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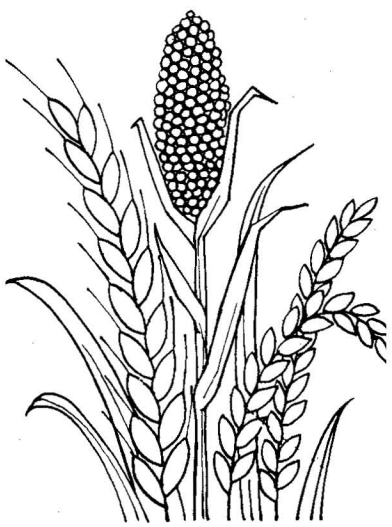

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GROWTH OF CROP PRODUCTION: 1960-61 TO 1978-79—IS IT DECELERATING?

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CHOICE OF PERIODS

The period since 1965-66 or 1967-68 is regarded as the post-green revolution period for agricultural growth analysis.[1] We do not find it easy to accept these as the cut-off years.

It is true that the high-yielding varieties (HYVs) were introduced in 1965-66, but even in 1966-67 they accounted for only 1.64 per cent of the area under foodgrains (Table I). In 1967-68, wheat crop alone accounted for 50 per cent of the total area covered under HYVs under foodgrains. The difference in the average per hectare yield of area under irrigated HYVs and 'Other Irrigated Areas' of wheat was 0.7 tonne at the all-India level.[2]

TABLE I—PER CENT AREA UNDER HIGH-YIELDING VARIETIES OF FOODGRAINS, PER HECTARE FERTILIZER CONSUMPTION AND FOODGRAINS OUTPUT—ALL-INDIA: 1964-65 TO 1972-73

Year	Area under HYV as per cent of total area under foodgrains	Fertilizer consumption (kg./hectare)	Foodgrains output (million tonnes)
(1)	(2)	(3)	(4)
1964-65	—	4·1	89·4
1965-66	—	5·1	72·3
1966-67	1·64	7·0	74·2
1967-68	4·97	9·4	95·1
1968-69	7·72	11·0	94·0
1969-70	9·23	12·1	99·5
1970-71	12·32	13·7	108·4
1971-72	14·76	16·1	105·2
1972-73	18·59	17·1	97·0

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1. See amongst others, T. N. Srinivasan, "Trends in Agriculture in India, 1949-50—1977-78", *Economic and Political Weekly*, Vol. XIV, Nos. 30, 31 and 32, Special Number, August 1979, pp. 1283-1284.

2. Computed from the Reports of the National Sample Survey Organisation, Government of India.

Thus in this early period of the introduction of new technology even a shift of 10 per cent of wheat area from 'other irrigated' category to 'Irrigated High-Yielding' category would have increased the output through the years only by 8.5 per cent. Therefore, in order that the impact of HYV area is felt on foodgrains output, a minimum amount of coverage is necessary. We have chosen the cut-off point as the year in which the coverage of HYV rose to around 10 per cent of the area under foodgrains.

The production of foodgrains in 1964-65 was 89.4 million tonnes. It crossed this level only in 1967-68. Similarly, fertilizer consumption crossed 10 kg. per hectare only in 1968-69 and 1969-70.

We have, therefore, taken 1969-70 as the cut-off point for examining the differences in agricultural growth performances. The period 1960-61 to 1978-79 has been chosen for analysis and divided into two equal sub-periods: 1960-61 to 1969-70 and 1969-70 to 1978-79. Trends for the entire period 1960-61 to 1978-79 are also studied.

The periodisation has also been done keeping the policy requirement in perspective. From all indicators, the period before the Fourth Five-Year Plan saw a dip in economic activity.[3] The purpose is also to see the extent to which the agricultural sector was a constraining factor in the sixties as compared to the seventies.

GROWTH RATES

Annexure Tables 1 to 5 give the estimated trend growth rates for foodgrains, sugarcane, major oilseeds, cotton, jute and mesta for the country as a whole and major States for the following three time periods: (*i*) Period I —1960-61 to 1969-70; (*ii*) Period II—1969-70 to 1978-79 and (*iii*) Period III—1960-61 to 1978-79. It is quite clear that the growth rates at the all-India level for all crops are higher in period II as compared to period I. This position also obtains in most States.

It is interesting to note that as compared to the position in period I in which the regional spread of agricultural growth was somewhat limited, *i.e.*, predominated by Punjab and Haryana, in period II the growth pattern is more evenly spread across regions. To give an illustration, in foodgrains, the growth rate in Haryana and Punjab has flattened out in period II as compared to period I but that in Maharashtra, Andhra Pradesh and Bihar has picked up in the latter period. The cropwise position is indicated below.

