REGIONAL TRENDS IN OUTPUT, AREA

AND

PRODUCTIVITY OF FOODGRAINS AND SELECTED NON-FOODCROPS IN INDIA, 1960-61 TO 1986-87

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Certified that the dissertation entitled REGIONAL TRENDS IN OUTPUT AREA AND PRODUCTIVITY OF FOODGRAINS AND SELECTED NON FOODGRAINS IN INDIA, 1960-61 – 1986-87 submitted by SUNIL KUMAR BATRA in partial fulfilment for the award of the Degree of Master of Philosophy (M.Phil.) of this University, is his original work and may be placed before the examiners for evaluation. This dissertation has not been submitted for the award of any other degree of this University or of any other University.

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(SUNIL KUMAR BATRA)

C O N T E N T S

P R E F A C E

Since Independence India has come a long way in almost all the sectors, which are crucial for growth. Even after forty years of planned development, however, it has yet to achieve the basic objectives of the development plans, particularly the second and third five year plans, namely development along socialist lines, to secure rapid economic growth and expansion of employment, reduction of disparities in income and wealth, prevention of concentration of economic power and creation of the values and attitude of a free and equal society.[1]

Altogether, the pre-Independence period was one of near stagnation for the Indian economy. The growth of agricultural real output during the first half of twentieth century is estimated at less than 1 percent a year and per capita output by 1/2 percent a year or less. There was hardly any change in the structure of production or in productivity levels.

At the time of Independence, the economy was thus characterised by one of the lowest per capita consumption and income levels among the developing countries of the world. The average availability of food was not only inadequate in quantity and quality but also precarious. The problem of poverty was accentuated by the unequal distribution of resources between social groups and regions. Economic development in post-Independence period in the agricultural sector has been rapid by historical

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standards although inadequate compared to aspirations; and it has aggravated inequalities. Particularly after the inception of the green revolution in the mid-sixties, increase in regional unevenness is posing a serious problem before the policy makers. The new technology was introduced inorder to achieve quick growth in agricultural production particularly of foodgrains. The adoption of the new technology has undoubtedly increased foodgrains production substantially and India's import dependence reduced to zero by the mid-1980's as self-sufficiency was attained. This achievement, however, was accompanied by increase in the regional inequalities to such a level that if this problem is not tackled immediately, it may give rise to a situation where it will become impossible to resolve the crisis of regional imbalances.

In this study our aim will be to analyse the trends in the production of foodgrains and a few selected non food grains on the basis of regions. Policy makers seem to have intentionally or otherwise, concentrated on the rapid development of a few regions particularly North-Western region which had conducive land distribution pattern and irrigational infrastructure to adopt green revolution technology. We have chosen the period 1960 to 1986 as the beginning marks the inception of green revolution. and 1986-87 is the latest year for which production estimates are available.

In the first chapter, we try to trace the historical background of Indian agriculture during the British period from 1793 onwards. We discuss, briefly, the land revenue system in British period (i.e., methods of extraction of surplus from the Indian peasantry), and the conditions under which the commercialisation of Indian agriculture took place. The problem of food shortages in the nineteenth century is linked to the drain of wealth, which was transferred to Britain from India in one way or the other.

In the second chapter, we attempt a brief review of the literature pertaining to the subject. We have discussed the studies carried out by different economists at different time periods, beginning with the trends in output, availability and productivity in the first half of the present century in British India.

The third chapter begins with a discussion of the data base, the basis of aggregation of states into regions and the methodology adopted by us to carry out empirical investigation of the problem at hand. Secondly, the trends in output of foodgrains in various regions and all India, and trends in area and yield per hectare of total foodgrains are estimated and discussed. We briefly present the trends in selected non-food crops namely sugarcane, total oilseeds and cotton also in this chapter.

The fourth chapter is devoted to the estimated trends in the per capita output of total foodgrains in various regions and all India along with briefly touching non-food crops.

The study concludes with a summing up provided in the final chapter, viz., chapter 5.

NOTES

1. Minhas, B.S. (1974), <u>Planning and the Poor</u>, S. Chand & Co. (Pvt.) Ltd., New Delhi. P 1-2.

—CHAPTER 1

HISTORICAL BACKGROUND OF INDIAN AGRICULTURE

The British colonisation of India led to drastic changes in the Indian way of life. The most fundamental change which it brought was the disintegration of the older structure of the village community. It took place partly through the introduction of a new land revenue system and partly as a result of spread of commercialisation of agriculture since the third decade of the nineteenth century.

Before the British conquests there was a hierarchy of claims to the produce of the land. In the Mughal period, for instance, the King, Jagirdar and local overlords such as village headman, zamindar, all had various claims to the surplus of the land. The land was neither transferable nor saleable. The land-man ratio was favourable and further there was not much trade in agricultural produce. This was the situation till the beginning of the 19th century. The familiar characteristics of capitalist society like wage labour and capitalist exploitation were not present in the agrarian economy of that time. The land was not a profitable investment for the business class. The land laws introduced by the British Administrators sought to convert the cultivable land into a profitable business venture. Essentially, their purpose was to extract the maximum surplus from the Indian peasantry so that it could be invested in British industries.[1] They were anxious to secure the regular payments of land revenue and for this they decided to settle

the payment of the government demand with certain intermediaries who would hold themselves responsible for the payment of the land revenue.

There were differences in the systems of land tenures in different regions. The permanent settlement was introduced in Bengal and the adjacent places (Bihar and Orissa) in 1793. The government settled the land revenue demand with Zamindars in exchange for their undertaking the responsibility to collect the revenue demand of the state. In Bengal, there were Zamindars even before the Britishers took over the administration of that province, though their nature was merely revenue farmers. Their ownership of land was limited to their claim to a share in the produce of the land. But now they were the proprietors of land. With this settlement both the parties stood to gain. However, the advantage was secured by sacrificing the cultivators' interests from proprietor of land who was reduced to the status of a mere tenant. He could be removed from the land at the latter's will.

Under the permanent settlement the revenue was fixed for ever. Even though the government settled the land revenue demand once for all, the landlords still charged extra cesses from the peasants which added to the peasants' miseries. With the extension of cultivation and the rise in prices the landlord substantially increased the amount of rent collected. Thus

the margin between the rent and the fixed revenue grew larger. In fact, the new proprietory class took the zamindars as income yielding assets. Their sole interest lay in the maximisation of land rent. Before long they shifted to the towns and became the absentee landlords. So a chain of intermediary interests grew up in the land between the original landlords and the cultivators. Such subinfuedation reduced the chances of technological improvement in agriculture. Permanent settlement was also made in ceded and conquered provinces of Northern India. The difference between this settlement and permanent settlement in Bengal was that the intermediary class consisted of smaller scale landlords in Northern India as compared to the big Zamindars of Bengal and the assessment was temporary. The fact that the revenue demand could be raised. This system was called the 'Mahalwari' system.

The ryotwari system was introduced in Madras Presidency between 1792 and 1814 and later in Deccan and Punjab, the regions to be annexed last of all, in 1818 and 1849 respectively. In these ryotwari areas the proprietorship was given to the individual peasant. However, it was true theoretically only. As in practice the proprietorship was with the superior land holders known as mirasdars in Madras Presidency and khotedars in Deccan and Punjab.[2] Proprietory rights were

sought to be given to the cultivator so that the land could be mortgaged, sold or auctioned. In the ryotwari system the rate of the demand of revenue was increasing at every successive settlement. In fact it was the objective of the ryotwari system that with any increase in the cultivation the rate of revenue demand will be revised.

Thus, by the early 19th century, there were two main revenue systems or in other words, systems of extraction of agricultural surplus. According to the estimates of Irfan Habib[3], in 1789-90, the gain to Britain at the expense of India, i.e., the 'drain of wealth' from India was over ₤ 2 million, which increased to over ₤ 4.70 million by about 1801. The drain of wealth was in the form of excess of exports over imports. With a part of the land revenue collected from agricultural and other taxes, the East India Company , purchased Indian goods and transferred the same to Britain. Being 'unrequited exports', it was a unilateral transfer of wealth. A large part of the exports consisted of cotton textiles. The tribute of ₤ 4.70 million in 1801 amounted to about 2% of the British National Income estimated at ₤ 232 million for 1801. The capital formation in Britain at this time was about 7% of the national income, it means that India contributed almost 30% of the total national saving transformed into capital, such a high percentage of inflow of colonial wealth would have significantly hastened the

pace of industrial revolution. The first phase of the industrial revolution in Britain i.e. 1780-1830 was mainly characterised by the growth of cotton textile industry. This growth of cotton textile industry in England was helped not only by the flow of resources from India to finance investment but also by high tariff against the exports from India which protected the infant British textile industry. By about 1820, British cotton textile industry had become competitive because of growth and technological innovations and large scale exports of cheap textile to India began which competed out the indigenous textile industry and led to deindustrialisation.

This also led to obstructions in the realisation of tribute as the entire mechanism of the transfer of wealth from India to Britain was affected seriously. The export of Indian raw cotton could have taken place after losing the market for manufacturers but it proved impracticable for it was too short stapled and similarly Indian raw silk could not compete with the Chinese and Italian raw silk.[4]

In the third decade of the 19th century when the realisation problem became quite acute, the solution was found in opium. Britain took interest in the cultivation of opium because of their trade with China. A triangular trade took place between Britain, India and China. Britain required raw silk and tea and was importing from China. In return opium

was exported to China which was cultivated in India and purchased by British at very low prices.Britain was benefited with the cultivation of opium at the cost of India. In 1855, Britain imported tea and silk from China of the value of ₤ 8.5 million while it exported merely ₤ 1 million worth goods to that country. The balance was through the Indian exports of opium which in 1855 amounted to ₤ 6.23 million. Britain's objective in the opium trade with China was not merely to make his trade balanced but, it was transfer of wealth from India to Britain through China. Because before this wealth was transferred to Britain in the form of exports over imports of cotton textile directly from India. After the fall in the Indian cotton textile industry, transfer of wealth became difficult and thus solution was found in trade of opium with China.

As British demand for primary products was growing, it became profitable for the traders to deal in the trade of export of products such·as indigo, opium, jute and raw cotton. The shifting was taking place from the subsistance crops to commercial crops. Giving the requirements for the growth of commercial crops, these were more costly to grow, required irrigation and higher working capital,it was obvious that the cultivation of these crops would make peasant worse than earlier. Therefore, the problem for the traders was to induce the peasants to grow these crops and not only this

but to get the maximum profit they were giving very low prices
for the produce.[5]

So the peasants were forced to take up the cultivation
of these crops. Except in the case of indigo, where the phy-
sical force was applied by the European traders. Later it
was provoked after revolt in 1859, otherwise there was an
economic coercion. It was done in such a way that when the
peasants were in the need for cash to pay the rent, because
the time to pay the rent and time of harvest were coincided
that the peasants were generally short of cash, and they were
provided the loans by these traders at low rate of interest
but in exchange they took promise from the peasants that whole
of the produce would be sold to them at fixed contract prices
which were kept very low. And once the peasants were caught
in this trap they could never come out of it. In the differ-
ent regions of British India, under the similar conditions
the cultivation of commercial crops was taken up, i.e. the
time to pay the rent (the need for cash) and the traders'
cash advances were the important factors.

The process of growth of commercialisation in Ryotwari
areas was not different from that in Zamindari areas. Since
the mode of assessment in the Ryotwari areas was kept temporary
so it was subject to increase in every successive settlement
which resulted in the peasants borrowed to meet the revenue
demand from Sahukars and came in their trap.

A. Sarada Raju remarks regarding that despite very low prices why the cultivators were undertaking the cash crops production,"when asked why they continued growing it (cotton) at all under such admittedly unfavourable circumstances, the agriculturists of Coimbatore gave the curious explanation that it was done in order to pay the land revenue, and if they cultivated nothing but grain, they would have nothing there with to pay the Government rent as they and their families could and would consume the whole produce of the land, they having to content themselves at present with only two meals instead of three".[6]

Thus, it can be inferred that the commercialisation of agriculture brought prosperity to the traders and moneylenders whereas it proved to be disastrous for the cultivators. As the entire surplus from cash crops production was siphoned off by the merchants so it did not benefit the petty producers. With the commercialisation of agriculture, the rural classes which suffered most were the cultivators, landless labourers and weavers.[7]

By the middle of the 19th century, in all the regions, almost the production of commercial crops had taken place. Since the means of transportation and communication were not too advanced by that time, so the pace of trade in the agricultural produce was not very great. It was only around the middle of the 19th century, particularly with the expansion in the construction

of railways and opening of the Suez Canal that the consequences of the commercialisation of agriculture, through the tremendous increase in the foreign trade, were being felt. It affected badly country's food supply. In the period from 1860 to 1880, external trade in agricultural produce was expanding with stagnant agricultural production. But the population continued to grow which resulted in rise in rural unemployment.

The condition of population engaged in agriculture was getting bad with worsening of the food situation in the country and rising food prices. Growth of population with relatively declining food production and expansion of trade (export of foodstuffs) explain the whole situation. In the mid sixties another very important event happened. This was the American Civil War which contributed much to the increase in India's foreign trade. The war stopped temporarily the supply of raw cotton from America to Britain. And Britain had no alternative but to get its supply of raw cotton from India. This was, what enhanced India's export trade in agricultural produce especially in raw cotton and food stuffs. The periodic settlement in sixties along with rise in prices raised the value of agricultural land and the moneylenders not only started charging high rates of interest but also started expropriating the cultivator from his land.

One might expect, increasing export trade, rising prices and scarcity of foodgrains stock in the country, to lead to more cultivation of foodcrops. But the fact is that exactly the reverse happened. The cultivator continued to cultivate commercial crops particularly cash crops (those crops for which there was ready demand in the market) like cotton, jute, and sugarcane etc., under the influence of trader/moneylender. Thus, there was relative decline in the food supply of the country. Even more area proportionately was allotted to cash crops. The country was compelled to import manufactured good like cloth for consumption and capital goods for construction of railways and irrigation works etc. To payback for these imports India not only had to create export surplus in agricultural produce but the foreign debt from Britain also increased. Total external trade of India can be seen from the following table :

TABLE 1: FOREIGN TRADE
(VALUE IN CRORES OF RUPEES

| YEAR | TOTAL IMPORTS | TOTAL EXPORTS | EXPORTS | | | | | | |
			RAW COTTON	INDIGO	RICE, WHEAT & OTHER GRAINS	HIDES AND SKINS	RAW JUTE	OPIUM	TEA
1859-60	40.7	28.9	5.6	2.0	3.6	0.44	0.62	9.0	0.13
1864-65	49.5	69.5	37.5	1.9	6.0	0.73	1.4	9.9	0.3
1869-70	46.9	53.5	19.0	3.2	3.2	1.7	2.0	11.7	1.0
1874-75	44.3	58.0	15.3	2.6	5.5	2.7	2.7	12.0	2.0
1879-80	52.3	69.2	11.1	2.9	9.9	3.7	4.3	14.3	3.0

SOURCE: B.M. BHATIA, "FAMINES IN INDIA.
- (From 1859-60 to 1874-75, value of Sterling has been converted into Rupees @ R.10=£)

- (For 1859-60 & 1864-65, the exports of raw jute includes manufacturers also).

The total trade of India increased to Rs.122.0 crores in 1879-80 from Rs. 69.0 crores in 1859-60. The value of exports was all the times higher than the value of total imports except in 1859-60. Exports of India were mainly of foodstuffs and raw material. The serious problem was that India was producing cash crops but at the cost of food for her people. Export of raw cotton doubled in the 20 years with exceptionally high value in 1864-65 whereas the value of foodtuffs (rice, wheat and other grains increased to Rs. 9.9 crores in 1879-80 from Rs. 3.6 crores only in 1859-60. Similarly, exports of raw jute increased to almost 8 times. This resulted in the acute scarcity of foodgrains in the country. During 1876-77 to 1878-79, the prices of foodgrains rose by almost four times but the exports of food showed an increase. On the other hand g wages of labourers remained almost static. In 1876-77 and 1878-79, when the price index of food increased to 166 and 160 respectively (1871=100), the wage index fell to 99.[8]

Thus, in the period from 1860 to 1880 the factors which were responsible for the severe situation of food supply in the country were mainly - the expansion of railways, the opening of Suez Canal, American Civil War, substitution of cash crops for the cultivation of foodgrains and expansion of foreign trade.

The basis on which Indian agriculture was conducted was changing slowly. The change might be described as a change from 'the cultivation for home consumption to cultivation

for the market'. The commercialisation of agriculture was responsible in bringing in the market economy and the monetary economy.

The major cause of impoverishment of Indian rural people according to famous leaders of that time, such as Dada Bhai Naoroji and Ranade etc. was the amount of drain of wealth and resources from India to Britain. Between one-fifth to about one-third of the total economic surplus was taken away by the British in one form or the other. Dada Bhai Naoroji's calculation regarding the drain of wealth since 1835 from India to Britain were as follows :

TABLE 2

YEAR	YEARLY AVERAGE (£)
1835-39	5,347,000
1940-44	5,930,000
1845-49	7,760,000
1850-54	7,458,000
1855-59	7,736,000
1860-64	17,300,000
1865-69	24,600,000
1870-72	27,400,000

SOURCE: Bipan Chandra, "The Rise & Growth of Economic Nationalism in India", p. 648)

After 1850, the drain of capital resources went up considerably. Naoroji stated that the drain of wealth was largely in the shape of payment to Britain for the Home Charges such as dividends on East India debt, interest on home debt, the salaries of officers and establishments and cost of buildings connected with the home department of Indian Government, furlough and retired pay to English officers, and payments for British troops serving in India.[9] (Table 3)

In the first half of the 19th century, the nature of cultivation was of self-subsistence character and the bulk of the produce consisted of foodgrains. In the second half of the century, the consequences of commercialisation and the creation of market had been felt in the period from 1860 to 1880, particularly on the raw cotton cultivation. The decade 1870-80 was not normal enough to show the effects fully. The Suez Canal was opened only in 1869. After that came Franco-German war and next the famines. Inspite of all these, the export of wheat showed increase. But growth of this trade was temporarily stopped due to all these factors. It was only in 1880 to 1895 that an incredible increase in the exports of raw produce and foodstuffs took place. This period was more prosperous as compared to the early period as it was almost free from any famine of severe nature.[10]

In this period, the demand for agricultural produce was increasing internally as well as externally. Prices of

Dharma Kumar estimated the total Home Charges from 1861-62 to 1933-34 as follows :

TABLE 3:   THE HOME CHARGES 1861-62 to 1933-34

(ANNUAL AVERAGES IN £ MILLION)

	Interest on Railways, Irrigation & Others	military, pensions and furlough and other civil	Stores	Total
1861-62 to 1874-75	5.7	3.7	1.1	10.5
1875-76 to 1898-99	7.9	5.8	1.2	14.9
1899-1900 to 1913-14	9.4	6.7	1.6	18.9
1914-15 to 1920-21	13.1	7.3	2.9	23.9
1924-25	14.4	17.5		31.8
1933-34	15.7	13.1		28.8

SOURCE: DHARMA KUMAR, "The Fiscal System", in Cambridge Economic History of India, vol. 2 (1982).

industrial crops rose and specialisation of crops became better. It is reflected in the example of Berar district, where the cultivation of cotton increased upto such an extent that it had to import a substantial portion of its food supply. Similarly it was the case in the Bombay Deccan. In the total agricultural produce, foodgrains retained very high proportion. but with the increase in the area under cultivation, there was also a proportionate increase in the area under industrial crops. The major industrial crops were jute, sugarcane, oil-seeds and cotton. As the irrigation was spreading the culti-vation of industrial crops was undertaken largely. During this period the foreign trade with Britain was increasing in the export items foodgrains and pulses and in the import items capital goods such as machinery increased considerably. The statistics of foreign trade are as in Table IV.

The value of foreign trade increased from Rs.136.5 crores in 1880-81 to 1884-85 to Rs.191.5 crores in 1895-96. The exports of foodgrains were increasing at constant pace. In 1879-80 only 2.2 million cwt. of wheat was exported but in 1895-96 it increased to 10 million cwts. For rice also it increased from 22.2 million cwts to 35.2 million cwts in the same period. In the total value of exports in 1880-81 to 1884-85 which was Rs. 83.4 crores, the exports of highest value was of grains and pulses i.e. Rs. 15.3 crores. In 1895-96 also the value of grains and pulses was at the top. It

TABLE 4: FOREIGN TRADE (QIUNQUENNIAL AVERAGE)

(IN CRORES OF RUPEES)

YEAR	TOTAL IMPORTS	TOTAL EXPORTS	RAW COTTON	INDIGO	OPIUM	GRAIN & PULSES	RAW JUTE	TEA	COTTON TWIST & YARN	COTTON MANUFAC- TURES	MACHI- NERY
1880-81 to 1884-85	53.1	83.4	14.4	4.1	11.9	15.3	4.9	3.7	3.4	21.6	1.2
1885-86 to 1889-90	64.0	94.3	14.5	3.8	10.4	16.9	3.6	5.1	3.7	25.0	1.8
1890-91 to 1894-95	71.6	111.0	12.7	3.8	9.0	20.6	8.3	6.6	3.2	26.9	2.3
1895-96	72.9	118.6	14.1	3.35	8.5	18.7	9.99	8.0	2.97	22.8	3.2

SOURCE: B.M. BHATIA, "Famines in India, 1860 to 1965)

was followed by raw cotton and raw jute. In the imports
mainly the manufactured cotton was imported. In this period
the imports of capital goods also went up.

Export of this much amount of foodgrains affected adver-
sely on the internal food supply and prices of it particularly
on the poorer section of population. The wholesale price index
for food commodities increased from 109 in 1880-81 to 156 in
1895-96 (1871=100) whereas the general price index increased
frqm 106 to 140. In the ten years from 1880 to 1890 the imports
and exports of the country were increasing at the same pace
but in the last few years exports grew faster than the imports
and so the drain of wealth to Britain went up.

Prices were increasing because of the shortage of food
supply but the wages of the rural labourers were almost static
and, therefore, the foodsupply did not reach to the poorer
sections of the population even in the good years of harvest.
Sir W. Hunter, in his book 'England's work in India' has said
that, "Forty millions of people of India habitually go through
life on insufficient food".[11]

The large deficits of Britain, with other primary produ-
cing countries, were financed through the surpluses from coun-
tries like India. In 1880, the largest surplus that it had
was with India (+£ 25.0 million). Britain settled more than
1/3rd of her deficits with United States (-£ 64.9 million)
and Europe (-£ 40.5 million) through India. In this period

as Britain's deficit (Balance of payment) was rising, India's transfer of wealth to Britain too was rising.[12] If we look at the Balance of Payments of Britain in 1910, it is clear that around 2/3rd of the deficit was financed through India.

TABLE 5: BALANCE OF PAYMENTS OF BRITAIN (1910)

(£ MILLIONS)

DEBIT		CREDIT	
USA	50	India	60
Continental Europe	45	Australia	13
Canada	25	Japan	13
Straits Settlements	11	China (including Hong Kong)	13
South Africa	8	Turkey	10
New Zealand	4	Uruguay	6
Argentina	2	British West Africa	3
TOTAL	145	TOTAL	118

SOURCE: S.B. Saul, "Studies in British Overseas Trade, 1870-1914", p. 58).

Thus, Britain was having Balance of payments surplus of £ 118 millions out of which £ 60 million was with India.

The raison d'etre of British rule in India was the exploitation of India's resources to serve Britain's own interests. As we saw earlier, tribute extraction and transfer from India would have considerably hastened the pace of industrial

revolution. And this very transfer subsequently financed a considerable part of Britain's trade deficits with the US, Canada and certain other countries. The entire set of domestic policies of the British Government in India therefore should be seen in this overall context of the need for tribute extraction and transfer. This is something which certain writings on Indian economic history, the Cambridge Economic History of India, for instance, tends to miss out.[13]

Land revenue formed the largest part of internal revenue collection. As we noted earlier, to get the peasant to pay land revenue he was often coerced into growing commercial crops. The production of exportables, which was the only method whereby the tribute extracted could in substantial part be transfered to Britain, also necessitated forced commercialisation. In no sense was commercialisation the result of the peasant simply reacting to changed market conditions as B.B. Choudhary in the Cambridge Economic History of India maintains.[14]

The origin and subsequent increase of India's public debt should also be sought in the tribute transfer. India was initially obliged to import capital to bridge the gap between unilateral transfer and export surplus. The British government could raise the salaries and allowances of its personnel in India and simply recover the amount from India.

In conclusion, it can be said that the Indian economy experienced far reaching changes during the British period which transformed it into a colonial, semi-feudal, lop-sided, stagnant and backward economy.

NOTES

1. Irfan Habib, "Colonialization of the Indian Economy", Social Scientist, No-32, March, 1975.

2. Utsa Patnaik, "The Process of Commercialization under Colonial Conditions", Seminar Presented at Trivandrum, Nov. 1981.

3. Irfan Habib, (1975), op. cit.

4. Irfan Habib, (1975), op. cit.

5. Utsa Patnaik, (1981), op. cit.

6. A. Sarada Raju, "Economic Conditions in the Madras Presidency, 1800-1850", P.91, quoted in Utsa Patnaik, op. cit., P.27.

7. D.R. Gadgil, (1971), "The Industrial Evolution of India in Recent Times, 1860-1939", (Ed-5), OUP - Delhi.

8. B.M. Bhatia, (1967), "Famines in India, A study in the Aspect of the Economic History of India, 1860 to 1965", (Ed.2), Asia Publishing House, New York.

9. Bipan Chandra, (1966), "The Rise and Growth of Economic Nationalism in India", PPH, Delhi.

10. D.R. Gadgil, (1971), op. cit.

11. Bipan Chandra, (1966), op. cit.

12. S.B. Saul, (1967), "Studies in British Overseas Trade, 1870-1914", Liverpool University Press, Liverpool, PP, 55-56.

13. Utsa Patnaik, (1984), "Transfer of Tribute and the Balance of Payments in Cambridge Eco. History of India" Social Scientist, No. 139, Dec.

14. B.B. Choudhary, (1982), "Agrarian Relations in Eastern India", in Dharma Kumar (Ed.), (1982) "Cambridge Economic History of India, Vol. 2", Cambridge University Press, Cambridge.

CHAPTER 2

OUTPUT TRENDS IN THE COLONIAL AND

POST-INDEPENDENCE PERIODS :

A BRIEF SURVEY OF THE LITERATURE

In the previous chapter we have traced the process of surplus appropriation from Indian people during the colonial period. The mode of extracting the surplus from the direct producers was mainly in the form of land revenue and land rent. Ultimately the burden via various kinds of Zamindars and the demand of imperial revenue was on the cultivators, while that of indirect taxes was on the general population. As has been discussed, the cultivators were among those who suffered most during the British period. The appropriation of huge amount of surplus by British was the major setback to the Indian agrarian economy. A substantial part (ranging from 20 to 30 per cent) was appropriated as taxes. The part of the surplus left within agriculture went to landlords who were disinterested in accumulation or technological development in the Indian agriculture.

A pioneering work by George Blyn[*] covering the period from 1891-1947, shows that the annual trend growth rate of aggregate crop output was not very satisfactory at less than 1 percent. This rate of growth of total crop output was lower than that of population especially after 1921. Though the foodgrain output grew at only 0.11% the commercial crops output was increasing at 1.3 percent. The reason for the insufficient rise in total foodgrains output which resulted in decline in per capita availability of foodgrains was infact the decline in rice output, as rice accounted for half of the total food-

grains and one-third of the total crop output. The output of wheat was, indeed, rising during the period. However, owing to its small share i.e. one fourth in the total foodgrains it could not offset sufficiently the negative trend of rice output and hence there was insufficient rise in total foodgrains output.

Blyn finds that Greater Bengal was the region where the rate of decline was highest among all the regions. Greater Punjab and United Provinces were having equal average rates of foodgrains production and of population. The population growth was higher in Madras, Bombay, Sind and Central Provinces. In most of the regions population growth started exceeding the foodgrains production between 1911 and 1921 with the exception of Greater Bengal where population growth was higher from the beginning itself. Thus, the decline in per capita output of foodgrains in the various regions varied from 18% to 38%. In Greater Punjab, the decline was minimum,i.e. 1% p.a. against the maximum decline in Greater Bengal i.e. 1.18% p.a.

The output of commercial crops was greatly influenced by the varying conditions of foreign trade. The foreign market as well as the domestic market for indigo was almost finished with the introduction of German synthetic dye in 1897. Linseed also lost the international market due to the entry of some new competitors like Argentina. While the production of cotton increased because of American Civil War in 1860.

TABLE 1: PERCENT CHANGE IN ACREAGE AND YIELD PER ACRE IN

REGIONS OF BRITISH INDIA, 1891-95 TO 1941-46

Region	ACREAGE			YIELD PER ACRE		
	All Crops	Food-grains	Non food-grains	All crops	Food grains	Non food-grains
British India	+16.27	+25.55	+19.84	+ 6.45	- 7.31	+52.96
G. Bengal	- 3.37	+ 0.79	-29.54	-12.85	-22.17	+54.55
Madras	+16.45	+ 3.89	+82.95	+46.02	+30.35	+79.84
G. Punjab (including NWFP)	+51.69	+46.42	+94.38	+35.60	+19.24	+74.20
United Provinces	+28.18	+27.93	+29.12	+ 2.62	- 8.63	+29.32

(SOURCE: Compiled from Blyn. Quoted in A.K. Bagchi (1978), "Reflections on Patterns of Regional Growth in India during the period of British Rule".

Among all non foodgrain crops, tea, groundnut, cotton and sugarcane experienced increasing output. In terms of value cotton and sugarcane were the two leading crops whose output grew rapidly in the region of Greater Punjab. Madras accounted for increased output in Groundnut and tobacco.

Increased output of non foodgrains no doubt increased the per capita output but its production was essentially guided by foreign demand and promoted to earn foreign exchange for the metropolitan country.

Though crop output could not keep pace with the increase in population but the sharp decline in crop output of Greater Bengal aggravated the scenario. Declining foodgrains output was offset by non foodgrains output in all the regions except in Greater Bengal.

The factors which affected the crop output were the change in acreage and change in the level of yield per acre. But in the first half of the current century the output increased mainly due to the expansion in acreage.

During the British period, public investment in irrigation was the major factor for the discrimination. The main motive of the government was to stabilise and to increase the revenues from agriculture. Regional distribution of public investment was quite uneven. In Punjab there was significant

TABLE 2: PROVINCE-WISE DISTRIBUTION OF PUBLIC INVESTMENT IN
IRRIGATION DURING 1860-1947

(Rs.Millions)

State	Punjab	Bihar	Madras	Bombay	U.P.	Others	Total
Period							
1860-61 to 1897-98	135 (24.2)	34.48 (6.1)	112 (19.7)	50 (9.0)	135 (24.52)	94.52 (16.28)	558 (100)
1898-99 to 1918-19	315 (47.0)	28.09 (4.2)	119 (18.0)	96 (14.4)	58 (8.7)	53.11 (7.9)	669 (100)
1919-20 to 1946-47	590 (30.0)	46.20 (2.3)	284 (14.8)	514 (26.1)	360 (18.3)	170.8 (8.6)	1968 (100)

(SOURCE: MJK Thavaraj, "Public Investment in India". Quoted in Bharadwaj, "Regional Differentia
tion in India"; A note, EPW-Annual No. April 1982).

investment in irrigation as compared to the Zamindari areas of Eastern region.[1]

Thus the public investment was highest in Greater Punjab followed by Bombay, U.P. and Madras. They made intentionally uneven distribution of investment in canal irrigation. During the interwar years even, the only region was Greater Punjab where the yield per acre of foodgrains was positive, in all rest of the regions it was negative. So the development of irrigation and its importance can be understood. We would see later in the same chapter that the future development also follows the same pattern. A. Sivasubramaniam also reached an identical conclusion to Blyn, the gross value of output of agricultural produce at constant prices (1938-39), the index has increased from 97.0 in 1900-01 to 106.2 in 1946-47. Significant increase in the production of crops like tea, coffee and sugarcane was there. While the production of rice increased from 28.5 m. tons to 29.3 m. tons only during 1900-1 to 1946-47 and that of wheat also increased from 7.3 m. tons to 8.5 m. tons.[2]

A. Heston in his papers on national income has criticised Blyn's and Sivasubramaniam's findings on the basis that the official statistics on the yield level have downward bias particularly for foodcrops. According to Heston the output of foodgrains was more than that has been shown by Blyn and

Sivasubramaniam. Heston has been severely criticised as he has an arbitrary assumption that the yield level did not change from 1857 to 1947.[3]

At the time of independence in the low income countries like India poverty was widespread owing to effects of a long period of colonial rule and agriculture especially food production was stagnant. Development of food production acquired great urgency in the wake of the war-time Bengal famine and in order to provide marketed supplies for industrialisation. There were various institutional as well as structural constraints in agricultural sector. The uneven distribution of land was one of the major hinderance in the path of its development. After independence, the first and foremost task was the land reforms. The objective of the land reforms were the abolition of landlordism and of intermediary elements. But it was only a partial success.

After the various rounds of the legislation of land reforms in the various parts of India, the landlords with the help of local bureaucracy somehow managed to retain the bigger part of the land, on the pretext of self cultivation, by ejecting large number of tenants. The actual achievement of land reforms varied from state to state. The landlords and the big peasants got the maximum benefit from this while the landless and the poor peasants could not get the benefit which was due to them as surplus land was hardly distributed

due to litigations and other structural constraints.[4] These institutional changes along with the public investment in irrigation, power and other infrastructure led to increase in area under irrigation, which resulted in a marked increase of agricultural output in India. During the period 1950-65 the annual average compound growth rates of total agricultural output, foodgrains output and non foodgrains output were 3.1%, 2.9% and 3.25% respectively as compared to 0.8%, 0.11% and 1.3% in the pre-independence period from 1891-1946.

