Journal of Indian School of Political Economy

Vol. III, No. 3
July-Sept. 1991

A Journal devoted to the Study of Indian Economy, Polity, and Society

INDIAN SCHOOL OF POLITICAL ECONOMY

JOURNAL OF INDIAN SCHOOL OF POLITICAL ECONOMY is devoted to a study of the Indian Economy, Polity and Society. Emphasis is on reviewing developments since Independence with roots in the British administration where relevant. When a review is based on statistical data, as far as possible, full statistical base data are presented. The Journal is intended to be a quarterly. However, in the first year, we brought out only two issues, January-June and July -December 1989. In 1990, we brought out three issues January-April, May-August, and September-December 1990. Beginning 1991, we shall bring out four quarterly issues.

ANNUAL SUBSCRIPTION RATES
(in India)

	Institutional	Individual
1989 (2 issues):	Rs 200	Rs 100
1990 (3 issues):	Rs 300	Rs 150
1991 (4 issues): (and thereafter)	Rs 400	Rs 200
TWO years (1989-90):	Rs 400	Rs 200
FIVE years (1989-93):	Rs 1000	Rs 500

(Foreign)

1989 (2 issues):	US $ 20 or Rs 400	US $ 10/ Rs 200
1990 (3 issues):	US $ 30 or Rs 600	US $ 15/ Rs 300
1991 (4 issues): (and thereafter)	US $ 40 or Rs 800	US $ 20/ Rs 400
TWO years (1989-90):	US $ 40 or Rs 800	US $ 20 or Rs 400
FIVE years (1989-93):	US $ 100 or Rs 2000	US $ 50 or Rs 1000

Foreign rates cover airmail postage. All payments should be made by Demand Draft, payable to Indian School of Political Economy, drawn on any bank in Pune.

JOURNAL
OF INDIAN SCHOOL
OF POLITICAL ECONOMY

A Journal devoted to the study of
Indian Economy, Polity and Society

Vol. III | July-September 1991 | No. 3

CONSTRAINTS ON GROWTH: REFLECTIONS ON THE INDIAN EXPERIENCE

P. N. Dhar

Recent improvements in the performance of the Indian economy force on us two judgements, namely, that past performance has been poor and that future performance need not be so - indeed it should not be so. Hence, a close examination of the constraints on economic growth in India becomes relevant and important. We emphasize growth because it is necessary, though admittedly not sufficient, for the achievement of our major national goals, namely, creation of more productive employment, higher investment in human resource development, alleviation of poverty, sustenance of democracy at home and of stability and peace in South Asia. None of these objectives can be achieved without sufficient economic growth.

I

A few words about the past performance of our economy would be in order. Our significant achievements are the creation of a network of institutions for development, the diversification of the economy, the impressive gains in foodgrain production, the vast increase in trained manpower, the increase in technological capabilities and the big increase in domestic savings. However, these achievements notwithstanding, poverty and the associated phenomena of hunger, illiteracy and high birth rates persist on a scale which makes India the home of a majority of all poor, undernourished and illiterate people in the world. India continues to be a very poor country. Indeed, among the 109 countries reporting their GDP in 1987, India ranked 89th in terms of per capita income [World Bank, 1989].

The strategy chosen to develop the Indian economy was rapid industrialization. In 1955, India's industrial sector was the eighth largest (measured in terms of the aggregate volume of industrial value added) among market economy countries and tenth in the world. By 1973, these ranks came down to the sixteenth and the twentieth respectively. Obviously other countries were doing much better. The Indian industrial drive did, of course, produce a diversified industrial economy equipped with a heavy and capital goods sector, but it proved inadequate. A lower than planned growth of national income and greater than expected growth in population has trivialized our economic gains. The past inability to reverse these trends is registered in our low per capita income and in the burgeoning number of the poor.[1]

Only a decade after planned economic development was launched, Nehru gave expression to the widespread feeling that growth was inadequate and its benefits did not reach the poor. Unfortunately, the concern about inadequate development and poverty got side-tracked by other events which imposed unforeseen burdens on the economy. The sudden increase in defence expenditure consequent to the armed conflicts with China and Pakistan and the levelling-off of foreign aid, all in the short span of three years (1962-65), put the economy under severe strain. A crisis occurred when two consecutive droughts hit the country in 1966 and 1967 and real GDP declined in absolute terms.

The sharp deterioration of the economic situation and the security environment highlighted two main weaknesses of the existing strategy, namely, the relative neglect of agriculture and a critical dependence on foreign aid. Under the stress of circumstances some policy changes were made to encourage growth. These included a greater role for price incentives, the relaxation of some controls on the private sector to enable it to play a larger part in the economy, and a greater emphasis on export promotion. The decision to devalue the rupee in 1966 was part of the same process of policy revision. Changes in policies were required not only to meet the domestic crisis but also to take advantage of opportunities provided by new agricultural technologies and the unprecedented increase in the volume of world trade.[2] However, changes outside the agricultural sector were too

---

Former Secretary to the Prime Minister and Assistant Secretary General at the UN, P. N. Dhar is the Chairman of the Institute of Economic Growth Society, New Delhi.

The paper is based on the V. T. Krishnamachari Memorial Lecture, 1989, which the author delivered at the Institute of Economic Growth, and published by Oxford University Press. A Postscript is added.

minor to amount to a revision strategy.

To weave policy changes into a revised strategy required a strong and politically self-assured leadership, but it was precisely during these difficult years that the authority of political leadership declined. The death of two prime ministers in less than two years unleashed various political ambitions and introduced an element of instability in the structure and the leadership of the ruling party, and incoherence in the policies of the Government. In the prevailing circumstances, economic policies hovered between past political commitments and new economic compulsions, between meeting the demands of radical ideologues on the one hand and a pragmatic response to realities on the other. Thus, pragmatic elements such as the use of new seed-cum-fertiliser technology and an increased investment in irrigation and 'incentive' farm pricing were combined with the ideologically guided and more stringent regulations for industry, especially for larger companies. The new agricultural policy took shape against a compelling background of severe droughts. Changes in industrial policies emerged as a result of the political contest between the conservative and radical elements in the ruling Congress Party. The back drop of this contest was the Party's defeat in the northern states in the General Elections of 1967 and the perceived failure of market-based policies associated with the earlier devaluation of the rupee.

We should also take note here of the political power of the land-owning peasantry and the vulnerability of big business. The land-owning peasantry has the advantage of numbers and of its influence over even larger numbers of marginal farmers and landless labourers. Protection against foreign competition, a traditional interest of big business, was effortlessly secured for it by the strategy of import substitution and the economic nationalism that this strategy generated. But, the overall economic strategy with regard to industry as envisaged in the Second Plan remained unchanged. Indeed, the political and intellectual climate surrounding policy making made it even more doctrinaire than the earlier Plan. There was an increased emphasis on the de-concentration of economic power and distributive justice through nationalization, the expansion of the public sector and greater regulation of the private sector industry. There arose a regulatory system applied on a discretionary and case-by-case basis which made big business prefer the individual approach to a group approach to its problems. This made big business vulnerable and reduced its power as a political lobby though some individual businessmen have undoubtedly been very influential.

The new emphasis created an environment for the radicalization of industrial policies. This deflected attention from the primary need to maintain the momentum of growth. A preoccupation with the limitations of 'the trickle down' of growth de-emphasized growth itself; though it was obvious that a per capita increase of about one per cent, from which requirements of investment were to be set aside, did not leave much to trickle down. Indeed, it became fashionable to deride concern for growth as growthmanship. In retrospect, this seems to have been an anti-growth populist phase of radicalism. Unfortunately, the phase has lasted too long; it continues to weigh heavily on Indian politics. Today, it constitutes a formidable barrier to the acceleration of growth and to a solution for the problem of poverty.

There was a dominant concern for what was called self-reliance, that is, a reduced dependence on foreign aid and, for a while, it seemed as if it would succeed; the inflow of aid did decline. It came down from 1.3 billion US dollars in 1965-66 to under 1 billion dollars in 1967-68 and was turned into an outflow of 120 million dollars in 1972-73. But this was the result of change in the mood of the donors, culminating in the 'Nixon tilt', rather than a result of deliberate domestic policy or economic success. Adjustment to lower levels of aid was sought by economizing on imports and a reduction in public investment which resulted merely in reduced growth [Macdougall, 1964]. The annual increase in per capita income came down from the 1.7 per cent for the period 1950-65 to about 1 per cent for the period 1965-73 and effective anti-poverty programmes could not materialize. In the event, radicalism not only contributed to the deceleration of industrial growth, it also proved irrelevant to the problem of poverty.

It was an external event that jolted India out of its smug attitude to economic policy; the oil shock of 1973. It shattered the kind of insularity in which India was following its economic policies. Overnight, by their decision to quadruple the price of crude oil, the OPEC countries in effect imposed on India an annual tax of about one billion dollars. India was driven to seek more foreign aid, but more importantly, it was dragged into world market to increase its exports in order to be able to pay for oil.[3] The compelling need to increase exports was further sharpened by the second oil shock of 1979 and the subsequent deteriorating climate for concessional aid to developing countries. Since exports could not increase without becoming competitive in price and quality, logic compelled a review of the existing economic policies [Ministry of Commerce, 1984, Ministry of Finance, 1985, 1985(a) and RBI, 1985].

Since then, there has been a marked change in the policy stance of the Government, especially since 1985. There is now a greater emphasis on market incentives and indirect policy instruments than on direct physical controls. The rigour and reach of industrial licensing has been reduced. There has been some rationalization in the tax system and greater concern for the promotion of exports and for increasing efficiency through competition, and less inclination to take over 'sick' units. The pace of reform has, however, slowed down and is in danger of becoming, once again, a hostage to political uncertainty.

II

It is too early to make a firm assessment of the actual effect of the reforms introduced so far. It should be noted, however, that the period from the oil shock of 1973 to the end of the Sixth Plan (1985) shows an increase of about one percentage point in the growth rate of aggregate GDP, as also of manufacturing, as compared to the period from the mid-1960s to 1973.[4] The improvement in the manufacturing sector has been more marked in the Seventh Plan (1985-90).[5] The percentage of people below the poverty line has gone down, although the magnitude of the reduction is disputed.[6] There has also been some reduction in inter-state disparities in income and growth [Ahluwalia and Srinivasa, 1988]. These improvements probably have some relationship to recent shifts in policies. Despite this progress, the Seventh Plan estimated that 273 million people were living in absolute poverty in 1984-85. Since there is no evidence that the income distribution has worsened, poverty on this scale reflects slow growth and low per capita income.

These improvements, though perceptible, are neither impressive nor do they seem to have an in-built accelerator. There is also an element of uncertainty about the nature of the improvement that has characterized growth in recent years. An important contribution to the increase in the growth rate has been made by the tertiary sector which represents substantial growth in public administration and defence. As there are problems in the measurement in real terms of this contribution, this component of growth should not be interpreted too mechanically.[7] Furthermore, the recent spurt in industrial growth has been characterized by increased energy and import intensities, resulting in a fragile balance of payments situation despite the commendable increase in exports.

Thus, the improvement in growth though real is still quite modest. At this stage one might ask the basic question: What is it that prevents India from realizing its growth potential?. Resource constraints is the favourite answer of the Planning Commission. But is it really so?. India has been investing 22 per cent of its GDP during the 1980s and about 19 per cent during the decade before that. The bulk of this investment is financed mainly by domestic savings; foreign savings account for less than 2 per cent of India's GDP. This is a remarkable performance, which few low-income countries have matched.[8] Given this, the Indian growth rate should have been significantly higher than the average rates for these countries. But this has not been the case. It is, therefore, difficult to attribute the lack-lustre performance of the economy to insufficient resources. The pertinent question to ask is, could India not have done better with the resources it did mobilize?

III

As a result of the economic strategy adopted in 1956, the bulk of the resources mobilized through taxation, deficit financing, and external assistance have been invested in heavy industries, machine building industries, and in infrastructure. For pragmatic as well as ideological reasons, these investments were assigned to the public sector which now constitute about one half of the gross domestic capital formation [CSO, 1989, p. 33]. Since the public sector is one of the main driving forces of economic growth, it is necessary to examine its performance in terms of its contribution to the GDP and investable resources.

The public sector was expected to generate surpluses on an increasing scale, as is stated clearly in the Industrial Policy Resolution of 1956. In fact, Professor P.C. Mahalanobis believed that there would be no need for additional taxation in about fifteen years time, *i.e.* by the beginning of the 1970s. After more than thirty years, *i.e.* after more than twice the period in Mahalanobis's calculations, his expectations about the generation of surpluses by the public sector have not been realized. This poor performance has been widely discussed and several committees have made their various recommendations. There has been some improvement here and there but the public sector is no more a significant resource generator today than it was before. On the basis of the latest data available, the net profit on capital employed in 221 industrial and commercial public enterprises in the central sector works out at the rate of a mere 3.8 per cent for the year 1987-88, slightly above the 3.4 per cent for the previous year. And if the profits earned by the public sector oil companies are excluded, the net profit is wiped out or becomes negative [BPE, 1989]. This meagre result is the end product of a period of good performance since 1981-82, which was preceded by four consecutive years of net losses. This is the performance of enterprises which are supposed to be in the better managed segment of the public sector. The performance of state-level enterprises is much worse [CME, 1989].

Despite this dismal performance, the public sector has continued to expand. Moreover, hopes about its capacity for self-regeneration continue to influence estimates of resource availability. In Plan after Plan, the estimates of sources of finance for the Plan highlight a target figure assigned to the public sector on the assumption of improved performance. In Plan after Plan, disappointment at the past lack of success in this area is also faithfully recorded, but the practice continues. This is true even in the case of the Seventh Plan, during which public sector enterprises were expected to make a decisive break with the past in view of the special stress laid on the implementation of 'structural reforms in the management of public enterprises so that these enterprises can meet their production targets and also generate adequate internal resources for their expansion' [Planning Commission, 1985, p. 45] Nevertheless, the improvement has been substantially short of the target for internal resource generation [Planning Commission, 1987].

In theory, public sector enterprises are owned by the people and are run in their interest. In practice, they have spawned a number of economic interests and political constituencies which wield formidable power. All parties in power, regardless of their ideological inclinations, have found that the public sector can easily lend itself to political use. Public sector undertakings project the power of the Government, the Minister, his ministry and his political party over large groups of men and large amounts of money. This is particularly true in the case of the public sector in the states, where it provides an arena for the distribution of sinecures and patronage in return for political support. This is the major reason for the spread of the public sector to activities which are outside the key or strategic area originally recognized for it. Public corporations have been set up in the states for activities which are far from the 'commanding heights of the economy' and are normally undertaken by government departments, civic bodies, or private enterprises.[9] Many public sector companies, especially the larger ones, are required to undertake social obligations such as setting up housing colonies, hospitals, schools, bus services, and so on. Because of an element of subsidy involved in these services, the companies have to bear a financial and management burden which is unrelated to their main job.[10] The political process as it has evolved has

made the public sector an omnibus apparatus for undertaking tasks and responsibilities that belong to the State and society at large. A case in point is the bailing out of 'sick' units of the private sector, which are dumped on the public sector.

The industrial policy of the Government continues to be based on the Industrial Policy Resolution of 1956. Since then, the economy has become more diversified, more complex, and more developed. More financial, technological, and entrepreneurial resources have become available outside the public sector, while public finances and the Government's capacity to sustain or expand the public sector have deteriorated. In view of all this, the reform of the public sector will have to start with a redefinition of its purpose and its role in the development of the economy.

Such a policy review will no doubt lead to a re-allocation of the various spheres of activity between the public and private sectors in terms of the current needs of the economy. It may be found that at the present stage of development, we need more public sector activity in agriculture and infrastructure than in industry; an increased involvement of the State in rural infrastructure, *e.g.* in transport, irrigation, extension services, agricultural research, and a corresponding withdrawal from bakeries, breweries, hotels, the management of tourist resorts, and consumer goods industries. It may be found necessary to retrench some labour, and link wages to productivity in some form or another, to introduce competition between the public and private sectors in areas such as road transport; to restructure banking, insurance, and other financial institutions, and to allow scope for more competition, specialization, and innovation and to let them adjust to and take advantage of the changes that have taken place in the financial markets of the world. The review may also lead to changes in the organization and management of public enterprises; for example, the conversion of State Electricity Boards into autonomous public corporations. Other policy revisions might require the scrapping of some public sector corporations in the State, and transferring their activities to government departments, civic bodies, or to the private sector, or to allow those public sector enterprises which are not viable to close down while restructuring those which can be revived. In other words, the role of the public sector has to be reconsidered in terms of its effectiveness, outside any ideological straitjacket. Reform of this nature is not difficult to formulate and indeed many useful suggestions have been made by the official committees and others from time to time,[11] but it has not proved easy to implement them; too many vested interests are affected which resist reform.

A basic cause of weakness of the present attempts to reform the public sector is that the political party responsible has traditionally supported this sector on ideological grounds. Furthermore, the public sector has cast its spell over a wide spectrum of political groups and parties. Its poor economic performance has not diminished its appeal. These parties view its expansion as the realization of socialism and tend to ignore any distinction between means and ends. It is not easy for such political parties to accept the conclusion that public sector has turned out to be a flawed means of achieving true socialist ends. To undertake the necessary reform of the public sector requires reconsidering the relationship between the original socialist aims and effective means to achieve them.

A formidable obstacle to the reform of the public sector is the political clout of the organized work-force employed by it. Workers in the public sector are a privileged class organized in militant trade unions and they resist any change that affects their vested interests. Politicians need trade union support, and trade union leadership needs concessions for workers to sustain itself. It is a mutual arrangement for political power and economic advantage. As a result, the employed work-force is much larger than is warranted by technical or economic considerations. Moreover, as a model employer, the Government provides job security with the indexation of wages to inflation, and with steady increases in real wages regardless of productivity.

Hence, the solution to the problem of resource constraints does not lie in somehow raising more financial resources and continuing to use them as hitherto, but in getting better returns on what has been and is being invested. To be sure, to get better

returns from public sector investments requires additional investment in technological and managerial improvements. But, besides the requirement of additional resources to effect these improvements, the most important elements for raising the productivity of capital and labour in the public sector depend upon the co-operation of the trade union leadership. Higher productivity will require a smaller work-force, greater regard for work norms, and the linking of emoluments to productivity. These drastic changes, in turn, require amendments to labour legislation which are not feasible without a national consensus.

In public sector projects related to agricultural development the utilization of resources has acquired an additional dimension. Here, losses are only partly due to the heavy capital costs and inefficient operations normal to public sector projects; they are also partly caused by the under recovery of costs and a deliberate policy of subsidy. The political power of the farmers has provided them a variety of subsidies. Some of these subsidies are hand-outs unrelated to incentives. Thus, water rates, canal lining charges, interest rates, and electricity tariffs for agriculture are all subsidized. Credit recovery is slow and loans are sometimes simply written off. In the welter of subsidies, one does not know what part is because of the inefficiency of the establishments and what part is granted on considerations of 'equity'. The budgetary consequences of these amounts have reached alarming proportions.

It is not easy to reduce these subsidies even though their role in aggravating government deficits and in the inefficient use of resources is recognized [Ministry of Finance, 1985]. The beneficiaries are mostly rich and middle-income farmers who created the Green Revolution, reduced the country's food deficit, and gave her much needed food security. In the process, however, these farmers have not only become used to subsidies (which were necessary early on) but also more and more demanding in these matters. The importance of their leaders as powerbrokers who control vote banks makes political parties vie with each other in promising more advantages.

IV

Some of the policies that have shackled the performance of the public sector have also shackled the private sector. This is particularly true of policies that attempt to safeguard the employment of workers already employed. The phenomenon of what is called industrial sickness is a case in point. Until recently, policy with regard to industrial sickness was implicitly based on the assumption that each enterprise that has come into existence must continue, regardless of its value, mainly to safeguard the employment of workers in the organized sector. It is certainly fair to compensate retrenched labour for loss of employment and to train them for alternative employment but, in practice, labour has acquired a veto power on these questions. Paradoxically, trade union veto has also benefited those incompetent and dishonest entrepreneurs who have been responsible for bankrupting their businesses.