Foodgrains

During period I, *viz.*, 1960-61 to 1969-70, the trend growth rate of foodgrains output was 1.85 per cent and rose to 2.74 per cent in period II, *viz.*, 1969-70 to 1978-79, apparently indicating the impact of 'Green Revolution' during the latter period. Taking a longer time span of period III, *viz.*, 1960-61

3. For trends in savings, investment and output growth by sector, see Studies on the Structure of Indian Economy and Planning for Development, Perspective Planning Division, Planning Commission, Government of India, May 1977.

to 1978-79, the per annum trend growth rate works out as 2.77 per cent. In absolute terms at the all-India level, the foodgrains output increased at a linear rate of 1.67 million tonnes, 3.09 million tonnes and 2.70 million tonnes during periods I, II and III respectively. The performance has, however, varied across States. Punjab recorded the highest estimated growth trend of 9.54 per cent and 8.01 per cent per annum during periods I and III respectively, whereas Maharashtra with 9.15 per cent was in the lead during period II. The States of Andhra Pradesh, Bihar, Rajasthan and Tamil Nadu showed recovery during period II as compared to period I. It is, however, to be noted that in both Punjab and Haryana the trend growth rate decelerated in the seventies as compared to the sixties.

Sugarcane

At the all-India level, the trend growth rate for sugarcane output has been observed to be 2.29 per cent, 3.42 per cent and 2.93 per cent per annum respectively during periods I, II and III. This clearly shows an improvement in annual growth rates during period II as compared to that observed during period I. Uttar Pradesh, the most important sugarcane growing State, witnessed a negative growth rate during period I but staged a recovery during period II. In Maharashtra, the per annum growth rate in period II (7.52 per cent) was higher as compared to period I (4.22 per cent). Other States like Karnataka, Punjab, Haryana and Tamil Nadu witnessed deceleration in growth rates during period II as compared to period I. Bihar presents rather a dismal picture as the magnitude of the negative growth rates increased during period II as compared to period I.

Major Oilseeds

At the all-India level, the trend growth rate for major oilseeds per annum was observed to be 0.28 per cent, 1.35 per cent and 1.57 per cent during periods I, II and III respectively, indicating an improvement in period II as compared to period I. A similar situation prevailed in the States of Gujarat (6.43 per cent and—3.06 per cent), Tamil Nadu (0.57 per cent and —3.01 per cent), Karnataka (1.04 per cent and 0.61 per cent) and Maharashtra (2.06 per cent and—3.48 per cent). Further, it is a matter of concern that Uttar Pradesh and Andhra Pradesh, which together account for 35 per cent of major oilseeds output, have shown negative growth rates in period II as compared to period I. However, the other major oilseeds growing States like Gujarat, Maharashtra, Tamil Nadu and Karnataka have shown improvement during these periods, though marginal, barring that of Gujarat where the recovery has been substantial.

Cotton

At the all-India level, the trend growth rate per annum in cotton output during 1960-61 to 1978-79 was 1.62 per cent. It was nominal, being 0.31 per cent during 1960-61 to 1969-70 but increased substantially to 3.38

per cent during 1969-70 to 1978-79. Among the States, Rajasthan, Haryana and Andhra Pradesh have shown the highest growth rates, *viz.*, 6.62 per cent 6.55 per cent and 6·00 per cent respectively during 1960-61 to 1978-79. It is also noted that the performance of Andhra Pradesh, Rajasthan, Karnataka, Punjab and Maharashtra in the seventies has been better as compared to the sixties. In Haryana, however, a sharp deceleration in output growth rate is observed during the seventies as compared to the sixties.

Jute and Mesta

At the all-India level, the trend growth rate with respect to jute-mesta production during 1960-61 to 1978-79 was nominal, being 0.16 per cent. It was negative (—2.18 per cent) during 1960-61 to 1969-70 but was on the path of recovery during 1969-70 to 1978-79, being 1.61 per cent. West Bengal, which alone accounts for about 50 per cent of the all-India output, showed an annual trend growth rate during the 19-year period at 0.39 per cent. This growth rate has emerged from a negative growth rate observed during 1960-61 to 1969-70 (—2.13 per cent) coupled with a growth rate of 1.27 per cent during 1969-70 to 1978-79. Incidentally, it may be mentioned that West Bengal because of its weight in the all-India output has shown trend growth rates in periods I, II and III similar to the all-India trend growth rates.