During the period 1951-68, the compound growth rate of population and rate of foodgrains output both had kept pace with each other. Of population it was 2.18% p.a. and for foodgrains it was 2.25% p.a. During the 1950s, the output of foodgrains grew at 3.39% p.a. and population expanded at the rate of only 1.97 percent p.a. While in the 1960s the growth of foodgrains fell as low as 0.67% with the population growth of 2.43% p.a. During 1960s the output of food grains fell because of tremendous fall in its output in the mid-sixties.[5]

TABLE 3: COMPOUND GROWTH RATES OF FOODGRAINS

OUTPUT - ALL INDIA

TO	1956-57	1957-58	1958-59	1960-61	1961-62	1964-65
FROM						
1949-50	3.97	3.0	3.29	3.39	3.21	2.84
1950-51	5.14	3.62	3.84	3.78		2.98
1952-53			2.13		2.68	2.33
1953-54			0.85		2.16	2.05
1957-58						2.78
1958-59						1.61

SOURCE: Ashok Mitra (1970);

If the trends are examined in the individual states, regional differentiation is clearly depicted during this period. From 1952-53 to 1960-61, the rate of growth of food grains output was higher than the rate of growth of population in several states, but in the later years i.e. during 1960s only two states namely Punjab and Gujarat could maintain the higher growth of foodgrains over the population growth which can be seen from the Table 4.

If we compare Table 4 with that of the public invest-ment in irrigation in colonial period[6], it is clear that percent share of investment in irrigation was higher in Punjab and Gujarat among the four highest regions since 1898-99. And these are the two states whose foodgrains output has exceeded the population growth.

Till 1964-65, the increase in foodgrains output was on account of additions to area under cultivation. John Mellor[7] reports that during the period 1949-50 to 1960-61 increased area under cultivation was the main single factor contributing an estimated 35% of the increase in the output of foodgrains, whereas, the increased application of fertili-sers accounted for only 9% of the increase in output. But over the period 1961-65, fertilizers contributed a substan-tial share, 34% compared to only 9% during earlier period

TABLE 4 : COMPOUND GROWTH RATES OF POPULATION AND
FOODGRAINS OUTPUT IN DIFFERENT STATES

% P.A.

States	Population Growth Rate (1951-61)	Foodgrains Growth Rate 1952-53 to 1960-61	Population Growth Rate 1961-68	Foodgrains Growth Rate 1960-61 to 1967-68
Andhra Pradesh	1.46	3.29	1.98	1.51
Assam	2.99	0.51	2.98	1.31
Bihar	1.81	1.88	2.35	-1.96
Gujarat	2.40	-0.99	2.75	3.39
Kerala	2.23	4.82	2.52	0.40
M.P.	2.18	3.41	2.51	-2.64
Madras	1.14	5.15	1.72	1.18
Maharashtra	2.14	3.69	2.58	-2.12
Mysore	1.98	3.67	2.36	-1.47
Orissa	1.83	0.87	2.26	-0.12
Punjab	2.33	4.14	3.90	3.88
U.P.	1.55	1.14	2.26	0.44
W. Bengal	2.87	0.06	2.74	0.53
Rajasthan	2.35	2.54	2.90	1.94

of the increase in the total output of foodgrains. It suggests significantly that by the early 1960s limits to the increase of area under cultivation as a source of growth were being reached, thereby, necessitating a search for methods to increase productivity per unit of area.

After the increase in area became limited, the policy makers in India were in search for some modern technology to increase the productivity and the major breakthrough in the technology took place in the mid-sixties with the introduction of Borlaugh seed-fertiliser technology. The technology which became available was the dwarf, high yielding, short duration matured varieties responsive to high doses of fertilisers, assured water supply.[8] Thus these new variety seeds could become effective only in those regions where assured irrigation facilities were available. Already the regional differences were quite high after the land reforms but these became more acute after the advent of the green revolution technology. The question arises that at the time of adoption of green revolution technology,was there any other alternative technology, which could have generated equitable benefit to all regions?Since new technology was more dependent on assured irrigation facilities, so the applicability of this new technology was not plausible for all regions as the irrigation facilities also differed from region to region.

Though there have been significant technological changes, the overall rate of agricultural growth has not shown any tendency to accelerate, at best, the rate of growth can be said to have remained constant. The rate of fall in the increased area under cultivation was such that it could barely be compensated by the increase in yield level.[9] We will show how the green revolution increased the regional differences with the help of various empirical studies carried out by various economists from time to time.

Green revolution was confined not only to specific areas and specific classes but also to specific crops. Among the crops only wheat recorded a very high even accelerating rate of yield increase. Unlike wheat, HYV technology package did not have any impact on rice yield, except in few pockets. To compare tne performance of Indian agriculture in the pre and post green revolution periods, we can have a look at the following table.

The production of foodgrains is a substantial part of the total agricultural output, performed no better in post green revolution period as compared to the pre-green revolution period, it is quite evident from Table 6.

The percentage variation in the foodgrain production was positive in first two five-year plans only. After that

TABLE 5: COMPOUND GROWTH RATES OF AGRICULTURAL PRODUCTION

AREA UNDER CROPS AND YIELD PER UNIT AREA

(1949-50 TO 1978-79)

	1949-50 to 1964-65	1967-68 to 1978-79
FOODGRAINS		
Production	2.98	2.77
Area	1.34	0.44
Yield	1.61	1.84
NOON FOODGRAINS		
Production	3.61	2.88
Area	2.52	1.19
Yield	1.06	1.25
ALL CROPS		
Production	3.19	2.81
Area	1.55	0.63
Yield	1.60	1.63

SOURCE: G.S. Bhalla, "Peasant Movement and Agrarian change in India" in Y.V. Krishna Rao, G. Parthasarthy, Ch. Rajeshwara Rao, M. Yadav Reddy and Waheeduddin Khan (eds.), "Peasant Farming and growth of Capitalism in Indian Agriculture" (1984).

TABLE 6: PLAN TARGETS AND ACTUAL PERFORMANCE IN FOODGRAINS
PRODUCTION AND NET IMPORTS OF FOODGRAINS
DURING EACH PLAN PERIOD

Terminal Year	Target (Million tons)	Production (Million tons)	Variation (Percent)	Net Imports (Mil.tons)
1st Plan (1956)	62.6	69.3	+10.7	13.0
IInd Plan (1961)	81.8	82.2	+ 0.5	17.2
IIIrd Plan (1966)	101.6	72.3	-28.5	25.3
Annual Plans (1969)	102.0	94.0	- 7.8	24.6
IVth Plan (1974)	129.0	104.7	-18.8	12.5
Vth Plan (1979)	132.9	131.9	- 0.8	18.1
VIth Plan (1980)	133.0	109.7	-18.0	1.8
-do- (1980-81)	135.0	129.9	- 3.8	2.1
-do-(1981-82)	138.5	132.0	- 4.7	2.3

TOTAL IMPORTS =   116.9

SOURCE: Inderdeep Sinha, "Development of Agricultural Production
and Agrarian Relations during the Seventies" in Y.V.
Krishna Rao, G. Parthasarthy, Ch. Rajeshwara Rao, M.
Yadav Reddy and Waheeduddin Khan (eds.); op.cit. (1984).

it was negative i.e., the actual production exceeded the target
till 1961. It makes absolutely clear that the performance after
green revolution was no better as compared to the pre green revo-

lution period. The other striking factor is the total imports of foodgrains in the pre green revolution period (15 years to the pre-green revolution) were 55.5 million tons while in the post green revolution period (15 years after the green revolution) were 57.0 million tons. The production of foodgrains increased after mid-sixties but it failed to solve the problem of shortage of foodgrains as well as to achieve the long term growth rate (2.1%) over the population growth (2.46%)[10] which resulted in the decline in per capita availability of foodgrains (cereals and pulses). If we look at the two graphs No.1 & 2, which are showing the per capita availability of cereals plus pulses. Both graphs are for separate periods. Graph 1 is for the period of 1950 to 1965, Graph 2 is for the period of 1965 to 1984. It is clear from these two graphs that level of per capita availability of cereals plus pulses after 1965 never reached the level of 1965, i.e. 480 gms. per day except in one year i.e. in 1979.[11]

Now we can turn our discussion to the regional diff-erentiation in the post-green revolution period. Various economists have argued at different times with the help of evidences that with the adoption of new technology, regional differences have been increasing significantly. Still most parts of India are suffering from vagaries of nature while there are very few states in which the technology

PER CAPITA AVAILABILITY
OF FOODGRAINS GMS/DAY

GRAMS

YEARS

— Series A
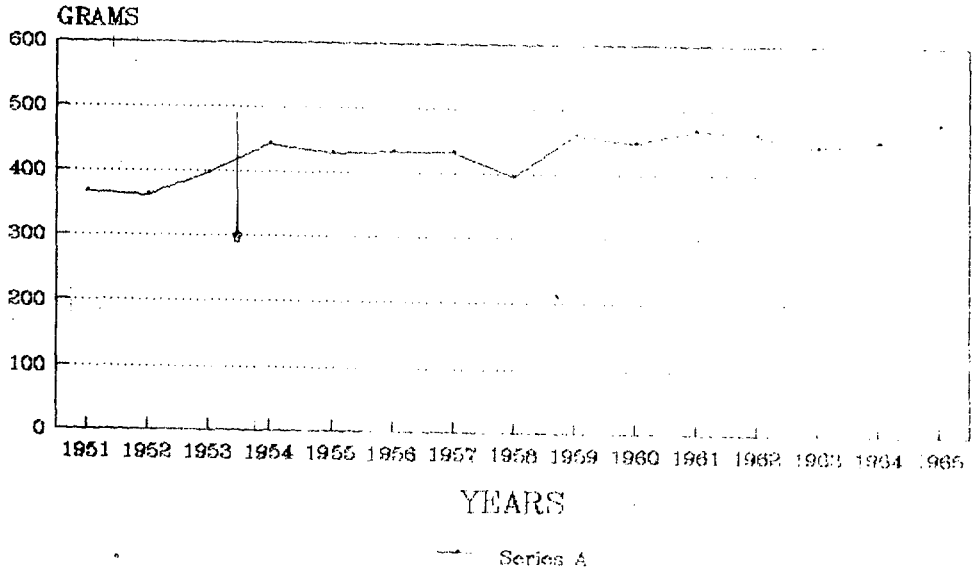
FIGURES ARE OF NET AVAILABILITY
(SOURCE: DE JANVRY & SUBBARAO (1986)

PER CAPITA AVAILABILITY
OF FOODGRAINS GMS/DAY

GRAMS

YEARS

— Series A
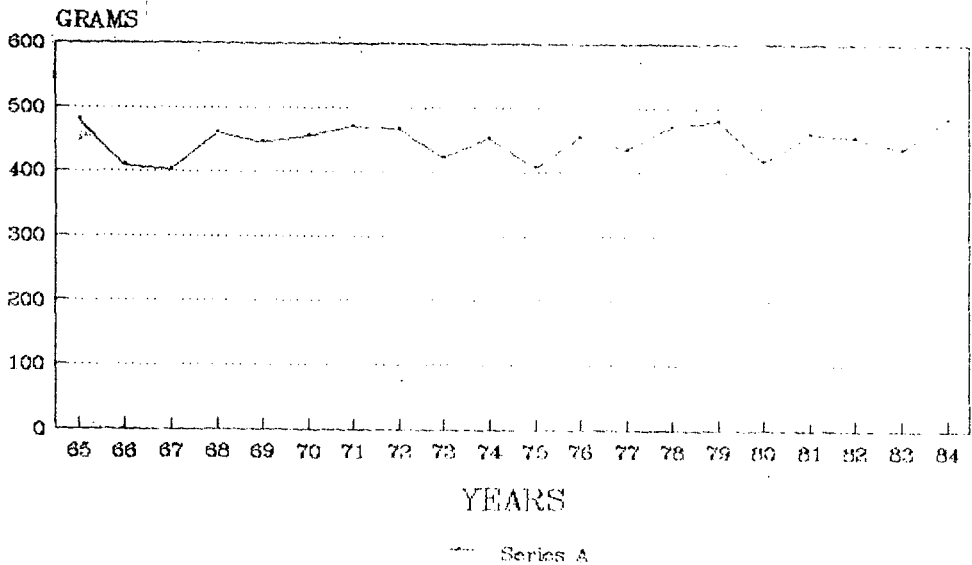
FIGURES ARE OF NET AVAILABILITY
(SOURCE: DE JANVRY & SUBBARAO .1986)

has brought prosperity. According to Clive Dewey, "If one superimposes a map of agricultural India today on a map of Indian agriculture in 1900, one finds that the areas in which the green revolution is currently prevailing - Punjab[12] and Gujarat are the regions in which agricultural growth was always pronounced".[13]

There are many factors owing to which regional diff-erences have been accentuated. A feature which becomes absolutely clear is that throughout the period a few states namely Punjab, Haryana and UP are the states where the growth rate of agricultural production was 3% p.a. or more. The rate of growth in the period from 1969-72 to 1981-84 in Punjab and Haryana has come down to 3.92% p.a. and 3.31% p.a. respectively from 7.91% p.a. and 5.73% p.a. during the period 1962-65 to 1970-73. While in the case of Western region the case of Maharashtra is rather exceptional, its growth rate from being negative (-3.77% p.a.) in the previous period has increased to 5.59% p.a. in the later period. In case of Gujarat also it has increased significantly i.e. from 1.95% p.a. to 3.92% p.a. while in Rajasthan it has declined markedly from 5.10% p.a. to 2.47% p.a.

On the other hand in Eastern and Southern regions (except Orissa and Andhra Pradesh) the growth rate of the states has shown deceleration. In Orissa and Andhra Pradesh

•from negative growth rates i.e., -0.30% p.a. and -0.60% p.a. respectively, it has increased to 2.28% p.a. and 3.31% p.a. respectively in same two periods i.e. from 1962-65 to 1970-73 and from 1969-72 to 1981-84.[14]

S. Mahanderdev in one of his studies, has compared the population growth with foodgrains production. In order to maintain the consumption level of the population in state, the rate of growth of foodgrains production should be atleast equal to the growth rate of population. From the period 1970-71 to 1984-85 among all the states of India there were only four states which fell in the category where the positive growth[15] in food production is greater than the population growth. While maximum number of states i.e. ten fall in the category where growth in foodgrains production is positive out the rate is less than the population growth rate. And only two states fall in a category where the growth rate in foodgrains production is negative and also it is less than the population growth.[16] (See Table 7)

In the study by Hanumantha Rao, S.K. Ray and Subbarao, positive growth has taken place in all crop production, since the beginning of the planning, though at different rates in different sub-periods. But the output fluctuations have increased considerably particularly after the inception of green revolution technology. The factor of rainfall

TABLE 7

Category 1		Category 2		Category 3	
Maharashtra	(6.23,2.22)	J & K	(2.31,2.54)	Kerala	(-0.38,1.80)
Punjab	(5.92,2.15)	Gujarat	(2.07,2.37)	Tamilnadu	(-0.64,1.65)
U.P.	(4.32,2.26)	M.P.	(1.95,2.37)		
A.P.	(3.16,2.06)	Assam	(1.90,2.76)		
All India	(2.70,2.24)	Orissa	(1.59,1.86)		
		Bihar	(1.25,2.18)		
		Rajasthan	(1.07,2.87)		
		Karnataka	(1.03,2.25)		
		H.P.	(0.80,2.10)		
		W.Bengal	(0.54,2.09)		

(SOURCE: S. Mahenderadev, EPW, Sept., 1987).

plays an important role, as crop output particularly of foodgrains is very sensitive to rainfall. Moreover, since the new technology which requires assured water supply through irrigation facilities, in areas where these are not available, instability tends to rise with growth. This is because if rainfall is sufficient in some year the crop production is very good but the converse is also true.[17] From the period 1960-61 to 1984-85, the range of instability varied from 7.4% in Kerala to as high as 32.2% in Gujarat. And there are states other than Gujarat - Rajasthan, Bihar, Maharashtra, Orissa and Madhya Pradesh where instability is more than 20%. Three states namely Haryana, Karnataka and Tamil Nadu where instability is around 20% while in Punjab, Assam, Andhra Pradesh and J&K, instability is less than 15%.[18]

However, sensitivity of output to variations in rainfall may change depending upon the nature of technology and inputs used, and also upon the level of development in infrastructural facilities like irrigation. As the high rainfall states like Orissa and West Bengal have recorded increasing instability with low growth rate while on the other hand low rainfall states like Punjab and Haryana have registered high growth rate with declining instability. So it is not only the rainfall but the difference in the development of irrigation which can be used as a major factor for growth and variability in crop production across States. Not only the spread of irrigation but the kind of irrigation is also important. From the table given below changes in net sown area irrigated under tube wells across States, importance of spread as well as kind of irrigation is quite evident.

TABLE 8: NET SOWN AREA IRRIGATED AND NET
IRRIGATED AREA UNDER TUBEWELLS

States	Percent of net Sown area irrigated		Percent Increase	Percentage of net irrigated area	
	1960-61	1983-84		1970-71	1983-84
Andhra Pradesh	27.0	33.9	25.6	2.0	4.9
Assam	25.7	25.7	-	N.A.	N.A.
Bihar	25.7	33.2	29.2	16.9	29.7
Gujarat	7.3	33.7	220.5	6.9	12.7
Haryana	29.6	60.8	105.4	24.5	45.8
Himachal Pradesh	14.4	15.9	10.4	0.6	6.5
J&K	41.7	44.0	5.5	0.7	0.6
Karnataka	8.4	15.0	78.6	0.1	0.1
Kerala	18.5	12.2	-	-	18.4
Madhya Pradesh	5.8	14.4	148.3	0.8	2.0
Manarashtra	6.0	10.7	78.3	N.A.	N.A.
Orissa	17.4	30.8	77.0	1.6	1.9
Punjab	52.9	85.7	62.0	39.8	57.4
Rajasthan	13.4	20.2	50.7	0.2	5.2
Tamilnadu	41.1	44.8	9.0	0.7	6.3
U.P.	29.5	57.2	93.9	32.3	54.4
W.Bengal	24.9	37.1	49.0	N.A.	22.1
All India	18.5	29.4	58.9	14.3	26.2

(SOURCE: S. Mahendradev, EPW, Sep. 1987)

The above table makes it abundantly clear that areas like Punjab, Haryana and U.P. (the green revolution belt) where instability is declining with the increasing growth is not only because of development of irrigation facilities but also because of the quality of irrigation.

There is other evidence as well, some of which has been discussed by M. Zarkovic[19] While analysing the issue of regional disparities. His analysis focuses on the development of the various types of irrigational facilities at differential rates in different states, giving rise to increase in regional imbalances. A high incidence of irrigation is associated with high incidence of fixed capital like machinery. These have been studied in ten major agricultural states of India, by definition, these are the states in which agricultural contribution to state income exceeded 50% in 1960. These states are Andhra Pradesh, Haryana, Karnataka, Kerala, Madhya Pradesh, Orissa, Punjab, Tamilnadu and U.P.

He has omitted four major states because of the reason that their agricultural income falls below 50% namely- Gujarat, Maharashtra, Rajasthan and West Bengal. Omission of these is only problematic in so far as these highly industrial states are obviously linked to agricultural states through labour and product markets. Of course there are

rural regions in these states in which the characteristics of agricultural states are present but by virtue of their highly developed industrial base, a comparison on the state level with predominantly agricultural states is inappropriate.[20] The empirical evidences of his for ten states, thus, are as under :

TABLE 9: TRACTOR OWNERSHIP

States	Percentage change		Tractors(x100) in 1977
	1966 to 1972	1972 to 1977	
Andhra Pradesh	116.4	76.2	111
Bihar	162.4	87.5	105
Haryana	279.4	65.2	304
Karnataka	148.4	45.6	83
Kerala	258.9	13.3	17
Madhya Pradesh	99.0	202.0	151
Orissa	169.9	-22.2	14
Punjab	268.3	57.3	667
Tamilnadu	64.7	20.4	65
U.P.	172.2	158.3	713

SOURCE: M. Zarkovic, "Issues in Agricultural Development: 1987") pp. 34.

The differences regarding the concentration of ownership of tractors is clear with U.P. and Orissa constituting

the two extremes.

TABLE 10: FERTILIZER CONSUMPTION

| | Percentage Change | | Fertilizers(Kg/Hec.) |
	1960-61 to 1974-75	1974-75 to 1982-83	1982-83
Andhra Pradesh	183.7	3.7	25.3
Bihar	916.7	-50.0	12.2
Haryana	N.A.	297.7	59.5
Karnataka	251.6	105.5	22.4
Kerala	142.6	20.2	27.4
M.P.	433.3	12.5	5.4
Orissa	610.0	-19.7	5.7
Punjab	1291.1	256.2	168.5
Tamilnadu	205.5	3.0	34.6
U.P.	709.1	39.9	49.6

SOURCE: (M. Zarkovic, 1987; op. cit.)

TABLE 11: AREA UNDER HYVs

States	Percentage charge (1975-76 to 1980-81)	Area(x1000) hectares, 1980-81	Area under HYVs as % of Net Sown Area 1980-81
A.P.	24.4	3686	34.3
Bihar	55.0	3650	43.9
Haryana	42.2	2165	60.1
Karnataka	16.7	1863	18.8
Kerala	38.5	360	16.5
M.P.	58.6	3615	19.3
Orissa	118.1	1254	20.5
Punjab	39.5	4035	96.3
T.Nadu	34.0	2795	52.2
U.P.	26.8	8030	46.6

SOURCE: M. Zarkovic, 1987, op. cit.

The last three tables reveal after the green revolution the percentage change and usage of tractors, fertiliser consumption and area under HYV, the three major factors of development after irrigation. These are all of course significantly higher in green revolution belt (Punjab, Haryana and U.P.) but the situation is not too bad in a few other states like Tamilnadu and Bihar. Then the question

is why adequate growth is not taking place in these states inspite of availability of various resources (i.e. development of irrigation).

Some part of the explanation can be provided by the changing pattern in the country. In India there have been significant shifts in major foodgrains crops (wheat and rice) among the states between pre and post-green revolution periods.[21] The share of Eastern region (Orissa, Bihar and West Bengal) in total rice output has declined significantly, not compensated sufficiently by rise in share in wheat production. The major gain has gone to Northern region, similarly in case of wheat it has shifted from Western region to Northern region.

Thus the regional cropping pattern shifts are evident from the table.12 After the green revolution the tendency of policy makers is to advance those regions more which are already advanced. Concentration in few regions and specific crops increases the instability in total crop output.

V.M. Rao and R.S. Deshpande have argued that there are three major constraints in development of Indian agriculture. First, irrigation facilities are developed in few states, second, the new technology and inputs are in favour of few crops leaving others no opportunity for quick

TABLE 12 RELATIVE CONTRIBUTION OF STATES IN ALL INDIA

RICE AND WHEAT PRODUCTION

State	RICE		WHEAT	
	1963-65	1983-85	1963-65	1983-85
W. Bengal	14.16	12.67	0.28	1.72
Orissa	11.33	7.42	0.06	0.28
Bihar	12.59	8.10	4.09	6.34
Eastern Region	38.08	28.19	4.43	8.34
Maharashtra	3.74	3.83	3.70	2.12
Gujarat	1.22	1.26	3.33	3.26
M.P.	8.32	7.26	18.46	9.15
Rajasthan	0.32	0.31	9.28	7.57
Western Region	13.60	12.66	34.77	22.10
Andhra Pradesh	11.32	14.12	0.04	0.03
Tamilnadu	10.80	8.05	0.01	Negligible
Karnataka	4.03	4.09	0.89	0.44
Kerala	3.04	2.28	-	-
Southern Region	29.19	28.54	0.94	0.47
Punjab	0.94	8.30	19.32	21.73
Haryana	0.58	2.40	7.78	9.77
U.P.	8.88	11.82	30.13	35.56
Northern Region	10.40	22.52	57.23	67.06
Others	8.73	8.09	2.63	2.03
All India	100.00 (36.51)	100.00 (55.18)	100.00 (10.96)	100.00 (44.11)

SOURCE: Ch. Hanumantha Rao, S.K. Ray and K. Subbarao, 1988

breakthrough. Third, the small and marginal farmers and others with modest means often lag and fall behind due to lack of access to resources.[22]

Whereas the green revolution technology is certainly more capital intensive, in that it requires far greater money outlays, the question of labour is more difficult one to answer as the technology has both a labour saving as well as labour absorbing aspect to it, and in the final analysis it would depend upon which of these would dominate. There is a certain school of thought of which I. Sinha is a representative. As argued by him that after the inception of green revolution technology the labour absorbing production has been displaced by the capital intensive technology.[23] At the same time we can refer a study by Sheila Bhalla. As has been argued by her the main reason why green revolution technology has been beneficial to agriculture is that it is land augmenting. It is labour using in the sense that it has increased the under relatively labour intensive crops. However so far as individual crops are concerned land augmenting technology combined with the greater use of chemical fertilisers and weedicides is labour saving. The combined effect of labour absorbing and labour saving aspect of green revolution technology has been that 'total labour absorption has either been stagnant or may even have fallen in absolute terms in several of the most technologically dynamic states'.

As per her finding, 'what has happened in India is that for those crops and those states where the Green Revolution came early, the usual initial response was a sustained rise in labour use per hectare. This trend characteristically peaked in mid-seventies or shortly afterwards, and subsequent increases in yield were associated with declines in per hectare labour absorption. However, in some states where improved practices and inputs were introduced, labour intensity continued to rise concurrently with yields and with total production. She has explained it as a inverted U-shape curve, i.e. when the introduction of 'labour saving technological factors' begins to outweigh the impact of labour-using factors, the labour absorption trend line falls.[24]

M.L. Dantwala has argued that when this technology was adopted, at that time the country was going through several crisis like food shortages which resulted in increase in imports of foodgrains, high prices of foodgrains and insufficiently expanding area under cultivation. Keeping all these in mind the policy makers took the decision of utilising green revolution technology in order to attain quick and sufficient increase in foodgrains production both for growth and equity[25] through lowering the foodprices keeping in mind that short term regional inequalities had to be accepted for long term attainment of the development of Indian agriculture.

Finally, a study by Subbarao and Dejanvry, the recent trends in the yields of wheat in the decade of seventies suggest that regional differences can be reduced by concentrating in regions other than Punjab. Because in the decade of seventies the yield of wheat was stagnant in Punjab inspite of green revolution technology. Also the real costs of wheat production were not reducing in Punjab. On the other hand regions like Madhya Pradesh yield in wheat production is showing an upward trend.[26] (See Table 13)

Thus, after a long discussion, we may conclude that the regional inequalities have been accentuated after mid-sixties with the advent of green revolution technology. The facts regarding the agricultural growth in India are well documented. In fact there are a number of factors which are responsible for why the growth is not faster and for the fluctuations across the states and across the years. Some authors have pointed out that it is because of inadequate investment (particularly, public investment) in irrigation and its poor quality. Some authors have emphasised on the inequitable asset holdings and failure of land reforms, no breakthrough in yields of dryland crops and finally lack of incentives to the agricultural sector to develop at a faster rate. All of these factors explain the agricultural situation in India after the adoption of new green revolution

TABLE 13:   REAL COSTS AND YIELDS OF WHEAT IN
PUNJAB AND MADHYA PRADESH

Year	Total cost per hectare at current prices(Rs)	Cost(c) per qtl. at current prices (Rs)	Input Price Index	Cost(c) per quintal at constant prices (Rs)	Yield/ Hectare (quintal)
PUNJAB					
1970-71	1,654.59	61.04	95.7	63.78	24.40
1971-72	1,769.25	59.71	100	59.71	26.43
1972-73	1,650.54	67.10	104.6	64.15	22.66
1973-74	2,037.14	74.34	118.6	62.68	24.87
1974-75	2,666.65	87.76	178.2	49.25	27.00
1975-76	2,632.32	99.45	173.3	57.39	23.11
1976-77	2,611.89	101.39	169.1	59.96	22.74
1977-78	2,722.36	108.57	167.7	64.74	22.61
1978-79	3,040.93	101.45	169.5	59.85	27.49
Madhya Pradesh					
1971-72	641.86	60.42	100	60.42	8.92
1972-73	798.68	63.07	106.4	59.28	10.65
1973-74	1,012.03	88.94	119.7	74.30	9.17
1974-75	1,491.52	109.90	167.9	65.47	11.76
1975-76	1,288.99	91.85	165.2	55.60	12.30
1976-77	N.A	N.A	169.0	N.A	N.A
1977-78	1,250.32	87.11	164.8	52.86	12.64
1978-79	N.A	N.A	161.9	N.A	N.A

SOURCE: K. Subbarao and A. DeJanvry, :Agriculturakl Price
Policy and Income Distribution in India*, 1986).

technology, collectively. None of these factors individually explain for the observed fact.

We would substantiate the fact of regional imbalances in the following chapters by looking at the problem and trends in the total output as well as percapita output of foodgrains and a few selected nonfoodgrain crops for the period 1960-61 to 1986-87.

NOTES

* Blyn. G (1966). *Agricultural Trends in India, 1891-1947: Output, Availability and Productivity*, Philadelphia: Pennyslavania.

1. Krishna Bharadwaj (1982), "Regional Differentiation in India", <u>EPW</u>, April (Annual Number).

2. A. Sivasubramaniam, "Papers on National Income".

3. A. Heston (1982), "National Income in Dharma ,Kumar, (ed.) <u>Cambridge Economic History of India</u>, Vol.2, Cambridge University Press, pp. 387-390.

4. G.S. Bhalla (1984), "Peasant Movement and Agrarian change in India" in Y.V. Krishna Rao, G. Parthasarthy, C.H. Rajeshwara Rao,M. Yadava Reddy and Waheedudeen Khan (eds.), <u>Peasant Farming and Growth of capitalism in Indian Agriculture</u>, Vijaywada; Visaalandhra Publishing House.

5. Ashok Mitra (1970), "Population and Foodgrains output in India" in E.A.G. Robinson and M. Kidron <u>Economic Development in South Asia</u>: Proceedings of a Conference, London, McMillan.

6. See Table No. 2 of the present chapter.

7. V.M. Balasubramanyam (1984), <u>Economy of India</u>, Weidenfeld and Nicolson, pp. 82-84.

8. M.L. Dantwala (1987), "Growth Vs. Equality in Agricultural Development Strategy", in P.R. Brahmananda and V.R. Panchmukhi (eds.), <u>Development Process of the Indian Economy</u>, Bombay, Himalaya Publishers.

9. A. Vaidyanathan (1986), "Agricultural Development and Rural Poverty", Paper presented in seminar on Indian Economy, Boston University, Oct.

10. Indepdeep Sinha, (1984), "Development of Agricultural Production and Agrarian Relation in India", in Y.V. Krishna Rao, G. Parthasarthy, Ch. Rajeshwara Rao, M. Reddy and Waheedukhan (eds.), op. cit.

11. K. Subbarao and A. Dejanvry (1986), "<u>Agricultural Price Policy and Income Distribution in India</u>, OUP, Delhi, pp.6-10.

12. Punjab includes present Punjab and Haryana.

13. M. Mufakharul Khan (1988), "Trends in crop production in Undivided Punjab", in Clive J. Dewey (ed.) <u>Arrested Development in India</u>: The Historical Dimension, Manohar Publisher, New Delhi, pp. 319.

14. G.S. Bhalla (1987), "Some Issues in Agricultural Development in India - An Overview" in P.R. Brahmananda and V.R. Panchmukhi (eds.), op. cit.

15. Growth is adjusted growth rate for variations in Rainfall in all categories.

16. S. Mahendradev (1987), "Growth and Instability in Foodgrains Production" EPW, Sep.

17. Hanumantha Rao, S.K. Ray and K. Subbarao (1988) Unstable Agriculture and Drought, Vikas Publishing House, New Delhi, pp. 17-19.

18. S. Mahendradev (1987), op. cit.

19. M. Zarkovic (1987), Issue in Indian Agricultural Development, West View.

20. Ibid.

21. Ch. Hanumantha Rao, S.K. Ray and K. Subbarao (1988),op.cit.

22. V.M. Rao and R.S. Deshpanden (1987), "Agricultural Growth in India: A Review of Experiences and Prospects", in P.R. Brahmananda and V.R. Panchmukhi (eds.), op. cit.

23. Inderdeep Sinha, op. cit.

24. Shiela Bhalla (1987), "Trends in employment in Indian Agriculture, Land and Asset Distribution", Indian Journal of Agriculture Economics, Vol. 42, No.4, Oct-Dec.

25. Growth Vs. Equity is a very disputable as well as debatable issue. Since we are focussing at particularly this problem, for details, see, M.L. Dantwala (1987), op. cit. and Ch. Hanumantha Rao, "Steps to strengthen the growing peasant sector", in Y.V. Krishna Rao, G. Parthasarthy, M. Yadav Reddy, Ch. Rajeshwara Rao and M. Waheedu Khan (eds.), op. cit.

26. K. Subbarao and A. Dejanvry (1986), op. cit.

CHAPTER III

METHODOLOGY, DATA BASE AND TRENDS IN

OUTPUT, AREA AND YIELD OF FOODGRAINS

AND SELECTED NON-FOOD CROPS.