Why is industrial sickness so widespread in India? We are not concerned here with causes internal to the firm but with factors over which it has no control. This leads us to the policies under which the private sector has to operate. These policies either prevent adjustment to changing circumstances, or at least cause long delay in adjustment. Despite recent exemptions and a relaxation in the licensing procedures, there are still several provisions which inhibit a firm from diversifying its products or processes or in making a timely reallocation of its resources to more productive uses. And yet, oddly enough, after suffering losses over a prolonged period, firms are given liberal financial concessions and help to overcome policy restrictions. In fact, the rehabilitation programme is attractive enough to induce non-viable firms to delay adjustment so as to be recognized as sick units. Before being declared sick, the firm has to pay for the adjustment costs and seek the approval of relevant authorities. But if it delays adjustment and is then

pronounced sick it gets help from the government, the banks, and the Board for Industrial and Finance Reconstruction. Recent policy changes in licensing have made it easier for new firms to enter the market and for the existing ones to expand. As a consequence, industrial sickness is likely to increase at a faster rate unless contraction and exit for declining firms is made less costly and more timely. The introduction of competition imposes a two-way traffic rule, on both the entry and the exit sides.

The present size of the problem of industrial sickness demonstrates the negative effects of regulatory policies which reduce the adaptability of industry to changing conditions; it also demonstrates the power of unionized labour without whose co-operation it is not possible to have flexible employment policy in declining firms. As a consequence, resources locked up in sick industries, instead of being released for productive redeployment elsewhere, have attracted more resources into non-viable ventures.

Industrial sickness is a dramatized version of the disease of low productivity that has afflicted Indian industry generally and is commonly described in terms of the high capital to output ratio. This raises basic questions about the performance of Indian industry. Assuming that agricultural growth is not likely to accelerate much beyond the current trend, the main burden of improving growth prospects of the Indian economy falls on the industrial sector. What then are the prospects of industrial growth in India? To answer that question one has to examine why growth has been so low for so long. There are many reasons. The slow-down in public investment in the mid-1960s with its particular impact on infrastructural investment has already been noted. Poor management of the infrastructure sector, particularly of railways, power and coal - which are exclusively run by the public sector - compounded the effect of the slow-down in investment. The high levels of protection fostered inefficiency in both the public and private sectors. On the demand side, the slow growth of agricultural incomes limited the domestic demand for industrial goods, and the low quality or high cost of many products limited their exportability. Many of these causes of stifled industrial growth can be traced to the policy-frame itself.

V

In a review of policies it is necessary to keep in mind that, in a democratic system, the government has to balance economic objectives against non-economic aims. In the field of industrial development, one such policy has been to disperse industry in order to maintain regional balance. This was considered a political desideratum, as well as an economic requirement for balanced regional growth. This has sometimes resulted in the unfavourable location of enterprises and also fragmentation of what, on a techno-economic consideration alone, would have been single units or just a few enterprises. The result has been a loss in the economies of scale, higher investment costs, and higher fixed costs per employee.

Another socio-political objective of the State was to reduce concentration of economic power. The bulk of industry at the time of Independence was owned and controlled by a few large business houses with a very narrow social and geographical base. To give greater social and political ballast to the process of industrialization, it was thought necessary to reduce the existing concentration, and to simultaneously promote industrial enterprises outside the existing conglomerates. Hence, small-scale industry was to be promoted as a nursery for the growth of entrepreneurs in different parts of the country and thus provide a widely based entrepreneurial class. Besides, it was presumed that small industry used more labour and less capital per unit of output than did large industry. Thus the choice of techniques in small industry was assumed to be more in accord with the factor endowments of the country. It was believed that small-scale industry was more footloose and could be spread out more easily and at lower cost. The role of small-scale industry in development was therefore twice blessed; it was socially and politically desirable and economically advantageous [Dhar, 1979].

There are two kinds of enterprises that benefit from being small-scale, and they are at the two opposite ends of the industrial spectrum. One kind, the most numerous, are those producing

traditional goods. They are pre-modern, household enterprises, employing little or no hired labour. Most of them get their raw materials from local sources and sell their products in local markets. They are, in sum, small-scale, rural and localized units of production. They are labour-using and capital-saving and widely scattered. No further effort was required to decentralize them. But the scope of these enterprises to expand was limited; with the rise in incomes, demand tended to move away from 'inferior' traditional goods towards 'superior' or modern products. With an increase in rural income, especially after the Green Revolution, rural demand patterns became increasingly similar to the urban ones and shifted away from traditional products.

The second kind of small-scale industry has appeared as a result of the growth of modern large-scale industry, which has created several areas of complementarity between the large and small sectors. Certain parts and processes of modern manufacture can be taken out as ancillaries, which can be set up as separate enterprises, either independent or subcontracted. Though small in size, these firms concentrate on the production of a single or a few components and thereby reap the advantages of economies of scale, and contribute to overall industrial efficiency. Japanese industry has used this arrangement to great advantage. In India, this type of small industry has not made much progress. Indian manufacturers have shown a preference for integrated plants. Some of the reasons for this preference are of organizational nature, such as the difficulties of ensuring quality and delivery schedules in situations of shortages of raw materials. The sales tax and other fiscal levies with their cascading effect further discourage sub-contracting. At the same time, sub-contracting may take place for negative reasons to escape the rigours of labour legislation applicable to large units, or to exploit the advantage of reservations for the small-unit sector.

The type of small enterprise that has developed faster than any other type in India is the capital-intensive small factory. Such an enterprise uses modern techniques to produce modern goods. It cannot be attracted to rural areas where the necessary facilities of trade, communications, and finance are lacking, and where enterprise and skilled labour are scarce. In short, it has not proved as footloose as it was expected to be. Nor has it been enjoying favourable capital output ratios. This is for the simple reason that it uses the same techniques as its counterpart in large industry [Dhar, 1979].

The establishment of industrial estates and the availability of technical assistance, hire purchase facilities, bank finance, marketing assistance, etc., have provided a powerful stimulus for the expansion of small industry. Like most of big industry it has been totally insulated from foreign competition and, gradually, from domestic large industry as well, by the reservation of certain products exclusively for it. The transition of government policies from promotion to protection has created a vested interest in smallness. The ultimate success of small enterprise is to cease to be small, but the policy environment has encouraged small enterprises to stay frozen in their existing state.

VI

We now move to the main instruments of policies devised to implement the development strategy of import substitution. Import substitution was expected to give rise to problems that needed to be anticipated and forestalled. One was that of investment being attracted by market demand into low priority industries, another that of over-investment in preferred ones. To keep investment flowing strictly according to plan preferences and in predetermined amounts required controls. This was the rationale of the Industries (Development and Regulation) Act of 1951 which provided the legal basis for the regulatory system in which industry was to develop. Under the Act, prior approval was required to establish a new manufacturing unit, expand output by more than 5 per cent a year or 25 per cent over five years, manufacture a new product in an existing plant, or relocate a plant. In other words, the government's role did not remain confined to the broad direction of the industrialization process; it was extended to detailed decisions at the micro-level concerning

individual enterprises, such as the choice of technology, the scale of operation, product mix, and location of the plant.

From time to time there have been some modifications or relaxations in its working, but in its basic essentials the system remains intact. The regulatory system has shaped the contours of Indian industry, as well as the quality of its entrepreneurship. A diversified industrial structure has come into existence which enables India to produce most of the manufactured goods it requires, if cost and quality considerations are set aside. Since the micro entrepreneurial functions were also taken over by the government, the private entrepreneur became in effect a rentier. He has to face little competition because he did not have to sell his products; he had only to distribute them. If he was ambitious and wanted to keep his market share or obtain an oligopolistic market, his effort would be directed to pre-empting licences, which he would use not to increase his own output but to prevent his rivals - existing or potential - from doing so. The best talent available to him would be deployed by him in New Delhi and other state capitals to canvass the support of the authorities concerned and to chase files through offices. The only competition relevant to him was competition for licences and permits.

Industrial performance has nonetheless improved in recent years, partly in response to the relaxations in restrictions and other policy changes. The domestic markets are now much larger and more varied than in the 1950s when many of the initial trade and industry policies were adopted. Despite the debilitating effect of these policies on the quality of entrepreneurship, there are many entrepreneurs who are able to respond to appropriate incentives and to the removal of constraints on competition. The younger generation of entrepreneurs and managers is more self-confident and professional in its outlook. The industrial sector now seems to have progressed to the point where a further loosening of the regulatory constraints and the infusion of competitive incentives are essential if it is to be the driving force for economic growth.

VII

This brief survey of some major aspects of the Indian development process shows that the constraints on growth are mostly embedded in the policies and institutions that accompanied the process. The full benefits of the resources mobilized for development have not been realized, and indeed could not be realized, because of political and social compulsions. Some of the resulting deviations from the dictates of economic logic were inevitable and justified; for example, the suboptimal use of resources in the interests of regional balanced growth and the development of a co-operative federal system.[12] But there are other policies which have resulted in a less efficient use of resources where no such justification can be claimed. Examples are: import substitution beyond the requirement of protecting infant and strategic industries; extension of the public sector beyond the domain of 'commanding heights' till it became an end in itself, regardless of costs and returns; wage increases in the organized sector without a sustainable relationship to productivity; protection of jobs and, therefore, the maintenance of unprofitable private units by subsidies; protection of small industries beyond the requirements of their growth; the subsidization of rich and middle farmers beyond the incentives they needed. Other policy failures have been: the neglect of available export opportunities; the absence of the discipline of competition; the substitution of capital for labour because of distortions in factor prices; slow growth of employment; increasing budget deficits. Policies often became doctrines and the result has been low growth and extensive poverty.

These polices need to be changed. What are the prospects? As already noted, there are powerful interest groups who have benefitted from present policies and who will resist change. Measures required to achieve an increase in the volume and efficiency of investment resources will impinge upon the interests of such powerful groups as big farmers, small industrialists, trade union elite groups, and several business groups operating in sheltered markets or trading in scarce commodities. Through their influence over the electoral process, these groups have acquired a political clout which they use effectively to promote their

interests; they have successfully projected measures that further their interests as policies to help the cause of equality and socialism. It is their influence and support that has made the economic arrangement, resulting in low growth and continued poverty, politically acceptable.

But, the present economic arrangement is becoming less and less viable. Within the system, the deterioration of public finances has reached a point where the burden of defence, subsidies, public enterprise losses and debt obligations cannot be sustained.[13] Something has to give; hence the pressure for reform from within the system itself. Outside the system the urban poor, landless rural workers, marginal farmers, and deprived ethnic groups, whom development has so far bypassed, are becoming politicized very rapidly. As these groups become more salient in the political process, their economic claims pose a serious challenge to the existing arrangement. In a democracy it is not easy to adopt policies which benefit only some, because others lose; particularly if the losers are important political groups. In these circumstances the low growth system will no longer be viable. Accelerated growth will be required to meet the new demands.[14]

This requires reform of a far-reaching nature - to dismantle the structures of protection and privilege and to tackle successfully the problems of the public sector, industrial sickness, subsidies, protection of small industries, and the introduction of competition in the organized sector through open entry and exit, as well as through a reduction in the protection from international competition. Such reforms, as noted earlier, are bound to be resisted by the interest groups affected; their resistance will stiffen if the reforms hurt them seriously.[15] Support of the poor and the unemployed will have to await a perceptible increase in employment. At the ideological level, fears have been expressed that the policy revisions made so far have a pro-rich and pro-urban bias and pose a threat to our traditional policy of economic self-reliance and indigenous research and development and, indeed, to our national sovereignty. Though unfounded, in the absence of refutation, these fears draw attention. In these circumstances, it will not be enough for reforms to be technically sound and defensible; to be successful, the reforms will need critical political support, indeed a new consensus for growth and development.

A serious attempt in this direction demands an exercise on a scale undertaken at the Second Plan. The exercise could perhaps be in three parts. First, it would provide a balanced critique of the earlier policies indicating their inadequacies in achieving the objectives for which they were designed. The second part would be a clear statement of the policy changes proposed, of their internal consistency and practical feasibility, and of the sequence in which they could be implemented. The final part would outline the possible impact of the new or revised policies on growth, employment, poverty, and India's position in the interdependent world economy which is currently undergoing rapid technological change and significant shifts in the balance of economic power.

Normally such exercises are undertaken by governments or political parties committed to economic reforms and determined to implement them. In an environment as heavily laden with populism as it is in India today, political parties think it imprudent to spell out reforms. But India does need extensive economic reforms; without them the prospects for growth and the alleviation of poverty are unlikely to become better than they are. Such an outcome would not be a case of poor economic management; it would be a national failure and would confirm the old gibe that 'India is a country of the future ... and will always remain so.'

Post Script

I

Two years have passed since the above assessment was made. It would be useful to consider how the economy has functioned and what the policy stance of the Government has been since then. Two points I made in the lecture have unfortunately been borne out. One, that 'the pace of reform ..... is in danger of becoming, once again, a hostage to political uncertainty'; and two, that 'the present economic arrangement is

becoming less and less viable ..... The deterioration of public finance has reached a point where the burden of defence, subsidies, public enterprise losses and debt obligations cannot be sustained. Something has to give .....' The General Elections of 1989 with their inconclusive results further encouraged competitive populism rather than the pursuit of reform. For example, soon after it was installed the Janata Dal Government announced loan waivers resulting in a new burden of Rs 8,000 crore on the exchequer. Again, the procurement price of wheat and rice was raised twice in 1990-91 without any attempt to raise the fertilizer price which had remained unchanged since 1981 so that the burden of fertilizer subsidy rose to Rs 4,400 crore in 1990-91. This happened despite the Government's promise to contain the budget deficit and restore fiscal balances. These and similar policies led to accelerating fiscal deficits. The ninth Finance Commission had projected the Centre's revenue deficit at the level of Rs 8,500 crore for 1990-91 and 1991-92. The actual figures turned out to be twice as high with the inevitable increase in inflationary pressures which spilled over and aggravated the balance of payments deficits. By the beginning of 1989, the balance of payments situation was serious enough to require the Government to seek IMF assistance. For political reasons a recourse to IMF was avoided in favour of short-term commercial borrowing, a decision which boomeranged when the situation deteriorated further due to the Gulf crisis. The Gulf crisis resulted in a substantial loss of worker's remittances and of reduced exports to the countries of the region and increase in the import bill for crude oil and petroleum products.[16] These developments resulted in a sharp decline in foreign exchange reserves from Rs 5,050 crore in August 1990 to Rs 4,388 crore at the end of the fiscal year 1990-91. The decline in reserves occurred despite two IMF loans during this period, the first in July-September 1990 amounting to Rs 1,173 crore and the second in January 1991 amounting to Rs 3,344 crore. Evidently the balance of payments situation was extremely precarious. This fact combined with political uncertainty brought down India's credit rating in financial markets abroad and among the NRI's. The postponement of the budget and the protracted electoral process of the General Elections of 1991 delayed the implementation of corrective measures. When the banks decided to stop roll-overs of the short-term debt which had started accumulating since 1988 and a default on international obligation became a possibility, the new Government that took office in June 1991 was faced with the most severe financial crisis in the post-independence history of the country.

II

The immediate task of the Government was to ward off the default which it did and to achieve a viable balance of payments situation in the context of the necessary macro-economic adjustment. This required a series of hard decisions which had been avoided so far. When the Government committed itself in December 1990 to reduce the fiscal deficit of the Central Government from an expected 8.3 per cent of GDP in 1990-91 to about 6.5 per cent in 1991-92, it amounted to an acknowledgement that soft options were not available any more.

The new Government under the stress of a much graver situation and in preparation for negotiations with the IMF has spelt out in detail its approach to the problem. In his budget speech, the Finance Minister said that 'for the management of the economy, the starting point and indeed the centre-piece of our strategy should be a credible fiscal adjustment and macro-economic stabilization during the current fiscal year to be followed by continued fiscal consolidation thereafter'. Later on in the speech, he added that 'macro-economic stabilization and fiscal adjustment alone cannot suffice. They must be supported by essential reform in economic policy and economic management, as an integral part of the adjustment process, reforms which would help to eliminate waste and inefficiency and impart a new element of dynamism to growth processes in our economy' [Union Budget, 1991-92]. Taking all the measures announced by the Finance Minister into account, the fiscal deficit is expected to decline from 8.3 per cent to 6.5 per cent of the GDP. These calculations are based on the assumption of a 13 per cent GDP growth - 4 per cent real and 9 per cent inflation. The calculation will of course change if there is any change in the

assumed growth rates and changes in the financial proposals before they are passed by Parliament.

The presentation of the budget was preceded by changes in trade and industrial policies indicating the Government's resolve to carry out adjustment policies and structural reforms concurrently as it should, rather than sequentially as some critics desired. Following the devaluation of the rupee on the first and third of July and the introduction of the enlarged REP System the cash compensatory support for exports was discontinued with effect from the date of the second devaluation. Apart from promoting exports and linking import capacity to export earnings the changes in trade policy have resulted in a saving of Rs 2,000 crore on account of the abolition of export subsidies.

The changes in trade policy were followed by more drastic changes in the industrial policy. Under the new policy, licensing was abolished for all projects except for a short list of industries related to security and strategic concerns and social reasons, hazardous chemicals and overriding environmental reasons and white goods (items of so-called elitist consumption).[17] The exemption from licensing is also to apply to all substantial expansions of existing units. Industries of security and strategic significance are to remain in the public sector.[18] Industries reserved for the small-scale sector are to continue to be reserved. Industrial investment has also been freed from locational constraints except in cities with a population of more than one million. In such cities industries other than those of a non-polluting nature like electronics, computer software and printing, will be located outside 20 kilometres of the periphery except in industrial areas which have already been designated. To promote the dispersal of industries in backward areas, reliance will be placed on investment in infrastructure.

The new projects have also been freed from the obligation of phased manufacturing programmes. The mandatory convertibility clause will no longer be applicable in the case of term loans from financial institutions for new projects. Approval for foreign direct investment upto 51 per cent of the equity in high priority areas will be automatic. A special empowered Board will be constituted to negotiate with large international firms and approve direct foreign investment in selected areas. There will be a special programme to attract substantial investment which would provide access to high technology and external markets. The policy envisages disinvestment of Government equity in the public sector to mutual funds, financial institutions, the general public and to workers. The sick public sector enterprises will now come under the purview of the Board of Industrial and Financial Reconstruction for their revival. A social security mechanism will be created to protect the interests of the workers affected by such rehabilitation. The MRTP Act will be amended to remove the threshold limits of assets in respect of MRTP companies and dominant undertakings. Thus the requirement of prior approval for the establishment of new undertakings or expansions or mergers, etc., has been abolished.

III

Reforms announced by the Government in the very first month of its existence are significant in their sweep. They largely correspond with the requirements I had indicated in my lecture although more changes are certainly needed for example, in trade policy, especially in the area of tariff reforms. The Government has yet to spell out more fully its policy regarding the public sector. It has also to work out the implications of the reforms on the nature of future economic planning and indeed on the structure and functioning of the Planning Commission itself. Nevertheless the fact remains that what has been announced so far is very impressive especially since these initiatives come from a minority Government.

What are the prospects of the kind of reforms which have now been announced?. I had said in the lecture that 'there are powerful interests which have benefitted from present policies and who will resist change'. The Government seems to have taken a realistic view of the strength of the entrenched interests and made some concessions to them. Some advocates of reforms may not consider this a happy augury but compromise, it must be remembered, is an essential element in the democratic process. The reforms programme will be successful only if it is politically feasible.

The requirement for political support seems to explain why the Government has decided to continue to keep certain items reserved for the production of small scale industries although the economics of this policy is open to serious doubt. The same requirement prompted it to respond to the Opposition and agree to reduce by 10 per cent the proposed hike in the price of fertilizer, from 40 per cent to 30 per cent, although the reasons advanced for this on the basis of equity are not valid.[19] It is, again, the political clout of the militant trade union leadership that explains the ambivalence of the Government on the issues of labour retrenchment in sick mills and unviable public sector enterprises.

The real problem for the success of the reforms will be the nature and extent of concessions that will have to be made to the interests that will be adversely affected by them. If the concessions made lessen their burden of adjustment to the new situation and smoothen the process of transition the concessions will be worthwhile. The effectiveness of the reforms undertaken, therefore, will depend on the way they are implemented and the political support that is generated in their favour.