The discussion on the estimates in the preceding paragraphs is that of "trend growth".[4] The problem of seasonal fluctuations and other factors determining the variation from the trend is discussed below.

IS GROWTH DECELERATING ?

The issue of acceleration or deceleration of growth has been discussed in the literature with the use of dummy variables or test of significance.[5] The following test[6] was applied to examine if the growth rates in the two periods are significantly different from each other:

$$(i) \quad t = \frac{b_1 - b_2}{(SE_{b_1})^2 + (SE_{b_2})^2}$$

where b_1 = regression coefficient of output for period I,
b_2 = regression coefficient of output for Period II,
SE_{b_1} = standard error of b_1,
SE_{b_2} = standard error of b_2.

4. These growth rates correspond to the trend growth rates given in Estimates of Area and Production of Principal Crops in India 1977-78, Directorate of Economics and Statistics, Ministry of Agriculture and Irrigation, Government of India, New Delhi, 1979, p. 143. It may be noted that the Ministry of Agriculture generally discusses the trend growth rates but does not highlight the standard errors which are associated with these estimates.

5. See Y. K. Alagh, "Disparate Rates of Growth in Indian Agriculture", Indian School of Political Economy, Lonavla, June 1977 (mimeo.) and Srinivasan, *op. cit.*

6. We are grateful to Dr. Padam Singh and Shri M. J. Manohar Rao for help. There is a slight problem in the test statistic on account of 1969-70 being a common year for both the periods, since the test assumes independence of structure in each equation.

It may be noted that out of sixty-seven pairs of estimated growth rates through the regression method, only nine-pair estimates are significant for the two time periods. Out of nine estimates, it was found that no significant differences existed between the growth rates in six out of nine estimates in the two time periods (Annexure Table 6).

It was decided to pursue this finding in some detail. The plain fact of the matter is that both in period I and period II, the variation of output around the trend has been much higher than the estimated trend growth. This point is made in Table II for foodgrains. The position in the commercial crops shows greater instability in production.

TABLE II—GROWTH AND VARIATION IN FOODGRAINS OUTPUT

State	Linear		Log-linear	
	Trend growth rate (absolute) (1969-70 to 1978-79) (lakh tonnes)	Maximum deviation from trend (1974-75 to 1978-79) (lakh tonnes)	Trend growth rate (per cent) (1969-70 to 1978-79)	Maximum per cent deviation from trend (1974-75 to 1978-79)
(1)	(2)	(3)	(4)	(5)
Andhra Pradesh	2·88	(—) 15·31	3·46	(—)19·56
Assam	0·49	(—) 1·27	2·11	(—) 5·41
Bihar	2·16	(—) 6·49	2·51	(—) 7·40
Gujarat	0·72	(—) 15·87	2·07	(—)68·40
Karnataka	1·51	(—) 18·81	2·24	(—)37·77
Kerala	0·02	(+) 0·68	(—)0·14	(+) 5·00
Madhya Pradesh	1·04	(—) 15·71	0·92	(—)15·95
Maharashtra	6·33	(+) 6·84	9·15	(+)11·80
Orissa	0·54	(—) 10·09	0·95	(—)24·37
Punjab (including Haryana) ..	6·05	(—) 22·73	4·38	(—)18·61
Rajasthan	1·67	(—) 18·04	2·93	(—)33·81
Tamil Nadu	1·08	(—) 21·52	1·44	(—)43·40
Uttar Pradesh	4·57	(—) 26·28	2·34	(—)15·20
West Bengal	1·06	(+) 9·10	1·34	(+)10·48
All-India	30·90	(—)121·78	2·74	(—)11·59
Haryana	1·59	(—) 14·51	3·09	(—)41·10
Punjab	4·46	(—) 8·22	5·15	(—) 8·91

Table II has been deliberately cited in terms of growth rates compared with maximum percentage or absolute deviation during the last five years (1974-75 to 1978-79) from the period to trend. It is obvious that given the formula in (*i*) above, the variation in each growth rate is generally much higher than the estimate of the growth trend itself leading to the results indicated above. It may be noted that even if India's growth rate accelerates further—say reaches 4 per cent annual—, if relative fluctuations continue, the differences with the past will still not be 'significant', in the statistical sense. It may also be noted that it is this factor which leads to the somewhat peculiar result that in some cases, the growth rates in the entire period (period III) are either above or below the sub-period (periods I/II) growth rates. The problem of fluctuations of agricultural output is, therefore, still an extremely serious one for the Indian economy.

SUMMARY AND CONCLUSIONS

The main results of this paper are being presented essentially as points for discussion in the Seminar and not as firmed up conclusions.