In the previous chapters, we have presented a brief historical background as well as a short account of studies made to gauge the problem of regional differentiation in food-grains production. Before we present our empirical analysis for the period 1960-86 we wish to state the methodology adopted by us for the above mentioned issue.

Reasons for Selecting Period 1960-61 to 1986-87 :

The new agricultural strategy was initiated on a wide scale around the mid sixties in India. The impact of new tech-nology started showing its effect towards end of the sixties. As we know the possibility of increase in area under crops particularly foodgrains became limited and agricultural produc-tion became stagnant. Around the mid-sixties new bio-chemical technology provided a new potential for Indian agriculture especially in foodgrains; but the pattern of adoption simul-taneously accentuated regional differences and inequalities. A continuous time period from 1960-61 to 1986-87 seemed a suitable choice of period since the initial year precedes the adoption of the new strategy while the terminal year is that for which the latest estimates are available.

Sources of Data :

For our empirical investigation we have relied exclu-sively on secondary data sources. The study of different states (further aggregated into various regions) was selected keeping

in view that it would provide a good illustration of what is happening in this vast and varied country.

The data sources are: various issues of the Annual Economic Surveys for the output of foodgrains, total cereals and total pulses and the Bulletin of Food Statistics (Ministry of Agriculture publication) for the mid-year projected figures of population of different states. Estimates of Area and Production of Principal Crops in India (Ministry of Agriculture) for the output of selected non foodcrops, area under foodgrains and selected non food crops. Agricultural Situation in India (Ministry of Agriculture publication of different years) for the data on total cropped area and net sown area for different states and India. All the data which are required for the study are collected for the continuous 27 year period, i.e. 1960-61 to 1986-87 inclusive.

Grouping of States : For studying and analysing the dynamics of regional variations in total foodgrains and selected non food crops we have clubbed various states in four major regions, viz. :

Group A: Punjab, Haryana and U.P. (North Western Region)

Group B: Assam, Bihar, West Bengal and Orissa (Eastern Region)

Group C: Tamilnadu, Kerala, Andhra Pradesh and Karnataka (Southern Region)

Group D: Maharashtra, Madhya Pradesh, Rajasthan and Gujarat (West Central Region)

We have made further subgroups out of the last two major groups where it is possible which are as follows :

Group E   Tamilnadu and Kerala

Group F   Andhra Pradesh and Karnataka

Group G   Maharashtra and Madhya Pradesh

Group H   Gujarat and Rajasthan

Group ROI   Rest of India (India – Group A-Group B-Group C-Group D)

In order to aggregate these states into the various regions given above, keeping all factors in mind we first calculated compound growth rates (of foodgrains production) of each state and on the basis of similarities among the growth rates of states and also according to the geographical contiguity, the regions have been formed. The sub-groups are formed on the basis of fairly marked differences within each region e.g., in the southern region Andhra Pradesh and Karnataka have fared noticeably better than Tamilnadu and Kerala. While in the West Central region similarly, Gujarat and Rajasthan have fared better than Madhya Pradesh and Maharashtra.

Thus, no doubt there are variations in growth within these regions as well; but the variations across the regions

TABLE : TREND RATE OF GROWTH OF TOTAL FOODGRAINS IN

REGIONS : (1960-61 to 1986-87)

Groups of States	Rate of Growth
A	4.5
B	1.7
C	1.8
D	2.2
E	0.9
F	2.3
G	2.01
H	2.5
ROI	4.7
INDIA	2.7

(SOURCE: Computed)

which appear ⸽ ⸽ ⸽⸽⸽⸽⸽⸽. The thrust of our study is to explore certain social, economic institutional factors which have shaped the pattern of growth particularly of food grains in such a manner that a few regions became more conducive for fostering foodgrains production and other regions lagged behind.

Though a number of attempts have been made to study the impact of new green revolution technology[1], we believe that it requires an altogether different approach where the

data has to be at much disaggregated level. Another reason for taking up the region-wise study is that, we have followed G. Blyn's methodology in order to link up our empirical findings with the historical trends on a regional basis explored by him for 55 year period from 1891-1946. Blyn had divided the period into ten 'reference decades' of ten years each.[2]

Since our study is for a shorter period of 27 years from 1960-61 to 1986-87, we have divided the entire series into eight overlapping segments each of six reference years only e.g. 1960-65, 1966-71 to 1973-78 and overlapping segments as 1963-68, 1969-74 ... to 1981-86. Trend growth rates have been calculated for each six year segment. The entire period is divided into two parts, the first four reference segments (1960-74) and last four reference segments (1972-86). Similarly we have fitted a trend to the entire series as well. We have obtained the trend growth rates by fitting a simple exponential function of the form $Y = A (1+r)^t$ or $Y=A B^t$, which has a linear form in logrithms :

Log Y = Log A + t log B

Where Y = output

A = Statistic

t = time

B = (1+r)

r = rate of growth

Thus, we calculated the trend growth rates of all eight overlapping segments, two sub periods as well as of entire series.

The performance of the agricultural sector in India during the forty years since independence, though modest, has been much better than that achieved during the half century preceeding the end of colonial rule. The compound growth rate of foodgrains production was 0.11% p.a. for the period 1899-1900 to 1946-47 while for the period 1947-48 to 1986-87 it was 2.3% p.a. (Chapter 2).

As has been discussed in the previous chapter after independence untill the beginning of 1960s area was the main source of increase in output of foodgrains. By the early sixties the scope for further increase in area became limited and the policy makers were looking for some alternative methods to increase output particularly of foodgrains. India was facing acute food crisis, in 1966 it registered the highest net imports of 10.30 million tons of cereals. At this time a new agricultural strategy was adopted, the HYV-seed-Fertiliser technology which was made available in limited areas. Precisely in those areas only where productive irrigation facilities were already available or where the requirement of public investment in irrigation was low. This resulted to a new dimension of uneven development of various regions in the country. There were regional imbalances existing

prior to the adoption of this new green revolution technology also, this new policy further accentuated the regional differences.

Firstly, we will discuss the above issue in the case of total foodgrains, taking the performance at the national level and at the regional level. Secondly, we shall see the trends in areas under total foodgrains and yield per hectare of total foodgrains.

Since independence till date India's total foodgrains output has roughly trebled, from around 50 m. tons in 1951 to around 150 m. tons by 1985-86. As far the period of our study is concerned i.e. from 1960-61 to 1986-87 it has increased from 79 m. tons in 1960-61 to 144 m. tons in 1986-87 with peak production in 1983-84. At the same time regional view that is also important not only for observing the trends in their output but also to explain the increasing differences among the regions over time. Also the performance at aggregate level hides the fact that there are large inter-regional variations in both the level and growth of output of food grains. Which is evident from the Table 1.

It is clear that while in North-Western region average output has nearly trebled (175 per cent rise) between the triennium ending in 1962 and that in 1986, it has risen only by one-third to half in other regions. Putting the data in Table 1 in index form we get this.

GROUPS OF STATES

Triennial Average ending in	A	B	C	D	E	F	G	H	ROI	INDIA
1962	20008.33	18406.67	17213.33	23149.33	6622.33	10591.00	15907.33	7242.00	1364.33	80142.
1965	19524.87	19724.07	17591.03	21823.70	6600.30	10990.73	14860.17	6963.53	1665.53	80329.
1968	23465.07	20060.53	18764.63	22952.17	6885.50	11879.13	15345.00	7607.16	2522.93	87765.
1971	30291.27	22611.60	21368.73	27184.43	8030.96	13337.77	16593.93	10590.50	2907.63	104363.
1974	28275.10	22549.00	21771.53	24797.07	7773.53	13998.00	16417.27	8379.80	3046.30	100439.
1977	34881.50	25128.17	23387.23	32659.53	8415.83	14971.40	21057.83	11601.70	3479.53	119536.
1980	39121.17	24344.47	25180.57	31447.53	8215.63	16964.93	20603.70	10843.83	3636.56	123730.
1983	47160.73	24073.27	25795.53	37557.03	7447.80	18347.73	23960.87	13596.17	3809.27	138395.
1986	55023.54	29132.37	24543.77	33327.54	8335.76	16208.00	22482.10	10845.43	4655.36	146682.

TABLE 2: INDEX NUMBER OF TOTAL FOODGRAINS OUTPUT(TRIENNIUM ENDING 1962=100)
GROUPS OF STATES

Trienniam ending in	A	B	C	D	E	F	G	H	ROI	INDIA
1962	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1965	97.58	107.15	102.19	94.27	99.66	103.77	93.41	96.15	122.07	100.23
1968	117.27	108.98	109.01	99.14	103.97	112.16	96.46	105.04	184.92	109.51
1971	151.39	122.84	124.14	117.43	121.27	125.93	1C4.31	146.23	213.11	130.22
1974	141.31	122.50	126.48	107.11	117.38	132.16	103.20	115.71	223.28	125.32
1977	174.33	136.51	135.86	141.08	127.08	141.35	132.37	160.20	255.03	149.15
1980	195.52	132.25	146.28	135.84	124.05	160.18	129.52	149.73	266.54	154.38
1983	235.70	130.78	149.85	162.23	112.46	173.23	150.62	187.74	279.20	172.68
1986	275.00	158.27	142.58	143.96	125.87	153.03	141.33	149.75	341.21	183.02

SOURCE : COMPUTED.

In most of regions and in India except the North-West India (Group A), after 1983-84 because of two successive drought years, the output did not touch the 1983 level. North Western region registered highest output around 57 m. tons in 1985-86. But during these periods the exception is Eastern Region (Group B) and subgroup E (Kerala and Tamilnadu), except this major region and subregion, the output in all other regions tended to decline. In the Eastern region there is not much increase but still its performance is better than other regions while sub-group E of two states (Tamilnadu and Kerala are showing continuous increase in their output of total foodgrains after 1983-84. In the 5-years moving average graphs, the North Western region is showing a very smooth and upward rising curve. The Eastern region (Group B) is showing a slow upward rise in the sixties, little growth in the seventies and recovery in the eighties. The Southern region's performance in the last around one decade has deteriorated which is clear from the Table 1 as well as graph of moving averages and we shall discuss also in following pages. The performance of West Central region (Group D) also is not better to Southern and Eastern region. In the last 5 years moving period, except, North Western and Eastern region and all India rest of the regions have shown decline in foodgrains output.

5-YEAR MOVING AVERAGES OF TOTAL FOODGRAINS PRODUCTION (000"TONS)
GROUP - A,B,C,D

GRAPH 1

_____ A   .... B   ___ C   __ __ D
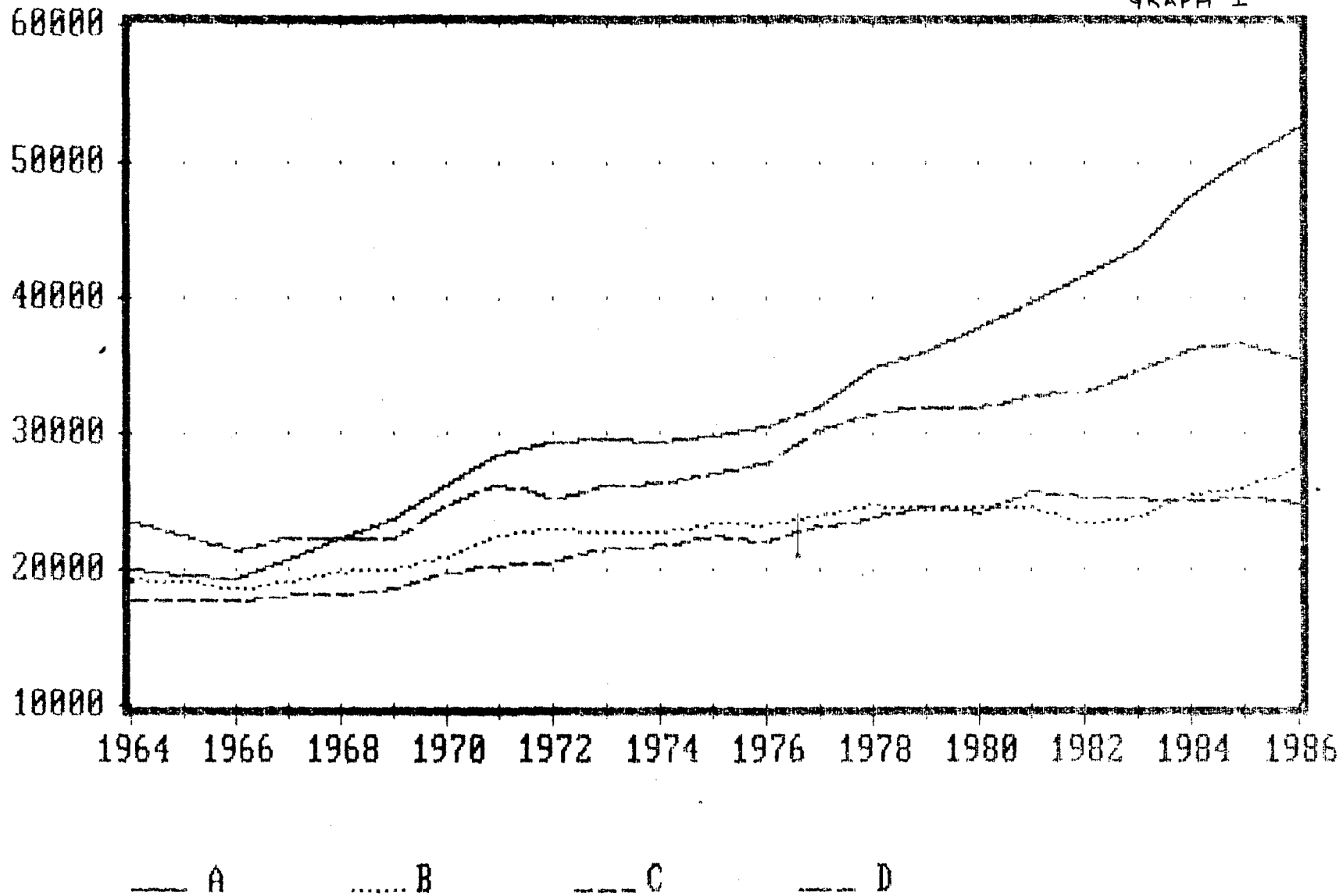
5-YEARS MOVING AVERAGE OF TOTAL FOODGRAINS PRODUCTION (000''TONS)
INDIA

GRAPH 2.
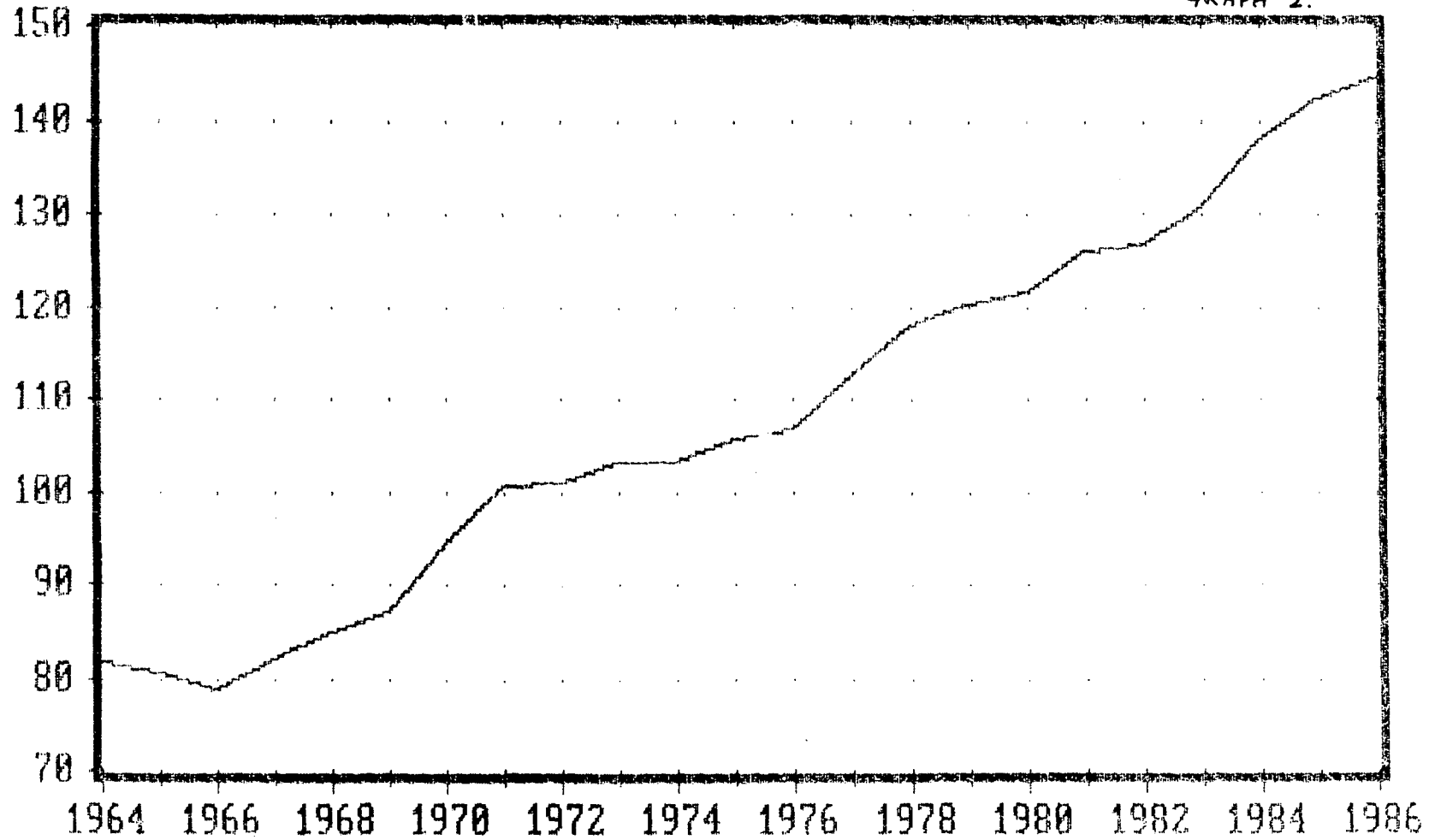
____ INDIA

Increase in the output of total foodgrains is only because of increase in total cereals. Though total pulses form a very small proportion of total foodgrains but its production at all India level is virtually stagnant. In case of total pulses southern region and west-central region both have shown considerable increase in the total pulses output. In southern region taking triennial average its output of total pulses from .7 m tons in 1962 has increased to more than one million ton in 1985. And in the West-Central region also from 4 m. tons, it has increased to around 6m. tons. While the north-Western region (Punjab, Haryana, and U.P.) where a tremendous increase has taken place in the output of total cereals as compared to other regions i.e. from around 15 m. tons in 1962 (triennial average) to 50 m. tons in 1985. But in case of pulses it has declined considerably from 5 m. tons in 1962 to 3 m. tons in 1985. The Eastern region also is stagnant in the output of total pulses but its performance in the output of total cereals is better particularly in later years (see Table 3 and 4).

Before we actually explain the regional differenciation of foodgrains output we shall like to explain in brief about the regional differentiation in various infrastructural facilities which in fact set the pace for further accentuation of regional differentiation.

Table 3 : Triennial Average of total cereals output (000' tons)

GROUPS OF STATES

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Triennium ending in	A	B	C	D	E	F	G	H	ROI	INDIA
1962	14834.67	16572.33	16478.33	19045.67	6502.33	9976.00	13240.67	5805.00	1323.66	68254.66
1965	15124.57	17634.63	16843.37	18317.00	6483.66	10359.70	12420.67	5896.33	1617.26	69536.84
1968	19342.77	18144.43	18037.67	19496.70	6773.50	11264.17	13070.60	6426.10	2454.57	77476.14
1971	25936.43	20766.73	20440.13	22845.70	7890.03	12550.10	13807.10	9038.60	2840.70	92829.70
1974	25176.67	20968.30	20764.40	20584.83	7589.63	13174.77	13406.23	7178.60	2968.66	90462.87
1977	31011.60	23454.97	22313.67	27230.47	8233.16	14080.50	17840.53	9389.93	3400.83	107411.5
1980	36101.57	22559.50	24017.13	27035.03	8010.53	16006.60	17722.60	9312.43	3556.63	113269.9
1983	44252.03	22052.17	24435.47	31821.77	7213.90	17221.57	20279.93	11541.83	3748.56	126310.0
1985	50051.30	26786.77	23832.80	31652.03	7699.06	16133.73	20899.90	10752.13	4521.42	136844.3

==

Table 4 : Triennial average of total pulses output (000' tons)

GROUPS OF STATES

Triennium ending in	A	B	C	D	E	F	G	H	ROI	INDIA
1962	5173.66	1834.33	735.00	4103.66	120.00	615.00	2666.66	1437.00	40.66	11887.33
1965	4400.30	2089.43	747.66	3506.70	116.63	631.03	2439.50	1067.20	48.26	10792.37
1968	4122.30	1916.10	726.96	3455.46	112.00	614.96	2274.40	1181.06	68.36	10289.20
1971	4354.83	1844.86	928.60	4338.73	140.93	787.66	2786.83	1551.90	66.93	11533.97
1974	3098.43	1580.70	1007.13	4212.23	183.90	823.23	3011.03	1201.20	77.63	9976.13
1977	3869.90	1673.20	1073.56	5429.06	182.66	890.90	3217.30	2211.76	78.69	12124.43
1980	3019.60	1784.96	1163.43	4412.50	205.10	958.33	2881.10	1531.40	79.93	10460.43
1983	2908.70	2021.10	1360.06	5735.26	233.90	1126.16	3680.93	2054.33	60.70	12085.83
1985	3285.80	2082.53	1393.46	5778.46	290.93	1102.53	3686.50	2091.96	66.40	12606.67

Various types of land revenue collection system prevailing in different parts of the country before independence gave rise to differential land structure in different regions (Chapter 1). The regions which were historically middle and rich peasants dominated were the regions having better irrigation facilities as well namely the North-Western region comprising Punjab, Haryana and West U.P.

An important strategy undertaken in India to change the agrarian structure was land reforms. Land reforms which intended to change the ownership and control over land not only was an utter failure, it resulted in eviction of large number of tenants-at-will. Therefore, at the time of initiation of green revolution technology, land distribution was highly skewed. Green revolution technology with its 'production oriented approach' in the absence of any change in production structure, the output increases which resulted from the adoption of green revolution technology led to the appropriation of gains in the hands of those who owned the means of production. This fact clearly emerges in the strategy after the mid-sixties, which we have already noted in the previous chapters. The North-Western region with its well-to-do middle and rich peasants benefited the most. Such type of development process has its own logic and has clearly reflected itself in the regional differences in the production of foodgrains which was the outcome of green revolution technology.

To discuss the regional differentiation in details, we shall take up first of all the most easily quantifiable element which shows uneven development of various regions after inception of new green revolution technology i.e., the percentage contribution of each region in the total food grains output.

For the four major regions we have constructed Pie charts for three periods i.e. per cent share of four major regions and rest of India in 1962, 1974 and in 1986. The contribution of four regions - north-western (Punjab and Haryana and U.P.), Eastern Region (Assam, Bihar, Orissa and West Bengal), Southern Region (Andhra Pradesh, Karnataka Tamilnadu and Kerala) and West Central region (Maharashtra, Madhya Pradesh, Gujarat and Rajasthan) in the beginning i.e. in 1962 was very close to each other. West Central region's share was highest in 1960-62 i.e. 28.29%, But with the passage of time the picture changed drastically. The contribution of Group A ((North western region) increased remarkably from 25% in 1960-62 to 37.5% in 1984-85. While rest of all regions share declined i.e. Eastern, Southern and West central regions' share declined from 23%, 21.5% and 29% to 20%, 16.8% and 22.7% respectively. If we link up these trends with the historical trends i.e. (say) in the first half of the century, a study by Blyn,[3] highest rate of growth amount of foodgrains

Table 5 : Percentage share of each region in total Foodgrains output

Triennium ending in	A	B	C	D	E	F	G	H	ROI
1962	24.96	22.96	21.47	28.88	8.26	13.21	19.84	9.03	1.70
1965	24.30	24.55	21.89	27.16	8.21	13.68	18.49	8.66	2.07
1968	26.73	22.85	21.38	26.15	7.84	13.53	17.48	8.66	2.87
1971	29.02	21.66	20.47	26.04	7.69	12.78	15.90	10.14	2.78
1974	28.15	22.45	21.67	24.68	7.73	13.93	16.34	8.34	3.03
1977	29.18	21.02	19.56	27.32	7.04	12.52	17.61	9.70	2.91
1980	31.61	19.67	20.35	25.41	6.63	13.71	16.65	8.76	2.93
1983	34.07	17.39	18.63	27.13	5.38	13.25	17.31	9.82	2.75
1986	37.51	19.86	16.73	22.72	5.68	11.04	15.32	7.39	3.17

SHARE IN TOTAL OUTPUT
1962 , 1974 , 1986

Group—B 22.97 · Group—A 24.97 · ROI 1.7 · Group—D 28.89 · Group—C 21.48

1962

Group—B 22.45 · Group—A 28.15 · ROI 3.03 · Group—C 21.68 · Group—D 24.69

1974
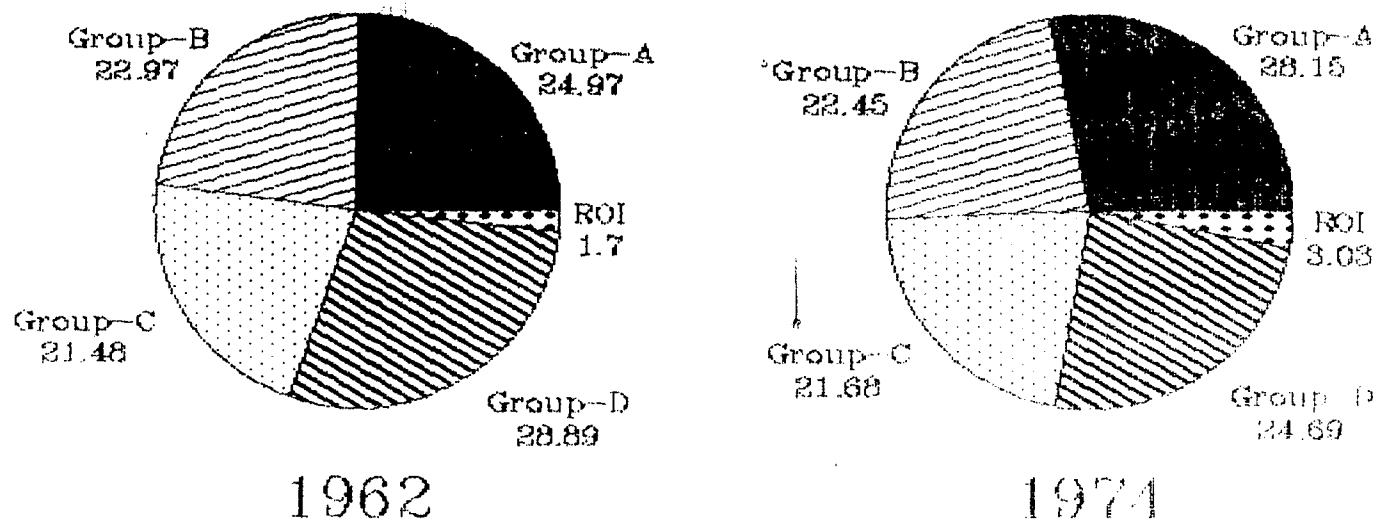
Group—A=North—Western Region
Group—B=Eastern Region,Group—C=Southern
Region,Group—D=West—Central & ROI

Group-A
37.51

ROI
3.17

Group-D
22.72

Group-B
19.86

Group-C
16.73
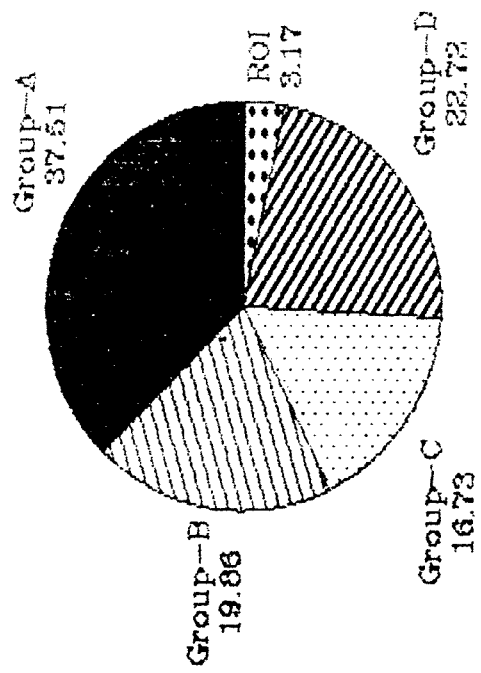
1986

output was in Greater Punjab. As has been noted in previous chapter that the public investment was also highest in Greater Punjab.[4] And this was the region in which more facilities were provided for the development of irrigation by Britishers intentionally. As has been said earlier same pattern would follow in the future development also, that seems to be true.

The outstanding features of the above table are: In 1960-62 taking eastern and southern regions (8 states) toge-ther, their share in the total foodgrains output was slightly less than the double of North western region (3 states), but in 1984-86, North western region's (3 states) contribution was more than the total of Eastern and Southern regions toge-ther, i.e., three states (Punjab, Haryana and U.P.) are con-tributing more than 8 major states. Second, the west central region which was at top in 1960-62 with its share of around 29% never reached at this level afterwards till date. Third, in the period when the share of North western region declined, in that period the share of Eastern as well as Southern region's separately increased though marginally i.e. in 1969-71 to 1972-74.

Among other sub regions Group E's i.e. Tamilnadu and Kerala, its share is declining continuously. Thus in the share of southern region the contribution is mainly from the states namely Karnataka and Andhra Pradesh, though their share is also declining. Similarly, in the west central region

Table 6 : Percentage share of Different Region in Total Net Sown Area

GROUPS OF STATES

==

Triennial Average ending in	A	B	C	D	E	F	G	H	ROI
1964	18.19	16.23	21.91	42.44	5.90	16.01	25.32	17.12	1.21
1965	18.17	16.30	21.65	42.64	5.87	15.77	25.40	17.24	1.22
1968	17.9	16.03	21.25	43.43	5.89	15.36	26.03	17.40	1.39
1971	17.83	15.89	21.54	43.06	5.98	15.56	25.80	17.26	1.66
1974	17.8	16.04	21.40	43.14	5.96	15.42	25.85	17.29	1.61
1977	17.8	16.06	20.65	43.21	5.88	14.77	25.71	17.50	2.22
1980	17.78	15.98	20.74	43.66	5.78	14.96	26.21	17.44	1.82
1983	17.69	15.42	20.80	44.25	5.49	15.30	26.32	17.93	1.83
1984	17.72	15.40	20.72	44.30	5.52	15.19	26.42	17.88	1.85

==

the contribution is mainly from the states namely Karnataka
and Andhra Pradesh, though their share is also declining.
Similarly, in the west central region Maharashtra and Madhya
Pradesh (Group G) are contributing more than double of share
of Rajasthan and Gujarat (Group H). The share of other small
states i.e. rest of India is very small and stagnant also.

What is most striking that if we look at the percent
share of total net sown area occupied by different regions
the picture of lop-sided regional differences becomes more
clear.

Thus the north western region comprising Punjab, Har-
yana and U.P. is occupying only 17 and 18 percent of total
net sown area of India and contributing 38% of total foodgrain
output of the country. In sharp contrast the West Central
i.e. Maharashtra,Madhya Pradesh,Rajasthan and Gujarat is
occupying the highest netsown area i.e. 44% in 1984 which
increased from 42.3% in 1962 but with its increase its share
in total foodgrains output declined. The other two regions
share i.e. Eastern and Southern, remained almost same or
slightly declined, which shows that these regions are in
the grip of stagnation.

Since we are not looking at trends in different states
separately, but as has been seen in Chapter two that after
Punjab,Haryana & U.P. if any other state which is performing
well is Andhra Pradesh. These four states having small proportions of
total net sown area are contributing more than 40% of total food

TABLE 7: PERCENTAGE SHARE OF VARIOUS REGIONS IN TOTAL PULSES OUTPUT

GROUP OF STATES

Triennial Average ending in	A	B	C	D	E	F	G	H	ROI
1962	43.52	15.43	6.18	34.52	1.00	5.17	22.43	12.08	0.34
1965	40.77	19.36	6.92	32.49	1.08	5.84	22.60	9.88	0.44
1968	40.06	18.62	7.06	33.58	1.08	5.97	22.10	11.47	0.66
1971	37.75	15.99	8.05	37.61	1.22	6.82	24.16	13.45	0.58
1974	31.05	15.84	10.09	42.22	1.84	8.25	30.18	12.04	0.77
1977	31.91	13.80	8.85	44.77	1.50	7.34	26.53	18.24	0.64
1980	28.86	17.06	11.12	42.18	1.96	9.16	27.54	14.63	0.76
1983	24.06	16.72	11.25	47/45	1.93	9.31	30.45	16.99	0.50
1985	26.06	16.51	11.05	45.83	2.30	8.74	29.24	16.59	0.52

grains production. Such has been the lop-sided development of agriculture
production
/particularly of foodgrains after mid-sixties. It has been

already said that these were the four states which were

major beneficiaries of colonial investment in irrigation.[5]

Though the total pulses make very small proportions

of total foodgrains, even any increase in its share in

any region does not make much difference, but nevertheless

it is equally important to analyse the trends in the pulses.

The above table reveals a very contrasting picture

in comparison to total foodgrains. In total foodgrains

only North-Western region's (Group-A) share was increasing

remarkably and for rest of the regions, it was declining.