The structural reforms that India needs impinge on powerful vested interests listed in the lecture. These interests are bound to resist the reforms. The need to undertake the reforms simultaneously with the stabilization programme makes for greater political difficulties because in the short run, the programme is going to impose on several sections of society sacrifices in the form of slow growth of employment and loss of income. The fact that the Government initiatives are under the shadow of IMF loan negotiations further adds to the Government's problems of the political management of reforms. Most countries where reforms of this nature have been attempted successfully have been able to carry them out on the basis of some kind of a national consensus. In India's case the need for such a consensus is even greater. Whether such a consensus will evolve depends on the calibre of the Indian national leadership. More importantly, it will be a test of democracy as an instrument of economic development and social change. The final outcome will depend upon how successful the political leadership will be in adjudicating rival claims of different interest groups - some of whom are coercive in their political techniques - during the period of transition to high growth and reduced poverty promised by the reforms.

NOTES

1. According to the International Comparisons Project of the United Nations and the World Bank, Indian GDP per capita was estimated to be 4.7 per cent of the per capita GDP of the United States in international dollar terms of purchasing power parities [World Bank, 1989, Table 30].

2. Addressing the Lok Sabha on 13 December 1963 Nehru said, 'One thing that distresses me greatly is that there is a good number of people in India who have not profited by development planning and whose poverty is abysmal and most painful. I do think that some method should be found to remedy the situation.'

3. The export drive was vigorous. Exports registered a growth rate of over 20 per cent (7-8 per cent in volume terms) from 1973-74 to 1977-78, an impressive performance by Indian standards.

4. The growth rate of the aggregate GDP increased from 3.33 per cent during the period 1964-65 to 1973-74 to 4.25 per cent during the period 1973-74 to 1985-86. The corresponding growth rates for the manufacturing sector are 3.47 per cent and 4.60 per cent respectively [Sundaram and Tendulkar, 1989].

5. In terms of the revised index of industrial production, with 1980-81 as the base, the growth rate in manufacturing is 8.9 per cent during 1984-85 to 1988-89 compared to 5.7 per cent during 1980-81 to 1984-85 [RBI, 1989].

6. According to the Planning Commission, the percentage of people below the poverty line decline from 48.3 per cent in 1977-78 to 41 per cent in 1981-82. The latter estimate has been contested by B.S. Minhas, *et al* [Minhas, *et al*, 1987]

7. Between 1973-74 and 1985-86 the aggregate GDP increased at the rate of 4.25 per cent while the tertiary sector increased at the rate of 6.18 per cent and public administration, defence at the rate of 9.75 per cent [Sundaram and Tendulkar, 1989].

8. The active role of the Government in raising resources has been very impressive. Between the First and the Seventh Plans-from 1950-51 to 1987-88- the Government succeeded in raising tax revenue as a percentage of GDP from 6.8 per cent to 17.2 per cent.

9. P.L. Tandon, a distinguished manager with experience of both the public and private sectors, has observed, 'the recourse to public sector is taken because money can be spent on purchases, advertising, travelling, vehicles, guest houses, entertainment, employing staff - all of which in a government department would come under strict scrutiny, which can all be shed in a corporation in the same name of autonomy [Tandon, 1987].

10. P.L. Tandon, a former director of Hindustan Steel has observed, 'when the management of a steel making enterprise has to run large housing colonies, clubs, schools, polytechnics, hospitals, temples, colleges, waterworks, lighting, roads, sanitations, bus services, shops and co-operatives, it will inevitably have less time to concentrate on its main function, to make steel' [Tandon, 1987].

11. Soon after the nationalization of banks in 1969 the role of the public sector in the economy was widely discussed. In a discussion organized by *The Citizen and Weekend Review* with Prime Minister Indira Gandhi, several suggestions were discussed, ranging from the establishment of an autonomous development bank which would scrutinize the profitability and efficiency of the candidate projects of the public sector before agreeing to finance them, to the deliberate introduction of competition between the public and private sectors, particularly in industries where the former has established a dominant position, to the professionalization of management and the introduction of more relevant accounting practices.

12. Critics can say that the choice of instruments to increase regional balance could be better and less costly. Commenting on the approach to the problem of regional balance Louis Lefeber described, as early as 1961, the governments policy of low-yield type rural programmes, or arbitrary location of industrial investment, as a transfer payment to improve income distribution rather than a contribution to economic development. His preference was for investments that would prepare the ground for national integration and future development, like land reclamation, reforestation, and public works which increase communications and mobility like roads and schools [Lefeber, 1964].

13. In the fiscal year 1988-89, 'the three components of non-plan expenditure, *viz.*, defence, interest payments and major subsidies alone pre-empted about 105 per cent of the Centre's net tax revenue ... ' [RBI, 1989].

14. For a fuller discussion on this point see [Dhar, 1987].

15. Several observers have expressed serious doubts about the ability of a democratic regime in India to undertake a major shift in development strategy. For example, [Kohli, 1989, Kochanek, 1986].

16. The Cost of POL imports which was estimated at Rs 6,400 crore in April increased to Rs 10,820 crore during 1990-91. Rs 965 crore were lost in remittances from and exports to Kuwait and Iraq [Ministry of Finance, 1991, p. 181].

17. Industries specified for compulsory industrial licences: coal, lignite, petroleum other than crude, distillation and brewing of alcoholic drinks, sugar, cigars and cigarettes for tobacco and manufacturing tobacco substitutes, motor cars, entertainment electronics like VCRs, colour televisions, tape recorders, and refrigerators, washing machines and air-conditioners.

18. Industries reserved for the public sector are: arms and ammunition and related defence equipment, defence aircraft and warships, atomic energy, coal and lignites, mineral oils, mining of iron ore, manganese ore, chrome ore, gypsum, sulphur, gold and diamond, mining of copper lead, zinc, tin, molybdenum and wolfram, minerals (atomic energy and railway transport).

19. The medium and large farm households constitute less than 8 per cent of total rural households but own about 50 per cent of the cultivated area. The bulk of the fertilizer subsidy and other implicit subsidies on power and irrigation thus accrue to a minority of the rural rich.

REFERENCES

Ahluwalia, Isher Judge and Krishna Srinivasa, 1988; 'Income and Growth: A Regional Profile' in *Economic Times*, February 25-26, 1988, Bombay.

B.P.E., 1989; *Survey of Public Enterprises, 1987-88*, Bureau of Public Enterprises, Government of India, New Delhi.

C.M.E., 1989; *Economic Outlook, June 1989*, Centre for Monitoring Indian Economy, Bombay.

C.S.O., 1989; *National Accounts Statistics, 1980-81 - 1986-87*, Central Statistical Organisation, Government of India, New Delhi.

Dhar, P.N. 1987; 'The Political Economy of Development in India in *Indian Economic Review*, Jan-June 1987, Delhi School of Economics, Delhi.

Dhar P.N. 1979; 'Some Observations on Small Scale Enterprise Development' in C.H. Hanumantha Rao and P.C. Joshi (Eds), *Reflections on Economic Development and Social Change*, Allied Publishers, Delhi.

Economic Times, July 26, 1989.

Kochanek, Stanley A., 1986; 'Regulation and Liberalization Theology in India', *Asian Survey*, Vol. 26, No. 12, December 1986.

Kohli, Atul, 1989; 'Politics of Economic Liberalization in India,' *World Development*, Vol. 17, No. 3, March 1989.

Lefeber Louis, 1964; 'Regional Allocation of Resources in India', in Rosenstein-Rodan (Ed), *Pricing and Policies*, MIT Press, Cambridge, M.A.

Macdougall, Sir Donald, 1964; 'India's Balance of Payments Problem' in P.N. Rosentstein (Ed), *Pricing and Policies*, MIT Press, Cambridge, M.A.

Minhas, B.S., L.R. Jain, S.M. Kansal and M.R. Saluja, 1987; 'On the Choice of Appropriate Consumer Price Indices and Data Sets for Estimating the Incidence of Poverty in India' in *The Indian Economic Review*, Vol. 22, No. 1, Jan-June 1987.

Ministry of Commerce, 1984; *Report of the Committee on Trade Policies*, (Chairman: A. Hussain), Government of India, New Delhi.

Ministry of Finance, 1985; *Report of the Committee to Examine Principles of a Possible Shift from Physical to Financial Controls*, (Chairman: Narasimham), Government of India, New Delhi.

Ministry of Finance, 1985 (a); *Long Term Fiscal Policy*, Government of India, New Delhi.

Ministry of Finance, 1989; *Economic Survey, 1988-89*, Ministry of Finance, Government of India, New Delhi.

Ministry of Finance, 1991; *Economic Survey 1990-91*, Ministry of Finance, Government of India, New Delhi.

Mohanty P.K., 1988; *Collective Bargaining in Steel*, India Publishing House, Delhi.

Mukhapadhayay, Swapana, 1989; *Urban Labour Markets in India*, Working Paper No. 32, World Employment Programme Research, ILO, Geneva, June 1989.

Pais H., 1988; *Wages and the State; Policy and Perspectives*, National Labour Institute, New Delhi (mimeographed).

Planning Commission, 1985; *Seventh Five Year Plan, 1985-90*, Planning Commission, Government of India, New Delhi.

Planning Commission, 1987; *Mid-Term Appraisal of the Seventh Five Year Plan, 1985-90*, Planning Commission, Government of India, New Delhi.

Planning Commission, 1989; *Perspectives and Issues, and Implications of Alternative Growth Rates for the Eighth Plan*, Planning Commission, Government of India, New Delhi, June 1989 (mimeographed).

RBI, 1985; *Report of the Committee to Review the Working of the Monetary System*, (Chairman: S. Chakravarty), Reserve Bank of India, Bombay.

RBI, 1988; *Report on Currency and Finance*, 1987-88, Vol. I, Reserve Bank of India, Bombay.

RBI, 1989; *Annual Report 1988-89*, Reserve Bank of India, Bombay.

Sundaram, K. and S.D. Tendulkar, 1989; *Third Growth Rates Relating to the Indian Growth Process* (mimeographed).

Tandon, 1987; 'Focus on Public Sector', *Mainstream*, May 3, 1987, New Delhi.

The Citizen and Weekend Review, New Delhi, Vol. 1, No. 22, 1970.

Union Budget, 1991-92; Finance Ministers' Speech, Part A, July 24, 1991, Government of India, New Delhi.

World Bank, 1989; *World Development Report, 1989*, World Bank, Washington, D.C.

RURAL AND URBAN COST OF LIVING : 1983 TO 1987-88 STATE-WISE AND ALL-INDIA

B. S. Minhas, L.R. Jain
and S. D. Tendulkar

With a view to meeting the growing need of the researchers, this paper takes up the task of constructing almost fully representative rural and urban cost of living indices, at the state and all-India level. These indices have been obtained for three broad aggregates- all food, all non-food and all consumer items together (general) - for four recent agricultural years, viz., 1984-85, 1985-86, 1986-87 and 1987-88. The weighting diagrams for these indices are based on rural and urban consumer expenditure surveys in the two alternative base years of 1970-71 and 1983.

1. Introduction

In two recent studies [Minhas *et al* (1988,1990)], almost fully representative cost of living indices, separately for the entire rural and urban population at the all-India level as well as for twenty states/union territories, were constructed. These consumer price indices related to three broad aggregates-all food, all non-food and all commodities- and pertained only to five National Sample Survey (NSS) periods between 1970-71 and 1983, viz., 1970-71, 1972-73, 1973-74, 1977-78 and 1983. In the construction of these indices, extensive monthly retail price data, collected for the compilation of official consumer price indices for different occupational groups such as agricultural labourers (CPIAL), industrial workers (CPIIW) and non-manual employees (CPINM), was combined with the NSS-based consumer expenditure patterns, using two alternative weighting diagrams relating to the base years of 1960-61 and 1970-71.

In this paper, which is an extension of the two earlier studies quoted in the previous paragraph, we present rural and urban cost of living indices for the same twenty states/union territories as well as all-India for four consecutive years in the mid-1980s, based on two alternative weighting diagrams relating to 1970-71 and the more recent year 1983. These new consumer price indices for three broad aggregates- all food, all non-food and general (food plus non-food)- relate to agricultural (July-June) years 1984-85, 1985-86, 1986-87 and 1987-88.

The remainder of the paper is organised as follows. Data used and their limitations are briefly described in Section 2. The procedural steps, followed in the construction of item group-wise and general indices for rural and urban populations of different states and all-India, are described in Section 3. Based on these procedural steps, the state-wise and all-India indices for the four consecutive years, from 1984-85 to 1987-88 (with 1983=100), are reported in Section 4. In this section, we also compare these new indices with the less satisfactory official constructs (which, though not strictly comparable but just happen to be used for similar purposes) pertaining to the same points of time. The index movements over time in respect of food, non-food and general are also analysed both for different states and all-India, separately for the rural and the urban populations. Finally, in Section 5, some concluding remarks and summaries of important numerical results are provided.

2. Data and Their Limitations

For the purpose of compiling the various indices, we have chosen the agricultural (July-June) rather than the calender or financial (April-March) year as the reference period. This choice is governed by the consideration that it coincides with the NSS survey period relating to the 42nd and 43rd rounds so that ready price-adjustment factors become available to analyse the latest available consumer expenditure data. There are two essential ingredients in the construction of a consumer price index, viz., (a) the budget pattern or the weighting diagram in the

---

B.S. Minhas is Distinguished Scientist Emeritus, and L.R. Jain is Professor, Indian Statistical Institute, Delhi Centre. S.D. Tendulkar is Professor, Delhi School of Economics, University of Delhi.

S.D. Verma was deeply involved in the collection and processing of price data at the initial stage in the preparation of this paper. His contribution to this study is gratefully acknowledged.

base year, and (b) the retail prices of the various items of consumption forming the budget in the base and the current years or the relevant price relatives for current years. The data source and its limitations, in the context of these two ingredients, are described in the following sub-sections, separately relating to the construction of state-wise rural, state-wise urban and all-India rural or urban indices.

2.1. State-wise Rural Indices

The retail price data used in this study are taken from the CPIAL series, which regularly collect item-wise monthly retail prices from a fixed set of 422 sample villages spread among 39 Agricultural Labour Enquiry zones and 15 states/groups of states. Since some further reorganization of states was undertaken after the CPIAL series began to be collected, we have been constrained to assume that the base year price data of the combined Punjab applied to present day Punjab, Haryana, Himachal Pradesh and Delhi. Similarly, Assam data on prices for 1960-61 is taken to apply to Manipur and Tripura as well.

Price quotations are collected by the National Sample Survey Organisation (NSSO), once a month on the first market day or Saturday, for a large number of items whose specifications were fixed in the base period July 1960 to June 1961 (1960-61). For each item, monthly price relatives, with 1960-61=100, are obtained for all the sampled villages falling in a particular zone of a state and the simple arithmetic average of all these price relatives gives the zonal price relative of that item. The state level price relative is obtained as the weighted average of the price relatives of all the zones belonging to the state, the weights being the estimated aggregate consumer expenditures on the item at the zonal level in the base period. These state-wise monthly retail price relatives for 62 items of consumption were made available to us. These constitute the price data set used in this study. We have confined ourselves to only those months which formed the calender year 1983 and five agricultural years, viz., 1970-71, 1984-85, 1985-86, 1986-87 and 1987-88.

Of the 62 items used in the computation of the CPIAL series, 37 items belong to the food group, 4 to fuel and light group, 11 to clothing, bedding and footwear group and 10 to miscellaneous goods and services group. In the present study, we consider all the 37 food items, all the 10 items relating to miscellaneous goods and services and two composite item groups, viz., Fuel and light, and clothing, bedding and footwear. This provides us with 47 individual items and two composite item groups which together constitute the set of consumption items included in our weighting diagram. All these items have been further re-aggregated into 13 groups: Nine relating to food and four to non-food. The description of these item groups, along with the individual items constituting them, is given in Appendix Table A.1R of this study as well as in Jain and Minhas [1990].

The retail price relatives of the above mentioned item groups of the CPIAL series have been found to suffer from some lacunae. One of these relates to the limited coverage of items of consumption in the CPIAL series. We are given to understand that the 62 items of the CPIAL series are picked out from the rural retail price quotations on about 100 items collected by the NSSO for the Labour Bureau. We feel that, particularly for the fruits and vegetables group and other non-food (see item group no.3 and 13 as listed in Appendix Table A. 1R),the coverage, in terms of the individual items, is extremely limited. The price data of the rural cost of living index could be fruitfully widened if the full set of quotations - on all the 100 items regularly collected by the NSSO - were pressed into use. However, because of the enormous additional computational burden involved in this task, we were forced to live with this shortcoming in the item coverage of the CPIAL series.

The second limitation of the price data of the CPIAL series is far more serious. It concerns the retail price relatives relating to firewood, whose weightage within the fuel and light group, in the base year 1960-61, is quite high-varying from 72 to 87 per cent across the various states. It is indeed shocking that the Labour Bureau have been using 100 as the fixed value of the price relative (with 1960-61=100) for most of the sample villages for

this high weightage items (firewood) at every point of time. This has been presumably done under the premise that in rural areas, firewood is obtained by agricultural labourers free of cost from the nearby jungle. However, the all-India average rural retail price series published monthly from 1970 onwards by the Central Statistical Organisation (CSO for short) in their Monthly Abstract of Statistics (MAS for short) indicates a fairly steep and continuous rise in the average all-India rural retail price of firewood. The procedure used in CPIAL would thus impart a progressively increasing downward bias in the retail price index of fuel and light group. For correcting the bias, an indirect procedure was used in our earlier studies [Jain and Tendulkar, 1989, Pp. 313-34, and Minhas *et al*, 1990, Pp. 75-104]. The same procedure has been followed here for correcting the downward bias and obtaining the adjusted estimate of the price indices for fuel and light group for various years with 1970-71 as the base year. Thus corrected, the price relatives of the CPIAL form the basis for the construction of the general as well as item group-wise consumer price indices (base year 1970-71) at the state and all-India level in the present study.

For constructing state-specific rural consumer price indices, apart from the price relatives, the other essential ingredient is the state-specific weighting diagram in the base year for the entire rural population of the state. For the base year 1960-61, this weighting diagram is represented by the average consumer expenditures on the 49 items/groups forming the consumption basket for the rural population of the state in question. Such detailed consumer expenditure data are available in the tabulated form in the NSS Report No. 184, relating to the 17th round of NSS which covered the period from September 1961 to July 1962 (1961-62). In view of the non-availability of similar consumer expenditure data at the state level for the 16th NSS round (July 1960 - June 1961), the state-specific weighting diagram for the year 1960-61 has been assumed to be the same as that for 1961-62.

For the base year, 1970-71 or 1983, the NSS consumer expenditure data at the state level were not available at the detailed individual item level similar to that for 1961-62. As such, the state-specific weighting diagrams in the base years 1970-71 and 1983 are represented by average consumer expenditures on 13 item groups comprising the consumption basket for the state-specific rural population. This information is taken from the NSS Report No. 231 and *Sarvekshana*, vol. IX, No. 4, April 1986, containing the relevant NSS consume expenditure data (available in a tabulated form), relating to the 25th and the 38th rounds covering the respective periods from July 1970 to June 1971 and January to December 1983.

2.2. Statewise Urban Indices

In constructing the urban consumer price indices, the retail prices collected for both the CPIIW and the CPINM series constitute our price data base consisting of (a) commoditywise monthly consumer price quotations collected from 50 (for CPIIW) and 45 (for CPINM) urban centres up to September 1988 and October 1987 respectively with the old base year 1960, and (b) similar price data being collected and compiled thereafter under the revised base CPIIW (1982=100) and CPINM (April 1984-March 1985=100) series for 70 and 59 urban centres, respectively. Among the centres selected for the old and the revised base, 44 and 43 centres are common for the CPIIW and the CPINM series, respectively. The monthly price data for each CPINM centre under the old base were collected for about 180 consumer items with 16 to 48 quotations for each item, depending upon the importance of the centre; and for about 100 items with 8 or more price quotations for each item from each CPIIW centre selected under the old base (Note that for big centres the number of quotations per consumer item was very large - as large as 96, for instance, in Bombay). In the revised base of each series, the item coverage and number of quotations for an item for the same centre is much greater than in the old base.