(1) It is felt that the Green Revolution started having an appreciable effect on the Indian economy only since 1969-70 and it may be useful to develop sub-periods keeping the indicators of the spread of the Green Revolution in view.

(2) The estimated growth rates in period II are generally higher than those for period I.

(3) Growth is more evenly spread in period II as compared to period I.

(4) The variation around the growth trend is still large.

(5) Anti-cyclical policies either of the buffer stock variety or of consideration of forward markets for selected crops[7] are important. This is true irrespective of the consideration of the problem of non-inflationary growth, given the agricultural sector as a constraint or of ensuring equity in any bad agricultural year. Also such policies are important to the extent that the farmer has to be ensured stable prices to permit him to take advantage of the new technological opportunities being created by a mix of public policy and private efforts.

If the conclusion is accepted that agricultural growth in the period 1969-70 to 1978-79 is higher than in the period 1960-61 to 1969-70, then the agricultural sector as a constraint to the planning of a higher growth rate of the Indian economy is now less of a problem. The more important problem seems to lie in the areas of financial intermediation to permit orderly growth of public investment, the use of trade policies, both external and internal, to permit price stability. However, it still needs to be noted that most of the growth rates estimated for period II are lower than those which are required for the medium-term and the perspective periods to permit the economy to achieve its desired objectives.[8]

7. The Government of India (Ministry of Commerce and Civil Supplies) has set up a Committee on Forward Markets in 1979 under the Chairmanship of Professor A. M. Khusro.

8. See in this connection, Government of India: Draft Sixth Five Year Plan 1978-83, Revised, Planning Commission, Government of India, New Delhi, December 1979, Chapters 2 and 4.

ANNEXURE TABLE 1—FOODGRAINS

PER ANNUM TREND GROWTH RATES OF FOODGRAINS OUTPUT IN PERIOD I (1960-61 TO 1969-70), PERIOD II (1969-70 TO 1978-79) AND PERIOD III (1960-61 TO 1978-79) FOR MAJOR STATES AND ALL-INDIA

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh ..	8·4	I	25·7455	0·428	0·0039	0·451	0·39
		II	288·4858**	3·051	0·0340**	2·986	3·46
		III	136·0965*	4·015	0·0167*	3·964	1·69
Assam ..	2·2	I	47·9706*	3·422	0·0244*	3·426	2·47
		II	48·9698**	3·210	0·0209*	3·323	2·11
		III	49·8588*	9·242	0·0233*	9·277	2·36
Bihar ..	7·7	I	42·9744	0·292	0·0021	0·087	0·21
		II	216·4734*	3·280	0·0248**	3·241	2·51
		III	150·8912*	3·480	0·0190**	2·762	1·92
Gujarat ..	3·3	I	31·1707	1·811	0·0311	1·795	3·16
		II	71·7070	0·714	0·0205	0·644	2·07
		III	111·7223*	3·826	0·0349*	3·653	3·56
Karnataka ..	6·2	I	136·5830	1·972	0·0281	1·700	2·85
		II	150·7808	1·457	0·0222	1·230	2·24
		III	180·0864*	5·544	0·0335*	5·231	3·40
Kerala ..	1·2	I	23·9883	2·291	0·0199**	2·315	2·01
		II	(—) 1·9189	0·299	0·0014	0·291	(—)0·14
		III	16·5405*	4·444	0·0138*	4·563	1·39
Madhya Pradesh ..	10·0	I	(—)25·5448	0·159	(—)0·0042	0·214	(—)0·42
		II	104·0784	1·006	0·0092	0·964	0·92
		III	161·1298*	2·992	0·0165**	2·675	1·67
Maharashtra ..	7·4	I	(—)35·6600	0·388	(—)0·0052	0·343	(—)0·52
		II	633·4937*	3·653	0·0876**	2·683	9·15
		III	154·6456**	2·181	0·0175	1·489	1·77

(*Contd.*)

ANNEXURE TABLE 1—FOODGRAINS (*Concld.*)