Whereas in case of total pulses only North-Western region's

share has declined drastically, i.e., from 42.2 percent

in 1962 to 28.37 in 1985. Whereas the percentage share

of West-Central region's (Group-D) share has increased

from 33.82% in 1962 to 44.28% in 1985. Similarly Southern

region's share has gone up. Eastern region share has also

declined but marginally. The increasing share of Southern

and West Central region in the output of total pulses does

not alter the declining trend in the contribution of total

foodgrains because of its small proportion in total food-

grains. In the increasing share of West Central region,

group G's i.e., Maharashtra and Madhya Pradesh has contributed

more than other two states i.e., Gujarat and Rajasthan

(Group H). Group G's share has increased from 22% to 28% and group H's share has increased from 12% to 16%.

The above discussion clearly explains the performance of various regions and India's in the foodgrains output. Simultaneously the aspect of rate of growth is equally important, without looking at the trends in the rate of growth of the output, it is very difficult to classify the regions into different categories. Moreover it makes the picture of regional imbalances more clear.

For this first of all we shall discuss trends in the growth rate of total foodgrains, total cereals and total pulses in all India which is as follows :

Table 8 : Trend Growth Rate of total foodgrains, total cereals and total pulses in India (% p.a.)

	TFGs	TCs	TPs
1960-65	-0.7	-0.2	-3.1
1963-68	3.0	3.5	-0.14
1966-71	6.5	6.8	4.3
1969.74	-0.5	-0.09	-3.9
1972-77	5.0	5.0	4.7
1975-80	1.0	1.6	-5.2
1978-83	3.6	3.6	3.9
1981-86	2.3	3.8	2.5
1960-74	2.075(2.4)	2.5(2.9)	-0.71(-0.9)
1972-86	2.9(3.0)	3.0(3.4)	1.5(1.4)
1960-86	2.7 (2.5)	3.5 (3.1)	0.38(0.3)

Source : Computed

Note: 1. Figures in brackets are the trend growth rates computed directly by fitting a trend.

2. For total cereals and total pulses data is upto 1985-86.

At all India level the performance of total foodgrains in last four overlapping reference periods is comparitively better than in the first four reference periods similar is the case of total cereals and total pulses. The growth rate of total foodgrains and total cereals ranged between -0.7 to +6.5 and -0.2 to 6.8 percent p.a. respectively and the growth rate for both total cereals and total foodgrains is negative in the same period. Whereas the performance of total pulses is disappointing as in the four out of eight reference periods its growth rate is negative.

For the subperiods i.e., 1960-74 and 1972-86 and for the period as a whole i.e., 1960-86 we have calculated the average growth rate (arithmatic mean) of first four reference six-year periods making up the first sub period (1960-74) and for the last four reference six-year periods making up the second subperiod (1972-86) and similarly for whole of the period we took the average of all eight reference six-year periods. At the same time we have also calculated directly the compound growth rate over the two subperiods as well as for the period as a whole. The latter

calculation is more affected by the end point values of output, than is the calculation based on averaging reference period trends. There is as expected a difference in the rates obtained, the averaging of reference period trends generally giving a lower growth rate than direct calculation, except in the case of pulses.

It is clear from the above table that in the second subperiod (1972-86), the performance at all India level is better than the first subperiod (1960-74). From the figures of growth rate for these two periods and for the whole period it can be said that at the best it could maintain the previous growth rate i.e., in the pre-green revolution period. While in case of pulses which is the major source of proteine for rural people, as it seems, that new HYV-seed technology does not have any impact on the production of pulses.

The performance of various regions regarding the trend/rate of growth of total foodgrains, total cereals and total pulses is as follows :

The following table and the appendix table for reference periods growth rates clearly substantiates the fact that the North Western region has recorded remarkably high growth rate of total foodgrains. Since the new HYV-seed-fertiliser-pe ticide technology depends on the availability of irrigation.

TABLE 9: TREND RATE GROWTH OF OUTPUT OF TOTAL
FOODGRAINS, TOTAL CEREALS AND TOTAL PULSES
IN VARIOUS REGIONS

Groups of States	1960-74			1972-86			1960-86		
	TFGs	TCs*	TPs*	TFGs	TCs*	TPs*	TFGs	TCs*	TPs*
A	3.37 (3.8)	4.9 (5.4)	-3.4 (-3.4)	5.22 (5.5)	6.0 (6.2)	0.5 (-0.6)	4.3 (4.5)	5.4 (5.5)	-2.9 (-2.1)
B	2.25 (1.9)	2.6 (2.2)	-1.0 (-1.3)	2.55 (1.6)	3.0 (1.3)	2.5 (2.5)	2.4 (1.7)	2.8 (1.8)	0.7 (-0.03)
C	1.42 (2.2)	1.3 (2.1)	3.6 (3.6)	0.32 (1.1)	0.1 (1.2)	2.6 (2.6)	0.87 (1.8)	0.7 (1.8)	3.1 (3.1)
D	0.8 (1.2)	0.8 (1.3)	1.0 (0.96)	2.6 (2.5)	3.4 (3.4)	1.8 (2.1)	1.7 (2.2)	2.1 (2.5)	1.4 (1.9)
E	0.52 (1.5)	0.5 (1.5)	2.8 (3.1)	-0.97 (-0.1)	-1.2 (-0.5)	4.9 (4.0)	-0.22 (0.9)	-0.4 (0.8)	3.8 (3.9)
F	1.87 (2.5)	1.8 (2.5)	3.8 (2.8)	1.1 (1.8)	1.0 (2.1)	2.2 (3.1)	1.49 (2.3)	1.4 (2.4)	3.0 (2.9)
G	0.3 (0.6)	– (0.4)	1.9 (1.4)	2.93 (2.6)	4.2 (3.6)	1.05 (1.6)	1.63 (2.01)	2.1 (2.3)	1.5 (1.7)
H	1.82 (2.3)	2.4 (2.8)	-0.9 (0.04)	1.6 (2.2)	2.0 (3.0)	3.5 (3.3)	1.71 (2.5)	4.4 (2.8)	1.3 (2.4)
ROI	7.1 (7.5)	7.0 (7.5)	6.6 (5.8)	3.4 (3.1)	4.3 (3.5)	-0.7 (-1.8)	5.2 (4.7)	5.7 (4.9)	3.0 (2.4)

TFGs   Total foodgrains
TCs   Total cereals
TPs   Total Pulses

* For total cereals and total pulses data is available upto 1985-86.

NOTES:

1. Rate of growth is the arithmatic mean of first four references, last four reference and all eight reference periods.

2. For overlapping segments trend growth rate see Appendix Table 1.

3. Figures in brackets are the growth rates obtained directly by fitting a trend to the series of these periods.

Undoubtedly, these three states (Punjab, Haryana and UP) have high base of irrigation.[6] Next to North-Western region, it is West-Central region. This region also inspite of negative growth rates in four out of eight overlapping periods, it has shown high growth rate in the second subperiod (1972-86). It was mainly because of favourable weather conditions in Maharashtra and Gujarat. [S. Mahendradev, EPW, Sep. 87]. Eastern region comprising Assam, Bihar, Orissa and West Bengal has registered very low or negative growth rate in most of the periods but in the later years i.e., from 1981-86 it has shown very high growth rate in total foodgrains output (7% p.a.) whereas for only total cereals it is 9.4% p.a.

Southern region is absolutely in the grip of stagnation inspite of good performance in output of total pulses. In case of pulses there is only North-Western region in which there is negative growth rate in two subperiods as well as in the whole period. Eastern region is also not performing well in the field of pulses. Only West Central and Southern region have recorded very high growth rate in the production of total pulses but because of its small proportion it could not change the overall position of total foodgrains.

TABLE 10: CORRELATION COEFFICIENT BETWEEN TOTAL CEREALS,
TOTAL FOODGRAINS AND TOTAL CEREALS, TOTAL PULSES
IN VARIOUS REGIONS

	1960-74		1972-86		1960-86	
	Total foodgrains and total cereals	Total cereals & total pulses	Total food grains and total cereals	Total cereals & total pulses	Total foodgrain and total cereals	Total cereals & total pulses
Group A	0.98	-0.36	0.99	0.01	0.99	-0.54
Group B	0.99	-0.35	0.99	0.63	0.99	0.09
Group C	0.99	0.84	0.99	0.75	0.99	0.90
Group D	0.99	0.84	0.99	0.80	0.99	0.90
Group E	0.99	0.78	0.99	0.18	0.99	0.49
Group F	0.99	0.86	0.99	0.91	0.99	0.94
Group G	0.99	0.67	0.99	0.66	0.99	0.83
Group H	0.99	0.79	0.99	0.70	0.99	0.81
Group ROI	0.99	0.87	0.99	-0.27	0.99	0.60
All India	0.99	0.08	0.99	0.72	0.99	0.43

(SOURCE: COMPUTED)

In most of the regions there is a very high correlation coefficient between output of total cereals and total food-grains while the correlation coefficient between total cereals and total pulses it is negative or very low particularly in North-Western region whereas in Southern and West Central region it is quite good.

The rural population of India leans heavily on pulses for the derivation of basic proteins. Unfortunately there has been a virtual stagnation in the production of total pulses. The question is why this extra ordinarily gloomy performance in the field of pulses ? The part of the explanation may be that the difficulties faced in evolving suitable seeds. Further the prevalence of high prices for other grains, as well as more dependable production of these crops. Besides the increased yield of cereals due to improved seeds and irrigation facilities. The system of support prices and government purchases increased the profitability of cereals viz-a-viz those crops which did not have support prices in general and pulses in particular. Also it can be expected that after green revolution period the increased variability in pulses is because these are grown under unirrigated and uncertain rainfall conditions.[7]

We have decomposed the growth rate of total foodgrains into area under total foodgrains and average yield level

of foodgrains. In the following lines we shall discuss the performance of these factors. Before discussing these issues we shall explain briefly the trends in total cropped area, net sown area and cropping intensity in different regions and in India.

Table 11 : Trend Growth Rate of Gross Cropped Area and Net Sown Area in different Regions

Groups of States	1962-74		1972-84		1962-84	
	GCA	NSA	GCA	NSA	GCA	NSA
A	0.7	neg.	1.0	0.07	0.8	0.05
B	0.4	0.06	0.6	-0.2	0.6	-0.01
C	0.4	0.05	-0.02	-0.1	0.01	-0.1
D	0.6	0.4	0.8	0.04	0.7	0.3
E	0.7	0.4	-0.7	-0.6	neg.	-0.1
F	0.2	-0.05	0.3	0.06	0.2	-0.09
G	0.6	0.4	0.8	0.4	0.7	0.3
H	0.6	0.2	0.8	0.4	0.7	0.3
ROI	4.2	3.7	0.7	0.7	2.5	2.6
INDIA	0.6	0.2	0.6	0.1	0.6	0.2

(Source: Computed)

neg. - negligible

Note: 1. Data is from 1962-84. Figures after 1982 are provisional.

2. Trend growth rates have been obtained by directly fitting a trend to the series.

From the above table and from the absolute figures [see Appendix Table No. 2] it becomes clear that there is a small increase in the Gross Cropped Area in India. The maximum increase took place in the North-Western and West-Central region apart from the rest of India. In the Southern region (Group C) there was slight decline in gross cropped area in period 1972-84 clearly on account of decline in subgroup E, while in net sown area both Eastern and Southern region have shown a negative growth rate during 1972-84, resulting in slight negative value for the entire period. While in other two regions i.e., North-Western and West Central and in India there is a very low positive growth rate.

Therefore change in cropping intensity did not contribute much to the increase of total foodgrains output. Only in the North-Western region after the inception of green revolution technology cropping intensity has increased quite a bit, from 128.7 to 150.3 followed by Eastern India which has seen a 14 percent rise over 123.7 in 1962.

As it is a well known fact that growth in foodgrains production is primarily determined by level of technology. Area under total foodgrains after mid-sixties expanded at a very low growth rate and it was only the productivity

TABLE 12: CROPPING INTENSITY OF DIFFERENT REGIONS

BY TRIENNIUAL AVERAGE

Triennium ending in	A	B	C	D	E	F	G	H	ROI	ALL-INDIA
1964	128.14	123.55	110.82	107.93	119.82	107.51	109.04	106.29	132.50	115.07
1965	127.60	123.77	110.82	107.31	119.85	107.45	108.15	106.07	131.83	114.74
1968	130.50	125.21	112.50	107.07	121.80	108.93	107.16	106.95	149.00	115.91
1971	134.46	126.52	113.73	108.92	123.42	109.98	109.03	108.75	139.84	117.82
1974	136.66	126.48	114.09	109.53	124.16	110.20	109.49	109.59	143.55	118.60
1977	138.84	131.95	114.36	112.27	124.54	110.30	113.11	111.04	120.08	120.79
1980	144.27	134.08	115.38	112.27	124.78	111.75	112.02	112.63	138.08	122.56
1983	149.05	137.06	114.74	114.81	121.97	112.15	114.34	115.50	136.87	124.69
1984	149.41	137.91	115.26	114.35	122.28	112.71	114.85	113.62	137.21	124.81

NOTE: COMPUTED AS CROPPING INTENSITY = GROSS CROPPED AREA/NET SOWN AREA X 100

AREA UNDER TOTAL FOODGRAINS (000"HA) — GROUP A,B,C,D

GRAPH 3.

| 55000 |
| 50000 |
| 45000 |
| 40000 |
| 35000 |
| 30000 |
| 25000 |
| 20000 |
| 15000 |

60 62 64 66 68 70 72 74 76 78 80 82 84 86

___ A   ......B   ___C   ___D
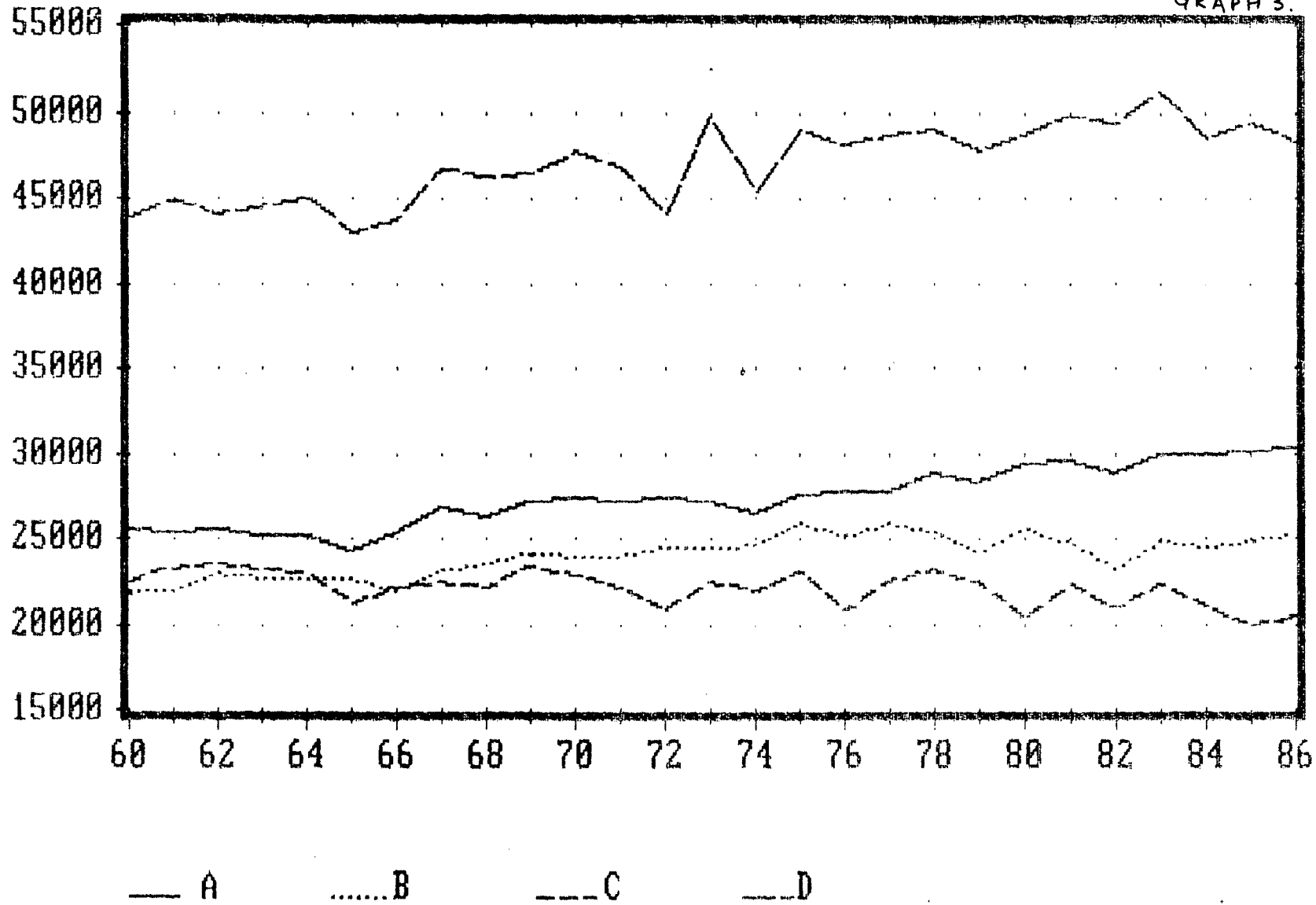
AREA UNDER TOTAL FOODGRAINS (000''HA) — INDIA

GRAPH 4.

___ INDIA

of land which increased tremendously during last one and half decade. [Graph 3 & 4] Trends in Area under total foodgrains and yield per hectare of total foodgrains in different regions :

In most of the regions the growth of area under total foodgrains is either negative or very low. There is a very small rise in the area under foodgrains in North-Western region (G roup A) and West Central region (Group D) in both subperiods i.e., 1960-74 and 1972-86. In the Eastern region there was a small rise in it in first period but in second subperiod it has declined though marginally. In the Southern region in both subperiod as well in the entire period the rate of growth of area under total food-grains is negative. While for all India it is more or less the same. Therefore it is the yield per hectare which resulted in increase in the output of foodgrains, which is evident from the following discussion.

The following   table makes it abundantly clear that area under total foodgrains has remained either stagnant or declined in most of the regions. In Southern region the growth rate, in six out of eight reference periods, is negative, as well as it is negative both subperiods and entire period. Only in North-Western region and West Central region the growth rate is positive in both subperiods and

TABLE 13: TREND GROWTH RATE OF AREA UNDER TOTAL FOODGRAINS IN DIFFERENT REGIONS BY REFERENCE PERIODS

GROUPS OF STATES

	A	B	C	D	E	F	G	H	ROI	INDIA
1960-65	-0.9	0.8	-1.0	-0.3	-0.2	-1.3	-0.5	0.2	-0.2	-0.2
1963-68	1.3	0.6	-0.8	0.9	-0.2	-1.0	1.0	0.6	0.7	0.7
1966-71	1.3	1.7	0.3	1.2	0.8	0.1	0.9	1.5	1.2	1.2
1969-74	-0.4	0.5	-1.2	-0.1	-2.0	-1.0	0.1	-0.6	-0.2	-0.2
1972-77	0.4	1.2	0.6	1.3	0.1	0.8	2.4	-0.5	1.0	1.0
1975-80	1.2	-0.6	-1.1	-0.1	-2.4	-0.6	0.3	-0.8	-0.1	-0.1
1978-83	0.7	-0.7	-0.9	1.0	-3.1	-0.1	0.6	1.8	0.3	0.3
1981-86	0.7	0.9	-1.8	-0.6	-0.6	-2.2	-1.1	-1.1	-0.2	-0.2
1960-74	0.3 (0.6)	0.9 (0.9)	0.68 (0.4)	0.43 (0.5)	-0.4 (-0.5)	0.8 (0.5)	0.38 (0.8)	0.4 (0.6)	0.4 (3.7)	0.2 (0.3)
1972-86	0.75 (0.9)	0.2 (-0.1)	-0.8 (-0.5)	0.4 (0.4)	-1.5 (-1.3)	-0.5 (-0.2)	0.55 (0.6)	-0.1 (0.1)	0.25 (0.9)	0.25 (0.4)
1960-86	0.54 (0.8)	0.55 (0.5)	-0.96 (-0.4)	0.4 (0.5)	-0.95 (-0.6)	-0.66 (-0.3)	0.46 (0.6)	0.14 (0.3)	0.3 (2.2)	0.3 (0.4)

SOURCE: COMPUTED

NOTE:

Figures in brackets are obtained directly by fitting a trend.

in the entire period. On the other hand the Eastern has shown negative growth in the second subperiod i.e., 1972-86. In all India it has remained same, from 0.3% in 1960-74, it has increased to 0.4 in 1972-86.

As we have already seen that in the percentage contribution in total foodgrains output by various regions, the North Western region's share increased markedly While rest of all other regions' share has declined. To see whether it is because of that percentage share of each regions' area under total foodgrains to total area under foodgrains of India is also showing the same trend.

In the North Western region whose share in the total foodgrains output has increased very sharply but its share in Area under total foodgrains to total area under foodgrains has increased very marginally. And the West Central region whose share in total output has declined continuously without any decline in the percent share of area under foodgrains to total area under foodgrains. There is a distinct decline in the percent share of area under foodgrains to total area under foodgrains in the Southern region (Group C) owing to decline in both of its subgroups i.e., group E and group F. Which are Tamilnadu, Kerala and Karnataka, Andhra Pradesh respectively. For Eastern Region initially it was stagnant then in 1971 it increased slightly and again became stagnant.

TABLE 14: PERCENTAGE SHARE OF EACH REGION IN TOTAL AREA UNDER
FOODGRAINS

GROUPS OF STATES

Triennium ending in	A	B	C	D	E	F	G	H	ROI
1962	21.84	19.00	19.80	37.92	5.08	14.72	24.23	13.69	1.41
1965	21.391	19.47	19.32	38.01	5.06	14.25	24.19	13.82	1.80
1968	21.96	19,17	18.65	38.28	4.93	13.71	24.40	13.88	1.92
1971	22.07	19.44	18.43	38.05	4.93	13.49	24.05	14.00	1.98
1974	22.08	20.01	17.77	37.95	4.76	13.00	24.15	13.80	2.17
1977	21.81	20.22	17.45	38.30	4.73	12.72	24.92	13.37	2.18
1980	22.66	19.69	17.28	38.15	4.47	12.81	25.03	13.12	2.18
1983	22.90	18.85	16.96	39.01	4.07	12.89	25.14	13.86	2.26
1986	23.68	19.56	16.06	38.34	4.12	11.93	25.06	13.27	2.33

Now we shall discuss second source of increase in the output of foodgrains i.e., yield per hectare which is the result of new HYV-biochemical technology and this is a factor which has mainly accentuated the regional differences after mid-sixties.

Whereas in the triennium ending 1962 the average yield was around a similar level of 730 to 830 kg/ha. in regions A, B, and C, and lower at 520 kg/ha. in region D, by the last triennium ending 1986, region A had the highest yield of 1830 kg/ha followed considerably behind by regions B and C with around 1200 kg/ha. Region D appears to have fared worst with little rise in yield and remained in the last portion with only 680 kg/ha. Such a remarkable performance by North-Western region (Group A) in the yield level particularly after 1972 as compared to other regions has left various question in the mind. As we know and also we have seen in chapter two from the various empirical studies for instance, S. Mahendradev, M. Zarkovic and others that the reasons for such a high level of yield/ha is the high irrigation base. In North-Western region it has become more than double during the period of 1960-86. While other regions i.e., Eastern and Southern regions yields have risen moderately only, in the West-Central region, yield has increased at a very low growth rate (Graph 5 & 6).

TABLE 15 :   AVERAGE YIELD/HEC.(KG.) OF DIFFERENT REGIONS
                IN TOTAL FOODGRAINS OUTPUT

Triennium ending in	A	B	C	D	E	F	G	H	ROI	ALL INDIA
1962	783.48	829.42	743.22	522.17	1114.39	614.97	561.58	451.65	822.46	685.67
1965	785.32	871.51	782.10	492.69	1120.23	662.11	526.59	432.70	800.07	690.35
1968	894.79	875.27	845.09	501.96	1171.00	727.72	526.47	456.92	1100.97	735.75
1971	1110.78	941.54	939.51	577.92	1316.56	801.15	558.58	608.51	1188.88	845.00
1974	1047.10	921.21	1000.34	532.42	1325.88	875.99	554.01	492.38	1146.10	821.16
1977	1261.94	979.87	1054.49	672.84	1401.30	925.04	666.42	684.25	1254.92	943.16
1980	1357.48	971.00	1146.20	648.54	1442.21	1042.48	647.96	649.59	1306.57	973.88
1983	1602.64	991.42	1182.41	748.45	1417.87	1107.44	740.83	762.34	1308.95	1076.42
1986	1829.00	1172.34	1203.89	684.40	1596.69	1070.87	706.07	644.25	1567.11	1155.19

GROUPS OF STATES

SOURCE: COMPUTED

OTE: Average yield/hec. is (Output of all foodgrains) / (Gross cropped area   for the agricultural year.
                                                        under all foodgrains)

YIELD/HA OF TOTAL FOODGRAINS (KG) - GROUP A,B,C,D

GRAPH 5.
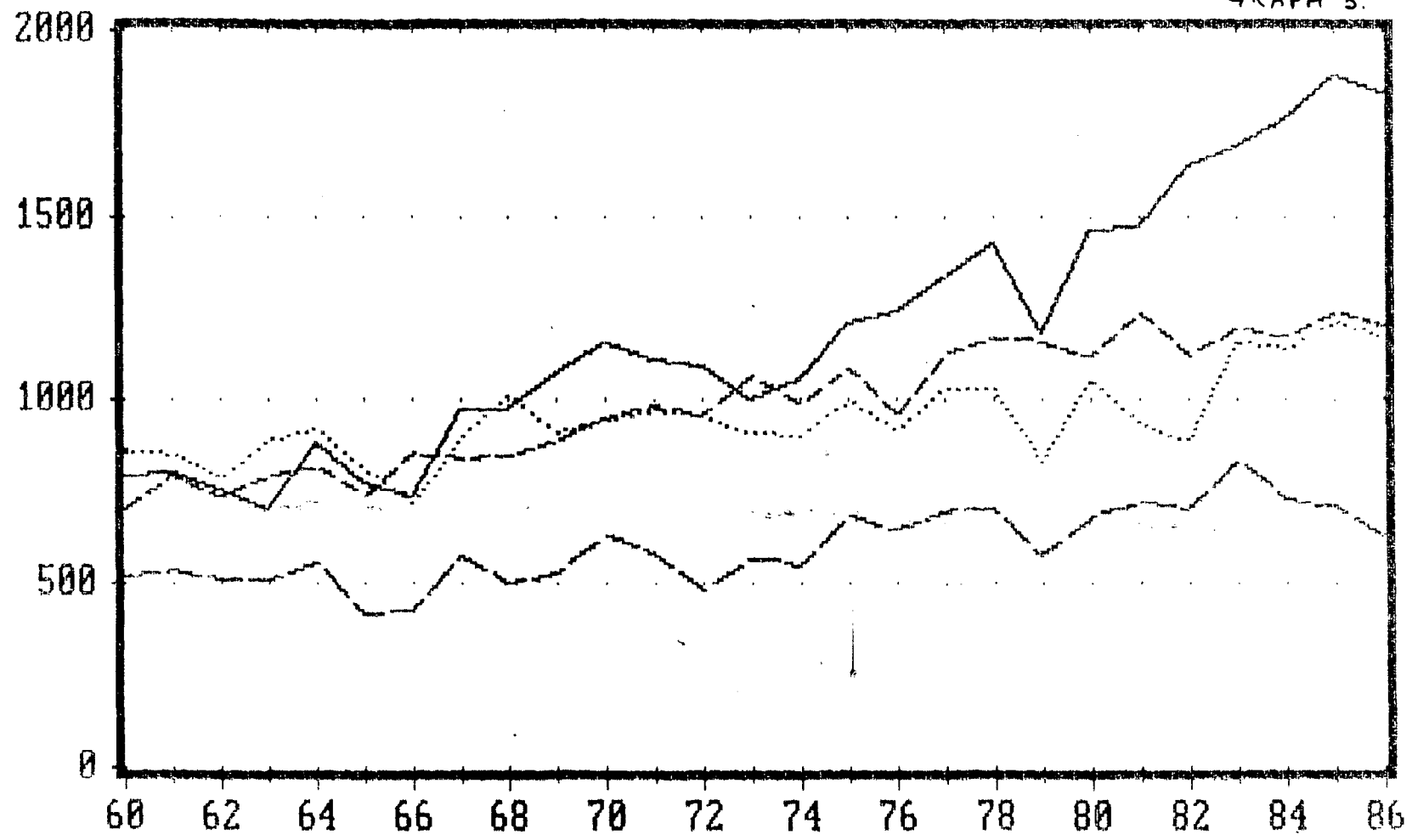
Legend:
——— A   ....B   ———C   ———'D

YIELD/HA OF TOTAL FOODGRAINS (KG) — INDIA

GRAPH 6.
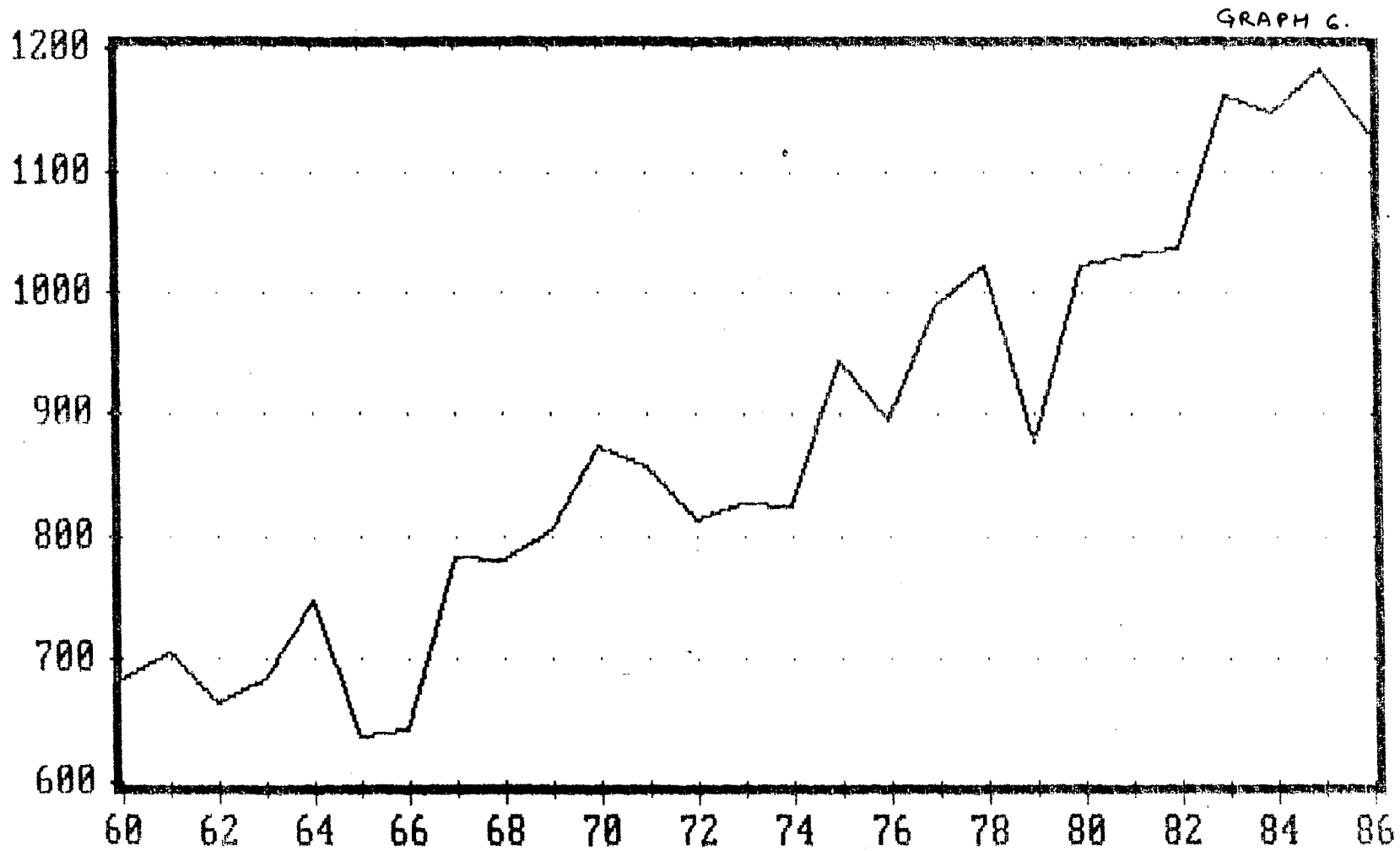
——YIND

It becomes more clear from the table of growth of yield/ha of foodgrains.