The series of CPINM and CPIIW with old base have 17 centres in common. Comparison of the consumer item specifications at some of the common centres showed that the varieties of

items covered under the two series are almost similar, with a few minor exceptions. For example, some of the costly items, such as superior varieties of rice and wheat, fruits and consumer durables are covered under the CPINM but are excluded from the CPIIW. Curiously, CPIIW covers more costly varieties (of some items like clothing) as compared to the varieties covered under the CPINM.

To retrieve and make use of the full set of item-wise price quotations collected every month under the two series is a daunting task. The basic data set is so massive that the cost of processing, in terms of time and money, would be beyond the means that a few private researchers can marshall. Also the CSO maintains records of detailed price quotations for the CPINM series only for the latest 3 months and, as such, it is practically impossible to get hold of original price quotations for the earlier months. In view of the above limitations, we decided to work with the aggregated retail price data which are available in the form of monthly price indices for various item groups.

Centrewise monthly price indices, with the old or the revised base, are available for 22 item groups for the CPINM series and for 17 item groups for the CPIIW series. For our study, 22 item groups of the CPINM series have been aggregated into 17 item groups (using appropriate weights of the CPINM series so as to have one to one correspondence between the two sets of item groups). The list of these item groups, under the two series, is given in Appendix Table A. 1U. The CPINM item groups with serial nos. (3 and 4), (9,10 and 11), (17 and 18), and (21 and 22) have been grouped together so as to correspond to the CPIIW item groups with serial nos. 3,8,14 and 17 respectively. Notice that the items and their specifications covered under an item group, as expected, are not exactly the same for the two series. They are bound to be somewhat different as the two series relate to two different occupational groups.

Let us note that different methods are used under the two series for getting the price indices for different items/item groups. In the CPINM series, the price relatives are worked out first for different quotations of an item in a centre and then the average of these price relatives across quotations is worked out to represent the price index of the item at that centre. In the CPIIW series, on the other hand, the average of the monthly price quotations of an item for a centre is obtained first and then the price relative is worked out to represent the price index of the item for the centre. This, however, should not affect the comparability of the two indices in any serious manner.

Our price data requirement for all the years with respect to CPIIW, has been met by taking the above mentioned centre-wise and item group-wise monthly price relatives data, collected and compiled under the old base year 1960. With reference to CPINM for the year 1987-88, the monthly price data are available for the four months period from July to October 1987 with old base (1960=100) and for the next eight months from November 1987 to June 1988 with the revised base (1984-85=100). To have the same base year for the centre-wise monthly price relatives (across twelve months of the year 1987-88) relating to the CPINM series, we convert monthly price relatives (with 1984-85=100) for the last eight months of 1987-88 for each centre to the corresponding price relatives with 1960=100. This is done by using the centre-specific and item group-specific price relative for 1984-85 with 1960=100 as the multiplying factor. This conversion is done for each of the 45 centres of the old base CPINM series. It may be noted here that all the 45 centres of the old base CPINM are included among the 59 centres of the revised base except one. As 'Kozhikode' centre of the old base CPINM is replaced by new centre 'Calicut' in the revised base, we have been constrained to assume that for the last eight months of 1987-88, the monthly price relatives (with 1984-85=100) are the same for Kozhikode and Calicut, both belonging to the state of Kerala.

Ninety-five centres (according to the old base) of the two series put together are allocated to the respective states to which they belong. For state-wise location of the centres under the two series with the old base, readers are referred to the Appendix Table A. 2 of our earlier study [Minhas *et al*, 1988, Pp. 1-23]. Notice that, among the 20

states for which urban indices are constructed, two are union territories, viz., Chandigarh and Delhi. It may be noted further that the four states/union territories - Himachal Pradesh, Haryana, Meghalaya and Chandigarh - have only one centre each: whereas most of the other states have 5-8 centres. In view of this limitation, the price indices constructed for these four states/union territories cannot be as representative as those of the other states/union territories.

For obtaining the representative, state-specific weighting diagram (i.e. consumer expenditures on the 17 item groups) in each of the two base years, 1970-71 and 1983, for the urban population of the different states, we have used the NSS consumer expenditure data (available in tabulated form), relating to the 25th and 38th rounds. The sources of these data are the same as that in case of the rural sector quoted in previous Section 2.1.

It may be noted that the break-up of the state-specific urban consumer expenditure in 1970-71 and 1983 for the last five miscellaneous item groups was not available from the tabulated data for the 25th and the 38th rounds. Nevertheless, we were able to have access to similar details for 1972-73 from the 27th round, which have been used, alongwith the control totals of miscellaneous groups for 1970-71 and 1983, in order to obtain the relevant item groups details for 1970-71 and 1983. Notice also that for Meghalaya state, the NSS consumer expenditure pattern was not available for 1970-71. As such for this state the weighting diagram for 1970-71 is taken to be the same as that for Assam.

2.3. All-India Rural (Urban) Indices

From the user's point of view, we also present in this study consumer price indices at the all-India level for the entire rural and urban population for various item groups forming the entire consumption basket. These indices are arrived at by aggregating the item group-specific state-wise rural (urban) price indices (across states) with item group-specific total consumption expenditure of the rural (urban) population of various states in the base year as the relevant weighting diagram. Such item group-wise rural (urban) weighting diagrams (across states), in turn, can be obtained from the rural (urban) state-wise (a) population, and (b) per person consumption expenditure, for the base year. For the two alternative base years of 1970-71 and 1983, the data sources for population are 1971 Population Census for 1970-71 and *Sarvekshana* vol. XI, No. 4, Issue No. 35, April 1988, Table (P) (page S-222) for 1983, whereas the data sources for state-specific per person consumption expenditure are the same as those quoted in Section 2.1.

3. Procedure Followed for Constructing Consumer Price Indices

The procedures we have adopted for the compilation of various indices are more or less the same as in our earlier studies [Minhas et al (1990)] on rural indices and [Minhas et al (1988)] on urban indices. We describe them briefly in the following sub-section.

3.1. State-specific Rural Indices

(a) For each state, arithmetic average is taken of the price indices for each of the 49 consumer items/groups (with 1960-61 = 100) across months belonging to each of the years, 1970-71, 1983, 1984-85, 1985-86, 1986-87 and 1987-88.

(b) As the 49 consumer items/groups have been further aggregated into 13 groups for each state, the group-specific price index is worked out as the weighted average of the price indices for consumer items belonging to the specific item group, weights being the shares of the individual items in the consumer expenditure on the same group in the base year 1960-61.

(c) State-specific price indices for each of the 13 item groups (with 1960-61 as the base year), as obtained above, are converted to the new base year 1970-71 by dividing them with the corresponding price indices for 1970-71. In view of the shortcomings in the CPIAL data on firewood, as noted in Section 2.1, we replace the original state-specific price relatives for item group fuel and light by the appropriately adjusted ones. These indices (with 1970-71 = 100) are, furthermore, converted to the latest base year 1983 by dividing them with the corresponding indices for

1983 (with 1970-71 = 100).

(d) We then work out separately the weighted averages of the state-specific price indices (with 1970-71 and 1983=100) for nine food, four non-food and all the thirteen item groups, as calculated in step (c) above. The relevant weighting diagrams for 1970-71 and 1983 are given in Appendix Tables A. 2R and A. 3R respectively. This enables us to calculate state-wise food, non-food and general rural consumer price indices with alternative base years of 1970-71 and 1983.

3.2. State-specific Urban Indices

(a) For each urban centre of the CPIIW or the CPINM series, we obtain an annual price index for each of the seventeen consumer item groups by taking an arithmetic average of monthly price indices across the months belonging to each year.

(b) State-specific price indices for each item group are then worked out by taking simple average of the price indices of the centres (in both the series) belonging to a particular state. These state-specific price indices for each item group have the calendar year 1960 as the base.

(c) The price indices, obtained in step (b), are converted to the new base years, 1970-71 as well as 1983, by dividing them with the corresponding indices for 1970-71 and 1983, respectively.

(d) We then work out separately the weighted averages of the state-specific price indices (with 1970-71 and 1983 = 100) obtained in Step (c) for eight food, nine non-food and all the seventeen item groups together. The relevant weighting diagrams for 1970-71 and 1983 are given in Appendix Tables A. 2U and A. 3U, respectively. This provides us the state-wise food, non-food and general urban consumer price indices with the base year 1970-71 as well as 1983.

3.3. All-India Rural (urban) Indices

All-India rural or urban price indices, with 1970-71 or 1983 base, for each of the thirteen (rural) or seventeen (urban) item groups and three broad aggregates-food, non-food and general - are worked out as follows:

(a) First, the total rural (urban) consumption expenditure of a state on an item group is obtained by multiplying the state-specific average per capita rural (urban) expenditure on the item group with the total rural (urban) population of the state.

(b) Second, the all-India rural (urban) index for each item group is obtained by taking the weighted average of the state-specific rural (urban) indices for the item group [as obtained in Step 3.1 (c) or 3.2 (c)] across states, weights being the total rural (urban) consumer expenditure on the item group in different states [as calculated above in step (a)].

(c) Finally, the all-India rural (urban) price indices for the three major aggregates, viz. food, non-food and general, are worked out by taking weighted average of the item group-specific all-India rural (urban) indices [as obtained above in Step (b)] across relevant item groups belonging to an aggregate, weights being the all-India rural (urban) expenditure on various item groups belonging to the aggregate.

4. Results On Consumer Price Indices : Discussion and Comparisons

Following the procedures outlined in Section 3, consumer price indices for the entire rural and urban population of each of the 20 states/union territories and all states (20 states together) and for the calender year 1983 and for the four consecutive agricultural years 1984-85, 1985-86, 1986-87 and 1987-88, are presented in Tables 1.R and 1.U based on the weighting diagram (W^1) for the base year of 1983 and in Tables 2.R and 2.U based on the weighting diagram (W_2) of the base year of 1970-71. The two sets of weighting diagrams W_1 and W_2 are reported in Appendix Tables A. 2R and A. 3R for the rural population and A. 2U and A. 3U for the urban population.

To depict the disparity in the state-specific consumer price indices across states, their coefficient of variation (C.V. in percentage terms), around their weighted average across states, which is the same as all states index, is also presented in the last line of Tables 1.R and 1.U.

The 20 states considered here together accounted for more than 99 percent of the rural and the urban population of the Indian union in both 1970-71 and 1983. Therefore, for all practical purposes, the term all-states (20 states together) and all-India can be used

inter-changeably. Notice that each of the serially ordered twenty states listed in Tables 1.R or 2.R for the rural population and in Tables 1.U or 2.U for the urban population is the same for the rural and the urban section except those at serial numbers 12 and 20. The states located at these serial numbers are Manipur and Tripura (rural), Meghalaya and Chandigarh (urban). This difference in the coverage has arisen because for Meghalaya and Chandigarh (a) the NSS consumer expenditure in 1970-71 was not available for the rural population and (b) the retail price relative data used was available *only* for the urban population.

In our earlier studies [Minhas *et al;* 1990, 1988], we had presented similar consumer price indices separately for the rural and urban population pertaining to earlier years, 1972-73, 1973-74, 1977-78 and 1983 ,using the 1970-71 weighting diagram as the base. The indices given in Tables 2.R and 2.U offer to the research community a continuous series of rural and urban consumer price indices at the state and all-India level from the base year 1970-71 to the latest year 1987-88, using the base year (1970-71) weighting diagram.

Let us denote by CPI(W_1) the direct index value obtained by using the weighting diagram W_1 of the base year 1983. These direct index values are given in Tables 1.R and 1.U. From the index values with the base year 1970-71 weighting diagram W_2 (given in Tables 2.R and 2.U), it is possible to derive an indirect index value, referred to as CPI(W_2), by changing the time-comparison base to 1983=100. These two sets of direct and indirect index values CPI (W_1) and CPI (W_2) have the same time-comparison base of 1983 but different weighting diagrams W_1 and W_2. These two alternative sets of index values are found to be not much different from one another for the broad item groups all food, all non-food and general at the state as well as all-India level. In view of this and to conserve space, we have not presented the indirect index values CPI W_2 at the state level. Nevertheless, to present the comparative picture of CPI (W_1) and CPI (W_2), we report in Tables 3.R and 3.U all-India rural and urban index values of the two sets for individual item groups and major aggregates of all food, all non-food and general for the four years 1984-85 to 1987-88. Examination of the results of these tables shows that CPI (W_1) is either the same or slightly higher than CPI (W_2) in all the cases for rural all-India and in 74 cases out of a total of 80 for urban all-India. In the exceptional six cases for urban all-India, CPI(W_1) is slightly lower than CPI (W_2). In other words, the indices are not sensitive to the differences in alternative weighting diagrams at the all-India level for the comparable periods.

On the other hand, the comparison of the two weighting diagrams W_1 and W_2 at all-India level shows that over twelve and a half year period from 1970-71 to 1983, the shares of all food in the total expenditure went down from 73 to 65 per cent, registering a decline of 8 percentage points for the rural population. The corresponding rural share of all non-food rose from 27 to 35 per cent. Here the main contributors were the item group of cereals and cereal products experiencing a decline of 9 percentage points, and the other non-food item group experiencing a rise of 6 percentage points. For the urban population, the value of total food (total non-food) in consumer expenditure declined (rose) from 64 to 57 percent (36 to 43 percent) registering a fall (rise) of 7 percentage points. The item groups mainly responsible for this were cereals and cereal products with a decline of 4 percentage points, and clothing, bedding and footwear and other non-food item group with a rise of 2.6 and 2.5 percentage points, respectively. At the state level, the decline in the share of all food in the total expenditure was minimum for Jammu and Kashmir (1.8 percentage points) and maximum for Delhi (12.4 percentage points) for the rural population. For the urban population, it turned out to be minimum (2.3 percentage points) for Assam and maximum (14.7 percentage points) for Chandigarh.

This shows that changes between the two weighting diagrams W_2 and W_1 did take place. This change, however, does not seem to have much bearing on the comparison of the two alternative index values CPI (W_2) and CPI (W_1). The underlying reason seems to be that CPI (W_2) is indirectly derived as a ratio of two indices, where each index is expected to carry the effect of the change in weighting diagram from W_1 to

W_2 in the same direction and, consequently, in the ratio of the two indices, the effect of change from W_1 to W_2 is not captured in a detectable fashion.

4.1. All-India Rural and Urban All Food and General Price Indices

With a view to undertaking comparisons of our newly constructed consumer price indices for the total rural (CPITR) or urban (CPITU) population with the already available various price indices, we present in Table 4, alongwith CPITR and CPITU, the other indices, viz., (a) CPIAL, (b) CPIIW, (c) CPINM and (d) the CSO's implicit deflator[1] of private consumption expenditure. The indices CPITR and CPITU can be regarded as most-comprehensive in coverage as they are based on (a) the weighting diagram (W_1) relating to the consumption pattern of the latest available year 1983. and (b) the adjusted retail price relative data of the CPIAL series at the state level for rural population and the combined retail price relative data of the CPIIW and the CPINM series at the centre level.

Comparisons among these indices, separately for the rural and urban population, bring out that for all the four years (a) our index CPITR is higher than (i) CPIAL both for food and general and (ii) CSO's deflator for general and (b) our index CPITU for the urban population is higher than (i) CPIIW for both food and general and (ii) CPINM as well as the CSO deflator for general. CSO deflator is found to be the lowest among these indices. In other words, the use of alternative occupational group-specific indices or the CSO deflator would tend to understate the extent of price rise for the total rural or urban population as a whole at the all-India level.

4.2. Country-wide Price Index

Combining CPITR and CPITU, using the relevant weights of total consumer expenditures of the all-India rural and urban population in the base year 1983, we work out entire India consumer price indices (CPIEI) for all food and general. These are presented in Table 5 alongwith (a) wholesale price indices (WPI) for food and general, and (b) CSO implicit deflator. On comparing them we find that (a) in all the four years our index CPIEI is higher than CSO deflator for all commodities and lower than WPI for food and (b) for all commodities, CPIEI I is lower than WPI in the first two years and higher in the last two years. Thus, while the CSO deflator tends to understate the extent of inflation for the entire (rural plus urban) population of India, there does not appear to be similar uniform bias with reference to WPI. This may be because WPI contains several intermediate and capital goods and completely excludes consumer services.

4.3. State-specific Rural and Urban Price Indices

For the purpose of comparing with our index, the other price index readily available at the state level is *only* the CPIAL for major aggregates-food and general and relevant for rural areas only. We, therefore, present in Table 6 the values of the two indices at the four consecutive points of time (with 1983=100) and for fifteen states for which CPIAL is available. At the all-India level, CPITR has been noted to be substantially higher than CPIAL for both food and general in all the years. However, at the state level, out of the total 60 cases, our index CPITR is found to be greater than CPIAL in 53 cases for food and 58 cases for general. The exceptional cases are (a) Andhra Pradesh, Rajasthan and Uttar Pradesh in 1984-85, and Andhra Pradesh, Punjab, Rajasthan and Uttar Pradesh in 1985-86 for food and (b) Rajasthan in 1984-85 and 1985-86 for general.

Notice that for food the two indices CPITR and CPIAL use the same price data but different weighting diagrams, one relating to the entire rural population and the other to the population of only agricultural labour households, constituting less than one-third of the total rural households. Therefore, the above noted differences in the two-indices for food can be attributed to the differences in the weighting diagrams used.

In order to give a summary picture of the results on the state-level index presented in Tables 1.R and 1.U, we report in Table 7 the minimum, maximum and weighted coefficient of variation (C.V.) of the state-specific index across states for food, non-food and general for the four years, separately for the rural and urban population.

In the rural areas, we note that (a) in all the years,

the state of Orissa had the lowest level of food index and the highest level of non-food index, (b) the food index was maximum for the food-deficit states of Kerala in (1984-85 and 1986-87) and Rajasthan (in 1985-86 and 1987-88), (c) the minimum non-food index value was experienced by West Bengal in the first three year and by Jammu and Kashmir in 1987-88, and (d) in all the years, the state with the minimum (maximum) index value for food also had the minimum (maximum) index value for general except in 1985-86 in the case of minimum index value.

In the urban area, (a) in all the years Orissa had the minimum index value for food as well as for general, and Chandigarh and Assam had the maximum index value for food and non-food, respectively; (b) minimum index value of non-food was experienced by Chandigarh in the first three years; (c) in all the years the states with the minimum index value for food and for general were the same, whereas contrary to the rural case, the state with the maximum food index value was not necessarily the same as that having the maximum index value for general. This is a reflection of a higher real level of living for the urban population with correspondingly lower weight of food consumption in the urban consumption basket.

In the rural areas, in contrast with the urban sector, the food as well as the general index was on the lower side for majority of the states in all the years. The possible reason could be the ready availability of food which is produced in the rural sector and bulk of which is consumed by producers in their own homes. The non-food index for majority of the states was lower for the rural than for the urban population in the first two years and higher in the last two years.

Inter-state relative disparity in the level of consumer price index (1983=100) is measured by the weighted coefficient of variation (in per cent units) with the state-specific total consumer expenditures as the weights. The inter-state relative disparity in all the years may be observed to be higher for food than that for non-food in the rural areas whereas it was the other way round for the urban population. In all the years, even though the level of the index for food for a majority of states has been noted to be *lower* for the rural than for the urban population, the inter-state relative disparity in the index for food turned out to be *higher* for the rural than for the urban segments. The rural-urban inter-state relative disparity got reversed for the non-food group in all the years. There is no discernible pattern in the inter-state disparity of each of the three indices over time.

4.4. Movement of State-specific Price Indices over Time

In order to examine the movements over time in state-specific consumer price indices, we have worked out from Tables 1.R and 1.U, the state-specific annual rates of increase (R in percentage terms) between successive pairs of adjacent years for each of the three indices, viz., food, non-food and general. These computations of the annual rates of inflation in cost of living are reported in Tables 8.R and 8.U, respectively for the rural and urban populations, for the four consecutive periods, covering successive pairs of years, namely, 1983 to 1984-85 (period I), 1984-85 to 1985-86 (period II), 1985-86 to 1986-87 (period III) and 1986-87 to 1987-88 (period IV). A summary view of the state-specific annual rates of inflation is given in Table 9 which presents across the states the minimum and the maximum values as well as the unweighted coefficient of variation (C.V.) of the annual rate of inflation in food, non-food and general cost of living indices in the four different time periods.

