833	141
Bihar	.. .. ..	438	90	565	96

(Contd.)

1	2	3	4	5
Bombay	335	69	445	75
Jammu & Kashmir	736	151	804	136
Kerala	754	154	1115	189
Madhya Pradesh	383	78	549	93
Madras	653	134	973	165
Mysore	376	77	482	82
Orissa	500	102	483	82
Punjab	595	122	740	125
Rajasthan	291	60	427	72
Uttar Pradesh	611	125	632	107
West Bengal	857	175	809	137
All-India	489	100	590	100

Orissa and West Bengal show a decrease in yield per acre. All the States which were below all-India average have improved their relative position although none except Andhra, which was practically at the all-India level, has crossed the all-India level. Kerala and Madras have shown spectacular rise in yield.

### Sugarcane

TABLE VIII—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF SUGARCANE  
(yield in lbs. of gur per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	(4)	(5)
Andhra Pradesh	5685	204	7218	227
Assam	2314	83	2820	89
Bihar	1186	42	2856	90
Bombay	5656	203	6126	192
Madhya Pradesh	2297	82	2523	79
Madras	5954	213	6365	200
Mysore	4587	164	6013	189
Orissa	3976	142	3159	99
Punjab	2454	88	3101	97
Rajasthan	1645	59	2028	64
Uttar Pradesh	2458	88	2456	77
West Bengal	3983	143	3912	123
All-India	2793	100	3185	100

Orissa has recorded a decrease in yield. Uttar Pradesh and West Bengal show a stagnant yield per acre. Bihar from a very low position has improved its position almost to reach the all-India average. Madhya Pradesh's position has deteriorated although it was below the all-India level. Other States which were below the all-India level have improved position slightly.

### Total Oilseeds

TABLE IX—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF TOTAL OILSEEDS  
(yield in lbs. per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	(4)	(5)
Andhra Pradesh .. .. ..	518	129	588	128
Assam .. .. ..	376	94	404	88
Bihar .. .. ..	253	63	248	54
Bombay .. .. ..	362	90	504	109
Kerala .. .. ..	917	228	434	94
Madhya Pradesh .. .. ..	220	55	335	73
Madras .. .. ..	752	187	976	212
Mysore .. .. ..	469	117	519	113
Orissa .. .. ..	275	68	271	59
Punjab .. .. ..	338	84	441	96
Rajasthan .. .. ..	212	53	245	53
Uttar Pradesh .. .. ..	366	91	309	67
West Bengal .. .. ..	404	100	257	56
All-India .. .. ..	402	100	461	100

Bihar, Kerala, Orissa, Uttar Pradesh and West Bengal show a fall in yield per acre. In Kerala the fall is very sharp. Bombay has improved from below all-India position to slightly above all-India position. Madhya Pradesh and Punjab have also improved though still below the all-India level. Assam's position has deteriorated.

### Cotton

TABLE X—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF COTTON  
(yield in lbs. per acre)

States	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	(4)	(5)
Andhra Pradesh .. .. ..	48	60	54	61
Assam .. .. ..	174	217	71	80
Bombay .. .. ..	80	100	74	83
Madhya Pradesh .. .. ..	66	82	81	91
Madras .. .. ..	118	147	130	146
Mysore .. .. ..	52	65	73	82
Punjab .. .. ..	194	242	218	245
Rajasthan .. .. ..	112	140	110	124
Uttar Pradesh .. .. ..	140	175	99	111
All-India .. .. ..	80	100	89	100

Assam, Bombay, Rajasthan and Uttar Pradesh have recorded a decrease in yield per acre; other States have in general maintained their relative position.

*Jute*

TABLE XI—INITIAL AND FINAL YEAR COMPUTED VALUES OF YIELD PER ACRE OF JUTE

(yield in lbs. per acre)

State	Trend value 1950-51	Index All-India = 100	Trend value 1959-60	Index All-India = 100
(1)	(2)	(3)	4	(5)
Assam	1,139	122	1,279	124
Bihar	646	69	853	82
Orissa	900	96	855	83
Uttar Pradesh	667	71	1,115	108
West Bengal	1,016	108	1,033	100
All-India	937	100	1,034	100

Of the five jute producing States, Orissa only shows a slight decrease in yield per acre. Uttar Pradesh and Bihar have improved their position.

From the above paragraphs it would appear that disparities between States in yield per acre have not diminished to any appreciable extent.<sup>2</sup>

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## A REGIONAL APPROACH TO AGRICULTURAL DEVELOPMENT IN INDIA—SOME PRELIMINARY RESULTS

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The general level of development of an economy can be assessed in a number of ways. One of the approaches might be to assess the annual rate of growth of a particular economy in relation to the annual growth rates of other undeveloped, developing and developed economies. The annual rate of growth of an economy is mainly a determinate of the growth in the goods producing sector of an economy less the annual rate of growth of population. Here, if the increases in prices during the stipulated period of growth are allowed for, real rate

2. A fuller discussion on this is available in our paper "Regional Pattern of Growth of Agricultural Output in India (1950-51 to 1959-60) in the mimeographed series [PD. EAU. WP/141(277)] of the Planning Division of the Indian Statistical Institute.

\*The author's personal views alone are given here. The author is grateful to Shri A. Mitra, I.C.S., Census Commissioner, India for suggesting various improvements in the original draft. Thanks are also due to Shri D. S. Mehra for valuable assistance.