Table 16 : Trend Rate of Growth of Average yield/ha of foodgrains in different regions by reference periods

Groups of States

Period	A	B	C	D	E	F	G	H	ROI	INDIA
1960-65	0.3	0.2	1.2	-3.0	-0.2	1.9	-4.0	-0.5	-0.4	-0.4
1963-68	5.6	1.3	1.6	0.1	0.6	2.1	-0.3	0.8	2.3	2.3
1966-71	7.8	4.6	3.3	5.1	3.7	2.9	3.0	8.8	5.2	5.2
1969-74	-1.5	-0.5	2.4	-0.8	-0.3	3.8	0.9	-3.8	-0.2	-0.2
1972-77	5.2	1.5	1.7	7.2	0.6	2.7	6.2	8.9	4.0	4.0
1975-80	2.5	0.0	2.1	-1.0	0.5	3.2	-0.3	-2.3	·1.1	1.1
1978-83	5.4	1.9	0.3	4.5	-1.9	1.5	4.3	5.0	3.3	3.3
1981-86	4.5	6.1	0.4	-2.2	3.0	-0.9	-1.2	-4.2	2.5	2.5
1960-74	3.05	1.4	2.1	0.35	0.95	2.7	-0.1	2.7	1.7	1.7
	(3.2)	(1.0)	(2.6)	(0.7)	(1.6)	(3.0)	(0.1)	(1.8)	(1.9)	(1.9)
1972-86	4.4	2.4	1.1	2.1	0.55	1.6	2.25	1.85	2.7	2.7
	(4.5)	(1.7)	(1.6)	(2.0)	(1.2)	(2.0)	(2.0)	(2.1)	(2.7)	(2.7)
1960-86	3.7	1.9	1.6	1.2	0.75	2.1	1.1	1.6	2.2	2.2
	(3.7)	(1.1)	(2.2)	(1.7)	(1.4)	(2.6)	(1.4)	(-2.1)	(2.3)	(2.3)

Note: Figures in brackets are trend growth rates obtained directly fitting a trend.

From the above table a particular feature becomes very clear that in all four major regions (Group A, B, C & D) and all India the growth rate of yield per hectare in the second subperiod has increased compared to first subperiod

i.e., from 1960-74 to 1972-86 except in the Southern region. In the Southern region from 1960-74 it was 2.6% in 1960-74 but it declined to 1.6% in 1972-86. And it is only Southern region in which in all eight reference periods the rate of growth of yield per hectare is positive. Whereas in West Central region it has increased in the second subperiod 19,72-86 remarkably as compared to the first subperiod. It may be because of good rainfall in the seventies which increased yield level of both Gujarat as well as Maharashtra. In the Eastern region the rate of growth is positive but very low. From 1981-86 it has shown very high growth rate. In this chapter while discussing all issues we have found that Eastern region is performing well in terms of rate of growth in the later years. (last reference period, i.e., 1981-86). We shall further discuss the aspect of yield per hectare of foodgrains while discussing percapita output of foodgrains in the following chapter.

If we look at a graph of yield per hectare of foodgrains for the four major regions as well as all India it becomes very much clear that in the last year after 1985-86 the yield per hectare of foodgrains has declined.

Finally, it can be summed up as follows : there are large inter-regional variations after mid-sixties which

resulted in uneven development and concentration in limited areas. North-Western region is on one hand and all other regions are on the other. Certainly there are some favourable characteristics in North-Western region such as land-man ratio is very high and the irrigation base is also quite high so it is not surprising if this region has recorded very high growth rate. But the stagnation in other regions poses a serious problem in front of the policy makers as we have seen that even in North-Western region in later years, after 1985, yield per hectare intended to decline without any decline in Area under total foodgrains.

Finally we would like to see what is happening in the field of non foodcropoutput. We shall explain the trends in non food crops output, area under nonfood crops and average yield/ha. for three nonfood crops namely sugarcane, total oilseeds and cotton.

From [Table 3 in Appendix] the production of nonfood crops it is clear that except sugarcane the other two crops are having very low weightage in the total agricultural produce. Our basic purpose to see the trends in these nonfood crops is that in the regions where foodgrains production is not rising sufficiently, are these nonfood crops growing largly or displacing foodgrains. We have seen the trends in the growth rate of these crops, which are as follows :

TABLE 17: TREND RATE OF GROWTH OF NON FOOD CROPS
IN DIFFERENT REGIONS

	A	B	C	D	E	F	G	H	ROI	INDIA
Sugarcane										
1960-74	2.8	0.9	6.7	3.5	10.2	5.1	2.8	7.7	7.5	3.6
1972-86	2.5	-0.8	2.2	5.1	3.0	1.5	4.5	7.6	0.8	2.6
1960-86	2.6	0.06	4.4	4.3	6.6	3.3	3.6	7.6	4.2	3.1
Total Oilseeds										
1960-74	2.9	6.3	3.7	-0.2	0.8	5.9	0.7	-1.2	6.9	2.2
1972-85	-3.1	7.8	0.7	5.3	-2.4	2.2	6.3	4.6	6.5	2.2
1960-85	-0.1	7.0	2.2	2.5	-0.8	4.0	3.5	1.7	6.7	2.2
Cotton										
1960-74	3.9	0.5	2.2	0.9	-3.57	5.4	-1.05	2.3	4.6	1.75
1972-85	0.05	-3.75	5.4	1.1	4.5	6.05	1.5	0.9	3.3	1.85
1960-85	1.96	-1.6	3.8	1.0	0.5	5.7	0.2	1.6	3.98	1.8

NOTE:

1. For total oilseeds and cotton data is upto 1985-86

2. Growth rate has been obtained by taking the average of trend rate of growth of first four reference periods, last four reference period and all eight periods. For the trend growth rate of all reference periods and for trend growth rate obtained directly by fitting a trend to two sub-periods and entire period (See Appendix Table No. 4).

In case of sugarcane southern and west central region have registered quite high growth rate as compared to other two regions. North western region (group A) is growing at nearly the same rate over the two sub periods 2.8% p.a. and 2.5% p.a. respectively, the rate over the entire period being 2.6% p.a. But the performance of Eastern region in field of sugarcane also is worst. As it has declined to -0.8% p.a. in second subperiod from 0.9% p.a. (low but positive) in first subperiod. In southern region the increase is clearly on account of increase in sub group E (Tamilnadu and Kerala) and in west central region it is due to sub group H (Rajasthan and Gujarat). In all India its growth rate has declined in the second sub period.

In case of total oil seeds the Eastern region has occupied the pride of place among the four major regions. Apart from Eastern region, Southern and West central region are moving in opposite direction, as southern region's growth rate is declining in the second period while west central region's is increasing remarkably from negative growth rate in first sub period. Increase in southern region is because of high growth in sub group (Andhra Pradesh and Karnataka) and in West central region it is clearly on account of increase in sub group g (Maharashtra and Madhya Pradesh). In India the rate of growth has remained same in both sub periods as well as in the entire period. And the north western region which

registered a positive growth rate in the first sub period dec-
lined to negative growth rate which resulted in negative value
in the entire period.

In production of cotton sufficiently high growth rate
has been registered by southern region (group C) followed by
north western region (Group A). In which growth rate declined
in the second sub period. West central region registered positive
growth rate but it is very low. In southern region the increase
is entirely because of rapid increase in the growth rate of
sub group F (Andhra Pradesh and Karnataka). In India the growth
rate of cotton production has remained more or less same.

Thus in the production of non food crops, Eastern region
is performing well only in the field of total oilseeds. While
southern and west central regions are performing well in output
of sugarcane but in the case of total oilseeds and cotton also
they are better as compared to other regions and the north
western region is doing well, along with remarkable performance
in foodgrains production, only in sugarcane somehow.

In the following lines, we shall discuss the trends
in area under these non food crops and average yield/hec.

In area under sugarcane,   very high growth took place
in two regions i.e. Southern (Group C), and West Central region
(Group D). Southern region followed the same trend i.e. in

TABLE 18: TREND RATE OF GROWTH OF AREA UNDER
SUGARCANE, TOTAL OILSEEDS AND COTTON IN TWO SUB-
PERIODS AND IN THE PERIOD AS A WHOLE

GROUPS OF STATES

	A	B	C	D	E	F	G	H	ROI	INDIA
SUGARCANE										
1960-74	0.9	-0.5	5.1	2.1	6.7	4.2	1.7	3.5	1.4	1.5
1972-86	0.5	-0.6	1.3	3.0	1.7	1.4	2.8	3.4	0.3	0.8
1960-86	0.7	-0.55	3.2	2.5	4.2	2.8	2.2	3.45	0.8	1.1
TOTAL OILSEEDS										
1960-74	0.8	3.0	2.7	0.9	2.0	3.0	2.1	-0.5	5.5	1.5
1972-86	-4.8	5.2	0.7	2.9	-0.3	1.3	3.0	2.9	4.9	0.95
1960-86	-2.0	4.1	1.7	1.9	0.8	2.1	2.5	1.2	5.2	1.2
COTTON										
1960-74	1.8	-8.7	-0.4	-0.5	-3.45	0.4	-1.1	0.35	4.1	-0.3
1972-86	0.8	0.2	-0.02	-0.4	-1.55	0.25	0.4	-1.7	-0.6	-0.2
1960-86	1.3	-4.2	-2.0	-0.5	-2.5	0.3	-0.35	-0.7	1.7	-0.25

(SOURCE: COMPUTED)

NOTE:

Growth rates have been obtained by averaging the first four,
last four and all eight reference periods; for growth rate
of all reference periods and growth rate in two sub period
obtained directly by fitting a trend (See appendix Table No.5.)

the second sub period it declines while for west central region it increases. West central region's high growth rate is clearly because of sub group H (Rajasthan and Gujarat). In the eastern region the growth rate is negative in both sub periods as well as in the entire period as a whole. North western region has registered positive but very low growth rate. In India also it remained quite low. But southern and west central region as compared growth rate of area under total foodgrains, it is very high.

As has been seen that eastern region (Group B) is doing well in the field of total oilseeds production only. There is no doubt that area under total oilseeds also increased in this region. While in north western region it declined to -4.8% in second sub period from 0.8% p.a. in first sub period. Southern and west central region, both have positive rate of growth but in the second sub period in southern region it has declined while in west central region it has increased. In India, it has declined in the second sub period.

The rate of growth of area under cotton is highest in North Western region. While in southern region, west central region and in India it is negative in both sub periods as well as in the entire period. Eastern region has shown slight recovery in the second sub period. It is remarkable that southern and west central region have shown positive growth in production of cotton inspite of its negative growth rate of area under

cotton which shows that average yield per hectare has contributed much for this.

While discussing the level of average yield/ha. that except sugarcane, it is quite low for total oilseeds and cotton (See appendix table 6).

Now we shall see the trends in trend rate of growth of average yield/ha. of three non food crops, which is as follows:

From the following table the growth of average yield/ha of sugarcane is highest in the north western region followed by west central and southern region, in southern region the growth is clearly on account of high growth in sub group E (Tamilnadu and Kerala). For total oilseeds also, the north western region is registering constant sufficiently than other regions followed by Eastern region. West central region has registered positive trend growth rate in the second sub period from its negative value in the first sub period. On the whole for India its growth rate remained very low.

For cotton the highest rate of growth is achieved by southern region (Group C). In west central region also its value is positive in both sub periods as well as in the entire period. North western region (Group A) had positive growth rate in the first sub period but it declined to negative value in the second sub period. Eastern region (Group B)

TABLE 19: TRENDS IN RATE OF GROWTH OF AVERAGE
YIELD/HA.

GROUPS OF STATES

	A	B	C	D	E	F	G	H	ROI	INDIA
SUGARCANE										
1960-74	1.8	1.4	1.65	1.4	3.2	0.6	1.1	3.8	6.0	2.1
1972-86	2.0	0.02	0.65	1.8	1.3	-0.2	1.4	3.9	0.4	1.7
1960-86	1.9	0.7	1.15	1.6	2.2	0.2	1.2	3.85	3.2	1.9
TOTAL OILSEEDS										
1960-74	2.1	3.1	0.9	-1.2	-1.3	2.4	-1.5	-0.8	1.4	0.7
1972-85	2.1	0.9	-0.02	2.2	-1.3	0.9	3.2	1.6	1.6	1.2
1960-85	2.1	2.0	0.44	0.5	-1.3	1.6	0.8	0.4	1.5	0.9
COTTON										
1960-74	2.1	10.8	2.55	1.4	-0.05	5.0	0.3	2.0	2.05	2.1
1972-85	-0.6	-4.1	5.7	1.5	5.9	5.8	1.1	2.6	2.05	2.1
1962-85	0.75	3.35	4.1	1.5	2.9	5.4	0.7	2.3	2.05	2.1

NOTE:

For trend growth rates for all reference periods for these
non food crops and for trend growth rate, for two sub periods
and for entire period, obtained directly by fitting a trend,
see Appendix Table No. 7).

registered highest growth rate in the first sub period but became negative in the second sub period. For India it remained stagnant in both sub periods as well as in the period as a whole.

From the above discussion of trends in non food crops (output, area and average yield), particularly from the performance of average yield/ha. it seems that north western region, in the field of non food crops also, is performing well. No doubt that other regions are in better position but it is difficult to say that those regions (where growth rate of foodgrains production is insufficient), they have compensated by the growth of non food crops as we know that except sugarcane,other two crops have very low weightage in total crop production.

NOTES

1. P.C. Aggarwal, The Green Revolution and Rural Labour-A study in Ludhiana, New Delhi Press (for Sri Ram Centre), Delhi, 1973; Pranab Bardhan, "Regional variations in the Rural Economy', EPN, July 23, 1983; G.S. Bhalla and Y.K. Allagh, Performance of Indian Agriculture: A District-wise Study, New Delhi; Sterling Publishers, 1979. G.S. Gosal and Gopal Krishan, 'Regional Distribution in levels of socio-economic development in Punjab', Vishal Publications, Kurukshetra, 1984.

2. G. Blyn, 'Agricultural trends in India, 1891-1947: Output, Availability and Productivity, Philadelphia, Pennyslavania, 1966.

His methodology is as follows :

He has divided the full length period into ten over-lapping segments between population census years and between mid-census decades. He has taken an arithmatic mean of the ten decade rates as the average trend rate over the whole period. According to him, by fitting a trend to short segment rather than to the entire length of series, only the data within given segment determines the trend rate which is derived. Because, by fitting a trend to entire series, the trend in the given segment mainly depends on the data of other years. He has obtained the trends by fitting simple exponential equations to over-lapping segments, for some purpose he has fitted straight line arithmatic or semi-logrithmic trend. He has used five years moving averages, to make the series smooth, giving advantages as well as disadvantages of using moving average to explain the trends. (For details, see, G. Blyn, pp. 82-85).

3. G. Blyn, (1966), op. cit.

4. Chapter two.

5. Krishna Bharadwaj "Regional Differentiation in India", Economic & Political Weekly, April Annual Number (1982).

6. M. Zarkovic, 'Issues in Indian Agricultural Development" (1987), West View.

7. Hanumantha Rao, S.K. Roy and K. Subbarao, 'Unstable Agriculture and Droughts' (1988), pp. 19.

CHAPTER 4

TRENDS IN PER CAPITA OUTPUT OF
FOODGRAINS AND SELECTED NON FOOD CROPS

To continue our effort to understand the regional dimension of foodgrains production in India we shall take up the issue of percapita output of foodgrains and pulses alongwith the brief presentation of trends in percapita output of nonfood crops in the present chapter.

In the previous chapter while discussing the production and trends in growth of foodgrains production we found that it has trebled from 50 m.tons in 1951 to around 150 m.tons by 1983-84; after four years of stagnation culminating in drought in 1987-88, and an estimated output of only 13. . the upswing of the cycle has carried production to a new peak of estimated 170 m.tons in the current year, 1988-89. However our last reference year is 1986-87, before either the drought or upswing. This is undoubtedly an impressive achievement as it not only made India self-sufficient [1] in foodgrains but also broke the shackles of stagnation in the foodgrains production prevalent in pre-independence period. Nevertheless we feel that the more vital issue is the percapita output of foodgrains which tells us whether foodgrains production has been able to keep pace with the increasing population or not. The picture on this aspect is not very rosy and we shall elaborate it with the evidences in the following lines. The Indian population which was 452 millions in 1960-62 (triennial average) increased with a rate of 2.3% p.a. and became 772 millions in 1984-86 (triennial average). The foodgrains output increased from 80 m.tons in 1960-62 (triennial average) to around 147 m.tons in 1984-86 with

the rate of growth of 2.7% p.a. Thus it is amply clear that for this period the foodgrain production has barely kept pace with the growth of pupulation. To see whether this type of picture continued all along the taken period or there were variations in between. We divided the entire period into two subperiods viz, 1960-74 and 1972-86. In the first subperiod i.e., 1960-74 population increased at the rate of growth of 2.2% p.a. while that of total foodgrains increased at the rate of 2.4% p.a. But in the second subperiod output of foodgrains increased at faster rate (3% p.a.) as compared to population which increased at the same rate i.e., 2.2% p.a. Thus at all India level the percapita output of foodgrains grew faster in the second subperiod.

The whole picture will become clear if we look at a table showing the annual percapita output of foodgrains of various regions as well as for whole of India.

From the following table and graphs showing annual percapita foodgrains output, it is evident that except North Western region where percapita foodgrains output has risen, the other major regions show a dismal picture of decline. The rise in North Western region however is large enough to compensate for decline in every other region so that the all-India value shows a small rise. Calculating the growth rate of percapita output simultaneously, we first look at the growth rate of entire period i.e., from 1960-61 to 1986-87:

Table 1 : Annual Percapita output of total foodgrains,

(Kg; Triennial Average)

GROUPS OF STATES

Triennium ending in	A	B	C	D	E	F	G	H	ROI	INDIA
1962	210.9	162.2	152.3	198.6	127.6	173.2	214.0	171.5	95.6	177.2
1965	194.5	162.4	146.9	174.0	120.0	169.7	185.9	153.0	106.9	166.4
1968	220.9	154.6	147.3	169.9	117.4	172.8	178.3	155.1	148.0	170.2
1971	269.0	163.7	157.1	187.3	127.9	182.2	179.8	200.4	149.1	189.3
1974	235.6	152.9	150.4	158.3	116.6	179.2	165.0	146.7	143.5	170.2
1977	271.2	159.5	152.2	194.0	119.9	179.4	197.8	187.5	150.0	189.3
1980	283.4	144.8	154.4	174.1	111.4	189.9	181.3	161.7	143.0	183.2
1983	318.8	134.5	148.3	193.6	95.0	192.0	197.2	187.6	139.4	191.6
1986	346.5	152.9	132.6	160.3	100.7	158.5	173.5	138.5	158.6	190.1

(Source: Computed)

PERCAPITA OUTPUT
TOTAL FOODGRAINS
BY TRIENNIAL AVERAGE

ANNUAL PER CA ITA OUTPUT
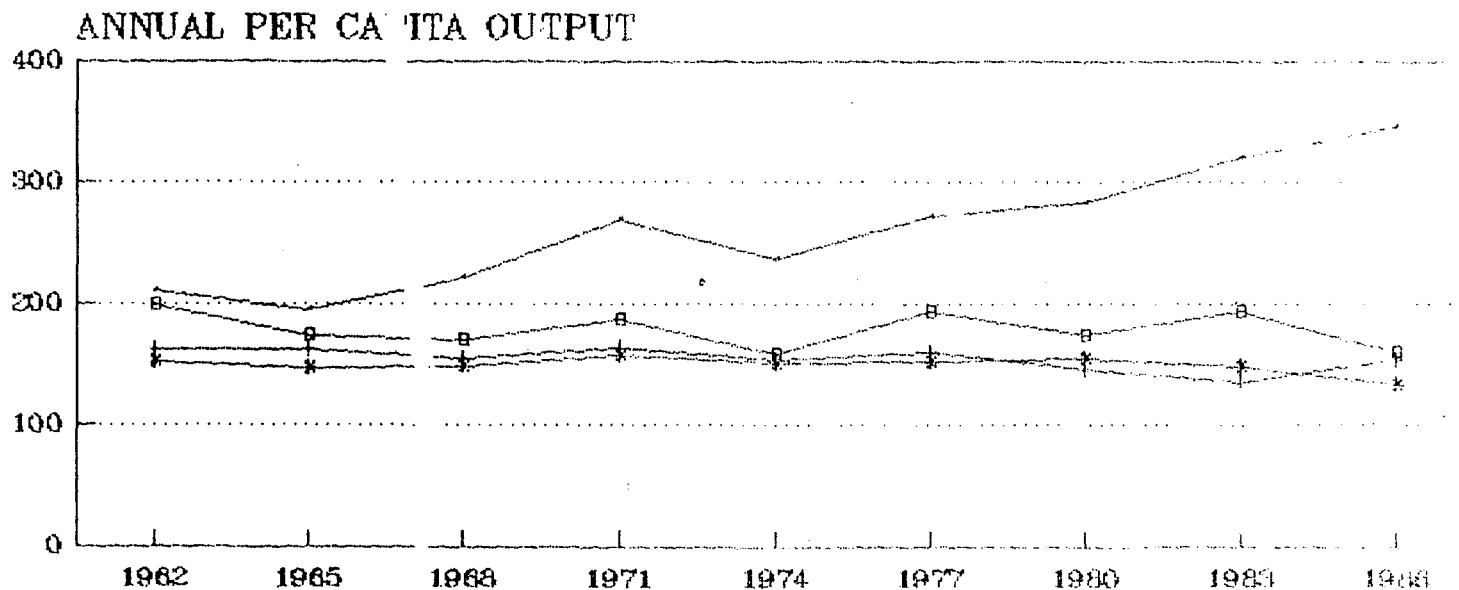
TRIENNIAL AVERAGE ENDING IN

—— Series A   ·+· Series B   ·*· Series C   ·o· Series D

Group—A=North Western Region
Group—B=Eastern, Group—C=Southern
Group—D=West—Central Region

GRAPH 2

PERCAPITA OUTPUT OF
TOTAL FOODGRAINS IN INDIA
BY TRIENIAL AVERAGE

ANNUAL PER CAPITA OUTPUT

TRIENNIAL AVERAGE ENDING IN
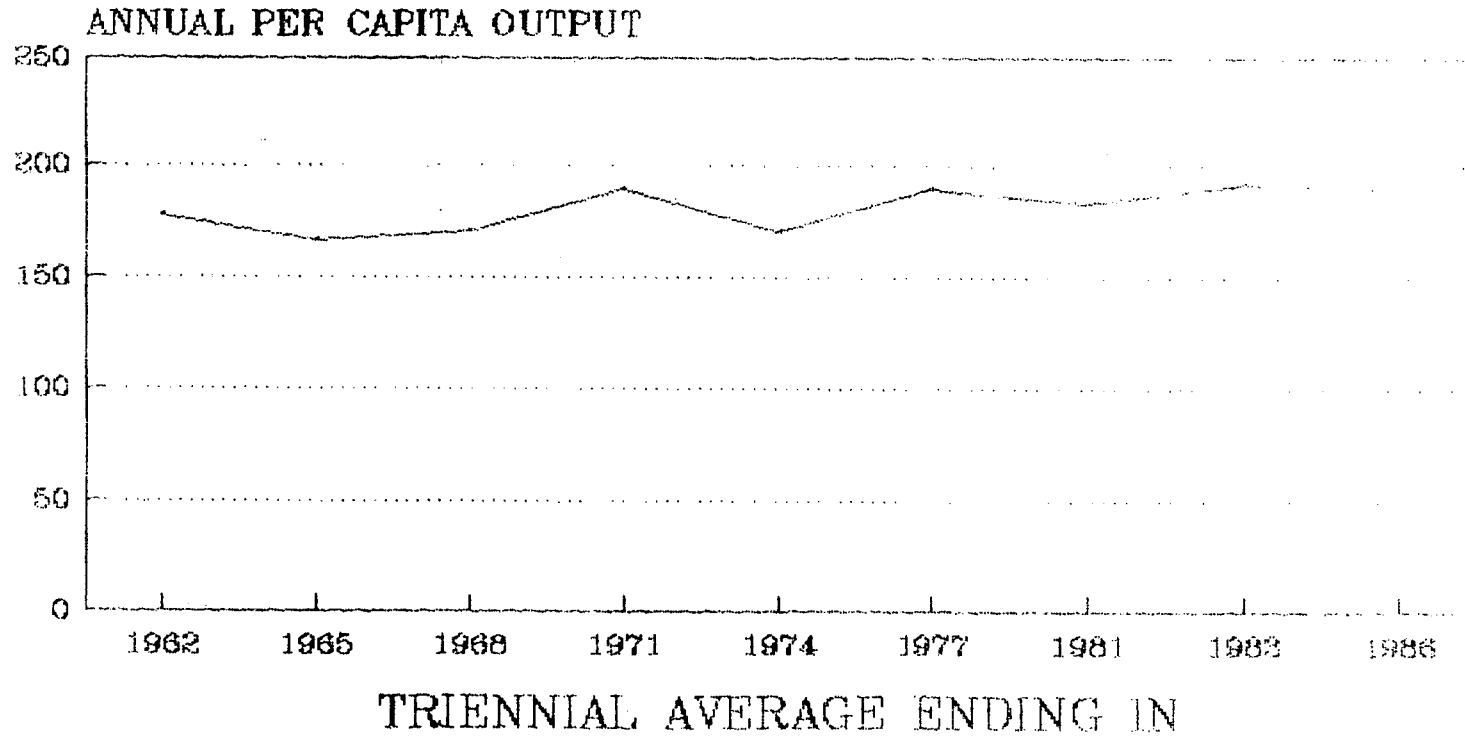
—·— Series A

SERIES A=INDIA

Table 2 : Trend Rate of Growth of annual percapita
foodgrains production from 1960-61 to 1986-87: (% p.a.)

Groups of States	Rate of Growth
A	2.1 (2.2)
B	0.25 (-0.5)
C	-1.1625 (-0.3)
D	-0.74 (-0.2)
E	-2.14 (-1.1)
F	-0.675 (0.09)
G	-0.64 (-0.3)
H	-0.83 (-0.1)
ROI	2.0 (1.5)
INDIA	0.26 (0.5)

(Sources: Computed)

Note: 1. Rate of growth has been obtained by taking the
average of all eight reference periods. Figures
in brackets are obtained by directly fitting a
trend to the entire series.

2. For trend rate of growth of eight reference periods
see Appendix Table No. 8.

North Western region registered highest rate of growth
(2.1% p.a.). Eastern region is showing positive trend growth
rate though very low (0.25% p.a.) but when we get it directly

by fitting a trend to the series it gives the negative value which is certainly because of the effect of begining year and the terminal year. While other two major regions are showing negative growth rate. Rest of India, which is an aggregate of left out states shows an impressive / fairly good performance of North Western region that the percapita foodgrains output for all India is showing positive growth rate. No doubt it further strengthens our assertion and widely held view that the remarkable performance of North Western region alone has been the vital factor in pulling India out of the humiliating situation of relying heavily on foreign assistance viz PL480.

We shall, in the following lines, make an attempt to categorize various regions on the basis of growth rate of annual percapita foodgrains production for the two sub-periods i.e., 1960-74 and 1972-86, these categories are as follows:

i)   Where rate of growth > 1

        $0 <$ rate of growth > 1

        rate of growth < 1

The idea behind such categorization is that whether the decline or increase in rate of growth of percapita food-grains production is explained by acreage shift and/or because of stagnation in agricultural productivity particularly of

total foodgrains. We shall confine our analyses to the four major regions namely - North Western region (group A), Eastern region (group B), Southern region (group C) and West Central region (group D) and all India.

Table 3 : Trend Growth Rate of Annual Percapita Foodgrains production in various regions and all India in two subperiods : (% p.a.)

Groups of States	Rate of Growth	
	1960-74	1972-86
A	1.4 (1.8)	2.8 (3.1)
B	0.075 (-0.3)	0.425 (-0.5)
C	-0.625 (0.09)	-1.7 (-1.0)
D	-1.625 (-1.2)	0.15 (0.07)
E	-1.55 (-0.6)	-2.7 (-1.9)
F	-0.175 (0.4)	-1.175(-0.5)
G	-2.1 (-1.8)	0.8 (0.4)
H	-0.7 (-0.2)	-0.95(-0.5)
ROI	3.4 (3.9)	0.6 (0.3)
INDIA	-0.15 (0.2)	0.07 (0.7)

SOURCE: COMPUTED

OTE :

• Figures in brackets are trend growth rates obtained directly by fitting a trend to the sub periods.

• For trend growth rates of reference periods see Appendix Table No. 8.

Only North-Western region (Group A) falls under category (i) in both sub periods. Eastern region comes in category (ii) when we calculate the growth rate by taking the average of first four and last four reference periods but it comes in category (iii) if growth rate, which is obtained directly by fitting a trend is considered. Similar is the case of Southern region. By taking average of the reference periods (first four reference periods for the first sub period and last four reference periods for the second sub period) it falls in category (iii) in both sub periods and if we consider the growth rate obtained directly ˄ ⌐ fitting a trend then it moves from category (ii) in first sub period to category (iii) in the second sub period. While West-Central region shows a recovery as it moves to category (ii) from category (iii) in the two sub period i.e. 1960-74 and 1972-86. All India also recovered from negative growth rate in first sub period to positive value in the second sub period.

Now our further exercise is to see that increase or decline is either because of acreage shift and/or high(low) growth rate of average yield per hectare of foodgrains. For percentage area under total foodgrains to total cropped area (see Appendix Table 9).

From Appendix Table 9, and graph showing the percentage of area under foodgrains to total cropped area it becomes absolutely clear that North Western region (Group A) which experienced an increase in growth rate of per capita food

GRAPH 3

AREA UNDER FOODGRAINS TO TOTAL CROPPED AREA (%) GROUP A,B,C,D
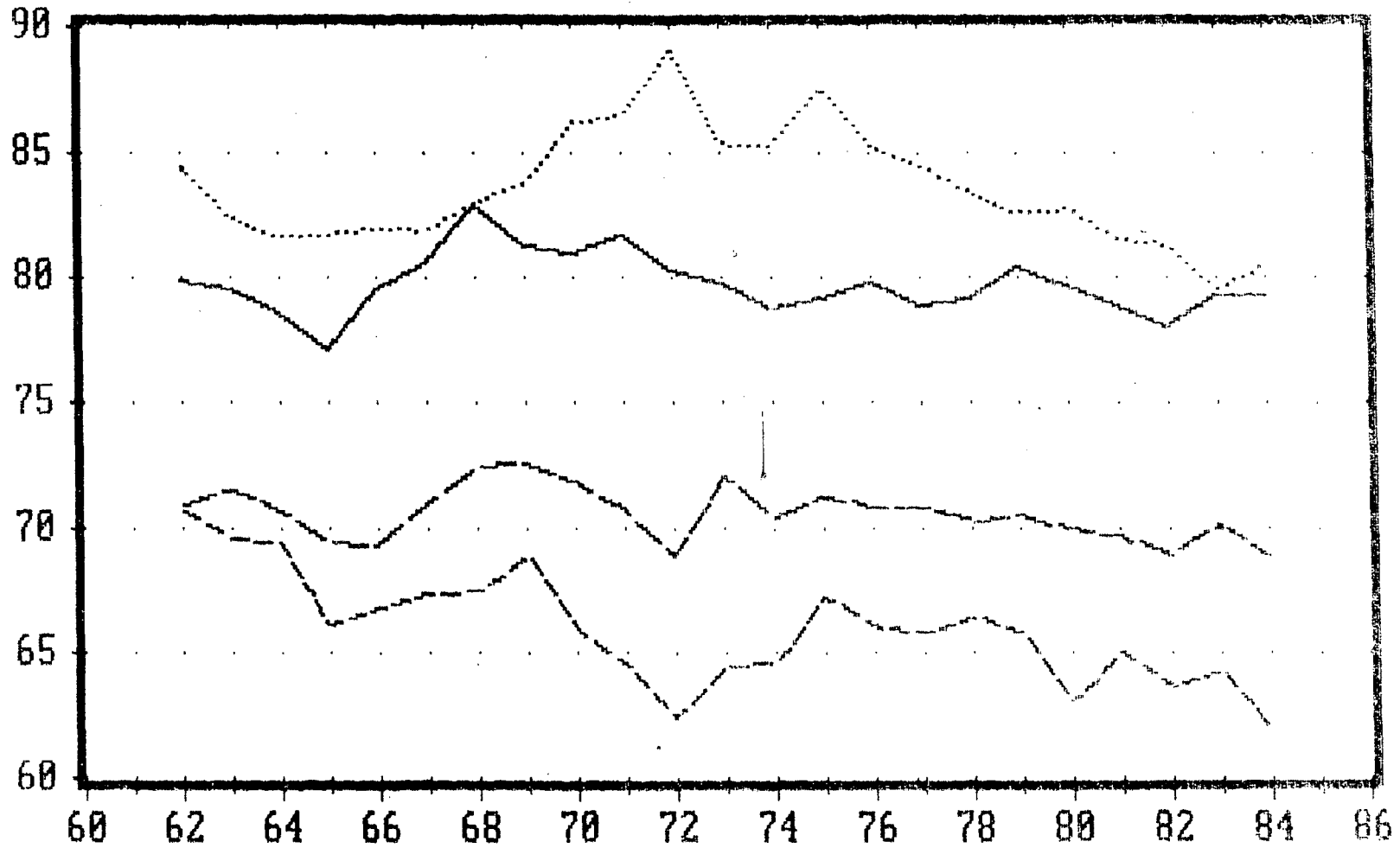
_____A   ......B   _____C   _____D

grains production from 1.4% p.a. in 1960-74 to 2.8% p.a. in 1972-86 is clearly on the account of tremendosus increase in average yield per hectare of foodgrains. Percentage of area under foodgrains to total cropped area reached at peak in 1970 after that it started declining and along with the fluctuations it has remained more or less the same. In the first sub period the trend growth rate of per capita foodgrains production was positive (1.4% p.a.) but it was quite less than that in the second sub period (2.8% p.a.).