Our main findings at the all-India (20 states together) level can be read from line 21 of Tables 8.R and 8.U. It is seen that annual rate of increase in index values for food, non-food and general was higher in the urban than in the rural sector over each of the periods I, II and III[2], with the exception of non-food in period III. However in period IV, the annual rates of increase in all the three indices were higher in the rural than in the urban sector. We might note that 1987-88- the final year of period IV- was a drought year; and between 1986-87 and 1987-88, double-digit annual rate of increase was registered by the food index [12.60 per cent (rural) and 11.06 per cent (urban)] as well as by the general index [11.33 per cent (rural) and 10.12 per cent (urban)]. A double-digit rate of annual increase had also been

noticed in period I for the non-food group [11.04 per cent (rural) and 11.45 per cent (urban)]. The lowest rate of annual increase was experienced in period I [3.46 per cent (rural) and 6.10 per cent (urban)] in the food index. On the other hand, the lowest increase in the non-food index was registered in rural India (7.23 per cent) over period II and urban India (6.57 per cent) over period III. The lowest annual rate of inflation in general cost of living was registered in rural areas (around 6.1 per cent) in periods I and II and in urban areas (7.24 per cent) over period II.

The summary picture presented in Table 9 indicates that at the state level, the picture in terms of the annual rate of increase of an index is more volatile than in terms of the level index. Unlike the level index, the same state in the rural or urban segment did not experience persistently high or low rate of increase. Exception to this occurred only for the rural food index in respect of which the maximum annual rate of increase was registered by Kerala over periods I and II and by Rajasthan over periods II and IV. Across various states, the maximum annual rate of increase (in percentage terms) over each period in the food or non-food index turned out to be double-digit. The same was found to be true in the urban areas with the exception of period III when the maximum rate of increase in the non-food index was 8.86 per cent for Delhi. In the rural areas, the double-digit annual rate of increase was experienced in respect of (a) the food index over period IV by 14 out of the 20 states constituting 66 per cent of the all-India population in 1983; (b) the non-food index over period IV by 8 out of the 20 states and over period I by 17 out of the 20 states accounting for four-fifth of the all-India population in 1983. The general index experienced double-digit inflation over the latest period IV for 12 out of the 20 states accounting for 63 per cent of the all-India rural population in 1983. In the urban areas, the double-digit annual rate of increase was registered by (a) the food index over period IV in case of 13 out of the 20 states representing 71 per cent of the all-India population in 1983,(b) the non-food index over period IV in the case of 6 out of 20 states and over period I in the case of 8 out of 20 states and (c) the general index over period IV in the case of 12 out of 20 states accounting for 58 percent of the all-India urban population in 1983. The states experiencing double-digit annual rates of inflation (in percentage terms) over the latest period from 1986-87 to 1987-88 (period IV), both in the rural and the urban areas, were Bihar, Gujarat, Haryana, Jammu & Kashmir, Karnataka, M.P., Punjab, Rajasthan and Delhi. The double-digit annual rate of increase was noticed to be more frequent (a) in rural than urban areas, and (b) in respect of the non-food index than the food index.

Progressively rising annual rate of inflation over the entire period from 1983 to 1987-88 was experienced by the states of Bihar, Maharashtra and Orissa and all states together in the rural areas; and by Bihar, Gujarat, Haryana, Orissa and U.P. in the urban areas. The urban segment of West Bengal was the unique case which underwent progressively declining annual rate of inflation over the period from 1983 to 1987-88. Other distinct cases were (a) Bihar (rural) registering slight negative inflation rate over period I and (b) Kerala (rural) experiencing zero inflation rate over period II.

Disparity across states in the state-specific annual rate of increase of an index, as depicted by the coefficient of variation (C.V. in percentage terms), was quite large in comparison to that in the level index, in all the periods and both for the rural and the urban areas. Similarly, the inter-state disparity in the annual rate of increase of an index over each period was found to be higher for food than non-food in the rural areas. In the urban areas, the same was found to hold in periods II and III but not in periods I and IV.

5. Concluding Remarks

By using (a) the already available monthly retail price data regularly collected for the official compilation of CPIAL, CPIIW and CPINM series and (b) the NSS-based rural and urban consumption patterns, almost fully representative rural and urban cost of living indices for twenty states/union territories as well as for all-India have been constructed in this paper. These rural and urban consumer price indices have been presented for three broad aggregates-all food, all non-food and general (all commodities)- for four recent agricultural years, 1984-85, 1985-86,

1986-87 and 1987-88, using two alternative weighting diagrams relating to the base years 1970-71 and 1983.

Among others, the following results of this paper would seem to be note-worthy:

1. The newly constructed general index for the entire rural population (CPITR) of India is found to be higher in all the four years than the official CPIAL as well as CSO's implicit deflator. Similarly, the general index for the entire urban population (CPITU) of India comes out to be higher than the CPIIW, CPINM as well as CSO's implicit deflator. In other words, all the official price indices, namely, CPIAL, CPINM and CPIIW, under-estimate the extent of general price rise in the 1980s in comparison with the appropriately constructed consumer price indices (CPITR and CPITU).
2. Compared to the official wholesale price index (WPI), our consumer price index (CPIEI) for all-India is found on the lower side for all food in all the four years. However, the general index (all commodities) turns out to be lower in the first two (1984-85 and 1985-86) and higher in the last two (1986-87 and 1987-88) years.
3. Based on our state-specific price indices (1983=100), it is interesting to note that in the rural sector, (a) both for food and general groups the same states had the lowest and highest index values (among the twenty states) in all the four years except 1985-86; (b) in all the four years, Orissa had the lowest index value for food and the highest index value for non-food group; (c) maximum value of food index was experienced by Kerala in 1984-85 and 1986-87 and by Rajasthan in the other two years 1985-86 and 1987-88; and (d) value of non-food index was the minimum for West Bengal in the first three years and for Jammu & Kashmir in 1987-88. In the urban sector, in all the years, (a) the lowest index value was registered by Orissa both for food and general groups and by Chandigarh for non-food group except in the last year, and (b) the highest index value was experienced by Chandigarh for food and by Assam for non-food group.
4. In all the years, inter-state relative disparity in the prices was noticed to be a higher in the rural sector and lower in the urban sector in respect of food than non-food group, and (b) higher in respect of food and lower in respect of non-food group for the rural than the urban sector.
5. For all the three aggregates-food, non-food and general-, the annual rate of increase in index values was higher in urban India than in the rural sector over each of the three consecutive periods, viz., 1983 to 1984-85 (period I), 1984-85 to 1985-86 (period II) and 1985-86 to 1986-87 (period III) with the exception of non-food over period III. The situation is reversed over period IV (1986-87 to 1987-88) whose terminal year was a drought year. Over the latest period IV (1986-87 to 1987-88), the annual rate of increase in food prices reached double-digit both in the rural (12.6 per cent) and urban (11.06 per cent) areas. As for the general index (overall cost of living), the respective annual inflation rates in the rural and urban India were 11.04 and 11.45 per cent.
6. At the state level, the double-digit annual rates of increase in consumer prices were found to be more frequent in rural than urban areas, particularly more so in respect of the non-food index than the food index. Inter-state disparity in the annual rate of increase in index values over each of the periods was noticed to be wider for food than non-food in the rural areas.
7. State experiencing progressively rising annual rate of inflation (general) over the four and half years period from 1983 to 1987-88 were Bihar, Maharashtra and Orissa in the rural areas, and Bihar, Gujarat, Haryana, Orissa and U.P. in the urban areas. The urban segment of West Bengal was the unique case having undergone progressively *declining* annual rate of inflation over the period from 1983 to 1987-88.

It is a matter of some satisfaction to us that the results of this paper, taken alongwith our two earlier studies [Minhas *et al*, 1990, 1988], make available to the research community two long series of fully representative consumer price indices (CPITR and CPITU) for rural and urban populations separately, with 1970-71 as the base year, at the state and all-India level for three broad

aggregates- all food, all non-food and all commodities together. These series relate to a span of 18 years, from 1970-71 to 1987-88, giving index values for nine different time periods-the first five of which correspond to the survey periods of the five rounds of the NSS consumer expenditure survey, viz., 1970-71, 1972-73, 1973-74, 1977-78 and 1983 and the last four corresponding to the four agricultural years, i.e., 1984-85, 1985-86, 1986-87 and 1987-88.

As the story of consumer prices in India has been brought up to 1987-88 in this paper, using the most recent base of 1983, it is our hope that the official statistical agencies of the government of India would now take up this work and begin to issue regularly these cost of living indices for different states and all-India, separately for the rural and urban populations. The need for the regular compilation of these indices is hard to over-emphasise both in research and economic policy work.

NOTES

1. Planning Commission (1985) have used this deflator as a common proxy for consumer price indices both for all-India rural and urban populations. In order to illustrate the inadequacy of the use of the CSO's deflator for depicting price movements in rural and urban India, CSO's deflator is compared with our new rural and urban price indices.

2. The same pattern of movements over time was also noticed in case of the level index (with 1983=100) of each of the three broad aggregates in all the four consecutive years (see, line 21 in Table 1.R and 1.U).

REFERENCE

Jain, L.R. and B.S. Minhas, 1990; Rural and Urban Consumer Price Indices by Commodities Groups (States and All-India : 1970-71 to 1983), *Technical Report No. 9008 (December)*, Indian Statistical Institute, Delhi Centre. Also forthcoming in *Sarvekshana*.

Jain, L.R. and S.D. Tendulkar, 1989; Inter-temporal and Inter-fractile-group Movements in Real levels of living for Rural and Urban Population of India: 1970-71 to 1983, *Journal of the Indian School of Political Economy*, Vol. 1, No. 2, July-December.

Minhas, B.S., L.R. Jain, S. Kansal and M.R. Saluja, 1988; Measurement of General Cost of Living for Urban India; All-India and Different States, *Sarvekshana*, July, Vol. xii, No. 1.

Minhas, B.S., L.R. Jain, S. Kansal and M.R. Saluja, 1990; Cost of Living in Rural India: 1970-71 to 1983, State-wise and All-India, *Indian Economic Review*, Vol. xxv, No. 1 January-June.

Planning Commission, 1985; *The Seventh Five Year Plan*, Vol. I, October, Government of India.

TABLE 1.R. STATE-WISE RURAL CONSUMER PRICE INDICES FOR FOOD, NON-FOOD AND GENERAL FOR YEARS 1984-85 TO 1987-88, BASED ON THE USE OF 1983 WEIGHTING DIAGRAM

(1983=100)

Sl. No.	Name of the State	1984-85			1985-86			1986-87			1987-88		
		F	NF	G	F	NF	G	F	NF	G	F	NF	G
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	A.P.	103.2	119.4	109.7	106.3	127.0	114.6	115.3	139.1	124.8	125.0	152.6	136.0
2	Assam	108.5	116.6	110.6	112.5	127.8	116.6	119.9	135.3	124.0	132.8	143.6	135.7
3	Bihar	93.4	116.3	99.4	98.5	123.7	105.1	107.8	133.1	114.5	124.7	145.5	130.0
4	Gujarat	108.7	115.5	111.0	118.1	125.5	120.6	123.0	135.4	127.3	143.4	145.5	144.1
5	Haryana	113.8	117.1	115.0	119.3	124.3	121.2	122.6	135.4	127.3	138.7	149.9	142.8
6	H.P.	112.9	116.0	114.0	119.2	123.1	120.6	121.8	134.0	126.3	138.9	147.4	142.0
7	J. & K.	108.7	116.7	111.2	114.3	125.9	117.8	122.8	133.4	126.0	137.8	140.6	138.7
8	Karnataka	110.6	117.8	113.2	110.8	126.1	116.4	112.5	138.2	121.9	126.2	149.6	134.8
9	Kerala	117.2	114.8	116.3	113.8	120.5	116.3	130.2	133.6	131.5	141.0	145.9	142.8
10	M.P.	105.9	117.2	109.7	116.1	127.9	120.1	117.6	141.7	125.7	132.8	150.8	138.9
11	Maharashtra	107.0	114.8	110.0	112.1	125.4	117.3	121.6	133.4	126.2	131.0	144.4	136.2
12	Manipur	107.4	116.8	110.1	110.9	128.1	115.8	118.9	135.4	123.6	130.2	144.1	134.2
13	Orissa	93.4	135.7	104.6	95.3	144.5	108.3	99.3	151.3	113.1	116.0	168.9	130.0
14	Punjab	114.5	116.7	115.4	120.4	122.9	121.4	123.9	134.3	128.2	139.4	148.8	143.3
15	Rajasthan	110.0	115.7	112.2	124.4	123.4	124.0	125.1	131.7	127.7	150.1	146.8	148.8
16	Tamil Nadu	102.0	115.8	106.9	104.3	123.6	111.1	114.5	135.8	122.0	125.2	149.6	133.8
17	U.P.	102.0	118.0	107.9	110.9	127.6	117.0	117.2	137.9	124.8	136.0	150.1	141.2
18	West Bengal	99.7	111.9	102.9	108.1	120.3	111.3	116.0	129.7	119.6	124.8	145.7	130.0
19	Delhi	112.3	119.0	115.3	117.0	126.3	121.2	123.6	137.4	129.8	140.6	152.7	146.1
20	Tripura	109.7	118.5	112.4	114.5	130.4	119.2	121.9	138.1	126.7	134.9	147.7	138.7
21	All States	105.2	117.0	109.3	111.0	125.5	116.1	117.8	136.0	124.1	132.6	148.6	138.2
22	C.V. (%)	6.31	2.98	4.14	6.51	3.12	4.23	5.65	2.84	3.65	6.13	2.87	3.88

Notes: F, NF and G refer to Food, Non-food and General (all item groups together) respectively.

TABLE 1.U. STATE-WISE URBAN CONSUMER PRICE INDICES FOR FOOD, NON-FOOD AND GENERAL FOR YEARS 1984-85 TO 1987-88, BASED ON THE USE OF 1983 WEIGHTING DIAGRAM

(1983=100)

Sl. No.	Name of the State	1984-85			1985-86			1986-87			1987-88		
		F	NF	G	F	NF	G	F	NF	G	F	NF	G
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	A.P.	111.3	118.0	114.4	116.6	125.1	120.5	128.1	132.9	130.3	144.8	145.7	145.2
2	Assam	111.2	144.3	123.2	112.8	158.7	129.3	120.0	167.0	137.0	128.2	179.3	146.6
3	Bihar	103.7	118.7	109.0	110.3	128.2	116.6	121.1	136.7	126.6	134.7	151.2	140.5
4	Gujarat	107.6	113.7	110.0	117.8	122.2	119.6	129.0	131.8	130.1	146.7	143.2	145.3
5	Haryana	106.1	109.3	107.5	112.2	119.5	115.4	123.6	128.6	125.8	133.5	148.7	140.2
6	H.P.	113.8	110.1	112.0	118.4	120.1	119.3	127.0	126.6	126.8	139.1	138.8	138.9
7	J. & K.	112.8	111.8	112.4	120.9	121.8	121.2	133.4	130.9	132.4	148.8	144.8	147.3
8	Karnataka	111.5	126.3	118.1	115.9	135.4	124.6	127.8	143.0	134.6	145.1	155.5	149.8
9	Kerala	112.6	115.0	113.6	114.8	122.9	118.2	132.2	130.2	131.4	140.1	138.8	139.6
10	M.P.	108.8	115.4	111.5	119.6	125.5	122.0	130.5	134.8	132.3	145.7	145.3	145.6
11	Maharashtra	111.4	112.3	111.8	118.4	121.0	119.6	129.2	128.2	128.8	141.0	140.7	140.8
12	Meghalaya	116.3	111.1	113.9	125.6	129.2	127.3	134.2	139.5	136.6	143.0	145.8	144.3
13	Orissa	99.7	122.0	107.8	105.5	129.8	114.3	113.7	135.4	121.6	125.5	146.2	133.0
14	Punjab	110.8	111.9	111.3	116.5	118.9	117.6	123.8	128.4	125.9	139.3	141.9	140.5
15	Rajasthan	110.1	112.5	111.2	119.6	122.0	120.7	127.3	127.7	127.5	148.3	139.7	144.6
16	Tamil Nadu	106.1	131.1	117.3	112.3	140.9	125.1	123.7	149.4	135.2	138.1	162.2	148.9
17	U.P.	109.1	111.8	110.2	117.4	120.4	118.7	127.3	129.4	128.1	141.9	138.3	140.4
18	West Bengal	108.3	124.6	115.0	117.4	136.2	125.2	128.0	145.3	135.2	136.8	156.0	144.7
19	Delhi	113.5	111.0	112.3	124.1	121.7	122.9	134.5	132.5	133.5	151.3	146.9	149.2
20	Chandigarh	122.3	106.6	113.8	129.9	113.4	121.0	140.7	120.7	129.9	159.7	140.3	149.2
21	All States	109.3	117.7	112.9	116.7	126.9	121.1	127.4	135.2	130.8	141.5	147.3	144.0
22	C.V. (%)	2.69	6.20	2.71	3.02	6.26	2.54	2.96	5.96	2.59	3.72	5.64	2.59

Notes: Same as of Table 1.R.

TABLE 2.R. STATE-WISE RURAL CONSUMER PRICE INDICES FOR FOOD, NON-FOOD AND GENERAL FOR YEARS 1984-85 TO 1987-88, BASED ON THE USE OF 1970-71 WEIGHTING DIAGRAM

(1983=100)

Sl. No.	Name of the State	1984-85			1985-86			1986-87			1987-88		
		F	NF	G	F	NF	G	F	NF	G	F	NF	G
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	A.P.	104.3	117.9	108.4	107.4	125.0	112.7	115.8	136.8	122.1	125.0	149.6	132.4
2	Assam	108.7	115.6	110.4	112.8	127.0	116.3	120.0	134.7	123.6	133.1	142.1	135.3
3	Bihar	93.9	115.7	99.4	98.5	122.7	104.6	107.3	131.8	113.4	124.9	142.9	129.4
4	Gujarat	108.9	115.0	110.5	118.6	124.9	120.2	122.5	135.3	125.8	141.8	144.2	142.5
5	Haryana	113.1	116.0	114.0	119.5	123.3	120.7	121.6	134.5	125.5	137.7	147.7	140.7
6	H.P.	112.9	115.0	113.7	120.0	122.1	120.8	121.9	132.9	126.0	138.8	145.3	141.3
7	J. & K.	107.4	117.0	110.1	112.5	126.1	116.4	120.5	133.3	124.2	135.7	140.8	137.1
8	Karnataka	108.7	117.4	111.5	109.5	125.6	114.6	110.4	137.3	119.0	122.9	148.3	131.0
9	Kerala	119.0	115.4	117.8	112.7	121.2	115.6	130.3	134.4	131.7	141.7	146.2	143.3
10	M.P.	105.6	116.4	108.8	115.9	126.7	119.2	117.5	139.9	124.2	132.3	148.2	137.1
11	Maharashtra	106.5	114.6	109.2	111.9	124.8	116.3	121.5	133.0	125.4	130.9	143.2	135.1
12	Manipur	107.4	115.9	110.1	111.1	126.9	116.0	119.1	134.8	124.1	130.7	142.6	134.4
13	Orissa	92.4	129.2	101.1	94.3	138.6	104.7	98.1	145.8	109.3	114.8	160.0	125.5
14	Punjab	114.5	116.1	115.1	120.7	122.0	121.2	123.6	133.9	127.3	139.1	147.6	142.2
15	Rajasthan	108.9	115.2	111.0	124.0	123.0	123.7	124.6	131.7	127.1	150.1	145.4	148.5
16	Tamil Nadu	97.7	115.4	102.0	101.1	123.2	106.6	110.5	135.4	116.6	120.3	149.2	127.4
17	U.P.	102.9	118.0	107.6	111.7	127.6	116.6	117.3	137.8	123.7	136.6	149.9	140.8
18	West Bengal	99.6	109.5	101.9	108.4	117.6	110.5	115.7	127.5	118.4	124.6	140.7	128.2
19	Delhi	111.3	118.1	113.7	117.8	125.1	120.5	121.2	136.1	126.5	137.9	149.6	142.1
20	Tripura	108.7	118.1	111.1	112.5	130.1	117.0	119.6	138.6	124.5	131.7	147.5	135.8
21	All States	103.9	116.4	107.6	110.0	125.0	114.4	116.2	135.4	121.8	131.1	147.0	135.8
22	All States (W.A.)	104.1	116.4	107.6	110.1	125.0	114.4	116.4	135.4	121.9	131.3	147.0	135.8
23	C.V. (%)	6.23	2.61	4.51	6.70	2.86	4.85	5.78	2.63	4.22	6.29	2.63	4.54

Notes: Same as of Table 1.R.