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Orissa ..	4·6	I	98·8844	1·907	0·0214	1·859	2·16
		II	53·7433	0·755	0·0094	0·628	0·95
		III	57·4457**	2·483	0·0119**	2·376	1·19
Punjab and Haryana ..	11·3	I	525·2100	3·725	0·0649*	3·614	6·70
		II	604·6147	4·149	0·0429*	4·193	4·38
		III	627·7913*	11·924	0·0632*	11·518	6·53
Rajasthan ..	6·0	I	(—)11·3220	0·113	(—)0·0040	0·202	(—)0·40
		II	167·1755	1·120	0·0288	1·265	2·93
		III	171·9947*	3·484	0·0293*	3·478	2·97
Tamil Nadu ..	5·9	I	40·1251	1·301	0·0069	1·266	0·69
		II	108·3011	1·048	0·0143	0·861	1·44
		III	119·5930*	4·075	0·0181*	3·817	1·83
Uttar Pradesh ..	15·8	I	348·3374	1·790	0·0224	1·621	2·27
		II	457·3892	2·276	0·0231	2·120	2·34
		III	460·2510*	6·276	0·0275*	5·970	2·79
West Bengal ..	7·2	I	172·1089**	2·396	0·0276	2·320	2·80
		II	105·6314	1·498	0·0133	1·476	1·34
		III	179·6965*	6·719	0·0269*	6·681	2·72
All-India ..		I	1665·4839	1·875	0·0184	1·733	1·85
		II	3090·2156*	3·567	0·0271*	3·517	2·74
		III	2703·4104*	7·449	0·0273*	7·712	2·77
Haryana ..	3·8	I	168·2907**	2·311	0·0507	2·127	5·20
		II	158·5512	1·913	0·0304	1·639	3·09
		III	192·2140*	6·864	0·0520*	6·661	5·33
Punjab ..	7·5	I	416·6907*	5·798	0·0911*	6·470	9·54
		II	446·1255*	6·474	0·0502*	7·640	5·15
		III	460·4948*	17·770	0·0771*	16·466	8·01

* Significant at 1 per cent level.
** Significant at 5 per cent level.

ANNEXURE TABLE 2—SUGARCANE

PER ANNUM TREND GROWTH RATES OF SUGARCANE OUTPUT IN PERIOD I (1960-61 TO 1969-70), PERIOD II (1969-70 TO 1978-79) AND PERIOD III (1960-61 TO 1978-79) FOR MAJOR STATES AND ALL-INDIA

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh ..	7·7	I	558·3926**	3·174	0·0664*	3·378	6·86
		II	71·6389	0·586	0·0061	0·542	0·61
		III	194·3737*	2·951	0·0228*	3·136	2·31
Assam ..	1·2	I	41·4250**	2·551	0·0348**	2·646	3·54
		II	30·6880	1·734	0·0211	1·759	3·13
		III	42·9161*	7·420	0·0333*	7·713	3·39
Bihar ..	3·7	I	(—) 88·0760	0·744	(—)0·0162	0·743	(—)1·60
		II	(—)186·7937**	2·769	(—)0·0352**	2·719	(—)3·46
		III	(—) 89·4270**	2·565	(—)0·0162**	2·482	(—)1·61
Gujarat ..	1·5	I	85·0366	1·971	0·0643**	2·487	6·64
		II	173·2452*	4·472	0·0695*	4·795	7·19
		III	100·6103*	6·000	0·0535*	6·684	5·50
Karnataka ..	6·3	I	399·4753*	5·455	0·0627*	5·855	6·47
		II	416·5869*	6·066	0·0431*	6·633	4·40
		III	342·1001*	12·206	0·0446*	11·884	4·56
Madhya Pradesh ..	1·4	I	(—) 1·8447	0·053	(—)0·0052	0·202	(—)0·51
		II	75·1131	2·116	0·0406	2·142	4·14
		III	41·8874*	3·010	0·0247**	2·782	2·50
Maharashtra	11·5	I	454·2839*	3·411	0·0413*	3·475	4·22
		II	1256·3926*	4·682	0·0726*	4·220	7·52
		III	734·6106*	7·677	0·0508*	8·720	5·21
Orissa ..	1·9	I	135·3337**	3·163	0·1050**	3·165	11·07
		II	129·8549*	4·553	0·0570*	4·476	5·86
		III	92·7964*	6·284	0·0543*	5·113	5·58

(Contd.)

ANNEXURE TABLE 2—SUGARCANE (*Concld.*)