As has been discussed in the previous chapter also that yield per hectare of foodgrains increased at much faster rate in the second sub period as compared to the first sub period. Per capita foodgrains output in North Western region, after 1965 declined once only i.e., from 1971-74 (see graph 1). And in the same period yield per hectare as well as area under foodgrains to total cropped area declined in this region.

Eastern region (group B) inspite of fertile soil has remained an enigma and its dismal performance in both periods is reflected in having very low growth rate of per capita foodgrains production. In the first sub period the area under foodgrains to total cropped area increased marginally while yield per hectare of foodgrains increased at the rate of 1.0% p.a. only in the period 1960-74 (Chapter 3). For the first period it can be said that there was not sufficient rise in the yield per hectare level as com-

pared to the North-Western region. In the second sub period the reason for low growth rate of per capita foodgrains production is the acreage shift as it declined from 89.1% in 1972 to 80.5% in 1984. Yield per hectare in the second sub period increased considerably as compared to the first sub period, particularly in the eighties. Its effect is clear from graph 1 as after 1983 per capita foodgrains production shows a rise though very low, as well as its recovery in the growth rate in the second sub period. As far as population of Eastern region is concerned its growth rate declined marginally in the second sub period i.e. from 2.2% p.a. in 1960-74 to 2.1% p.a. in 1972-86.

Most regions improved their performance in the second sub period i.e. in 1972-86 except the southern region (Group C). Its performance in the second sub period further deteriorated in terms of growth rate of per capita foodgrains production, though it is negative in both sub periods. Population growth of southern region has remained same over both the periods. But in this region there is acreage shift from foodgrain crops significantly, particularly in the first sub period it declined remarkably. In the first sub period its growth rate of yield per ha. was sufficiently high but it could not alter the negative trend of growth rate of per capita production. Thus in the first sub period the negative growth rate of per capita foodgrains production is on account of acreage shift from foodgrain crops. In

the second sub period there was a virtual stagnation as the growth rate of yield per ha. declined markedly as compared to a small decline in the area under foodgrains to total cropped area.

Therefore, whereas other regions are becoming more viable in the second sub period i.e. 1972-86, the southern region is getting into the grip of stagnation which is clear from the growth of yield of foodgrains in this region.

In the West Central region the area under foodgrains to total cropped area remained same in both periods. In the entire period there is a marginal decline. It is the yield per ha. which explains more. In the first sub period there was almost stagnation in the yield of foodgrains (Chapter 3). In the second period population growth was less in the second period and also the yield level increased as compared to first sub period. Thus, in this case all the factors collectively i.e., decline in population growth, increase in yield per ha. (though the absolute level of yield per ha. is quite low as compared to other regions) of foodgrains and stagnation in the area under foodgrains to total cropped area, pulled its negative growth rate, of per capita foodgrains production, to positive growth rate from -1.625% p.a. in 1960-74 to + 0.15% p.a. in 1972-86. But still its favourable trend in the later period could not alter its negative trend in the overall period.

In India, in the first sub period both decline in area under foodgrains to total cropped area and low growth rate of yield per ha. of foodgrains are responsible for its negative growth rate of per capita foodgrains production in the first sub period. In the second sub period area under foodgrains to total cropped area was still declining but at the same time good performance of yield per ha. made India possible to register positive growth rate in second sub period. If we look at the annual per capita foodgrains production we find that per capita foodgrains production is declining in North-western region and in India in the same triennia, i.e. 1971-74, it makes absolutely clear that all India's per capita foodgrains production depends much upon the performance of North-western region.

Among other sub regions apart from rest of India, only group G (Maharashtra and Madhya Pradesh) have registered positive low growth rate in the second sub period. But the performance of small states, forming rest of India, is remarkable where annual per capita food grains output has increased from 95.6 kg. in first triennia to 158.6 kg. in last triennia with trend growth rate of 2% p.a. from 1960-61 to 1986-87, and in both sub periods registering positive growth rate.

Thus the per capita foodgrains output in India which is nearly stagnant as it recovered from negative growth in first sub period to a very low but positive growth rate in the second period. And it is the per capita cereals

production which is enabling India to register positive growth in second period, otherwise, pulses which is a small proportion of total foodgrains but very necessary for the rural people is showing a decline significantly. The trends in per capita output of pulses are obvious from the following table.

The table displays a very disappointing pict ure in the per capita production of pulses. The North Western region where the per capita pulses production was highest though not sufficient in 1960-62 has declined very sharply to 21.19 kg. in the last triennia. The southern and west central regions which registered positive growth rate in pulses production are showing good performance in the field of per capita pulses production. Among the four major regions only Southern region is showing positive, though very low growth rate. The performance of North-western region is worst over the period. The trend growth rate in the per capita output of pulses in various regions and in India is as follows :

Except the southern region (Group C), all other major regions have negative or very low growth rate in both sub periods. Only Eastern region registered very low positive growth rate in the second sub period. In southern region the positive growth rate is mainly on account of high growth rate in the sub region (Group E) i.e. Tamilnadu and Kerala.

TABLE 4: ANNUAL PER CAPITA PULSES PRODUCTION IN

VARIOUS REGIONS AND IN INDIA (Kg.)

Triennium ending in	GROUPS OF STATES									
	A	B	C	D	E	F	G	H	ROI	INDIA
1962	54.54	16.16	6.50	35.21	2.31	10.06	35.88	34.04	2.85	26.29
1965	43.84	17.20	6.24	27.95	2.12	9.75	30.52	23.44	3.10	22.36
1968	38.80	14.77	5.71	25.58	1.91	8.94	26.43	24.08	4.01	19.96
1971	38.68	13.35	6.83	29.90	2.24	10.76	30.20	29.37	3.43	20.92
1974	25.82	10.72	6.96	26.90	2.76	10.54	30.27	21.03	3.66	16.91
1977	30.09	10.62	6.99	32.25	2.60	10.67	30.21	35.75	3.39	19.20
1980	21.87	10.62	7.14	24.42	2.79	10.73	25.36	22.84	3.14	15.49
1983	19.66	11.29	7.82	29.57	2.98	11.79	30.30	28.35	2.22	16.76
1986	21.19	11.16	7.69	28.44	3.58	11.03	29.06	27.40	2.32	16.70

SOURCE: COMPUTED

ANNUAL PER CAPITA OUTPUT OF PULSES (KG) - GROUP A,B,C,D
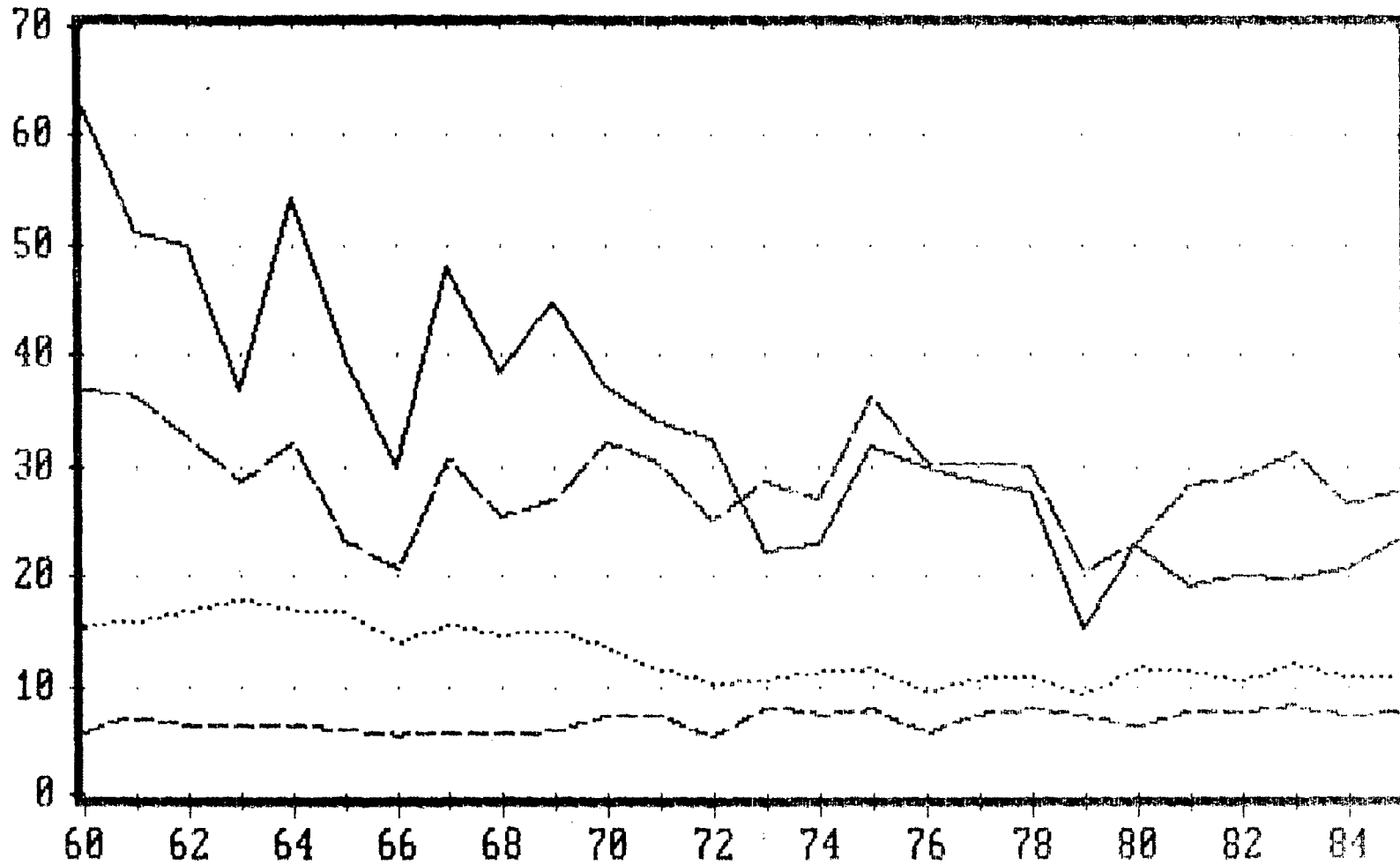
_____ A   ...... B   ___ C   ___ D

GRAPH 5

ANNUAL PERCAPITA OUTPUT OF PULSES (KG) — INDIA

___INDIA

TABLE 5: TREND RATE OF GROWTH OF PER CAPITA

PULSES PRODUCTION (% P.A.)

Groups of States	1960-74	1972-85	1960-85
A	-5.2 (-5.5)	-1.8 (-3.0)	-3.1 (-4.3)
B	-3.1 (-3.5)	0.3 (0.4)	-1.4 (-2.2)
C	1.5 (0.8)	0.5 (1.1)	1.0 (1.0)
D	-1.4 (-1.5)	-0.7 (-0.3)	-1.0 (-0.5)
E	0.6 (1.0)	3.0 (2.1)	1.8 (2.0)
F	1.6 (0.7)	-0.1 (0.8)	0.75(0.7)
G	-0.5 (-1.0)	-0.9 (-0.6)	-0.7 (-0.6)
H	-3.3 (-2.3)	0.8 (0.6)	-1.3 (-0.2)
ROI	2.95 (2.2)	-3.4 (-4.6)	-0.2 (-1.1)
INDIA	-3.0 (-3.1)	-0.8 (-0.8)	-1.9 (-2.0)

SOURCE: COMPUTED

NOTES :

1. Figures in brackets are the growth rates obtained directly by fitting a trend to the series.

2. For the growth rates in eight overlapping reference segments see Appendix Table 10.

Even the performance of second sub region of Southern region i.e. Group F (Andhra Pradesh and Karnataka) are also performing better than other sub regions.

It is thus clear in terms of growth of total output of foodgrains in India since independence, is a big achievement but

in terms of per capita production, the picture is quite dis-
appointing. From the output of foodgrains and by looking
at the foodgrains reserves with the government, self-sufficiency
seems to be an attained objective. Nevertheless as pointed
out by few economists, it is the level availability of food
grains which is also important and which one must turn one's
attention to. For the foodgrains stocks may be high and in
case of drought the domestic demand can be met by the internal
stocks but this can happen at an insufficient level of consump-
tion of the masses.

As pointed out by U. Patnaik,[2] 'We are not even as
yet, at the same level as at World War I', because during
the four decades before independence availability had declined
by around 25% (Blyn) and the small rise of 10% or so in the
availability in the four decades after independence has only
marginally redressed the situation.

The per capita production and availability of pulses
is declining, it is because of cereals that the per capita
total foodgrains remain more or less same, i.e., 166 kg. in
1961-65 to 168 kg. in 1981-85. Inspite of marginal increase
in the per capita foodgrains, the nutritional balance has
worsened due to sharp fall in the consumption of pulses.

In the following table, an interesting feature is that
after 1976-80 till mid-eighties for the first time after inde-
pendence the per capita availability is less than per capita
production of cereals. As argued by U. Patnaik, 'it can be

TABLE 6: ANNUAL PRODUCTION AND AVAILABILITY OF PER CAPITA

FOODGRAINS, 1951-85 (QUINQUENNIAL AVERAGE)

Period	Average Population (Millions)	Average Annual Availability of			Average annual cereals produced percapita (kg.)
		Cereals (Kg.)	Pulses (Kg.)	Total (kg.)	
1951-55	376.44	129.13	23.59	152.72	122.74
1956-60	414.78	135.93	24.84	160.77	121.48
1961-65	452.24	146.32	22.12	168.44	135.02
1966-70	515.74	140.94	17.78	158.72	129.83
1971-75	597.10	140.54	15.47	156.01	135.48
1976-80	645.94	145.79	15.63	161.42	147.13
1981-85	720.42	151.95	14.34	166.29	153.39

SOURCE: U. Patnaik, "Some aspects of development in the agra-
rian sector in Independent India", Social Scientist,
177, Vol. 16, No. 2, Feb. 1988).

an outcome of increased skewness in the distribution of sales,

a larger proportion now coming from the well-to-do surplus

producers in rural areas representing the capitalist tendency.

In short, those who need to eat more because they are at or

below the minimum, cannot afford to do so; and those who do

not need to eat more, supply most of the commoditised part

of output. The fact that the rural sector is unable to absorb

increased production owing to lack of purchasing power gets

reflected in availability lower than production' (1988).

Thus, the above discussion on the basis of regions and all India level amply shows that the regional imbalances which we had noted for pre-independence period did not get reversed in post-independence period also. The green revolution technology with its specificities and prior requirements for its adoption, firmly got rooted in only those regions which had developed irrigational facilities and relatively larger holdings. North-western region providing such conditions embarked not only on the path of agricultural development much faster than other regions but also shows remarkable progress in terms of growth of per capita foodgrains output. This type of progress atleast fulfilled the dream of making country self sufficient in foodgrains, but recent stagnation of growth of yield/ha. of foodgrains in this region has been a cause of worry for the policy makers in recent years. Therefore, we are hearing a lot about taking the green revolution to the other parts of the country - particularly to Eastern region (which has a very fertile and rich soil) and extending the package of new technology in development of dry-farm technology also as the cost of creating irrigation facilities in hitherto unirrigated region which requires huge investment.

As we have confined ourselves to selected non foodcrops (sugarcane, total oilseeds and cotton) we shall simply present the trends in per capita output of these crops to see that whether decline in the rate of growth of per capita food

grains output has been compensated by these three crops. Which is clear from the following table of growth rate of per capita output of these crops. For the figures of annual per capita output of these three crops, see Appendix Table 11.

From the table it is clear that the Eastern region is performing well in the field of oilseeds only as it has registered very high positive growth rate in per capita oilseeds production though in absolute terms it has increased from 2 kgs. per capita to 7.2 kgs. only. While West-central region's per capita oilseeds production increased in second sub period. Southern region has registered positive growth rate in the field of sugarcane but in second sub period again it declined significantly whereas West-central region's growth of sugarcane was higher in second period. The North-western region whose performance in per capita output of foodgrains determines all India's per capita foodgrains output. But in terms of non food crops north-western region is showing either negative or very low growth rate in most of the periods. and for all three crops. Southern region's per capita cotton production is also increasing with rate of growth of 1.75% p.a. for the period 1960 to 1986. Whereas India's performance in the non foodcrops is also disappointing. Only in sugarcane it has registered very low positive rate of growth in two sub periods and in the period as a whole.

TABLE 7:   TREND GROWTH RATE OF PER CAPITA OUTPUT OF

SUGARCANE, TOTAL OILSEEDS AND COTTON IN

TWO SUB PERIOD AND IN THE WHOLE PERIOD

					GROUPS	OF	STATES			
Period	A	B	C	D	E	F	G	H	ROI	INDIA
SUGARCANE										
1960-74	0.7	-1.3	4.7	1.0	7.8	3.0	0.3	5.0	3.9	1.3
1972-86	0.1	-2.9	0.05	2.55	1.2	-0.7	2.2	4.9	-1.9	0.3
1960-86	0.4	-2.1	2.4	1.8	4.5	1.15	1.2	4.9	1.0	0.8
TOTAL OILSEEDS										
1960-74	0.98	4.0	1.6	-2.6	-1.3	3.7	-1.7	-3.65	3.5	Neg.
1972-85	-3.4	5.6	-1.35	2.8	-4.05	-0.05	4.0	1.85	4.7	-0.025
1960-85	-1.2	4.8	0.1	0.075	-2.7	1.8	1.15	-0.9	3.6	-0.01
COTTON										
1960-74	1.9	-1.7	0.075	-1.6	-5.5	3.4	-3.25	-0.2	1.05	-0.5
1972-85	-2.2	2.5	3.4	-1.3	2.7	3.7	-0.8	-1.7	0.65	-0.4
1960-85	-0.2	0.4	1.75	-1.4	-1.4	3.55	-2.0	-0.96	0.85	-0.4

SOURCE: COMPUTED FROM APPENDIX TABLE 11

NOTE:

For trend growth rates of eight reference periods, two sub periods and whole period, obtained directly by fitting a trend, see Appendix Table 12.

GRAPH 6

ANNUAL PER CAPITA OUTPUT OF SUGARCANE (KG) — GROUP A,B,C,D
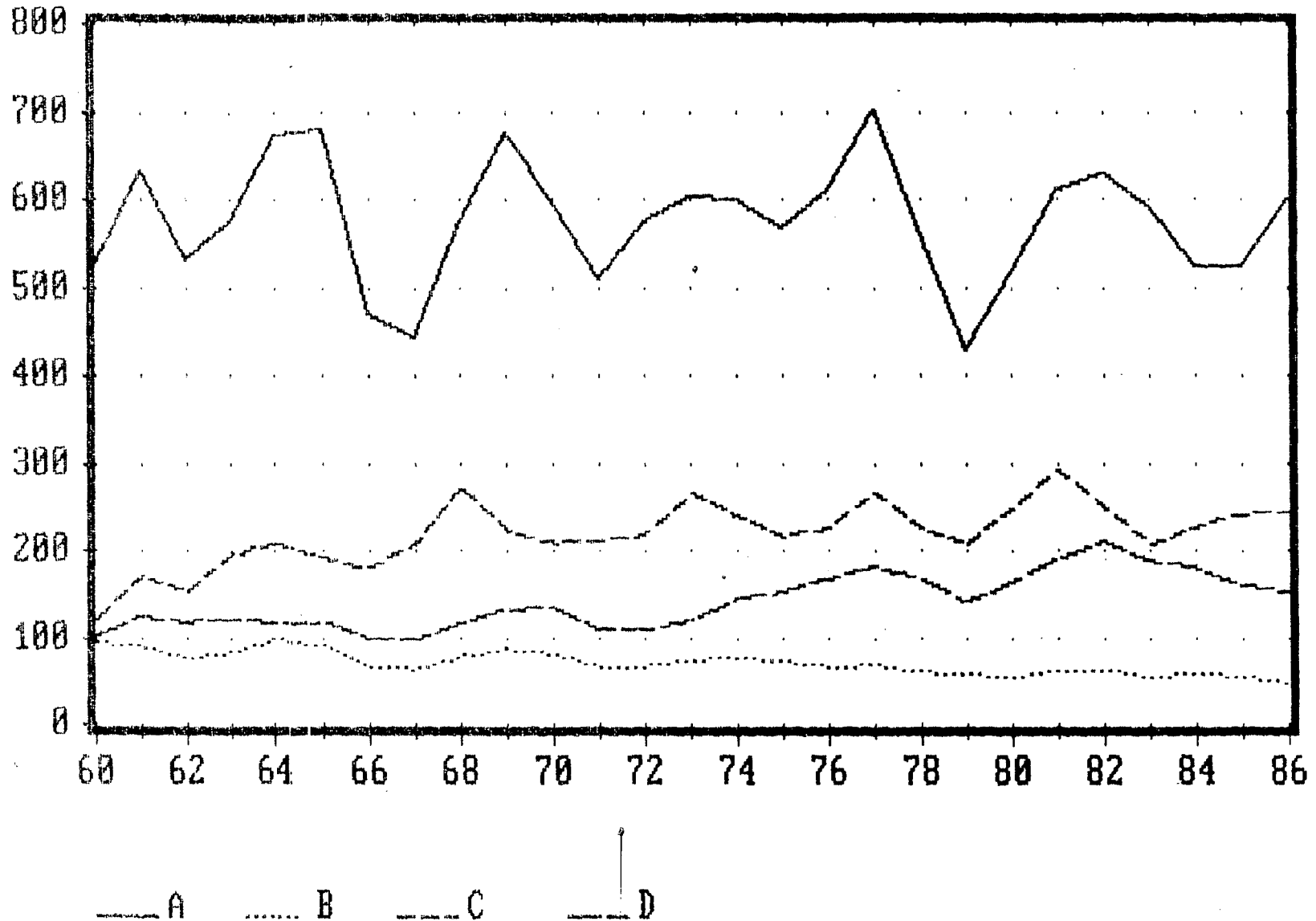
GRAPH 7

ANNUAL PER CAPITA OUTPUT OF TOTAL OILSEEDS (KG) GROUP A,B,C,D
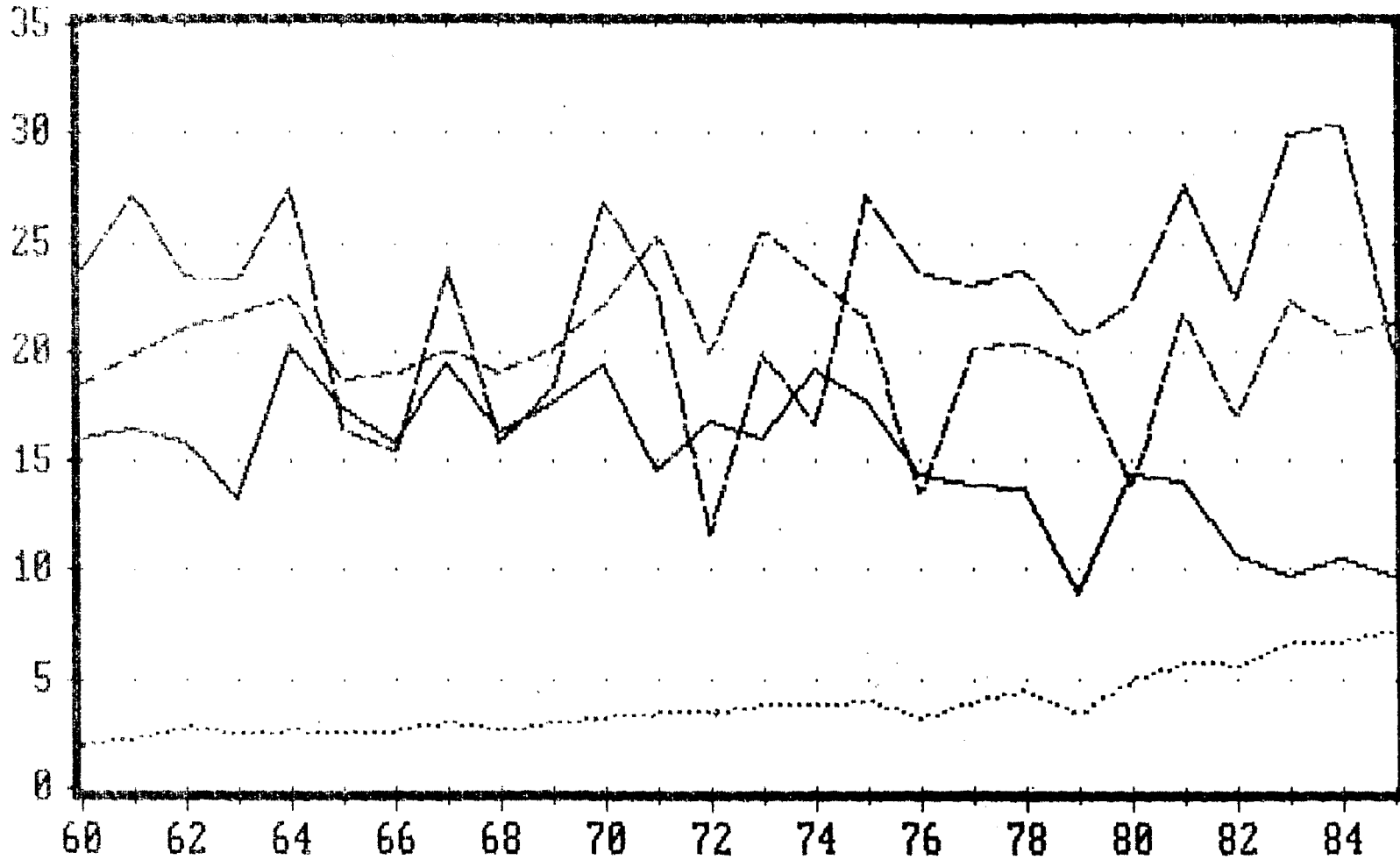
_____A   ......B   ___C   ___D

GRAPH 8

ANNUAL PER CAPITA OUTPUT OF COTTON (KG) GROUP A,B,C,D
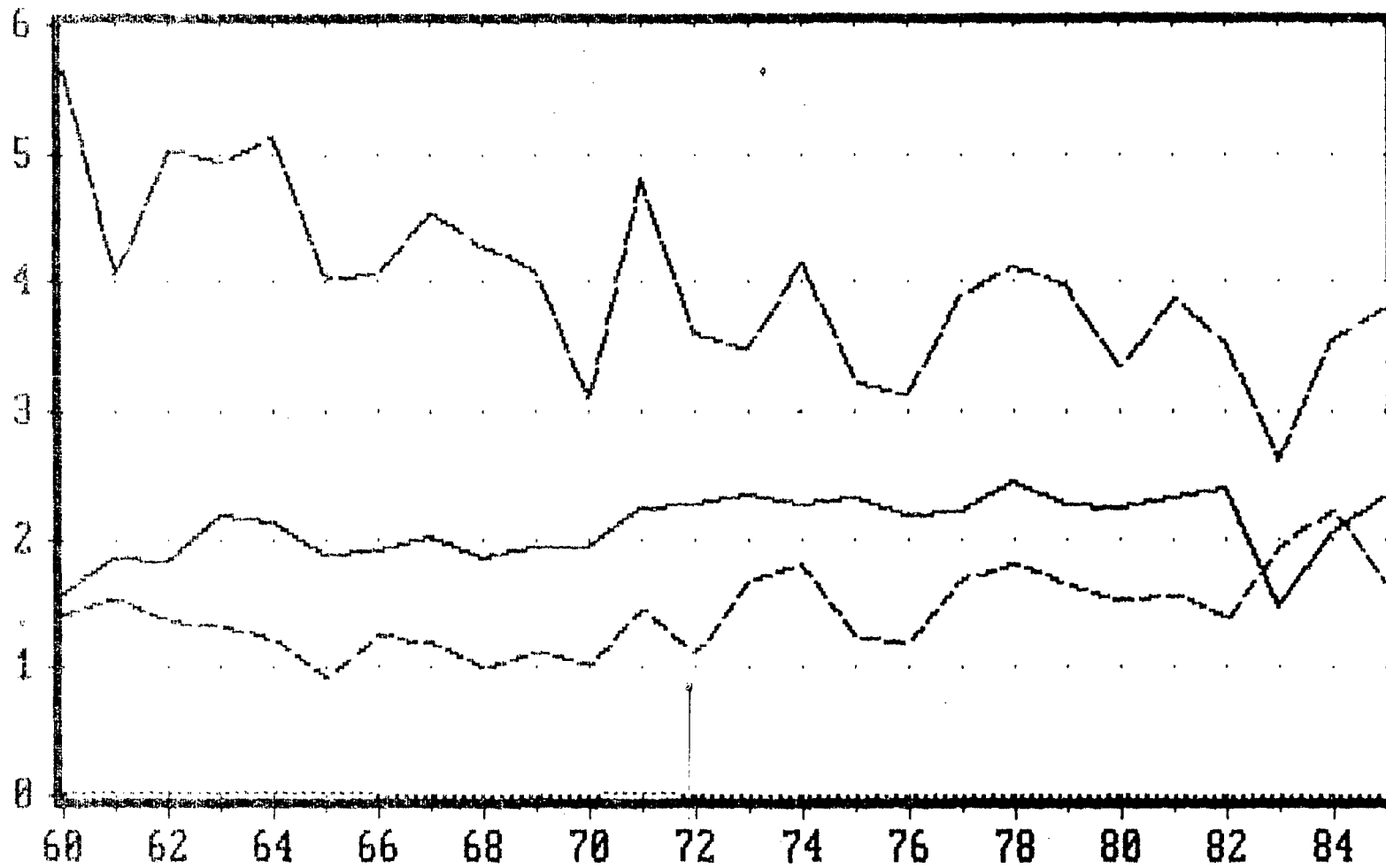
_____ A   ...... B   ___ C   __ __ D

GRAPH 9

ANNUAL PER CAPITA OUTPUT OF SUGARCANE,TOTAL OILSEEDS & COTTON (KG) IN INDIA

___ SUGAR   .... OILSEED   ___ COTTON
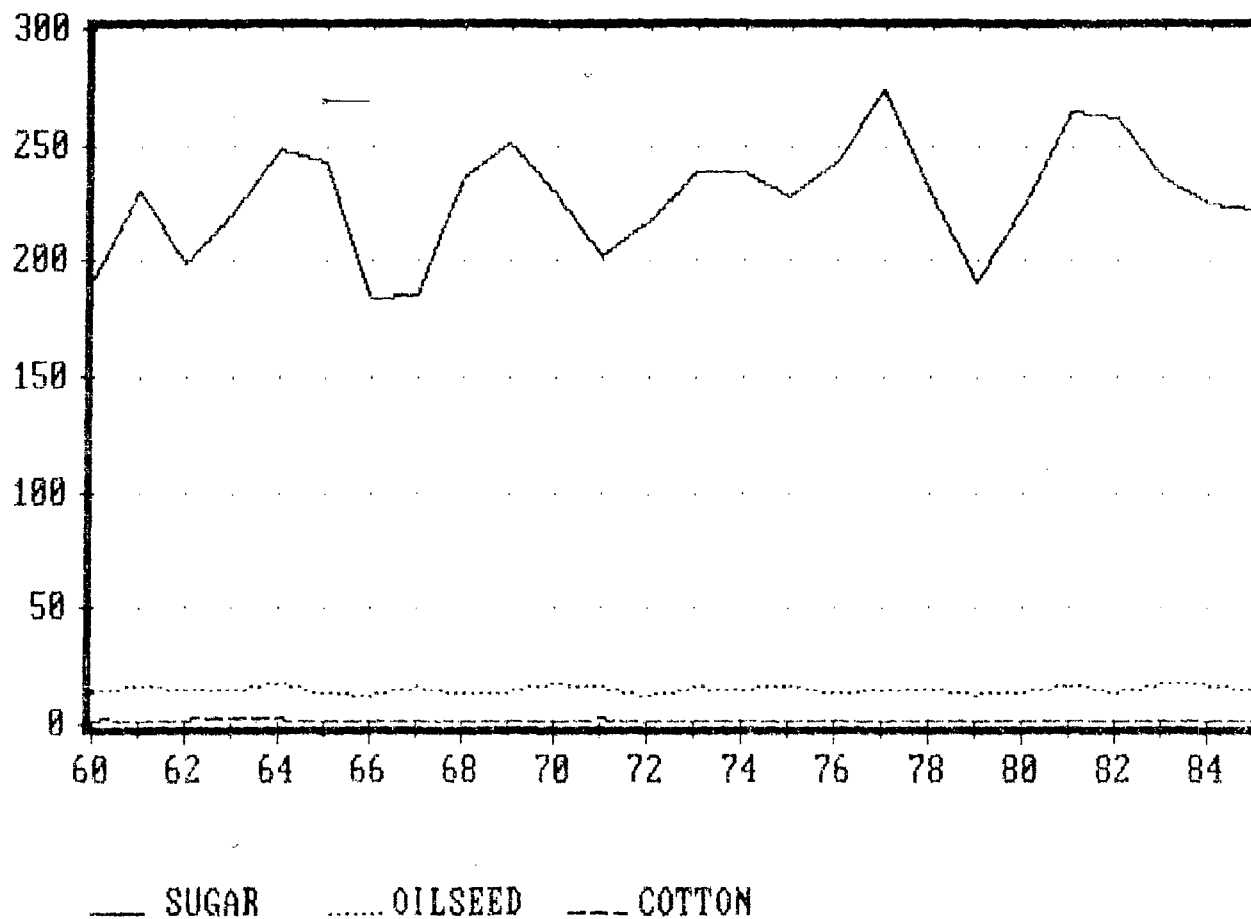
If we look at the graphs (in Appendix Graph Nos. 1,2,3)
for the percentage of area under these crops to total cropped
area of various regions, there is a distinct rise in area
under sugarcane to total cropped area of southern region while
west-central region's has increased very marginally. In North-
western region it has remained more or less same and in Eastern
region it has declined marginally. For all India also it
has remained same.