TABLE 2.U. STATE-WISE URBAN CONSUMER PRICE INDICES FOR FOOD, NON-FOOD AND GENERAL FOR YEARS 1984-85 TO 1987-88, BASED ON THE USE OF 1983 WEIGHTING DIAGRAM

(1983=100)

Sl. No.	Name of the State	1984-85			1985-86			1986-87			1987-88		
		F	NF	G	F	NF	G	F	NF	G	F	NF	G
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	A.P.	111.4	119.0	114.2	116.7	126.8	120.5	127.7	135.3	130.6	144.5	148.8	146.1
2	Assam	113.1	136.3	120.7	115.1	150.2	126.5	122.5	157.9	134.0	131.1	168.6	143.3
3	Bihar	104.7	118.9	109.4	111.3	129.2	117.2	122.0	138.6	127.5	136.5	152.7	141.8
4	Gujarat	107.2	115.0	109.6	117.7	123.7	119.5	128.1	133.3	129.7	145.6	144.8	145.4
5	Haryana	106.7	110.4	108.2	112.4	121.7	116.1	123.0	129.6	125.6	133.5	150.5	140.3
6	H.P.	113.3	111.0	112.4	118.6	123.1	120.3	127.0	130.1	128.2	139.1	140.5	139.7
7	J. & K.	113.1	111.9	112.7	121.5	121.5	121.5	133.6	130.3	132.6	148.5	144.3	147.2
8	Karnataka	111.5	125.2	116.4	116.5	135.2	123.2	128.0	142.6	133.2	145.1	154.5	148.5
9	Kerala	112.3	115.3	113.5	114.8	123.6	118.1	130.8	131.1	130.9	139.0	139.7	139.3
10	M.P.	109.6	115.4	111.9	119.9	126.2	122.4	130.6	135.5	132.5	146.5	146.1	146.3
11	Maharashtra	112.3	113.0	112.5	119.7	122.2	120.6	129.9	129.9	129.9	141.3	143.0	142.0
12	Meghalaya	116.5	111.5	114.3	125.9	116.9	121.9	133.9	117.4	126.7	142.3	135.7	139.4
13	Orissa	101.2	123.6	108.4	106.9	132.3	115.1	115.3	138.3	122.8	127.8	149.2	134.7
14	Punjab	110.5	112.1	111.1	116.5	119.4	117.6	123.4	129.5	125.8	138.7	144.1	140.7
15	Rajasthan	110.2	113.5	111.4	119.9	123.8	121.4	127.4	129.8	128.3	148.3	142.7	146.1
16	Tamil Nadu	105.2	135.4	114.2	111.7	146.2	122.0	122.6	155.3	132.3	136.6	168.7	146.1
17	U.P.	109.0	112.9	110.4	117.1	122.5	119.1	126.4	131.8	128.4	141.8	140.9	141.4
18	West Bengal	109.9	125.9	115.6	119.5	138.2	126.2	129.8	147.9	136.3	139.1	158.7	146.2
19	Delhi	113.4	112.3	112.9	124.1	123.3	123.8	134.7	134.3	134.5	151.1	149.6	150.4
20	Chandigarh	120.0	107.2	114.6	126.8	114.9	121.8	136.9	123.4	131.2	155.6	140.0	149.0
21	All States	109.3	118.8	112.7	116.8	128.7	121.0	127.2	137.3	130.8	141.4	149.6	144.3
22	All States (W.A.)	109.4	119.0	112.7	116.9	128.9	121.1	127.3	137.6	130.8	141.5	149.8	144.3
23	C.V. (%)	2.62	6.51	2.12	2.97	6.60	2.18	2.81	6.33	2.23	3.23	5.96	2.10

Notes: Same as of Table 1.R.

TABLE 3. R. ALL-INDIA RURAL CONSUMER PRICE INDICES FOR VARIOUS ITEM GROUPS AND FOR YEARS 1984-85 TO 1987-88 BASED ON USING WEIGHTING DIAGRAMS W_1 AND W_2

(1983=100)

Sl. No.	Name of the item group	84-85		85-86		86-87		87-88	
		W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Cereals and cereal products	93.0	93.7	100.1	101.2	102.1	103.0	113.9	114.4
2	Pulses and pulse products	115.7	118.1	116.4	119.1	127.0	128.2	162.0	163.0
3	Fruits and vegetables	92.0	92.9	100.9	100.9	130.6	130.2	144.5	145.2
4	Spices and salt	171.0	170.2	164.5	164.2	129.9	129.2	156.2	156.0
5	Edible oils and fats	105.6	106.9	98.7	99.2	133.6	133.9	164.8	164.7
6	Milk and milk products	117.5	117.3	121.6	120.8	130.6	129.8	147.3	147.2
7	Meat and fish	113.2	113.6	131.7	132.7	146.4	150.2	156.5	160.7
8	Sugar and gur	126.2	122.8	144.6	140.9	139.0	137.8	142.6	141.6
9	Other food	120.6	119.9	118.9	117.3	120.8	119.3	128.2	126.5
10	Intoxicants, etc.	115.2	115.3	125.3	125.0	135.7	135.5	146.4	146.0
11	Fuel and light	115.1	115.4	122.7	123.0	135.0	135.7	141.1	141.9
12	Clothing, bedding & footwear	111.4	111.4	119.0	118.7	124.1	123.8	131.6	131.3
13	Other non-food	121.7	121.7	131.2	131.0	144.4	144.0	163.6	163.3
14	All food	103.9	105.2	110.0	111.0	116.2	117.8	131.1	132.6
15	All non-food	116.4	117.0	125.0	125.5	135.4	136.0	147.0	148.6
16	General (All item groups)	107.6	109.3	114.4	116.1	121.8	124.1	135.8	138.2

Notes: W_1 and W_2 refer to the base year's weighting diagram for 1983 and 1970-71 respectively.

TABLE 3. U. ALL-INDIA URBAN CONSUMER PRICE INDICES FOR VARIOUS ITEM GROUPS AND FOR YEARS 1984-85 TO 1987-88 BASED ON USING WEIGHTING DIAGRAMS W_1 AND W_2

(1983=100)

Sl. No.	Name of the item group	84-85		85-86		86-87		87-88	
		W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Cereals and cereal products	96.9	97.5	105.9	106.2	109.9	110.3	119.0	119.4
2	Pulses and pulse products	117.8	118.8	118.7	119.7	126.9	127.6	163.1	163.8
3	Fruits and vegetables	106.9	106.4	116.6	117.2	134.3	134.6	145.3	144.9
4	Condiments and spices	135.6	133.9	135.5	135.0	152.2	151.3	186.4	185.7
5	Edible oils and fats	111.5	111.3	111.3	111.3	144.6	144.1	167.9	167.5
6	Milk and milk products	116.5	116.5	119.6	119.4	130.0	129.8	145.9	145.9
7	Meat, fish and eggs	115.8	116.1	131.9	132.1	143.8	144.4	153.1	153.5
8	Other food	116.5	116.4	127.2	127.2	135.0	134.8	145.3	145.1
9	Intoxicants, etc.	115.6	115.4	135.6	135.8	148.9	149.2	162.6	162.9
10	Fuel and light	122.7	122.8	132.7	132.9	140.6	140.8	149.5	149.6
11	Clothing, bedding & footwear	109.2	109.1	115.4	115.4	120.8	120.7	131.2	131.0
12	Housing	142.4	144.3	155.2	156.9	166.3	167.7	186.9	188.4
13	Medical care	106.6	106.3	113.7	113.0	120.4	119.6	131.0	130.0
14	Education and recreation	109.2	108.9	115.8	115.6	122.1	122.0	128.0	128.5
15	Transport and communication	108.9	109.1	119.1	119.5	125.9	126.8	136.0	136.9
16	Personal care and effects	125.7	125.9	127.6	127.5	138.3	138.3	157.1	157.2
17	Other non-food	120.6	120.7	132.6	132.7	143.1	143.3	157.3	157.6
18	All food	109.3	109.3	116.8	116.7	127.2	127.4	141.4	141.5
19	All non-food	118.8	117.7	128.7	126.9	137.3	135.2	149.6	147.3
20	General (All item groups)	112.7	112.9	121.0	121.1	130.8	130.8	144.3	144.0

Notes: W_1 and W_2 refer to the base year's weighting diagram for 1983 and 1970-71 respectively.

TABLE 4. ALL-INDIA RURAL AND URBAN PRICE INDICES: 1984-85 TO 1987-88: A COMPARISON

(1983=100)

Sl. No.	Year	Rural				Urban					CSO's implicit deflator
		Food		General		Food		General			
(0)	(1)	CPITR (2)	CPIAL (3)	CPITR (4)	CPIAL (5)	CPITU (6)	CPIIW (7)	CPITU (8)	CPIIW (9)	CPINM (10)	(11)
1	1984-85	105.2	101.6	109.3	102.7	109.3	108.8	112.9	111.1	112.7	107.3
2	1985-86	110.0	105.3	116.1	106.8	116.7	115.6	121.1	118.9	119.6	113.1
3	1986-87	117.8	110.2	124.1	111.9	127.4	126.6	130.8	129.2	130.0	120.7
4	1987-88	132.6	121.4	138.2	123.1	141.5	139.3	144.0	141.5	142.3	129.5

Note: For CSO's implicit deflator, base year is the financial year 1983-84.

TABLE 5. ENTIRE INDIA PRICE INDICES: 1984-85 TO 1987-88: A COMPARISON

(1983=100)

Sl. No.	Year	CPIEI		WPI		CSO's Implicit deflator
		Food	General	Food	General	
(0)	(1)	(2)	(3)	(4)	(5)	(6)
1	1984-85	106.1	110.2	110.5	112.6	107.3
2	1985-86	111.5	117.3	114.2	118.8	113.1
3	1986-87	119.9	125.7	127.1	123.9	120.7
4	1987-88	134.5	139.6	137.8	134.3	129.5

TABLE 6. STATEWISE FOOD AND GENERAL CONSUMER PRICE INDICES FOR TOTAL RURAL POPULATION (CPITR) AND FOR AGRICULTURAL LABOURERS (CPIAL) FOR YEARS 1984-85 TO 1987-88

(1983=100)

Sl. No.	Name of the state	1984-85				1985-86				1986-87				1987-88			
		Food		General		Food		General		Food		General		Food		General	
(0)	(1)	CPITR (2)	CPIAL (3)	CPITR (4)	CPIAL (5)	CPITR (6)	CPIAL (7)	CPITR (8)	CPIAL (9)	CPITR (10)	CPIAL (11)	CPITR (12)	CPIAL (13)	CPITR (14)	CPIAL (15)	CPITR (16)	CPIAL (17)
1	A.P.	103.2	106.4	109.7	107.6	106.3	108.0	114.6	109.5	115.3	111.6	124.8	113.5	125.0	117.8	136.0	122.5
2	Assam	108.5	106.6	110.6	107.4	112.5	107.1	116.6	109.4	119.9	115.1	124.0	117.2	132.8	125.0	135.7	126.2
3	Bihar	93.4	92.4	99.4	94.0	98.5	95.5	105.1	97.2	107.8	103.2	114.5	104.6	124.7	116.3	130.2	117.4
4	Gujarat	108.7	107.3	111.0	108.5	118.1	116.0	120.6	116.6	123.0	121.1	127.3	121.9	143.4	133.5	144.1	133.5
5	J. & K.	108.7	108.1	111.2	108.5	114.3	110.6	117.8	111.4	122.8	120.7	126.0	120.9	137.8	131.7	138.7	131.9
6	Karnataka	110.6	109.2	113.2	110.0	110.8	110.2	116.4	112.0	112.5	109.2	121.9	112.2	126.2	117.4	134.8	121.4
7	Kerala	117.2	110.7	116.3	113.3	113.8	107.1	116.3	109.7	130.2	120.8	131.5	121.9	141.0	129.8	142.8	130.7
8	M.P.	105.9	105.7	109.7	106.3	116.1	114.5	120.1	114.7	117.6	113.0	125.7	113.9	132.8	123.2	138.9	123.5
9	Maharashtra	107.0	107.0	110.0	107.6	112.1	108.8	117.3	110.1	121.6	116.9	126.2	117.7	131.0	128.2	136.2	128.2
10	Orissa	93.5	88.1	104.6	91.5	95.3	91.9	108.3	94.2	99.3	93.9	113.1	96.5	116.0	105.6	130.0	108.2
11	Punjab	114.5	114.3	115.4	114.1	120.4	122.4	121.4	120.8	123.9	122.1	128.2	121.6	139.4	133.6	143.3	132.7
12	Rajasthan	110.0	115.9	112.2	115.1	124.4	132.2	124.0	129.4	125.1	124.5	127.7	124.1	150.1	140.2	148.8	138.4
13	Tamil Nadu	102.0	96.8	106.9	99.4	104.3	99.3	111.1	102.3	114.5	107.6	122.0	110.1	125.2	117.1	133.8	120.6
14	U.P.	102.0	103.4	107.9	104.2	110.9	111.3	117.0	112.2	117.2	112.4	124.8	113.9	136.0	130.0	141.2	130.1
15	West Bengal	99.7	96.2	102.9	99.0	108.1	101.9	111.3	104.4	116.0	111.6	119.6	114.3	124.8	117.6	130.2	121.1
16	All India	105.2	101.6	109.3	102.7	111.0	105.3	116.1	106.8	117.8	110.2	124.1	111.9	132.6	121.4	138.2	123.1

Notes: (1) All-India Indices given in line 16 for CPITR represent weighted averages of the state-specific indices for 20 states. They are identical to those in line 21 in Table 1.R.
(2) All-India indices in line 16 for CPIAL are official estimates reported in the *Monthly Abstract of Statistics*.

TABLE 7. MINIMUM AND MAXIMUM VALUES AND COEFFICIENTS OF VARIATION (C.V.) OF FOOD, NON-FOOD AND GENERAL CONSUMER PRICE INDICES ACROSS STATES IN FOUR CONSECUTIVE YEARS FROM 1984-85 TO 1987-88: RURAL AND URBAN POPULATION (BASED ON USING WEIGHTING DIAGRAM OF THE BASE YEAR 1983)

(Per cent)

Sl. No.	Year	Food			Non-food			General		
		Min	Max	C.V.	Min	Max	C.V.	Min	Max	C.V.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					RURAL					
1	1984-85	93.4 (BHR) (ORS)	117.2 (KRL)	6.31	111.9 (WB)	135.7 (ORS)	2.98	99.4 (BHR)	116.3 (KRL)	4.14
2	1985-86	95.3 (ORS)	124.4 (RJN)	6.51	120.3 (WB)	144.5 (ORS)	3.12	105.1 (BHR)	124.0 (RJN)	4.23
3	1986-87	99.3 (ORS)	130.2 (KRL)	5.65	129.7 (WB)	151.3 (ORS)	2.84	113.1 (ORS)	131.5 (KRL)	3.65
4	1987-88	116.0 (ORS)	150.1 (RJN)	6.13	140.6 (J&K)	168.9 (ORS)	2.87	130.0 (ORS) (BHR) (WB)	148.8 (RJN)	3.88
					URBAN					
5	1984-85	99.7 (ORS)	122.3 (CHG)	2.69	106.6 (CHG)	144.3 (ASM)	6.20	107.8 (ORS) (HRY)	123.2 (ASM)	2.71
6	1985-86	105.5 (ORS)	129.9 (CHG)	3.02	113.4 (CHG)	158.7 (ASM)	6.26	114.3 (ORS)	129.3 (ASM)	2.54
7	1986-87	113.7 (ORS)	140.7 (CHG)	2.96	120.7 (CHG)	167.0 (ASM)	5.96	121.6 (ORS)	137.0 (ASM)	2.59
8	1987-88	125.5 (ORS)	159.7 (CHG)	3.72	138.8 (HP) (KRL) (UP)	179.3 (ASM)	5.64	133.0 (ORS)	149.2 (CHG) (DLI) (KRN)	2.59

Notes: (1) Min and Max refer to the minimum and the maximum index value.
(2) Name of the state in abbreviation to which the minimum or maximum index value belong is given below within brackets.
(3) See Table 8.R for the explanation of the abbreviations used for the names of states.
Source: Tables 1.R and 1.U.

TABLE 8. R. STATE-WISE ANNUAL RATE OF INCREASE OVER VARIOUS PERIODS IN RURAL CONSUMER PRICE INDICES OF FOOD, NON-FOOD AND GENERAL BASED ON THE USE OF 1983 WEIGHTING DIAGRAM

Sl. No.	Name of the state	Food				Non-food				General			
		I	II	III	IV	I	II	III	IV	I	II	III	IV
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	A.P. (AP)	2.14	2.99	8.42	8.47	12.52	6.37	9.58	9.68	6.35	4.46	8.94	9.01
2	Assam (ASM)	5.58	3.72	6.56	10.79	10.75	9.63	5.85	6.17	6.98	5.39	6.35	9.44
3	Bihar (BHR)	-4.48	5.51	9.46	15.66	10.61	6.34	7.62	9.27	-0.39	5.77	8.89	13.70
4	Gujarat (GJT)	5.72	8.60	4.22	16.55	10.08	8.69	7.86	7.47	7.23	8.63	5.52	13.23
5	Haryana (HRY)	8.98	4.89	2.78	13.12	11.11	6.17	8.87	10.75	9.76	5.37	5.06	12.20
6	H.P. (HP)	8.42	5.56	2.18	14.03	10.38	6.14	8.86	10.00	9.15	5.78	4.72	12.44
7	J. & K. (J&K)	5.74	5.09	7.45	12.25	10.86	7.83	5.97	5.39	7.31	5.97	6.97	10.04
8	Karnataka (KRN)	6.94	0.19	1.53	12.15	11.56	7.03	9.58	8.21	8.65	2.80	4.74	10.51
9	Kerala (KRL)	11.18	-2.89	14.35	8.30	9.62	4.97	10.91	9.18	10.60	0.00	13.02	8.64
10	M.P. (MP)	3.88	9.70	1.24	12.94	11.16	9.09	10.81	6.46	6.35	9.48	4.66	10.49
11	Maharashtra	4.63	4.78	8.40	7.73	9.62	9.26	6.42	8.24	6.58	6.59	7.58	7.94
12	(MHR)	4.89	3.23	7.21	9.56	10.93	9.61	5.71	6.43	6.64	5.17	6.74	8.58
13	Manipur ((MNP)	-4.41	1.95	4.23	16.84	22.55	6.49	4.74	11.64	3.05	3.51	4.41	15.00
14	Orissa (ORS)	9.43	5.21	2.86	12.53	10.87	5.24	9.31	10.81	10.03	5.22	5.56	11.78
15	Punjab ((PNB) Rajasthan (RJN)	6.54	13.12	0.59	19.91	10.23	6.65	6.68	11.49	8.00	10.50	2.97	16.50
16	Tamil Nadu (TN)	1.34	2.29	9.73	9.38	10.28	6.73	9.86	10.18	4.53	3.98	9.78	9.69
17	U.P. (UP)	1.31	8.70	5.71	16.05	11.67	8.12	8.08	8.87	5.17	8.47	6.66	13.14
18	West Bengal (WB)	0.18	8.41	7.30	7.59	7.80	7.47	7.82	12.31	1.93	8.15	7.45	8.92
19	Delhi (DLI)	8.04	4.23	5.58	13.76	12.32	6.07	8.85	11.13	9.98	5.09	7.11	12.51
20	Tripura (TRP)	6.39	4.29	6.52	10.65	11.99	10.01	5.92	6.97	8.07	6.09	6.33	9.46
21	All States (AS)	3.46	5.49	6.09	12.60	11.04	7.23	8.41	9.28	6.13	6.14	6.96	11.33
22	Mean (All States)	4.60	4.98	5.82	12.41	11.35	7.40	7.97	9.03	6.80	5.82	6.67	11.16
23	C.V. (%)	89.93	69.44	57.75	26.89	24.41	20.27	22.12	22.10	40.81	40.58	33.10	20.62

Notes: (1) I, II, III and IV refer to periods 1983 to 1984-85, 1984-85 to 1985-86, 1985-86 to 1986-87 and 1986-87 to 1987-88 respectively.
(2) In line 22, Mean (20 States) refer to the simple mean of annual rates of increase for the twenty states.
Source: Table 1.R.