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Punjab and Haryana ..	8·7	I	397·2339	2·155	0·0363	2·109	3·70
		II	242·5386	1·300	0·0202	1·303	2·04
		III	249·2403*	3·863	0·0223*	4·337	2·26
Rajasthan ..	1·3	I	(—)46·1187	2·229	(—)0·0729	2·064	(—)7·03
		II	180·2112*	4·956	0·1185*	4·999	12·58
		III	101·9462*	5·547	0·0801*	4·337	8·34
Tamil Nadu ..	10·5	I	734·1023*	3·787	0·0923*	4·273	9·67
		II	812·7002**	3·246	0·0616*	3·500	6·35
		III	712·5088*	8·557	0·0722*	9·553	7·49
Uttar Pradesh ..	42·4	I	0·5455	0·001	(—)0·0021	0·112	(—)0·21
		II	1559·5562**	2·438	0·0252**	2·478	2·55
		III	1084·4456*	3·575	0·0193*	3·308	1·95
West Bengal ..	1·2	I	(—)67·6911**	2·441	(—)0·0432**	2·404	(—)4·22
		II	19·9448	1·089	0·0124	1·227	1·25
		III	8·0431	0·706	0·0057	0·792	0·57
All-India ..		I	2640·1050	1·788	0·0226	1·676	2·29
		II	4017·5195*	3·848	0·0337*	3·835	3·42
		III	3641·6841*	7·079	0·0289*	6·917	2·93
Haryana ..	4·4	I	264·7380	2·198	0·0449	2·153	4·60
		II	106·6056	0·856	0·0157	0·869	1·58
		III	137·1001*	3·139	0·0230*	3·261	2·32
Punjab ..	4·3	I	182·4309	2·181	0·0391	2·145	3·99
		II	135·9391	1·739	0·0255	1·675	2·58
		III	130·4194*	4·588	0·0264*	4·401	2·67

* Significant at 1 per cent level.
** Significant at 5 per cent level.

ANNEXURE TABLE 3—MAJOR OILSEEDS

PER ANNUM TREND GROWTH RATES OF FIVE MAJOR OILSEEDS OUTPUT IN PERIOD I (1960-61 TO 1969-70), PERIOD II (1969-70 TO 1978-79) AND PERIOD III (1960-61 TO 1978-79) FOR MAJOR STATES AND ALL-INDIA

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh ..	15·7	I	47·8273*	3·638	0·0528*	3·496	5·42
		II	(—)22·8061	0·788	(—)0·0238	0·874	(—)2·35
		III	27·3113**	2·827	0·0265**	2·762	2·68
Assam ..	0·9	I	1·2376	1·959	0·0223	2·038	2·26
		II	2·5055	2·089	0·0342**	2·331	3·48
		III	2·0733*	5·921	0·0306*	6·591	3·11
Bihar ..	1·2	I	0·3630	0·160	(—)0·0005	0·017	(—)0·05
		II	1·8497	1·259	0·0189	1·288	1·90
		III	1·5432**	2·213	0·0174	1·953	1·76
Gujarat ..	15·0	I	(—)35·2357	1·263	(—)0·0310	1·370	(—)3·06
		II	88·3571	1·302	0·0623	0·966	6·43
		III	30·2739	1·466	0·0128	0·681	1·29
Karnataka ..	7·9	I	3·3609	0·381	0·0061	0·371	0·61
		II	8·6423	0·539	0·0103	0·389	1·04
		III	11·8536**	2·439	0·0185**	2·223	1·86
Kerala ..	0·3	I	1·2067*	3·568	0·0566*	3·634	5·82
		II	0·0067	0·023	(—)0·0007	0·051	(—)0·07
		III	0·0698	0·428	0·0045	0·603	0·45
Madhya Pradesh ..	7·7	I	(—) 3·3522	0·356	(—)0·0090	0·416	(—)0·90
		II	(—) 0·9916	0·098	(—)0·0032	0·202	(—)0·32
		III	7·8464	1·994	0·0142	1·848	1·43
Maharashtra	7·3	I	(—)26·7480	1·940	(—)0·0354	1·715	(—)3·48
		II	9·2535	0·556	0·0204	0·553	2·06
		III	(—)14·2582**	2·311	(—)0·0208	1·759	(—)2·05
Orissa ..	2·8	I	13·0727*	8·599	0·1078*	7·072	11·39
		II	15·2200**	3·340	0·0575*	3·569	5·92
		III	13·2632*	10·455	0·0762*	11·446	7·92

(*Contd.*)