In case of total oilseeds there is increase in regions
except north western region. After eighties it has declined
significantly in North-western region while in Eastern region
since 1976 it is increasing continuously. In other two regions
also it has increased particularly in southern region. In
west central region it has increased marginally. For all
India also it has increased very little.

While for cotton in all regions as well as in India
it has either declined marginally or has remained stagnant
(See Appendix Table 13).

On the whole it can be said that in the regions where
per capita foodgrain production is declining it is not entirely
compensated by these three non foodcrops for which we presented
the trends. The Eastern region where oilseeds production
is rising but its weightage is too less as compared to the
total foodgrains. While southern region and west central
region are performing well in the field of sugarcane per capita

production and west central region in total oilseeds also in the second sub period. In case of per capita cotton production, southern region is performing better as compared to other regions.

Thus, it can be concluded that in southern region only the decline in per capita foodgrains production has been compensated upto some extent with the increase in the production of sugarcane and cotton. Other two regions are not performing well as compared to southern region in the field of non food crops production.

NOTES

1. Self sufficiency of foodgrains has generated a contro-
    versial position among economists. For details, see,
    Ch. Hanumantha Rao, "Current Agrarian scene : Policy
    Alternatives", EPW, March 1988, and U. Patnaik, "Some
    aspects of Development in Agrarian Sector in Independent
    India", Social Scientist, No. 179.   They
    argue that if the purchasing power is provided to the
    rural people, who are not able to absorb the availabi-
    lity of foodgrains due to lack of it, there will be
    shortage of foodgrains.

.   U. Patnaik (1988), "Some aspects of Development in
    the Agrarian Sector in Independent India", Social
    Scientist, 177, Vol. 16, No. 2.

CHAPTER 5

SUMMARY AND CONCLUSION

During the past three decades in India the new agri-
cultural strategy based on green revolution technology,
aimed at increasing foodgrains production has had a subs-
tantial impact but produced at the same time some undesirable
effects with respect to the question of equity, poverty
and increasing regional imbalances. A good many schemes
and programmes ranging from redistribution of land, eradica-
tion of poverty and unemployment have seen the light of
the day. However, most of these programmes embody only
small outlays relative to the magnitude of the problems
and therefore have not had the desired impact.

One of the major fall out of the green revolution
technology has been accentuation of regional disparity in
agricultural production. Green revolution technology needs,
firstly, continuous investment on purchased inputs from
the side of the farmer and secondly, infrastructural facili-
ties in terms of a well developed irrigation system of which
tube well irrigation gives the greatest control over supply.
Therefore, the lead in such a situation was naturally grapped
by the erstwhile landlords and quite conveniently most of
them turned themselves into capitalist farmer wherever it
was profitable for them to do so.

A much publicised view is that new green revolution
technology is scale-neutral technology. In practice, the
technology requires a substantial investment in working

capital and most of the inputs required being monetised, there is no way out but to have sufficient credit in the hands of the farmers to finance their purchases. Even if the bio-chemical technology is neutral in the sense of being equally useful on small or large farms, existing institutional arrangements with little investible capacity for the majority of producers, marks its adoption biased.

Further, the basic infrastructural requirements resulted in adoption of this technology only in those regions where well developed irrigational network was available. The North-west region with relatively favourable land-distribution and irrigational facilities grabbed the opportunity and grew rapidly in terms of agricultural production. The impressive performance of this region and relatively much poor performance of other regions have raised numerous problems for our policy makers. Even the North-West region is plagued with problems, as the impressive performance has been realised only in terms of few foodgrains. Production of pulses, oilseeds etc. show a dismal picture in terms of total production as well as percapita output.

Against this background the present study is a modest attempt to highlight the problem of rising regional imbalances particularly in foodgrains production. However, an attempt to study the trends of selected non foodcrops has also been made.

In the main the study revolves around the following:

i. Tracing briefly the historical background of the performance of Indian agriculture. We focus particularly on the trends in agricultural output of various regions in British India during the five decades preceeding Independence.

ii. Estimating the regionwise and all-India trends in output, area and average yield of foodgrains and selected non foodcrops during the period 1960-61 to 1986-87. Of course the plan of regionalisation cannot coincide with that followed in the study relating to the colonial period; but a broad comparison is possible.

iii. Estimation of regionwise and all India trends in per capita production of foodgrains and selected non foodcrops during the same period.

Our findings may be summerised as follows :

i. A marked increase in regional disparities in total foodgrains production is observed. The North-Western region shows a remarkable increase with the index rising to 275 or near a trebling of total foodgrains production during the period of study (triennium ending 1962=100). The North Western region which had almost an equal share as other regions in total

foodgrains production of India during 1960-62, increased its share to such an extent that this region, comprising three states only, was contributing by 1984-86 more than two major regions taken together, namely the Eastern and Southern regions comprising eight major states. The percent increase of foodgrain production over base period production in other major regions ranges between 42 to 58% only and is naturally therefore shown up as a decline in their share in total foodgrains production of India.

ii.   So far as the performance of pulses is concerned it is the southern and west central regions only have registered positive growth. In Southern region it declined in the second sub period from 3.6% p.a. to 2.6% p.a. and in west central region it increased from 1.0% in first sub period to 1.8% in second sub period. The eastern region which registered negative growth rate (-1.0%) in first sub period has shown a remarkable recovery in the second sub period (2.5% p.a.) while North Western region also shows a recovery from -3.4% growth rate in first sub period to 0.5% in second sub period. The total pulses production for all India remained virtually stagnant for the entire period. This clearly shows that the North Western region has achieved remarkable increase in

cereals partly at the cost of pulses, which make up total foodgrains.

iii. It is observed that during the study all regions registered an acceleration in the growth rate of total foodgrains, total cereals and total pulses in the second sub period except the southern region. Thus, whereas the other regions are becoming more viable and adopting the technology more extensively the southern region is showing decline in it.

iv. In Southern and Eastern regions, there is decline in growth rate of net sown area in the second period (1972-84) though very marginally (-0.1 and -0.2) respectively while in the other two major regions it is low but positive, i.e. 0.07 in North-west region and 0.04 in West central region. While total cropped area shows negative growth rate in the second sub period (1972-84) only in the southern region i.e. -0.02, in all other major regions it is positive. All India trends in net sown area and total cropped area remained more or less the same; in net sown area it declined to 0.1 in 1972-84 from 0.2 in 1962-74 while for gross cropped area it remained 0.6 in both sub periods.

v. As regards area under foodgrains, it increased only in one region namely North Western region i.e. from

0.3% p.a. in 1960-74 to 0.7 in 1972-86. In other major regions either it has declined or remained the same over the two sub periods. In West Central region it is same i.e. 0.4. In Eastern and Southern region it has declined to 0.2 and -0.8 respectively in the second sub period from 0.9 and -0.7 in the first sub period i.e. 1960-74. For all India also it declined to 0.25 in 1972-86 from 0.375 in 1960-74.

Trends in the average yield level of foodgrains production of various regions reveal that it is the major factor which determines the increase or decline in total foodgrains production. In North Western region it has increased from 3.5% p.a. in 1960-74 to 4.4% in second sub period (1972-86). Which resulted in the tremendous rise of foodgrains production (175%) over the reference period. In Southern region again the growth rate of yield has declined in the second sub period to 1.1% from 2.1% in the first sub period. The other two regions have shown recovery. In the Eastern region it has increased marginally i.e., from 1.15% to 1.6% over the two sub periods. In the west central region also yield has shown a good increase from 0.35% in the first sub period to 2.1% in the second sub period. But in absolute terms the level of yield per hectare of foodgrains in the west central region is much less as compared to other region. In the Eastern region also the reason for insufficient rise

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in foodgrains production is low growth rate in the yield level of foodgrains.

vi.   Per capita foodgrains production also present a similar picture of regional differences. In the North Western region per capita production has increased to around 360 kg. p.a. in 1984-86 from 208 kg. p.a. in 1960-62. While the other three major regions have shown a decline. In terms of growth rate of per capita foodgrains production, North-west region has registered 2.1% over the entire period with increase in second sub period over the first sub period from 1.4% to 2.8% respectively.

In the Eastern region we get a positive value as well as increase in its growth rate of per capita foodgrains production over the two sub periods i.e. from 0.075% to 0.425%. But at the same time when we obtain the growth rate directly by fitting a trend, we get negative value as well as decline in the growth rate i.e. from -0.3 to -0.5% over the two sub periods. This shows that by fitting a trend over a long period, the trend which we get depends more upon the data of other years as well as the strong effect of initial and terminal years. The southern region shows a further decline in the second sub period from -0.625% to -1.7% in the two sub periods. West central region has shown a recovery from its negative growth rate in first sub period (-1.625%) to (0.15%) in the second sub period.

Similarly, India has shown a rise in its growth rate of per capita foodgrains production.

We found that decline in the per capita foodgrains production in southern region is because of shift in acreage as well as decline in its growth rate of average yield level of foodgrains. Whereas in other regions like recovery in West central region is/ stagnation in the area under foodgrains
due to
and rise in its growth rate of average yield per ha. In Eastern region area under food grains is declining in the second sub period though marginally and also insufficient rise in its growth rate are reasons for its decline in per capita foodgrains production over the entire period and a little recovery in the second sub period.

vii. We found that the inadequate growth of total foodgrains production and per capita production is not adequately compensated by the non foodcrops production. In the Southern region only the production of sugarcane and cotton (as well its per capita production) are able to compensate up to some extent. In the eastern region only the total oilseeds production has shown good performance but its low weightage in total agricultural production makes it insignificant. There is decline in per capita production of sugarcane and cotton in the Eastern region. The West central region also has shown a good performance only in the field of sugarcane. But in the total oilseeds production it has increased in

the second sub period significantly. From a negative growth rate (-0.225) in first period to 5.275 in second sub period.

In the North-western region's performance in the non-food crops is quite disappointing particularly in the case of total oilseeds. In sugarcane production its performance has remained more or less the same over the two sub periods.

It can be inferred that except the southern region, other regions which have registered negative growth rate in foodgrains production as well as its per capita production are not compensated adequately by the production of non food crops.

BIBILIOGRAPHY

1. Aggarwal, P.C. (1973), 'The Green Revolution and Rural Labour - A study in Ludhiana New India Press (For Sri Ram Centre), Delhi.

2. BAGCHI, A.K. (1970), Reflections on Patterns of Regional Growth in India During the Period of British Rule. , Mimeo.

3. BAGCHI, A.K. (1972), Private Investment in India 1900-1939, London; Cambridge.

4. BAGCHI, A.K.(1982), Political Economy of Underdevelopment, Cambridge Univ. Press; Cambridge.

5. BALASUBRAMANYAM, V.M.(1984), Economy of India, Weidenfeld and Nicolson.

6. Bardhan, Pranab (1983), "Regional variations in Rural Economy," EPW, July 23.

7. BHALLA, G.S. (1984), "Peasant Movement and Agrarian change in India," in Rao, Krishna Y.V., Parthasarthy, G.; Rao, C.H. Rajeshwara, Reddy, M. Yadan and Khan Waheedudin (Eds.), Peasant Farming and Growth of Capitalism in Indian Agriculture; Vijaywada; Visaal-andhaa Publishing House.

8. BHALLA, G.S. (1987), "Some Issues in Agricultural Development in India - An Overview," in Brahmananda, P.R. and Panchmukhi, V.R. (Eds.), Development Process of the Indian Economy, Bombay; Himalya Pub.

9. BHALLA, G.S. and ALLAGH, Y.K. (1979), Performance of Indian Agriculture : Districtwise Study, New Delhi; Sterling.

10. BHALLA, G.S. and CHADHA, G.K. (1982), "Green Revolution and the Small Peasants," Economic and Political weekly, May.

11. BHALLA, SHILA (1987), "Trends in Employment in Indian Agriculture, Land and Asset Distribution," Indian Journal of Agricultural Economics, Vol. 42; No.4, October-December.

12. Bhatia, B.M. (1967), Famines in India, A Study in the Aspect of the Economic History of India, 1860 to 1965; (Ed.2), Asia Publishing House, New York.

13. BHARDWAJ, KRISHNA (1980), On Some Issues of Method in Analysis of Social Change; Mysore; Prasarange Univ. of Mysore.

14. BHARDWAJ, KRISHNA (1982), "Regional Difference in India," Economic and Political weekly, April (Annual Number).

15. BHARDWAJ, KRISHNA (1985), "A View on Commercialization in Indian Agriculture and the Development of Capitalism," Journal of Peasant Studies, Vol.12; July.

16. BLYN, GEORGE (1966), Agricultural Trends in India, 1891-1947 : Output, Availability and Productivity, Philadelphia; Pennyslavania.

17. CHANRA, BIPAN (1966), The rise of Growth of Nationalism in India, People Publishing House, India.

18. Choudhary, B.B. (1982), "Agrarian Relations in Eastern India" in Dharma Kumar (Ed.), (1982), Cambridge Economic History of India, Vol.2, Cambridge University Press; Cambridge.

19. DANDEKAR, V.M. (1988), "Indian Economy since Independence," Economic and Political weekly, January.

20. DANTWALA, M.L. (1987), "Growth Vs. Equity in Agricultural Development Strategy," in Brahmananda, P.R. and Panchmukhi, V.R. (Eds.), Development Process of the Indian Economy, Bombay; Himalya Pub.

21. DEJANVRY, A. and SUBBARAO, K. (1986), Agricultural Price Policy and Income Distribution in India, Delhi; Oxford Univ. Press.

22. GADGIL, D.R. (1971), Industrial Evolution of India in Recent Times: 1860-1939; (Ed.5), Oxford, Delhi.

23. Gosal, G.S. and Krishan, Gopal, (1984), Regional Distribution in Levels of Socio-Economic Development in Punjab, Vishal Publications, Kurukshetra.

24. Habib, Irfan (1975), "Colonialization of the Indian Economy," Social Scientist, No.32, March.

25. HANUMANTHA RAO, C.H. (1984), "Steps to Strengthen Growing Peasant Sector," in Rao, Krishna Y.V., Parthasarthy, G., Rao, C.H. Rajeshwara, Reddy, M. Yadav and Khan, Waheedudin (Eds.), Peasant Farming and Growth of Capitalism in Indian Agriculture, Vijawada; Visaalandhra Publishing House.

26. HANUMANTHA RAO, C.H. (1988), "Current Agrarian Scene: Policy Alternatives," Economic and Political weekly, March.

27. HESTON, A. (1982), "National Income," in Dharam Kumar (Ed.), Cambridge Economic History of India, Vol.2, Cambridge Univ. Press.

28. JOSE, A.V. (1988), "Agricultural wages in India," Economic and Political weekly, June.

29. Khan, Mufakharul M. (1988), "Trends in crop production in Undivided Punjab" in clive, J Dewey (Ed.), <u>Arrested Development in India; The Historical Dimension,</u> Manohar Publishers, New Delhi.

30. KUMAR, Dharma (1982), "The Fiscal System," in Dharma Kumar (Ed.), <u>Cambridge Economic History of India,</u> Vol.2, Cambridge University Press.

31. MAHENDRA DEV, S. (1985), "Direction of change in Performance of All Crops in Indian Agriculture in Late 1970's," <u>Economic and Political Weekly,</u> December.

32. MAHENDRA DEV, S. (1987), "Growth and Instability in Foodgrain Production," <u>Economic and Political Weekly,</u> September.

33. MINHAS, B.S. (1974), <u>Planning and the Poor,</u> New Delhi; S. Chand and Co. (Pvt.) Ltd; New Delhi.

34. MITRA, ASHOK (1970), "Population and Foodgrains output in India", in Robinson, E.A.G. and Kidron, M., <u>Economic Development in South Asia: Proceedings of a Conference,</u> London; Mcmillan.

35. PATNAIK, UTSA (1981), "The process of commercialisation under Colonial Conditions", (mimeo). Paper presented at CDS Trivandrum, November.

36. PATNAIK, UTSA (1984), "Transfer of Tribute and the Balance of Payments in Cambridge Economic History of India", <u>Social Scientist,</u> No.139, Dec.

37. PATNAIK, UTSA (1986), "<u>The Agrarian Question in India and the Development of Capitalism in India</u>", Oxford, New Delhi

38. PATNAIK, UTSA (1988), "Some Aspects of Development in the Agrarian Sector in Independent India", Social Scientist.

39. RAO, HANUMANTHA, RAY, S.K., SUBBARAO, K. (1988), Unstable Agriculture and Droughts, Vikas Publishing, New Delhi.

40. RAO, V.M. and DESHPANDE, R.S. (1987), "Agricultural Growth in India: A Review of Experiences and Prospects", in Brahmananda, P.R. and Panchmukhi, V.R. (Eds.), Development Process of the Indian Economy, Bombay, Himalaya Pub.

41. RUDRA, ASHOK (1982), Indian Agricultural Economics: Myths and Realities, New Delhi, Allied Pub.

42. SAUL, S.B. (1967), Studies in British Overseas Trade 1870-1914, Liverpool, Liverpool Univ. Press.

43. SAWANT, S.D. (1987), "A Review of Performance in the Agricultural Sector", in Brahmananda, P.R. and Panchmukhi, V.R. (Eds.), Development Process of the Indian Economy, Bombay, Himalaya Pub.

44. SINGH, K. (1972), "The Impact of new Agricultural Technology on Agricultural Wage-Rates and Employment in IADP Districts", IJAE, Oct-Dec.

45. SINHA, INDERDEEP (1984), "Development of Agricultural Production and Agrarian Relations in India", in Rao, Krishna Y.V., Parthasarthy, G., Rao, Ch. Rajeshwara, Reddy M. Yadav and Khan, Waheedudin (Eds.), Peasant Farming and Growth of Capitalism in Indian Agriculture, Vijaywada, Visaalandhra Publishing House.

46. SIVA, SUBRAMANIAM, S. (1962), 'Estimates of Output in Undivided India", in V.K.R.V. (Ed.) Papers on National Income and Allied Topics, Vol. 1.

47. SWAMY, DALIP and GULATI, ASHOK (1986), "From Prosperity to Hetrogression", Economic and Political Weekly, June.

48. THORNER, DANIAL and THORNER, ALICE (1965), Land and Labour in India, Bombay, Asia.

49. VAIDYANATHAN, A. (1986), "Agricultural Development and Rural Poverty", Paper presented in seminar on Indian Economy, Boston University, Octoeber.

50. ZARKOVIC, M (1987), Issues in Indian Agricultural Development, West View.

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APPENDIX

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TABLE   I

TREND GROWTH RATES OF EIGHT REFERENCE PERIODS
GROUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
			TOTAL	FOODGRAINS						
1960-65	-Ø.7	Ø.9	Ø.1	-3.2	-Ø.5	Ø.5	-4.5	-Ø.3	6.7	-Ø.7
1963-68	6.9	1.9	Ø.9	1.Ø	Ø.4	1.1	Ø.7	1.5	14.Ø	3.Ø
1966-71	9.3	6.3	3.6	6.4	4.6	3.1	4.1	1Ø.5	5.6	6.5
1969-74	-2.Ø	-Ø.1	1.1	-1.Ø	-2.4	2.8	1.Ø	-4.4	2.Ø	-Ø.5
1972-77	5.7	2.7	2.3	8.7	Ø.7	3.5	8.6	8.1	4.7	5.Ø
1975-8Ø	3.7	-Ø.6	1.Ø	-1.1	-2.Ø	2.6	-Ø.Ø6	-3.1	1.9	1.Ø
1978-83	6.2	1.1	-Ø.6	5.6	-5.Ø	1.4	4.8	6.8	2.5	3.6
1981-86	5.3	7.Ø	-1.4	-2.8	2.4	-3.1	-1.6	-5.4	4.4	2.3
			TOTAL	CEREALS						
1960-65	Ø.7	Ø.6	Ø.Ø9	-2.8	-Ø.5	Ø.5	-4.6	1.5	6.6	-Ø.2
1963-68	8.6	2.3	Ø.9	1.2	Ø.4	1.2	1.Ø	1.5	14.Ø	3.5
1966-71	1Ø.6	7.1	3.4	5.97	4.5	2.7	3.2	1Ø.7	5.7	6.8
1969-74	-Ø.5	Ø.3	Ø.9	-1.3	-2.5	2.7	Ø.4	-4.2	1.8	-Ø.Ø9
1972-77	5.9	2.7	2.2	9.Ø	Ø.7	3.4	1Ø.3	6.7	4.8	5.Ø
1975-8Ø	5.Ø	-Ø.8	1.Ø	-Ø.Ø2	-2.1	2.7	Ø.7	-1.3	1.95	1.6
1978-83	6.7	Ø.8	-Ø.8	5.4	-5.1	1.3	4.6	6.8	2.8	3.6
1981-85	6.5	9.4	-1.Ø	-Ø.6	1.6	-3.4	1.2	-4.3	7.7	3.8
			TOTAL	PULSES						
1960-65	-4.8	4.1	1.Ø3	-5.5	-Ø.63	1.4	-3.9	-8.7	7.6	-3.1
1963-68	Ø.5	-1.9	-Ø.8	-Ø.Ø3	-1.1	-Ø.1	-Ø.9	1.3	11.6	-Ø.14
1966-71	2.1	-1.8	8.34	8.8	7.3	8.5	8.5	9.5	1.4	4.3
1969-74	-11.4	-4.3	5.5	Ø.9	5.5	5.2	3.9	-5.5	5.7	-3.9
1972-77	4.Ø	2.Ø5	4.Ø	6.7	-Ø.23	5.4	1.6	16.7	2.4	4.7
1975-8Ø	-7.95	1.98	Ø.93	-7.2	3.6	Ø.7	-4.4	-12.2	-1.Ø	-5.2
1978-83	-Ø.6	4.5	3.7	6.8	3.1	3.8	6.6	7.6	-8.2	3.9
1981-85	6.6	1.3	1.7	Ø.9	12.95	-1.1	Ø.4	1.7	3.9	2.5

TABLE 2. TRIENNIAL AVERAGE OF GROSS CROPPED AND NET SOWN AREA.

Gross Cropped Area — GROUPS OF STATES

Triennium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1964	31920.20	27468.10	33270.50	62754.54	9685.333	23585.17	37822.10	24932.43	2199.999	157613.3
1965	31744.97	27636.80	32859.00	62667.17	9645.300	23213.70	37618.23	25048.93	2209.400	157117.3
1968	32284.60	27736.77	33042.04	64272.47	9920.134	23121.90	38551.93	25720.53	2870.800	160206.7
1971	33532.40	28122.30	34269.04	65608.07	10331.33	23937.70	39346.50	26261.57	3262.029	164793.8
1974	33917.57	28294.40	34045.30	65910.97	10333.93	23711.37	39478.77	26432.20	3236.003	165404.2
1977	34899.13	29891.37	33301.73	68408.90	10329.67	22972.07	40999.83	27409.07	3796.464	170297.6
1980	36096.67	30170.83	33687.10	68987.60	10157.77	23529.33	41329.07	27658.53	3552.430	172494.6
1983	37396.47	29989.13	33858.87	72070.87	9504.233	24354.63	42690.80	29380.07	3556.468	176871.8
1984	37435.67	30046.00	33773.33	71650.66	9553.333	24220.00	42920.67	28730.00	3599.667	176505.3

Net Sown Area.

Triennium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1964	24909.47	22231.80	30020.07	58139.17	8082.733	21937.33	34684.23	23454.93	1660.333	136960.8
1965	24876.63	22327.43	29650.20	58397.70	8047.367	21602.83	34783.17	23614.53	1675.835	136927.8
1968	24737.93	22151.67	29370.10	60023.20	8143.967	21226.13	35975.13	24048.07	1926.699	138209.6
1971	24938.23	22227.27	30133.83	60234.03	8370.200	21763.63	36087.43	24146.60	2332.571	139865.9
1974	24817.73	22370.20	29839.07	60171.20	8322.666	21516.40	36054.20	24117.00	2254.201	139452.4
1977	25136.03	22652.53	29119.30	60928.83	8294.066	20825.23	36246.30	24682.53	3142.365	140979.1
1980	25019.80	22501.40	29195.20	61447.77	8140.533	21054.67	36892.90	24554.87	2572.705	140736.9
1983	25089.30	21880.10	29507.13	62772.20	7791.667	21715.47	37336.30	25435.90	2598.297	141847.0
1984	25054.00	21785.33	29301.00	62654.67	7812.334	21488.67	37368.67	25286.00	2623.333	141418.3

Note: Figures are from 1962 - 1984

TABLE-3

Triennial Average of Non food crops Output.

Sugar cane: Groups of States

Triennium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1962	53457.40	9791.434	16830.03	13388.23	5056.834	11773.20	11499.43	1888.800	174.6348	93641.73
1965	64546.50	10930.70	23819.40	14879.37	6710.700	17108.70	12261.57	2617.800	312.1012	114488.1
1968	52793.97	9001.867	28121.60	14082.13	10348.10	17773.50	12154.20	1927.933	334.4009	104334.0
1971	66741.93	10695.67	29106.50	18041.60	10517.80	18588.70	15125.97	2915.633	401.5671	124987.3
1974	71159.73	10697.03	34808.57	19474.27	15485.30	19323.27	15642.50	3831.767	513.7695	136653.4
1977	80744.47	10832.00	36411.53	28271.07	14821.57	21589.97	23384.30	4886.767	599.5026	156858.6
1980	69115.84	9639.967	37101.47	28432.47	16906.57	20194.90	23288.27	5144.200	622.4297	144912.2
1983	90443.53	10733.40	43393.50	38182.73	16949.27	26444.23	30243.87	7938.867	559.9633	183313.1
1986	87280.87	10234.47	43872.80	34008.87	20875.03	22997.77	26239.80	7769.066	632.8998	176029.9

Total Oilseeds.

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	1533.667	269.3333	2253.000	2900.000	1088.000	1165.000	1366.333	1533.667	19.66667	6975.667
1965	1705.200	312.2000	2515.167	2815.433	1038.033	1477.133	1264.433	1551.000	33.83332	7381.834
1968	1832.733	357.4000	2476.833	2481.033	938.3667	1538.467	1133.500	1347.533	42.69981	7190.700
1971	1934.267	445.1333	3080.567	3304.500	1129.100	1951.467	1338.833	1965.667	51.23333	8815.700
1974	2091.233	543.1667	3337.300	2521.933	1196.500	2140.800	1346.733	1175.200	65.29997	8558.934
1977	1963.433	585.2333	2823.300	4133.367	1137.600	1685.700	1680.300	2453.067	60.06649	9565.399
1980	1700.033	721.1667	2892.333	4014.167	1029.500	1862.833	1638.100	2376.067	75.76636	9403.467
1983	1694.900	1071.167	3555.933	5173.900	1095.133	2460.800	2203.767	2970.133	93.16691	11589.07
1985	1540.167	1280.367	3902.900	5438.467	1116.133	2786.767	2619.100	2819.367	102.2000	12264.10

Cotton

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	167.2517	2.011667	163.1207	572.3333	67.50134	95.61933	287.7873	286.1780	1.405343	906.1227
1965	206.2667	2.028667	138.0400	588.6816	62.31067	75.72933	293.3860	287.3850	1.433676	936.4507
1968	204.5327	1.592333	145.5823	581.3944	65.41600	80.16634	283.5827	297.8117	1.127660	934.2293
1971	230.4917	2.074000	164.5940	579.7907	69.05400	95.54000	211.1457	368.6450	2.102323	979.0527
1974	275.4114	0.986000	221.6743	587.5767	57.02933	164.6450	272.0510	315.5257	2.334648	1087.983
1977	287.2093	1.694333	211.4517	576.3397	66.07900	145.3727	210.5960	365.7437	1.796311	1078.491
1980	319.9400	1.535667	270.0110	687.5763	70.45934	199.5517	288.4730	399.1033	2.487653	1281.551
1983	303.7503	1.065333	282.7270	645.6544	46.29100	236.4360	269.0703	376.5840	2.402623	1235.600
1985	303.0930	0.821667	349.2707	675.8180	80.81800	268.4527	279.4630	396.3550	2.975007	1331.978

TABLE 4
TREND GROWTH RATES OF EIGHT REFERENCE PERIODS
&IN SUB PERIODS OF NON FOODCROPS OUTPUT
GROUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
			SUGARCANE							
1960-65	6.5	2.6	11.5	4.0	9.2	12.5	2.7	11.0	14.2	6.6
1963-68	-2.6	-3.2	5.8	-0.04	15.8	2.7	0.8	-4.0	2.8	-0.09
1966-71	6.3	4.4	4.0	7.2	4.8	3.6	6.0	13.7	6.1	5.7
1969-74	0.9	0.2	5.4	3.0	10.9	1.7	1.6	10.0	7.0	2.2
1972-77	5.2	1.3	3.4	14.0	2.0	4.5	14.6	11.1	4.9	5.8
1975-80	-2.7	-3.5	2.9	1.6	6.7	0.08	0.9	5.2	-1.2	-0.6
1978-83	7.2	1.7	3.0	8.2	-1.3	6.2	6.7	14.1	-4.9	6.0
1981-86	0.2	-2.6	-0.7	-3.5	4.6	-4.7	-4.3	0.08	4.3	-0.9
1960-74	2.1	0.5	5.8	3.3	9.4	3.9	2.8	5.4	8.0	2.9
1972-86	1.9	-0.4	2.2	4.9	2.6	1.8	4.5	6.7	1.0	2.3
1960-86	2.1	0.2	3.7	4.8	5.6	2.5	4.4	6.6	4.8	2.7
			TOTAL OILSEEDS							
1960-65	4.3	6.8	3.1	-2.6	-2.3	7.9	-4.5	-0.9	12.3	1.4
1963-68	4.5	4.1	-0.7	-4.4	-4.0	1.6	-2.8	-6.1	6.4	-0.7
1966-71	0.8	7.1	7.3	9.6	6.5	8.1	7.2	11.9	1.5	6.8
1969-74	2.2	7.1	4.9	-3.5	2.8	5.8	3.0	-9.7	7.4	1.5
1972-77	-1.7	2.8	-3.6	16.2	-2.2	-4.3	8.5	23.5	4.4	3.9
1975-80	-4.7	6.3	-1.3	-1.5	-5.2	1.0	-0.8	-2.0	10.1	-1.2
1978-83	-1.0	13.2	3.9	7.2	-2.2	6.8	10.3	5.1	7.7	5.2
1981-85	5.1	8.7	3.7	-0.8	0.2	5.3	7.3	-8.4	3.7	1.0
1960-74	2.6	6.2	3.4	-0.3	0.8	5.2	0.2	-1.1	5.6	2.1
1972-85	-2.6	8.3	1.6	6.1	-0.9	2.9	5.8	6.5	6.3	3.0
1960-85	0.06	6.7	1.9	3.0	0.2	2.9	2.9	3.0	8.9	2.4
			COTTON							
1960-65	6.0	2.5	-6.2	-0.3	-3.4	-8.7	-2.6	1.2	-0.3	-0.2
1963-68	-0.8	-6.0	-1.4	-0.5	-3.4	-0.2	-1.4	1.0	-7.6	-0.7
1966-71	4.2	9.9	3.5	1.3	-1.2	7.1	-8.6	7.6	21.5	2.4
1969-74	6.1	-4.5	12.9	3.0	-6.3	23.4	8.4	-0.7	5.0	5.5
1972-77	1.3	16.3	4.2	2.0	5.7	3.9	-1.7	4.7	-7.8	2.1
1975-80	2.5	-6.0	8.0	5.2	1.5	10.6	11.0	1.7	8.4	5.1
1978-83	-4.5	-14.8	1.6	-4.7	-13.3	6.3	-6.1	-4.1	0.7	-2.8
1981-85	0.9	-10.4	7.9	2.0	24.2	3.4	2.8	1.3	12.0	3.0
1960-74	3.8	-4.4	2.5	0.2	-1.1	4.2	-1.6	1.6	4.6	1.4
1972-85	1.3	-2.5	4.4	2.0	1.6	5.3	2.1	1.9	2.6	2.3
1960-85	2.9	-2.8	3.7	0.9	-0.7	5.5	0.01	1.7	3.5	1.9

TABLE 5
TREND GROWTH RATES OF EIGHT REFERENCE PERIODS,SUB PERIODS
& WHOLE PERIOD OF AREA UNDER NON FOODCROPS

GROUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
				SUGARCANE						
1960-65	2.1	0.05	5.9	4.3	3.6	6.9	3.0	8.3	4.6	2.6
1963-68	2.3	-2.5	5.4	1.3	12.8	1.7	2.2	-1.6	1.0	-0.9
1966-71	2.6	1.8	3.6	5.2	4.5	3.2	5.1	5.2	-0.8	2.9
1969-74	1.3	-1.3	5.5	-2.2	5.8	5.1	-3.6	2.2	3.0	1.3
1972-77	3.3	1.4	3.2	9.5	-0.3	5.4	9.8	8.0	6.9	3.9
1975-80	-2.1	-1.3	0.1	0.2	4.3	-0.9	-0.9	3.9	-2.7	-1.4
1978-83	2.7	-0.07	3.4	5.0	1.4	4.6	4.5	5.9	-2.6	2.8
1981-86	-1.8	-2.7	-1.6	-2.6	1.3	-3.3	-2.2	-4.1	-0.4	-2.1
1960-74	0.4	-0.7	4.5	1.8	6.3	3.5	1.6	2.5	1.5	1.0
1972-86	0.6	-0.5	1.5	3.0	1.6	1.5	2.9	3.3	0.3	1.0
1960-86	0.8	-0.5	2.9	2.5	3.6	2.6	2.3	3.3	1.5	1.2
				TOTAL OILSEEDS						
1960-65	1.3	1.4	1.8	0.6	-0.1	2.6	0.3	0.1	15.6	1.3
1963-68	1.3	-0.7	0.4	-1.2	0.7	0.7	-1.8	-0.8	1.9	-0.1
1966-71	0.2	4.5	5.7	2.0	5.4	5.9	5.8	-1.6	0.1	2.6
1969-74	-0.2	7.0	2.9	2.5	2.1	3.0	4.3	0.3	4.5	2.1
1972-77	0.5	4.2	-2.5	2.9	1.7	-2.0	3.8	1.8	3.8	0.9
1975-80	0.2	6.5	-0.8	1.3	-4.1	0.2	-0.8	4.0	4.5	0.9
1978-83	-6.8	5.8	3.1	3.2	-0.8	4.5	2.8	3.7	5.9	1.4
1981-85	-13.4	4.5	3.0	4.1	2.1	3.3	6.0	2.0	5.5	0.6
1960-74	0.8	2.7	2.6	0.3	2.0	2.9	1.6	-1.0	5.1	1.2
1972-85	-3.9	5.7	0.8	2.8	-0.1	1.4	2.3	3.4	4.5	1.2
1960-85	-1.0	4.4	1.3	1.5	0.6	1.6	2.1	0.9	4.3	1.2
				COTTON						
1960-65	3.8	-5.4	0.01	1.3	0.6	-0.2	1.6	0.8	-3.7	1.2
1963-68	-2.8	-1.9	-1.7	-1.3	-5.5	-0.7	-1.1	-1.6	-16.2	-1.5
1966-71	0.7	-17.7	-0.4	-0.6	-4.1	0.6	-1.6	0.9	36.4	-0.4
1969-74	5.5	-9.7	0.6	-1.5	-4.8	1.8	-3.2	1.3	-0.2	-0.4
1972-77	1.7	16.8	-0.7	-0.9	-1.4	-0.6	-1.5	0.1	-8.7	-0.6
1975-80	3.8	1.4	4.6	1.5	2.2	5.1	3.0	-0.8	2.9	2.4
1978-83	3.5	-9.5	-2.8	-1.1	-11.5	-1.3	0.3	-3.3	3.0	-0.9
1981-85	-5.9	-7.8	-1.2	-1.2	4.5	-2.2	-0.3	-2.8	0.3	-1.8
1960-74	1.3	-11.4	-0.4	-0.5	-2.9	0.2	-0.1	0.1	5.5	-0.3
1972-85	1.7	1.1	0.3	1.5	-1.9	0.7	0.8	-1.5	-0.3	0.2
1960-85	2.0	-5.0	-0.3	-1.2	-2.6	0.2	-0.5	-0.2	2.9	-0.1

Table: 6. Triennial Average of Yield per ha. of non food crops.