TABLE 8. U. STATE-WISE ANNUAL RATE OF INCREASE OVER VARIOUS PERIODS IN URBAN CONSUMER PRICE INDICES OF FOOD, NON-FOOD AND GENERAL BASED ON THE USE OF 1983 WEIGHTING DIAGRAM

Sl. No.	Name of the state	Food				Non-food				General			
		I	II	III	IV	I	II	III	IV	I	II	III	IV
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	A.P. (AP)	7.43	4.72	9.82	13.06	11.66	6.00	6.24	9.69	9.40	5.33	8.10	11.46
2	Assam (ASM)	7.36	1.37	6.41	6.80	27.67	9.99	5.23	7.39	14.90	5.01	5.89	7.06
3	Bihar (BHR)	2.47	6.33	9.80	11.26	12.10	7.97	6.67	10.57	5.90	6.96	8.59	11.00
4	Gujarat (GJT)	4.98	9.53	9.49	13.72	8.94	7.50	7.80	8.66	6.59	8.68	8.79	11.65
5	Haryana (HRY)	4.05	5.71	10.12	8.06	6.09	9.40	7.60	15.59	4.95	7.35	8.98	11.43
6	H.P. (HP)	8.98	4.10	7.20	9.53	6.63	9.11	5.34	9.66	7.86	6.46	6.30	9.59
7	J. & K. (J&K)	8.38	7.11	10.35	11.59	7.69	8.95	7.48	10.62	8.13	7.78	9.29	11.24
8	Karnataka (KRN)	7.54	3.93	10.31	13.52	16.86	7.21	5.60	8.75	11.74	5.50	8.03	11.26
9	Kerala (KRL)	8.25	1.95	15.15	5.98	9.74	6.89	5.94	6.63	8.88	4.03	11.15	6.25
10	M.P. (MP)	5.79	9.91	9.09	11.68	10.00	8.77	7.40	7.84	7.55	9.42	8.37	10.06
11	Maharashtra	7.48	6.28	9.11	9.11	8.05	7.74	5.95	9.70	7.73	6.93	7.70	9.37
12	(MHR)	10.59	8.02	6.81	6.57	7.28	16.29	7.94	4.53	9.08	11.72	7.34	5.62
13	Meghalaya (MGL)	-0.22	5.87	7.76	10.40	14.18	6.39	4.35	7.92	5.11	6.08	6.35	9.40
14	Orissa (ORS)	7.06	5.20	6.26	12.50	7.80	6.24	7.97	10.50	7.40	5.68	7.05	11.57
15	Punjab ((PNB) Rajasthan (RJN)	6.65	8.60	6.44	16.52	8.17	8.46	4.63	9.41	7.31	8.54	5.64	13.41
16	Tamil Nadu (TN)	4.01	5.87	10.16	11.65	19.79	7.49	5.99	8.59	11.20	6.68	8.06	10.14
17	U.P. (UP)	5.95	7.63	8.42	11.54	7.74	7.69	7.41	6.92	6.71	7.66	7.99	9.58
18	West Bengal (WB)	0.43	8.49	9.03	6.80	15.78	9.29	6.70	7.38	9.78	8.85	7.98	7.06
19	Delhi (DLI)	8.82	9.29	8.40	12.49	7.23	9.62	8.86	10.86	8.05	9.45	8.62	11.71
20	Chandigarh (CHG)	4.39	6.19	8.28	13.54	4.37	6.40	6.40	16.23	9.03	6.29	7.33	14.89
21	All States (AS)	6.10	6.75	9.22	11.06	11.45	7.85	6.57	8.94	8.42	7.24	8.02	10.12
22	Mean (20 States)	6.77	6.30	8.92	10.82	10.89	8.37	6.58	9.37	8.36	7.22	7.88	10.19
23	C.V. (%)	44.02	36.51	21.99	25.75	50.07	25.89	18.03	28.56	27.29	24.82	15.87	22.27

Notes: Same as of Table 8.R.
Source: Table 1.U.

TABLE 9. MINIMUM AND MAXIMUM VALUES AND COEFFICIENTS OF VARIATION (C.V.) OF THE ANNUAL RATE OF INCREASE OF FOOD, NON-FOOD AND GENERAL CONSUMER PRICE INDICES ACROSS STATES OVER FOUR CONSECUTIVE PERIODS: RURAL AND URBAN POPULATION

(Per cent)

Sl. No.	Year	Food			Non-food			General		
		Min	Max	C.V.	Min	Max	C.V.	Min	Max	C.V.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					RURAL					
1	1983 to 84-85	-4.48 (BHR) -4.41 (ORS)	11.18 (KRL)	89.93	7.80 (WB)	22.55 (ORS)	24.41	-0.39 (BHR)	10.60 (KRL) 10.03 (PNB)	40.81
2	1984-85 to 1985-86	-2.89 (KRL)	13.12 (RJN)	69.44	4.97 (KRL)	10.01 (TRP)	20.27	0.00 (KRL)	10.50 (RJN)	40.58
3	1985-86 to 1986-87	0.59 (RJN)	14.35 (KRL)	57.75	4.74 (ORS)	10.91 (KRL) 10.88 (MP)	22.12	2.97 (RJN)	13.03 (KRL)	33.10
4	1986-87 to 1987-88	7.59 (WB) 7.73 (MHR)	19.91 (RJN)	26.89	5.39 (J&K)	12.31 (WB)	22.10	7.94 (MHR)	16.50 (RJN)	20.62
					URBAN					
5	1983 to 84-85	-0.22 (ORS)	14.39 (CHG)	44.02	4.37 (CHG)	27.67 (ASM)	50.07	4.95 (HRY)	14.90 (ASM)	27.29
6	1984-85 to 1985-86	1.37 (ASM)	9.91 (MP)	36.51	6.00 (AP)	16.29 (MGL)	25.89	4.03 (KRL)	11.72 (MGL)	24.82
7	1985-86 to 1986-87	6.26 (PNB)	15.15 (KRL)	21.99	4.35 (ORS)	8.86 (DLI)	18.03	5.64 (RJN)	11.15 (KRL)	15.87
8	1986-87 to 1987-88	5.98 (KRL)	16.52 (RJN)	25.75	4.53 (MGL)	16.23 (CHG)	28.56	5.62 (MGL)	13.41 (RJN)	22.27

Notes: (1) Min and Max refer to Minimum and Maximum values of the annual rate of increase of an index over a period.
(2) Name of state in abbreviation given within brackets relates to the figure appearing above it.
(3) See Tables 8.R and 8.U for the explanation of abbreviations used for the names of the states in the rural and urban population.
Source: Tables 8.R and 8.U.

APPENDIX

TABLE A.1R. CLASSIFICATION OF INDIVIDUAL CONSUMPTION ITEMS FORMING CONSUMER BASKET OF THE CPIAL SERIES INTO THIRTEEN ITEM GROUPS

Sl. No. (1)	Name of the item group (2)	Individual items belonging to the item group (3)
1	Cereals and cereal products	Rice, wheat, wheat atta, jowar, bajra, maize, ragi, gram, barley and tapioca
2	Pulses and pulse products	Arhar dal, gram dal, masur dal, mong dal, urd dal, and khesari dal
3	Fruits and vegetables	Potato, onion, brinjal and coconuts
4	Spices and salt	Dry chillies, turmeric, tamarind and salt
5	Edible oils and fats	Mustard oil, coconut oil, groundnut oil, gingelly oil and vanaspati
6	Milk and milk products	Milk and ghee
7	Meat and fish	Meat and fresh fish
8	Sugar and gur	Sugar and gur
9	Other food	Tea leaf and coffee
10	Intoxicants etc.	Supari, tobacco, bidi, pan leaf and country liquor
11	Fuel and light	Firewood, Kerosene oil, Matchbox and dungcake
12	Clothing, bedding and footwear	Dhoti, saree, bath towel/gamcha, lungi, shirting, ghagra and salwar cloth, blouse cloth, long cloth, orni, chaddar (bed sheet), leather shoes and leather chappel
13	Other non-food	Anacin, washing soap, toilet soap, tailoring charges and barbar charges

TABLE A. 1U. LIST OF GROUPS OF CONSUMER ITEMS FOR WHICH MONTHLY CONSUMER PRICE INDICES (WITH 1960=100) ARE AVAILABLE FOR EACH CENTRE OF THE CPIIW AND THE CPINM SERIES

Sl. No.	CPIIW Series Name of the item group	Sl. No.	CPINM Series Name of the item group
1	Cereals and cereal products	1	Cereals and cereal products
2	Pulses and pulse products	2	Pulses and pulse products
3	Fruits and vegetables	3	Vegetables
4	Condiments and spices	4	Fruits
5	Oils and fats	5	condiments and spices
6	Milk and milk products	6	Oils and fats
7	Meat, fish and eggs	7	Milk and milk products
8	Other food	8	Meat, fish and eggs
9	Pan, supari, tobacco and intoxicants	9	Sugar (including gur)
10	Fuel and light	10	Non-alcoholic beverages
11	Clothing, bedding and footwear	11	Prepared meals and refreshments
12	Housing	12	Pan, supari, tobacco, etc.
13	Medical care	13	Fuel and light
14	Education, recreation and amusement	14	Clothing, bedding and footwear
15	Transport and communication	15	Housing
16	Personal care and effects	16	Medical care
17	Other non-food	17	Education
		18	Recreation
		19	Transport and communication
		20	Personal care and effects
		21	Household requisites
		22	Other non-food

APPENDIX-TABLE A. 2R. STATE-WISE PERCENTAGE SHARES OF GROUPS OF CONSUMER ITEMS IN TOTAL CONSUMER EXPENDITURE FOR RURAL POPULATION: 1970-71

Sl. No.	Name of the state	cereals & prds	Pulses & prds	Fruits & Veg.	Spices & salt	Ed. oils & fats	Milk & prds	Meat & fish	Sugar & gur	Other Food	Intoxi-cants etc.	Fuel & light	Clothing etc.	Other non-food	Total food	Total non-food	M.P.C. T. Exp. (Rs.)	Popu-lation. (Million)
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1	A.P.	42.3	3.1	3.9	6.4	3.3	4.6	4.3	1.5	2.6	6.0	5.6	7.4	8.9	72.0	28.0	34.35	35.11
2	Assam	46.8	3.0	5.5	2.3	3.6	4.6	8.2	2.3	1.8	5.5	6.6	4.5	5.3	78.1	21.9	40.27	13.36
3	Bihar	53.8	4.7	5.0	2.1	3.2	5.2	1.5	1.5	1.2	2.4	5.2	6.6	7.6	78.2	21.8	32.70	50.72
4	Gujarat	32.1	4.3	4.8	3.3	5.9	15.3	0.7	7.0	3.5	3.0	6.3	5.3	8.5	76.9	23.1	36.64	19.20
5	Haryana	30.1	2.8	3.3	2.3	1.7	24.9	0.6	5.3	2.7	2.4	6.0	8.0	9.8	73.8	26.2	48.86	8.26
6	H.P.	30.5	4.1	3.0	2.1	4.2	14.9	1.3	4.2	2.3	3.7	7.9	11.4	10.3	66.7	33.3	50.75	3.22
7	J. & K.	37.0	2.7	4.0	2.8	4.5	10.5	4.5	1.9	3.5	2.1	8.0	9.1	9.4	71.4	28.6	44.87	3.76
8	Karnataka	39.9	3.6	4.8	5.2	2.4	6.6	2.3	3.3	4.0	4.3	6.4	8.0	9.2	72.1	27.9	35.89	22.18
9	Kerala	34.1	1.4	7.8	3.7	2.3	4.4	4.9	2.4	9.2	3.8	5.3	4.9	15.8	70.2	29.8	36.12	17.88
10	M.P.	43.2	4.1	4.1	3.1	3.6	7.7	1.4	3.0	2.2	3.5	5.6	9.7	8.9	72.3	27.7	32.88	34.87
11	Maharashtra	33.2	4.2	4.8	4.9	4.3	6.7	3.5	3.9	3.2	2.8	7.0	10.3	11.1	68.8	31.2	36.34	34.70
12	Manipur	47.0	1.8	5.8	2.7	2.6	1.4	8.5	0.9	1.3	5.1	8.8	6.4	7.8	71.9	28.1	34.05	0.93
13	Orissa	54.3	2.3	6.4	2.6	2.6	1.7	4.0	1.5	2.0	3.4	6.7	6.3	6.3	77.3	22.7	28.83	20.10
14	Punjab	20.1	2.7	3.9	2.8	3.1	22.4	1.3	6.8	4.8	3.2	5.6	10.9	12.5	67.8	32.2	57.99	10.33
15	Rajasthan	32.0	2.2	2.9	3.6	3.4	20.2	0.8	4.2	1.6	3.4	5.8	11.8	8.2	70.8	29.2	35.39	21.22
16	Tamil Nadu	43.6	3.3	4.9	6.1	3.6	3.3	3.9	1.6	4.7	3.3	7.4	5.3	8.9	75.1	24.9	29.98	28.73
17	U.P.	37.7	5.2	4.4	2.5	3.7	10.2	1.7	5.1	1.0	2.7	5.9	9.4	10.4	71.5	28.5	35.62	75.95
18	West Bengal	51.0	2.4	6.4	2.1	4.2	4.0	5.1	2.0	2.7	3.2	5.3	5.3	6.3	79.9	20.1	33.22	33.35
19	Delhi	27.7	2.4	5.6	2.3	2.5	19.8	0.7	4.5	2.9	1.8	6.2	9.6	14.1	68.3	31.7	57.91	0.42
20	Tripura	47.2	1.8	6.4	2.9	3.0	3.4	7.5	1.7	2.7	4.9	5.1	5.6	7.7	76.7	23.3	41.72	1.39
21	All India	40.6	3.7	4.8	3.5	3.5	8.6	2.8	3.4	2.7	3.4	6.0	7.9	9.2	73.4	26.6	35.37	435.69

Notes: (1) M.P.C.T. Exp. given in column (17) refers to monthly per capita total expenditure.

APPENDIX-TABLE A. 2U. STATE-WISE PERCENTAGE SHARES OF GROUPS OF CONSUMER ITEMS IN TOTAL CONSUMER EXPENDITURE FOR URBAN POPULATION: 1970-71

Sl. No.	State name	Cereals & prds.	Pulses & prds.	Fruit & vegs.	Spices etc.	Oils & fats	Milk & prds.	Meat, fish & eggs	Other food	Intoxi-cants etc.	Fuel & light	Cloth-ing etc.	Hous-ing	Medi-cal care	Edn. & recn.	Tpt. & comn.	Personal care	Other non-food	M.P.C.T. Exp. (Rs)	Popu-lation (million)
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
1	AP	27.59	2.96	5.04	4.23	3.63	6.70	3.92	9.63	4.33	5.80	5.94	3.91	2.82	3.15	2.19	3.15	5.01	49.27	8.40
2	ASM	27.51	2.71	5.33	1.79	4.55	5.66	8.42	10.11	4.58	6.57	7.30	4.50	1.63	3.47	1.23	2.21	2.43	64.24	1.29
3	BHR	32.24	4.50	6.14	1.83	4.19	7.49	3.55	8.40	2.57	5.03	6.87	2.91	2.45	2.91	1.58	1.70	5.64	51.02	5.63
4	GJT	21.84	4.35	6.61	2.50	8.00	13.28	1.59	10.16	2.31	6.69	4.00	4.45	2.97	2.83	1.60	1.95	4.88	48.83	7.50
5	HRY	19.36	3.15	6.79	2.03	4.67	17.52	0.70	9.84	2.11	6.20	7.73	2.93	2.78	3.96	2.58	1.90	5.75	55.13	1.77
6	HP	17.06	2.77	5.19	1.65	5.21	14.93	1.67	12.31	3.07	7.17	8.36	4.71	1.30	4.48	2.81	2.24	5.07	73.94	0.24
7	J&K	21.72	2.33	5.63	2.93	6.53	12.88	6.11	8.67	2.88	8.64	7.04	2.09	2.88	2.60	1.62	2.31	3.14	45.84	0.86
8	KRN	26.06	3.64	5.66	3.77	3.16	7.45	3.38	12.66	2.88	6.59	7.22	4.74	1.58	2.74	2.23	2.23	4.00	50.71	7.12
9	KRL	23.33	1.69	7.12	2.84	2.44	5.44	4.49	15.99	3.48	5.08	6.55	2.43	4.09	3.22	2.63	2.97	6.21	47.63	3.47
10	MP	23.65	4.59	5.71	2.69	5.05	10.23	2.03	9.49	3.42	5.93	6.69	3.70	2.12	2.44	1.73	1.92	8.63	50.37	6.78
11	MHR	16.44	3.19	6.77	2.70	5.13	9.88	3.75	13.48	2.88	5.68	5.13	5.58	2.89	4.03	3.36	2.45	6.67	63.30	15.71
12	MGL	27.51	2.71	5.33	1.79	4.55	5.66	8.42	10.11	4.58	6.57	7.30	4.50	1.63	3.47	1.23	2.21	2.43	91.72	0.15
13	ORS	29.90	2.91	8.08	2.29	4.29	5.08	5.30	11.62	3.45	5.59	6.02	2.84	1.68	2.39	1.23	1.84	5.49	52.73	1.85
14	PNB	16.10	2.46	6.35	2.05	4.83	17.09	1.69	11.09	2.75	6.30	6.64	2.99	3.28	4.04	2.71	2.39	7.23	65.89	3.22
15	RJN	20.17	2.68	5.75	2.53	5.19	16.22	1.57	9.24	3.05	5.65	6.37	4.16	3.01	2.92	2.92	2.11	6.46	54.13	4.54
16	TN	26.05	3.16	5.66	4.10	3.78	6.69	3.95	12.04	2.30	6.78	4.43	5.98	1.99	2.91	2.08	3.29	4.81	44.69	12.46
17	UP	24.83	4.93	6.24	2.27	4.62	11.34	2.62	8.45	3.10	6.43	6.46	3.27	4.14	3.34	1.55	2.02	4.40	45.17	12.39
18	WB	22.53	2.25	7.47	1.71	4.22	6.59	6.41	13.53	3.20	4.63	5.04	5.69	2.16	3.61	2.32	2.03	6.61	60.89	10.97
19	DLI	11.98	2.19	7.92	1.67	5.77	14.42	2.91	10.85	2.04	5.66	7.79	7.19	2.13	3.98	4.02	2.00	7.48	82.36	3.65
20	CDG	13.95	2.16	6.85	1.27	5.58	15.85	1.50	13.45	2.00	5.28	5.81	6.50	1.78	5.52	4.32	1.36	6.80	88.98	0.23
21	AS	22.95	3.39	6.32	2.75	4.63	9.59	3.53	11.22	2.97	5.95	5.84	4.54	2.68	3.27	2.29	2.35	5.73	53.98	108.23

Notes: See Table 8U. for the explanation of abbreviations used for the names of the states.