ANNEXURE TABLE 3—MAJOR OILSEEDS *(Concld.)*

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Punjab and Haryana ..	4·2	I	15·0714**	2·329	0·0536**	2·358	5·51
		II	(—) 5·1977	0·953	(—)0·0169	1·085	(—)1·68
		III	5·1049	1·984	0·0184**	2·159	1·86
Rajasthan ..	4·5	I	(—) 3·4449	0·442	(—)0·0142	0·449	(—)1·41
		II	13·3449	1·228	0·0400	1·400	4·08
		III	15·0932*	3·943	0·0476*	3·840	4·87
Tamil Nadu ..	11·8	I	(—)31·2393*	4·329	(—)0·0306*	4·439	(—)3·01
		II	6·4857	0·328	0·0057	0·306	0·57
		III	1·8061	0·286	0·0011	0·176	0·11
Uttar Pradesh ..	19·5	I	38·6706	1·998	0·0273	2·016	2·77
		II	(—)10·6356	0·461	(—)0·0061	0·428	(—)0·61
		III	19·0175**	2·257	0·0131**	2·364	1·32
West Bengal ..	0·8	I	0·6770	0·999	0·0138	1·046	1·39
		II	4·9576*	4·739	0·0691*	5·014	7·15
		III	2·3669*	5·623	0·0367*	6·161	3·74
All-India ..		I	24·4417	0·296	0·0028	0·253	0·28
		II	114·1806	1·142	0·0135	1·114	1·35
		III	125·7088*	3·554	0·0156*	3·455	1·57
Haryana ..	1·1	I	(—) 4·9649	1·384	(—)0·0556	1·433	(—)5·41
		II	(—) 0·2776	0·104	(—)0·0036	0·136	(—)0·36
		III	(—) 1·2088	0·988	(—)0·0105	0·804	(—)1·04
Punjab ..	3·1	I	18·4297*	4·442	0·0980*	5·103	10·29
		II	(—) 4·9200	1·164	(—)0·0228	1·287	(—)2·25
		III	5·2782**	2·419	0·0288**	2·745	2·92

* Significant at 1 per cent level.
** Significant at 5 per cent level.

ANNEXURE TABLE 4—COTTON

PER ANNUM TREND GROWTH RATES OF COTTON OUTPUT IN PERIOD I (1960-61 TO 1969-70), PERIOD II (1969-70 TO 1978-79) AND PERIOD III (1960-61 TO 1978-79) FOR MAJOR STATES AND ALL-INDIA

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient ('000 tonnes)	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh ..	5·5	I	(—) 1·0636	0·393	(—)0·0118	0·533	(—)1·17
		II	24·5630	2·045	0·1335**	2·793	14·28
		III	12·2575*	3·472	0·0583*	3·628	6·00
Gujarat ..	24·9	I	13·7600	1·177	0·0094	1·240	0·94
		II	15·3479	0·444	0·0096	0·523	0·96
		III	23·1225**	2·406	0·0135**	2·590	1 35
Karnataka ..	10·8	I	13·4188	1·504	(—)0·0345	1·472	(—)3·39
		II	42·6612**	2·828	0·0764**	2·883	7·94
		III	20·7072*	3·589	0·0383*	3·267	3·90
Madhya Pradesh ..	4·5	I	(—) 4·1661	0·411	(—)0·0047	0·168	(—)0·47
		II	(—) 2·8054	0·324	(—)0·0056	0·184	(—)0·55
		III	(—) 5·6298	1·613	(—)0·0155	1·429	(—)1·54
Maharashtra ..	18·1	I	(—) 8·5703	0·354	(—)0·0038	0·200	(—)0·37
		II	27·5055	0·716	0·0316	0·828	3·21
		III	(—)16·3780	1·290	(—)0·0149	1·225	(—)1·47
Punjab (including Haryana)	25·5	I	34·3418*	4·364	0·0332*	4·265	3·38
		II	65·7703*	6·937	0·0433*	6·520	4·42
		III	53·4671*	14·557	0·0408*	15·045	4·16
Rajasthan ..	5·4	I	0·8515	0·244	0·0009	0·047	0·09
		II	33·1352*	4·142	0·1095*	3·786	11·56
		III	18·3307*	6·672	0·0642*	6·785	6·62
Tamil Nadu ..	4·6	I	(—) 1·4733	0·215	(—)0·0068	0·364	(—)0·67
		II	7·2933	0·724	0·0130	0·479	1·30
		III	(—) 0·7342	0·225	(—)0·0042	0·486	(—)0·42
All-India ..		I	15·7612	0·392	0·0032	0·423	0·31
		II	209·4885**	2·506	0·0332**	2·482	3·38
		III	100·5710*	3·707	0·0161*	3·631	1·62
Haryana ..	7·0	I	23·3928*	5·083	0·0990*	4·830	10·41
		II	20·1538*	4·196	0·0451*	4·293	4·62
		III	20·4344*	11·716	0·0635*	8·944	6·55
Punjab ..	18·5	I	(—) 1·7622	0·257	(—)0·0018	0·205	(—)0·18
		II	50·2048*	6·147	0·0503*	5·626	5·15
		III	31·6807*	7·215	0·0322*	6·980	3·27

* Significant at 1 per cent level.
** Significant at 5 per cent level.