Groups of states.

Sugarcane

Treinnium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1962	33844.12	35933.52	68219.84	51680.54	64355.63	70070.48	57085.78	32787.32	14688.76	39520.16
1965	39099.90	40659.30	76402.65	51100.63	70883.06	78839.72	56619.55	34450.93	22119.43	45114.63
1968	37194.28	38391.05	80744.59	50658.69	78089.78	82324.98	55766.24	32311.08	25858.00	45412.52
1971	41499.00	41346.97	79450.26	52826.36	77195.13	80814.36	56591.31	39687.54	31456.88	48318.09
1974	42286.11	43476.96	78840.56	62321.18	89223.38	72329.18	68186.27	46088.99	35555.70	50649.94
1977	44759.82	42979.29	79806.11	70379.14	93599.77	72481.13	77167.45	49536.67	31856.19	53481.92
1980	41161.71	40132.47	82810.14	71851.32	99501.13	72703.62	79872.36	49420.88	35436.48	52105.47
1983	46438.80	43061.32	82229.55	79394.92	91732.34	77111.48	86254.37	60648.23	34152.03	56926.06
1986	49171.30	44569.62	86849.16	77082.63	105187.1	74974.50	80874.45	66764.36	38827.88	59367.78

Total Oilseeds.

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	397.0176	357.9528	638.4365	451.2562	1023.597	472.3778	452.1279	450.4794	478.8935	477.0403
1965	418.7877	399.6730	676.7669	441.2127	991.1120	552.6712	413.3310	466.9280	493.7964	491.5136
1968	425.0772	469.7950	657.5320	402.7284	898.6812	564.9764	395.2278	407.6113	588.2631	477.1293
1971	445.9167	513.7501	679.2952	511.0188	900.7884	595.1719	398.3330	642.0892	685.5864	542.1996
1974	493.7932	518.0721	708.0522	379.7880	905.9395	627.5004	367.6199	394.7569	745.4705	512.0204
1977	461.1958	500.0790	667.4580	581.3087	919.6897	562.7937	418.1717	793.8287	643.2698	567.1558
1980	399.6599	495.9557	682.2409	540.7521	912.9022	599.0084	418.5356	677.0818	730.2773	539.5369
1983	483.5040	616.0026	746.3999	622.3930	941.6754	681.6362	514.5538	735.8872	754.2502	626.9849
1986	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Cotton

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	258.8348	80.86535	94.20649	107.0980	169.8625	71.66316	85.47945	146.1489	153.5509	116.7620
1965	276.8905	102.3816	77.82346	104.3473	153.6719	55.25885	81.26448	141.5260	163.9711	114.3836
1968	298.6943	85.57980	85.08635	107.8796	182.3199	59.16811	81.75201	155.0327	226.9032	119.6360
1971	334.0958	231.8713	97.62640	109.1303	209.3849	70.21141	63.33752	186.6017	126.7066	126.7681
1974	337.5252	173.9764	132.5433	115.2547	195.3350	118.1195	88.56477	154.0515	146.7577	143.1483
1977	332.7826	181.3331	140.9884	115.2544	244.8387	118.1649	72.68023	173.9041	148.2423	146.1113
1980	326.9134	151.4937	155.4856	130.0751	238.8237	138.0010	89.76285	192.7671	187.5540	159.6425
1983	277.3638	130.3311	174.1200	125.5631	224.2696	166.7540	82.44257	200.8506	168.8598	156.5629
1985	334.8908	122.4421	216.9250	135.4079	332.3336	195.2894	86.16530	226.2251	209.3343	176.5463

TABLE 7
TREND GROWTH RATES OF EIGHT REFERENCE PERIODS, SUB PERIODS
AND WHOLE PERIOD OF AVERAGE YIELD/HA OF NON FOODCROPS
GOUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
					SUGARCANE					
1960-65	4.3	2.5	5.1	-0.3	5.3	5.1	-0.3	2.3	9.2	4.0
1963-68	-0.2	-0.6	1.4	-1.3	2.7	0.1	-1.3	-2.5	3.9	0.8
1966-71	3.6	2.5	0.3	1.9	0.3	0.4	0.7	7.9	6.9	2.7
1969-74	-0.5	1.2	-0.2	5.3	4.6	-3.3	5.3	7.5	3.9	0.9
1972-77	1.9	-0.1	0.2	4.0	2.3	-0.9	4.2	2.6	-2.0	1.8
1975-80	-0.5	-1.7	1.9	1.4	2.3	0.1	1.9	1.3	1.4	0.8
1978-83	4.5	1.8	-0.4	3.0	-2.7	1.6	2.0	7.5	-2.5	3.1
1981-86	2.1	0.01	0.9	-0.9	3.3	-1.5	-2.3	4.2	4.8	1.1
1960-74	1.7	1.3	1.3	1.5	2.7	0.4	1.2	2.9	7.1	2.0
1972-86	1.2	0.2	0.7	1.8	1.1	0.4	1.5	3.2	0.8	1.3
1960-86	1.3	0.6	0.7	2.2	2.0	-0.04	2.1	3.2	3.3	1.5
					TOTAL OILSEEDS					
1960-65	2.4	5.2	1.3	-3.3	-2.2	5.1	-4.9	-0.9	-2.3	0.06
1963-68	3.2	4.7	-1.1	-3.2	-3.7	0.1	-1.0	-5.3	4.6	-0.6
1966-71	0.6	2.6	1.6	7.7	0.1	2.0	1.3	13.8	0.4	4.0
1969-74	2.4	0.09	2.0	-6.0	0.6	2.6	-1.3	-9.97	2.9	-0.6
1972-77	-2.2	-1.3	-1.0	12.9	-0.5	-1.5	4.4	21.3	0.6	3.0
1975-80	-5.0	-0.1	-0.4	-2.8	-1.3	0.8	0.02	-5.9	5.7	-2.2
1978-83	6.1	6.9	0.7	3.8	-1.4	2.2	7.1	1.3	1.9	3.8
1981-85	9.4	4.2	0.6	-4.9	-1.9	2.0	1.3	-10.2	-1.8	0.4
1960-74	1.7	3.4	0.7	-0.6	-1.2	2.3	-1.4	-0.1	3.7	0.8
1972-85	1.3	2.4	0.8	3.2	0.06	1.5	3.4	3.0	1.0	1.8
1960-85	1.1	2.2	0.6	1.5	-0.3	1.3	0.7	2.1	2.0	1.2
					COTTON					
1960-65	2.1	8.2	-6.2	-1.7	-3.9	-8.2	-4.1	0.5	3.5	-1.4
1963-68	2.2	-4.1	0.2	0.8	2.2	0.4	-0.3	2.8	10.3	0.8
1966-71	3.4	33.5	4.0	2.0	3.0	6.6	-6.8	6.8	-10.9	2.9
1969-74	0.6	5.8	12.2	4.6	-1.5	21.2	12.3	-2.0	5.3	6.0
1972-77	-0.4	-0.4	5.1	2.8	7.4	4.5	-0.2	4.5	1.3	2.7
1975-80	-1.4	-7.3	3.5	3.6	-0.7	5.1	7.6	2.4	5.6	2.6
1978-83	-7.7	-6.0	4.7	-3.6	-1.9	7.8	-6.2	-0.7	-2.2	-2.0
1981-85	7.2	-2.9	9.4	3.2	18.8	5.7	3.1	4.2	11.7	5.0
1960-74	2.4	7.9	3.0	0.7	1.8	4.1	-0.7	1.5	-0.8	1.8
1972-85	-0.3	-3.6	4.1	2.0	3.5	4.7	1.2	3.4	2.9	2.1
1960-85	0.9	2.3	4.0	1.3	2.6	5.4	0.5	1.9	0.6	2.0

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TABLE 8
TREND GROWTH RATES OF EIGHT REFERENCE PERIODS
OF PER CAPITA FOODGRAINS PRODUCTION
GROUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
1960-65	-2.5	-1.3	-1.8	-5.6	-2.4	-1.4	-6.8	-2.8	3.6	-2.8
1963-68	4.9	-Ø.3	-1.2	-1.4	-1.7	-Ø.9	-1.7	-1.Ø	1Ø.5	Ø.8
1966-71	7.2	4.1	1.4	3.9	2.2	Ø.9	1.6	7.8	Ø.9	4.1
1969-74	-4.Ø	-2.2	-Ø.9	-3.4	-4.3	Ø.7	-1.4	-6.8	-1.4	-2.7
1972-77	3.3	Ø.5	Ø.3	6.1	-1.Ø	1.2	6.4	5.5	1.5	2.6
1975-8Ø	1.3	-2.7	-1.Ø	-3.5	-3.6	Ø.3	-2.2	-5.7	-1.2	-1.3
1978-83	3.8	-Ø.9	-2.7	3.1	-6.9	-Ø.9	2.6	4.1	Ø.1	1.3
1981-86	2.8	4.8	-3.4	-5.1	Ø.6	-5.3	-3.6	-7.7	2.Ø	Ø.Ø5

Table: 9. Percentage Area Under foodgrains to Total Cropped Area.

Groups of States.

Triennium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1962	79.92967	84.39140	70.63978	70.93101	61.44193	74.43418	75.67835	63.78033	81.06209	75.17294
1965	77.03816	81.69980	66.06376	69.35668	60.72123	68.34840	73.63487	63.10618	102.7311	72.88583
1968	82.96452	83.02552	67.47248	72.46282	59.29312	70.94415	76.91132	65.31293	77.34887	75.49085
1971	81.66067	86.44904	64.54029	70.65496	57.41807	67.73379	74.93726	64.52559	69.46435	74.23339
1974	78.70406	85.22649	64.59504	70.38124	55.16767	68.34887	74.85881	63.08617	82.75613	73.74061
1977	78.80212	84.45164	65.81143	70.77320	57.85408	69.42083	77.38900	60.76024	78.80081	74.02350
1980	79.61200	82.73544	62.98875	69.93864	53.05829	67.02817	76.67481	59.96228	79.32156	73.17567
1983	79.23646	79.49137	64.31089	70.09103	55.94228	67.61068	75.44221	62.09932	84.50986	72.80132
1984	79.24693	80.54961	61.89992	68.80509	54.24413	65.09489	74.71587	59.61561	80.76042	71.99153

TABLE 10
TREND GROWTH RATES OF EIGHT REFERENCE PERIODS
OF PER CAPITA PULSES PRODUCTION
GROUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
1960-65	-6.5	1.8	-0.9	-7.7	-2.6	-0.6	-6.4	-11.0	4.6	-5.3
1963-68	-1.4	-4.1	-2.3	-2.5	-3.2	-2.1	-3.1	-1.1	8.2	-2.4
1966-71	0.2	-3.9	6.0	6.2	4.9	6.1	5.9	6.7	-3.2	2.0
1969-74	-13.2	-6.3	3.3	-1.6	3.4	3.0	1.5	-7.9	2.2	-6.3
1972-77	1.7	-0.2	2.0	4.1	-1.9	3.1	-0.7	13.7	-0.6	2.3
1975-80	-10.1	-0.2	-1.0	-9.4	1.9	-1.6	-6.7	-14.5	-4.1	-7.3
1978-83	-2.9	2.4	1.5	4.2	1.1	1.5	4.2	4.8	-10.4	1.6
1981-85	4.1	-0.8	-0.4	-1.5	10.9	-3.4	-1.8	-0.9	1.4	0.3

Table . 11. Annual Percapita Output of Nonfoodcrops (kg)

Groups of States.

Sugarcane

Triennium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1962	563.5043	86.28616	148.8602	114.8837	97.41166	192.5383	154.7328	44.73780	12.24247	207.0786
1965	643.1176	89.98113	198.9160	118.6035	122.0238	264.2229	153.4070	57.50079	20.03174	237.2202
1968	496.9392	69.38406	220.7394	104.2372	176.4552	258.5124	141.2551	39.30332	19.61488	202.3857
1971	592.7731	77.41661	213.9801	124.3140	167.4444	253.9070	163.8902	55.18270	20.58931	226.6696
1974	592.9088	72.54324	240.4277	124.3552	232.2726	247.3885	157.2353	67.08589	24.20207	231.5832
1977	627.7202	68.76138	236.9093	167.9336	211.0764	258.6400	219.6080	78.99124	25.83766	248.4279
1980	500.6642	57.33127	227.5563	157.3704	229.3028	226.1147	204.9627	76.72146	24.47812	214.5777
1983	611.3763	59.96715	249.4510	196.8479	216.1786	276.7523	248.9125	109.5520	20.49171	253.8346
1986	549.5826	53.70113	237.1106	163.5642	252.1900	224.9039	202.4848	99.17789	21.55971	228.1051

Total Oilseeds.

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	16.16667	2.373477	19.92760	24.88474	20.95855	19.05235	18.38495	36.32618	1.373698	15.42594
1965	16.98999	2.570019	21.00418	22.44183	18.87504	22.81251	15.81958	34.06820	2.171541	15.29522
1968	17.25115	2.754746	19.44180	18.36483	16.00098	22.37673	13.17344	27.47114	2.504633	13.94842
1971	17.17933	3.221931	22.64718	22.76935	17.97539	26.65551	14.50628	37.20318	2.626856	15.98764
1974	17.42433	3.683553	23.05120	16.10409	17.94696	27.40785	13.53709	20.57519	3.076077	14.50462
1977	15.26404	3.715052	18.36962	24.55271	16.20074	20.19407	15.78013	39.65215	2.588775	15.14939
1980	12.31477	4.288957	17.73969	22.21794	13.96304	20.85744	14.41710	35.43706	2.979643	13.92412
1983	11.45711	5.984574	20.44157	26.67361	13.96782	25.75352	18.13740	40.98620	3.409419	16.04745
1985	9.930493	6.859659	21.53078	26.76512	13.72874	27.87557	20.64608	36.93396	3.563294	16.24619

Cotton

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	1.763031	0.017728	1.442789	4.911160	1.300303	1.563753	3.872377	6.778365	0.098519	2.003793
1965	2.055166	0.016700	1.152773	4.692383	1.133024	1.169547	3.670613	6.312501	0.092018	1.940333
1968	1.925226	0.012273	1.142743	4.303533	1.115470	1.166005	3.295774	6.071264	0.066145	1.812205
1971	2.047128	0.015012	1.210034	3.994994	1.099347	1.305001	2.287767	6.977156	0.107791	1.775553
1974	2.294751	0.006687	1.531136	3.752039	0.855415	2.107888	2.734603	5.524168	0.109978	1.843779
1977	2.232810	0.010756	1.375797	3.423528	0.941042	1.741512	1.977761	5.911996	0.077418	1.708081
1980	2.317595	0.009133	1.656072	3.805654	0.955636	2.234305	2.538883	5.952293	0.097831	1.897648
1983	2.053273	0.005952	1.625279	3.328618	0.590416	2.474423	2.214498	5.196652	0.087923	1.710942
1985	1.954245	0.004402	1.936791	3.326002	0.994084	2.685288	2.202977	5.192287	0.103726	1.764465

TABLE 12
TREND GROWTH RATES OF EIGHT REFERENCE PERIODS,TWO SUB PERIODS
& ENTIRE PERIOD OF PER CAPITA OUTPUT OF NON FOODCROPS
GROUPS OF STATES

PERIOD	A	B	C	D	E	F	G	H	ROI	INDIA
					SUGARCANE					
1960-65	4.5	0.3	9.4	1.5	7.1	10.4	0.2	8.1	10.9	4.3
1963-68	-4.5	-5.3	4.6	-2.5	13.3	0.7	-1.6	-6.3	-0.2	-2.2
1966-71	4.2	2.2	1.7	4.6	2.4	1.4	3.5	10.9	1.4	3.3
1969-74	-1.3	-2.3	3.2	0.4	8.4	-0.5	-0.9	7.2	3.5	-0.1
1972-77	2.8	-0.9	1.3	11.2	0.3	2.2	12.0	8.2	1.8	3.4
1975-80	-4.9	-5.6	0.8	-0.8	4.9	-2.1	-1.2	2.5	-4.1	-2.7
1978-83	4.7	-0.4	0.8	5.5	-3.3	3.9	4.2	11.2	-7.2	3.6
1981-86	-2.2	-4.6	-2.7	-5.7	2.8	-6.8	-6.3	-2.4	1.9	-3.0
1960-74	-0.1	-1.6	3.6	0.7	7.1	1.8	0.4	2.8	4.4	0.7
1972-86	-0.5	-2.5	0.1	2.5	0.8	-0.4	2.2	3.9	-1.6	0.06
1960-86	-0.07	-2.0	1.6	2.3	3.6	0.3	2.0	3.9	1.6	0.5
					TOTAL OILSEEDS					
1960-65	2.4	4.3	1.2	-5.0	-4.1	5.8	-6.8	-3.3	9.7	-0.7
1963-68	2.6	1.8	-2.7	-6.7	-6.0	-0.4	-5.2	-8.5	3.4	-2.9
1966-71	-1.1	4.9	5.1	7.1	4.1	5.9	4.8	9.2	-3.1	4.4
1969-74	0.03	4.9	2.7	-5.9	0.8	3.5	0.5	-12.0	4.1	-0.8
1972-77	4.0	0.6	-5.4	13.4	-3.8	-6.5	6.0	20.3	1.3	1.6
1975-80	-6.9	4.2	-3.2	-3.8	-6.8	-1.1	-2.9	-4.6	7.1	-3.5
1978-83	-3.2	10.9	1.6	4.6	-4.1	4.4	7.7	2.4	5.3	3.0
1981-85	-7.5	6.7	1.6	-3.1	-1.5	3.0	5.1	-10.7	1.2	-1.2
1960-74	0.6	3.9	1.3	-2.8	-1.3	3.1	-2.2	-3.6	5.5	-0.2
1972-85	-4.7	6.0	-0.5	3.7	-2.5	0.6	3.4	3.8	2.8	0.7
1960-85	-2.1	4.4	-0.2	0.6	-1.7	0.7	0.5	0.4	3.2	0.07
					COTTON					
1960-65	4.0	0.2	-8.0	-2.8	-5.2	-10.1	-5.0	-1.3	-3.2	-2.4
1963-68	-2.6	-8.0	-3.5	-3.0	-5.3	-2.2	-3.7	-1.4	-10.3	-2.8
1966-71	2.2	7.6	1.3	-1.1	-3.5	5.1	-10.3	5.1	16.1	0.1
1969-74	3.9	-6.5	10.5	0.5	-8.0	20.8	6.0	-3.3	1.6	3.2
1972 77	-0.9	13.7	2.2	-0.5	4.0	1.7	-4.1	2.0	-10.3	-0.1
1975-80	0.1	-8.0	6.2	2.7	-0.2	8.0	8.4	-1.0	5.3	2.7
1978 83	-6.6	16.5	-0.5	-6.9	15.5	4.0	8.0	-6.5	1.7	5.7
1981-85	1.5	-12.3	5.8	-0.4	22.0	1.1	0.6	-1.3	9.3	0.8
1960-74	1.8	-6.4	0.4	2.3	-3.2	2.2	-4.0	-0.9	1.2	-0.8
1972-85	-1.0	-4.6	2.3	-0.5	0.2	3.1	-0.1	-0.8	-0.2	0.08
1960-85	0.7	-4.9	1.6	-1.5	-2.0	3.3	-2.3	-0.9	0.3	-0.4

Table: 13. Percentage Area Under nonfoodcrops to Total Cropped Area.

Groups of States.

Sugarcane

Triennium ending	A	B	C	D	E	F	G	H	ROI	INDIA
1962	4.704007	0.934153	0.689262	0.391927	0.663449	0.699911	0.512711	0.209996	0.466122	1.430175
1965	5.846201	1.032697	0.959649	0.534417	0.993043	0.945368	0.649375	0.366462	0.720653	1.790167
1968	4.791347	0.872208	1.324055	0.499863	1.839888	1.105114	0.625780	0.297481	0.461055	1.587298
1971	4.471480	0.866597	1.022205	0.449289	1.170777	0.955588	0.599113	0.234840	0.314829	1.447100
1974	5.295803	0.885600	1.440754	0.554360	1.757380	1.314679	0.664464	0.374972	0.477296	1.762705
1977	5.538782	0.842930	1.465116	0.619228	1.627400	1.391505	0.730815	0.450342	0.495447	1.829242
1980	4.210429	0.718115	1.486350	0.573443	2.044578	1.259279	0.709283	0.372261	0.469012	1.540501
1983	5.051415	0.766792	1.366979	0.649895	1.629615	1.263420	0.773801	0.464846	0.445529	1.726029
1984	4.637677	0.774066	1.439423	0.666790	1.779763	1.297390	0.782592	0.486751	0.425989	1.678384

Total Oilseeds.

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	12.43952	2.859141	10.91152	11.08894	11.44090	10.69313	8.307198	15.27892	2.176843	9.782221
1965	12.92698	2.714715	11.69924	10.14957	10.87357	12.05233	7.981577	13.31704	3.223985	9.613656
1968	13.01319	2.739256	11.19864	9.148665	10.49770	11.49614	7.235418	12.22375	2.351402	9.071579
1971	13.10167	3.309089	14.44464	10.51580	12.88232	15.14516	9.314571	12.23516	2.043672	10.45721
1974	13.01809	3.960945	14.31269	10.61630	12.68024	14.96271	9.765551	12.00238	2.750620	10.54462
1977	12.11498	4.106960	12.14996	10.74712	12.05211	12.19434	9.788473	12.19803	3.009470	9.965599
1980	12.23563	4.985366	12.31343	10.74466	10.02143	13.24575	9.492259	12.59948	3.089284	10.16900
1983	7.708046	5.943756	14.64946	11.92956	11.67958	15.82050	10.38873	14.23072	3.733809	10.37338
1984	6.538012	6.214909	14.48556	13.54153	11.28288	15.82213	11.55608	16.62831	3.831227	10.75474

Cotton.

	A	B	C	D	E	F	G	H	ROI	INDIA
1962	2.085391	0.096433	5.246251	8.489064	3.942693	5.784010	8.937383	7.813785	0.451702	4.931234
1965	2.284839	0.070099	5.189765	8.932473	4.466096	5.499230	9.594544	7.965182	0.322418	5.114893
1968	2.041267	0.067501	5.032323	8.280143	2.947711	5.917119	8.668755	7.655544	0.148204	4.761580
1971	2.317457	0.033553	5.061084	7.946084	3.019868	5.976337	7.905362	8.004374	0.541291	4.721783
1974	2.448552	0.022175	5.137639	7.705601	2.658309	6.124870	7.781904	7.581285	0.428334	4.605496
1977	2.551615	0.034592	5.103682	7.570721	3.084578	6.019532	7.254448	8.049398	0.339742	4.566342
1980	2.733763	0.028168	4.967203	7.460365	2.439992	5.995197	7.852914	6.878993	0.412842	4.519595
1983	2.888265	0.020819	4.515934	6.905062	1.877422	5.556315	7.380593	6.194881	0.405281	4.285516
1984	2.091590	0.019088	4.867141	7.002216	2.604899	5.811235	7.494163	6.237387	0.374773	4.195448

GRAPH 1

AREA UNDER SUGARCANE TO TOTAL CROPPED AREA (%)
GROUP - A,B,C,D
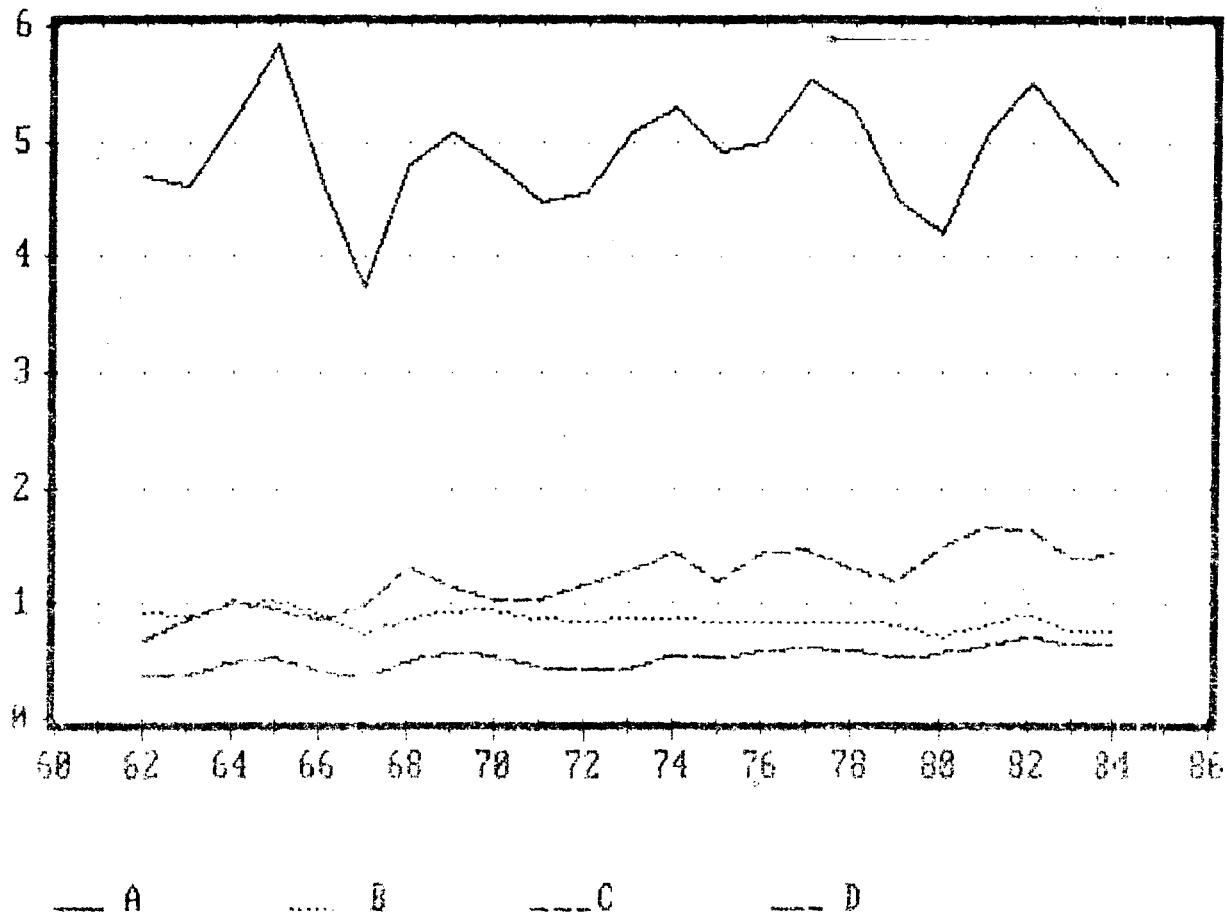
— A   ..... B   ___ C   — D

GRAPH 2

AREA UNDER TOTAL OILSEEDS TO TOTAL CROPPED AREA (%)
GROUP - A,B,C,D
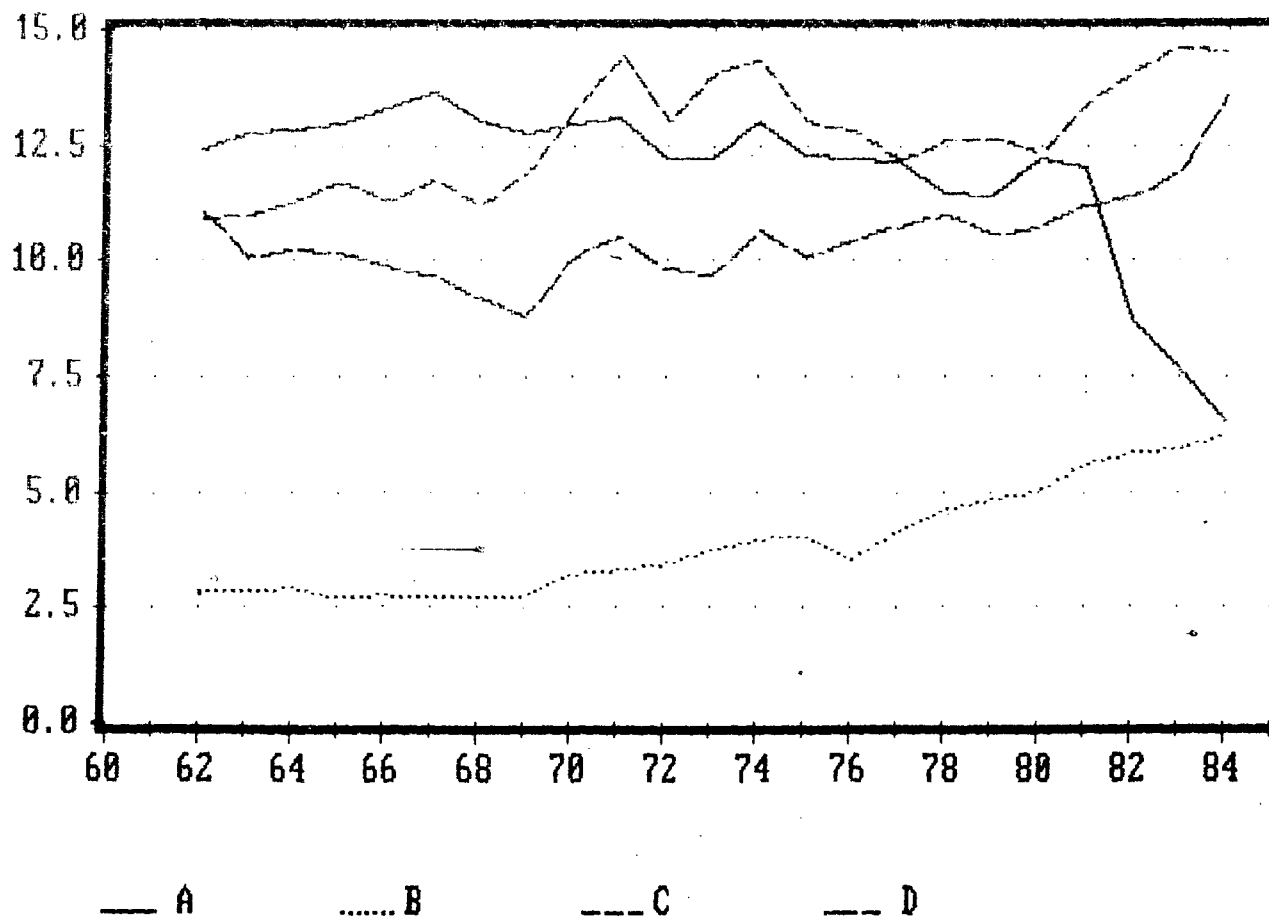
—— A	……B	___C	__ D

AREA UNDER COTTON TO TOTAL CROPPED AREA (%)
GROUP : A,B,C,D

          ___ A   ..... B   ___ C ___ D