ANNEXURE TABLE 5—JUTE AND MESTA

PER ANNUM TREND GROWTH RATES OF OUTPUT OF JUTE AND MESTA IN PERIOD I (1960-61 TO 1969-70), PERIOD II (1969-70 TO 1978-79) AND PERIOD III (1960-61 TO 1978-79) FOR MAJOR STATES AND ALL-INDIA

State	Per cent share in all-India output	Period	Linear function		Log-linear function		Growth rate (per cent)
			Regression coefficient	't'-value	Regression coefficient	't'-value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh ..	7·0	I	(—) 7·7418	0·815	(—)0·0184	0·655	(—)1·82
		II	80·3867*	9·200	0·1508*	12·480	16·28
		III	25·2128*	3·822	0·0544*	3·439	4·65
Assam ..	16·6	I	8·7406	0·533	0·0089	0·512	0·89
		II	(—)42·4073**	2·498	(—)0·0448**	2·501	(—)4·38
		III	(—) 2·7175	0·382	(—)0·0036	0·485	(—)0·36
Bihar ..	13·0	I	(—)71·3055**	2·559	(—)0·0739**	2·464	(—)7·12
		II	13·5121	0·783	(—)0·0170	0·783	(—)1·71
		III	(—)29·4477**	2·936	(—)0·0279**	2·484	(—)2·74
Karnataka ..	0·7	I	(—) 2·7758*	4·941	(—)0·0568*	5·235	(—)5·52
		II	3·0752	2·164	0·0872	1·225	9·10
		III	(—) 0·5740	1·042	(—)0·0173	0·803	(—)1·71
Madhya Pradesh ..	0·3	I	1·2133**	3·039	0·0604**	3·163	6·22
		II	(—) 1·2121**	3·331	(—)0·0489**	3·231	(—)4·77
		III	0·3523	1·823	0·0194**	2·214	1·96
Maharashtra	1·4	I	(—) 7·6212*	3·778	(—)0·0673*	3·566	(—)6·50
		II	4·1915	1·456	0·0579	1·329	5·95
		III	(—) 1·7903	1·495	(—)0·0171	1·146	(—)1·69
Orissa ..	8·2	I	11·4630	1·760	0·0308	1·734	3·13
		II	16·5642*	3·680	0·0303*	3·631	3·07
		III	16·3953*	7·726	0·0362*	6·970	3·69
Uttar Pradesh	1·0	I	(—) 5·2279	1·228	(—)0·0406	1·235	(—)3·98
		II	(—) 1·4327	0·723	(—)0·0197	0·723	(—)1·94
		III	(—) 5·3377*	4·240	(—)0·0474*	4·173	(—)4·62
West Bengal ..	50·3	I	(—)49·1564	0·467	(—)0·0216	0·576	(—)2·13
		II	48·0655	0·801	0·0126	0·726	1·27
		III	9·4517	0·294	0·0040	0·361	0·39
All-India ..		I	(—)127·8315	0·829	(—)0·0221	0·839	(—)2·18
		II	116·6970	1·385	0·0160	1·296	1·61
		III	6·7570	0·139	0·0017	0·208	0·16

* Significant at 1 per cent level.
** Significant at 5 per cent level.

ANNEXURE TABLE 6

SIGNIFICANCE OF PER ANNUM GROWTH RATES IN TWO TIME PERIODS IN OUTPUT FOR MAJOR CROPS IN STATES WHERE THE TREND GROWTH RATES IN BOTH TIME PERIODS WERE SIGNIFICANT

Crop	State	df	b_1	SE of b_1	b_2	SE of b_2	t-value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foodgrains	Assam	8	·0244	·0071	·0209	·0063	0·37
Foodgrains	Punjab (including Haryana)	8	·0649	·0179	·0429	·0102	1·07
Foodgrains	Punjab	8	·0911	·0141	·0502	·0066	2·62**
Sugarcane	Gujarat	8	·0643	·0258	·0695	·0145	0·18
Sugarcane	Karnataka	8	·0627	·0107	·0431	·0065	1·57
Sugarcane	Maharashtra	8	·0413	·0119	·0726	·0172	1·50
Sugarcane	Tamil Nadu	8	·0923	·0216	·0616	·0176	1·10
Sugarcane	Orissa	8	·1050	·0332	·0570	·0127	1·35
Oilseeds	Orissa	8	·1078	·0152	·0575	·0161	2·28**
Cotton	Punjab (including Haryana)	8	·0332	·0078	·0433	·0066	0·99
Cotton	Haryana	8	·0990	·0205	·0451	·0105	2·34**

** Significant at 5 per cent level.