APPENDIX-TABLE A. 3R. STATE-WISE PERCENTAGE SHARES OF GROUPS OF CONSUMER ITEMS IN TOTAL CONSUMER EXPENDITURE FOR RURAL POPULATION: 1983

Sl. No.	Name of the state	cereals & prds	Pulses & prds	Fruits & Veg.	Spices & salt	Ed. oils & fats	Milk & prds	Meat & fish	Sugar & gur	Other Food	Intoxi-cants etc.	Fuel & light	Clothing etc.	Other non-food	Total food	Total non-food	M.P.C. T. Exp. (Rs.)	Popu-lation. (Million)
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1	A.P.	29.9	3.4	5.0	3.5	4.1	4.5	4.5	1.5	3.6	4.7	5.9	11.3	18.0	60.1	39.9	115.82	42.33
2	Assam	41.0	2.7	7.0	1.7	3.7	4.6	7.8	2.0	2.8	4.3	7.8	5.8	8.9	73.3	26.7	113.16	18.73
3	Bihar	48.2	3.5	6.8	1.8	3.7	4.4	2.4	1.3	1.5	2.1	6.7	7.1	10.5	73.6	26.4	93.75	63.82
4	Gujarat	21.3	4.2	7.7	2.4	7.2	12.8	0.9	4.8	4.2	3.0	6.9	8.4	16.1	65.7	34.3	122.76	24.36
5	Haryana	18.8	2.7	4.6	1.9	2.2	24.5	0.6	5.0	3.3	2.6	6.6	10.8	16.4	63.6	36.4	151.85	10.61
6	H.P.	25.2	4.3	4.6	2.0	4.6	14.2	1.2	3.5	3.3	2.8	9.0	11.8	13.6	62.8	37.2	151.26	4.11
7	J. & K.	32.3	2.9	4.9	2.5	5.3	11.5	4.0	1.9	4.4	2.0	8.3	9.2	10.9	69.6	30.4	129.30	4.93
8	Karnataka	30.3	4.1	6.4	3.3	3.1	5.1	3.0	3.0	5.0	3.6	8.3	9.6	15.2	63.2	36.8	117.20	27.28
9	Kerala	25.1	1.6	8.2	2.0	2.6	4.0	6.0	5.4	7.8	3.0	5.6	6.8	21.8	62.7	37.3	149.99	21.38
10	M.P.	36.7	4.9	5.0	2.3	4.3	6.4	1.4	3.0	2.3	3.0	6.9	10.7	12.9	66.4	33.6	100.64	43.20
11	Maharashtra	26.0	4.8	6.4	2.9	5.2	5.3	3.3	3.7	3.7	2.9	8.2	11.2	16.5	61.2	38.8	110.94	42.22
12	Manipur	45.0	3.0	6.1	2.2	2.1	0.9	9.0	0.9	2.1	4.2	7.3	6.9	10.2	71.3	28.7	131.52	1.08
13	Orissa	50.7	2.1	6.9	2.0	2.7	1.5	3.3	1.6	2.8	2.6	7.5	6.5	9.9	73.6	26.4	98.86	24.58
14	Punjab	14.6	3.0	5.1	2.0	3.5	18.2	1.0	6.3	4.9	2.3	6.8	14.3	17.9	58.7	41.3	170.64	12.50
15	Rajasthan	24.5	2.4	3.2	2.4	3.6	16.5	0.8	4.7	2.6	3.0	6.2	13.9	16.3	60.7	39.3	127.17	28.47
16	Tamil Nadu	35.0	3.4	5.5	3.7	3.3	3.3	3.7	1.6	5.3	3.4	6.8	7.7	17.3	64.8	35.2	112.55	33.40
17	U.P.	29.7	4.7	6.0	2.3	4.5	9.5	1.7	3.2	1.7	2.4	7.8	10.9	15.6	63.3	36.7	104.55	94.14
18	West Bengal	45.1	2.0	7.7	2.1	4.0	3.5	5.4	1.7	2.5	2.4	6.2	6.2	11.2	73.9	26.1	104.65	41.79
19	Delhi	11.0	2.2	6.7	1.5	3.2	22.5	1.7	2.8	3.3	2.7	6.3	12.1	24.1	54.9	45.1	217.23	0.43
20	Tripura	35.5	2.2	7.2	2.3	3.8	4.6	10.0	1.6	3.1	4.3	5.3	7.6	12.5	70.3	29.7	127.11	1.95
21	All India	31.6	3.5	6.1	2.5	4.0	8.0	3.0	3.2	3.4	3.0	7.0	9.7	15.2	65.2	34.8	112.58	541.31

APPENDIX-TABLE A. 3U. STATE-WISE PERCENTAGE SHARES OF GROUPS OF CONSUMER ITEMS IN TOTAL CONSUMER EXPENDITURE FOR URBAN POPULATION: 1983

Sl. No.	State name	Cereals & prds.	Pulses & prds.	Fruit & vegs.	Spices etc.	Oils & fats	Milk & prds.	Meat, fish & eggs	Other food	Intoxi-cants etc.	Fuel & light	Clo-thing etc.	Hous-ing	Medi-cal care	Edn. & recn.	Tpt. & comn.	Personal care	Other non-food	M.P.C.T. Exp. (Rs)	Popu-lation (million)
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
1	AP	19.66	3.14	5.41	2.60	4.26	6.52	4.34	7.65	2.92	6.00	9.67	4.91	3.96	4.42	3.07	4.42	7.03	161.37	13.61
2	ASM	28.99	2.57	6.42	1.39	3.83	5.84	6.98	7.87	2.77	7.18	5.41	3.81	2.52	5.36	1.90	3.41	3.75	160.12	2.24
3	BHR	31.83	3.27	6.95	1.63	4.47	6.20	3.70	6.86	2.14	6.29	8.57	2.40	2.69	3.19	1.73	1.87	6.19	141.92	9.65
4	GJT	15.00	3.78	7.97	1.94	7.96	12.31	1.38	9.20	1.95	6.75	8.04	3.50	4.22	4.02	2.27	2.77	6.93	169.51	11.38
5	HRY	14.02	2.74	7.52	1.75	4.42	16.55	0.96	8.30	1.93	6.56	10.48	2.55	3.64	5.19	3.38	2.49	7.52	191.70	3.17
6	HP	12.99	2.74	5.77	1.54	4.05	13.07	1.89	9.93	3.06	7.09	12.87	3.95	1.72	5.93	3.72	2.96	6.71	269.19	0.34
7	J&K	22.00	2.13	5.90	2.42	6.06	12.77	5.48	6.37	3.40	9.28	7.32	1.38	3.55	3.21	2.00	2.85	3.87	157.47	1.36
8	KRN	19.38	3.39	6.40	2.40	3.53	6.69	3.20	10.44	2.58	6.82	9.37	4.60	2.62	4.54	3.70	3.70	6.64	174.28	11.74
9	KRL	19.74	1.68	8.21	2.17	2.80	5.02	6.46	12.15	2.35	5.69	8.92	1.93	4.90	3.85	3.15	3.56	7.43	179.74	5.15
10	MP	21.13	4.24	6.57	1.97	5.32	9.14	1.76	8.38	2.62	7.03	8.41	3.05	2.56	2.95	2.10	2.32	10.44	149.38	11.72
11	MHR	14.77	3.40	7.45	1.92	5.53	9.64	3.29	9.82	1.86	6.76	7.91	3.99	3.52	4.91	4.09	2.98	8.13	191.96	23.73
12	MGL	17.96	1.82	7.84	1.04	3.46	5.19	8.72	8.09	5.46	5.49	6.97	6.23	3.23	6.88	2.44	4.39	4.83	243.03	0.27
13	ORS	30.86	2.79	7.53	1.90	3.81	3.93	4.62	8.36	2.44	6.74	8.46	2.34	2.16	3.07	1.58	2.36	7.06	155.03	3.51
14	PNB	11.83	2.66	6.58	1.80	4.62	15.21	1.29	10.22	2.09	7.47	8.77	2.87	4.11	5.05	3.38	2.99	9.05	190.66	5.04
15	RJN	16.56	2.43	5.33	2.18	5.23	14.47	1.47	8.62	2.67	6.60	11.42	2.23	3.59	3.49	3.49	2.52	7.70	163.54	8.00
16	TN	22.38	3.01	5.74	2.61	3.26	5.71	3.39	9.21	2.08	6.17	7.47	5.34	3.12	4.56	3.26	5.15	7.54	172.93	16.90
17	UP	19.50	3.82	6.62	2.00	4.89	10.87	2.65	7.60	2.55	7.89	7.99	2.80	5.58	4.49	2.09	2.72	5.93	139.35	22.17
18	WB	21.35	2.00	7.35	1.62	4.10	6.01	7.19	8.92	2.68	6.54	7.31	3.77	2.74	4.57	2.93	2.56	8.37	176.56	15.35
19	DLI	9.35	2.73	8.55	1.85	4.69	13.05	2.36	9.01	2.14	5.85	8.38	4.63	2.98	5.56	5.62	2.80	10.45	239.90	6.39
20	CDG	7.63	2.04	7.54	1.11	4.04	11.24	1.08	11.26	0.98	4.75	9.93	8.12	2.73	8.45	6.62	2.08	10.40	313.72	0.38
21	AS	18.86	3.11	6.85	2.04	4.71	9.04	3.41	8.94	2.34	6.68	8.41	3.72	3.54	4.41	3.14	3.15	7.63	170.24	172.10

Notes: Same as of Appendix Table A. 2U.

EFFECT OF DOMESTIC GOVERNMENT DEBT ON PRIVATE CONSUMPTION AND SAVING IN INDIA

S. Gopalakrishnan

The Study, on the basis of theory, attempts to explain empirically the effect of domestic government debt on private consumption and saving in the Indian economy. Empirical analysis based on the method of restricted consumption function estimation shows that domestic debt in the country, except for its provident fund component, does little to mobilise additional real resources by affecting current private consumption and saving.

OBJECTIVE OF THE STUDY

India is a developing country with low income, insufficient saving, and inadequate investment. Domestic public debt is being increasingly used as an instrument for mobilising private savings, the effectiveness and desirability of which need to be examined. The objective of the present study is to examine empirically the effect of domestic government debt on private consumption and saving in the Indian economy. With this in view, Section 2 outlines major theoretical aspects; Section 3 reviews major empirical studies; Section 4 presents the structure of domestic government debt in India and conceptualises it; Section 5 describes the methodology adopted for the present empirical analysis; Section 6 presents and interprets the empirical results; the final section draws major inferences.

THEORETICAL ISSUES

To begin with, we may note that, in the past, the debate on the effect of government debt on private consumption was mainly subsumed in the discussion of the real burden of public debt. Further, the issue addressed here is in terms of the effect, on private consumption, of substituting government debt for taxes to finance given level of government expenditure in real terms; this is referred to as analysis in the differential incidence framework. In point of fact, private consumption constitutes an important component of aggregate demand and therefore the effect of government debt on private consumption determines its effectiveness as an instrument of fiscal policy in broader sense. Keynesian theory is based on the assumption that the fiscal policy variables, namely, taxes, transfer payments, and government debt, can affect private consumption, if at all, only through their effect on personal disposable income [Feldstein, 1982, Pp. 1-20]. Taxes reduce disposable income and thereby reduce private consumption. Similarly, government transfer payments increase disposable income and consequently increase private consumption. It is assumed that government debt is fully absorbed in current private saving and that it does not affect personal disposable income. In this framework, for given government expenditure, substitution of government debt for taxes would increase personal disposable income and result in increased private consumption, its magnitude depending on the marginal propensity to consume out of personal disposable income.

The expansionary effect of substitution of government debt for taxes in the Keynesian analysis thus crucially depends on the assumption that government debt does not reduce private consumption but merely transfers private saving for public purposes. In theory, whether government debt is absorbed in private saving or is absorbed in disposable income (as in the case of taxation) depends on the private sector perception of government debt, either as an addition to net wealth in private sector portfolio or as an addition to its future tax liability. In the literature, there are three distinct views as to the private sector perception of government debt [Pigou 1928, Buchanan, 1958 and Barro 1974].

Pigou illustrates what is popularly known as the classical theory and his exposition is very often referred to as the Ricardo - Pigou thesis [Shoup, 1962, Pp. 889-892]. Government debt entails periodic payment of interest and a final redemption of the debt which would essentially involve a future tax liability. According to Pigou, individuals are unable to perceive this future tax liability because of two reasons: (i) in a finite life

S. Gopalakrishnan is Economist at National Institute of Public Finance and Policy, New Delhi.

The author is grateful to Dr. M. Govinda Rao, Prof. P.R. Panchamukhi, Dr. S. Madhur, Dr. A. Das-Gupta and Mrs. Wadhwa for advice and assistance at various stages of the paper.

span they are uncertain as to their own future tax shares for the redemption of debt and (ii) large subscribers have good reason to hope that the interest on their holdings will exceed the contribution in taxes which they will make to provide for this interest [Pigou, 1928, p. 244]. Hence, government debt increases private consumption to the extent the private sector perceives government debt as net wealth.

Buchanan assumes perfect fiscal illusion under which individuals are completely myopic to future tax shares implicit in government debt. Therefore, they voluntarily exchange their current saving for government debt in order to secure a desired future stream of income. Government debt is fully perceived as net wealth in the private sector portfolio. The implication of this could be made clearer through a comparative static analysis wherein we examine the differential incidence of debt-tax substitution for a given government expenditure in real terms. Under these conditions, for given government expenditure in real terms, a substitution of government debt for taxes leads to an increase in disposable income and private consumption increases by the marginal propensity to consume [Buchanan, 1958].

Barro in an ingenious model assumes individuals who would behave as though they have an infinite life span. In his model, where inheritance links generations, the utility of the present generation depends not only on their own consumption but also on future consumption of the heirs. Basic to the Barro model is the assumption that the future tax liability of a current increase in government debt is fully perceived by the present generation and their discounted value of this future tax liability exactly equals the value of current increase in government debt. Therefore, rather than consuming any part of the additional saving, individuals pass it on to the descendents. Thus, private consumption remains unchanged; government debt does not have any expansionary effects [Barro, 1974, Pp. 1,095-1,117].

Bailey has given a new dimension to the effect of government debt on private consumption [Bailey, 1962]. According to him, private consumption depends, besides disposable income, also on the perceived benefits from government expenditure. To the extent individuals perceive government expenditure as providing consumption goods, private consumption is reduced. On the other hand, to the extent individuals perceive government expenditure as providing investment goods and only future consumer goods, reduction in private consumption would be not that great. The point to note is that, once the individuals perceive benefit from government expenditure, what is important for private consumption is the level of government expenditure, the mode of its financing, whether government debt or taxes, is not so relevant.

MAJOR EMPIRICAL STUDIES

All the major empirical studies on the effect of government debt on private consumption are done in the context of developed economies, particularly the United States, and have mainly taken two directions: (i) government debt is incorporated as an independent variable in a private consumption function and its coefficient is interpreted as the net wealth effect of government debt on private consumption, (ii) testing for the effect of government debt on private consumption is carried out by testing for certain coefficient restrictions in a consumption function implied by the net wealth effect of government debt.

In the US context, Kochin estimated a consumption function with government deficit (i.e. debt) as one variable and interpreted its negative coefficient as evidence against the net wealth effect of government bonds [Kochin, 1974, Pp. 385-394]. Yawitz and Meyer reported empirical evidence in support of the net wealth effect of government securities in the US as in their estimated consumption function the coefficients of the variables, stock of government securities and private wealth, were positive and not significantly different from one another [Yawitz and Meyer, 1976, Pp. 247-254]. Tanner contradicted the net wealth effect of government securities in the US since, in the consumption equation he estimated, the coefficient of the stock of government securities was not significantly different from zero [Tanner, 1979, Pp. 214-218]. Holcombe, Jackson, and Zardkoohi estimated a saving function for the US and interpreted the positive coefficient of the

flow of government debt as evidence of partial capitalisation of future tax liability, implicit in government securities, into private saving [Holcombe, *et al*, 1981, Pp. 186-202]. Further, in response to a criticism [Carmichael, 1982, Pp. 710-712], they later explicitly included tax as another variable in the saving function and accordingly interpreted the difference between the coefficients of the tax and debt variables in the estimated equation as the differential effect of substituting debt for taxes; their finding again supported partial capitalisation of future taxes, implicit in government debt, into private saving [Holcombe *et al*, 1982, Pp. 713-718]. Seater estimated total consumption function, non-durable consumption function, and asset demand function, making use of the US data; the net wealth effect is supported only by his non-durable consumption function wherein the coefficient of the government debt turned out significantly positive [Seater, 1982, Pp. 376-389].

Buiter and Tobin pointed out that private perception of government deficit as taxes when translated into empirical terms would imply that, in the private consumption function, coefficients of deficit and tax variables should be the same and their absolute value would equal the coefficient of income variable [Buiter and Tobin, 1979, Pp. 39-63]. Their results for the US are inconclusive. Carmichael and Hawtrey in the Australian context provided evidence against the debt-tax equivalence in their effect on private consumption by estimating a partial adjustment model of consumption. In fact, they tested for the restriction that the sum of the coefficients of disposable income variable and of flow of government security variable are not significantly different from zero. Their results supported the irrelevance of the means of financing of government expenditure, whether tax, debt, or money on its effect on private consumption [Carmichael and Hawtrey, 1981, Pp. 332-343]. Feldstein pointed out that the debt-tax equivalence can be empirically supported only if, in the estimated consumption function, the sum of the coefficients of the government debt and private wealth variables are not significantly different from zero. Feldstein's consumption function for the US showed no conclusive evidence to this effect [Feldstein, 1982, Pp. 1-20]. Koskela and Viren by estimating a private consumption function for the OECD countries rejected debt-tax equivalence by rejecting the coefficient restriction that the coefficients of the tax and debt variables are the same and their absolute value equals the coefficient of the income variable [Koskela and Viren, 1983, Pp. 575-588].

Kormendi in the US context provided evidence in favour of the debt-tax irrelevance for private consumption and the substitution effect of government expenditure on private consumption [Kormendi, 1983, Pp. 994-1,010]. Aschauer through his consumption function for the US, offered similar evidence. His principal result was that even though deficit and tax variables are irrelevant for private consumption, they are important for their informational content as to the expected government expenditure [Aschauer, 1985, Pp. 117-127].

STRUCTURE OF DOMESTIC GOVERNMENT DEBT

To analyse the effect of domestic government debt on private consumption and saving in India, it will be useful to outline the structure and components of domestic debt in the country. There are three major aspects to note: (i) debt of the Central and State governments in India consists of not only the stock of market borrowing but also diverse kinds of government liabilities, (ii) government's market borrowing in the country is largely confined to a captive market, the constituents of which are statutorily required to invest in government securities, and (iii) a substantial portion of the total marketable debt of the government is monetised.

For the purpose of the present study, following mainly the *Report of the Committee to Review the Working of the Monetary System* 1985, the domestic debt of the Central and State governments is combined and classified into (1) Marketable debt, (2) Small savings (3) Provident funds and (4) Other liabilities [RBI, 1985, Pp. 19-40]. This excludes the item 'Loans and advances from Central Government', which is part of the State governments' debt, as it is an inter-governmental debt. In the new scheme of classification, marketable debt includes (i) Market loans and bonds of Central and State governments and (ii) Treasury bills of the Central

government. Small savings exclusively belong to the Centre's debt. Provident funds of the Central and State governments are put together. All other domestic debts of the Centre and State governments are put in the residual category, other liabilities. Components of other liabilities are (i) Other unfunded debts, (ii) Reserve funds and deposits, (iii) Special floating loans (iv) Special securities issued to Reserve Bank of India (v) Ways and means advances from Reserve Bank and (vi) Loans from banks and other institutions; items (i) through (iv) form part of Central government's debt and items (v) and (vi) form part of State governments' debt. Table 1 shows combined domestic government debt of Central and State governments according to the classification adopted in the present study. It also gives (a) the deflator (1980-81=100) for the Net National Product (NNP) at factor cost, used for deflating Government expenditure on goods and services, Taxes net of transfers, and Monetised government debt; and (b) the deflator (1980-81=100) for Gross Domestic Capital Formation (GDFC) used for deflating Non-monetised marketable government debt, and Small savings, Provident Funds and other liabilities. Finally, the Table gives estimates of population used for working out per capita estimates of the several variables.

The institutional aspect of marketable debt in the country is that the government borrows from a captive market the constituents of which are required to invest in government securities by mandatory provisions. Major constituents of this captive market are the Commercial Banks, Life Insurance Corporation of India, and various Provident Funds. A brief description of the captive market for government securities is presented in an Annexure.

Various constituents of the captive market mobilise funds from the private sector. The government, through its market borrowing, mobilises a part of such funds. Besides, the Reserve Bank of India takes the part of the Government loan which even the captive market will not absorb. There is therefore an important difference between the government debt to the RBI and government debt to the market: briefly, the first is monetised; the second is not. Therefore, in analysing the effect of government debt on private consumption it is necessary to decompose the marketable debt into its monetised and non-monetised components.

Briefly, the following may be said about the remaining components of domestic government debt. Small savings mobilised by Central government through the post office net-work in the country closely resembles direct market borrowing from private sector. It may also be noted that traditionally fiscal incentives are given to the investing public in small savings. Provident fund is a mandatory contribution by employees as a social security measure which is to be repaid by government to the employees, along with a matching contribution by government, normally at the time of their retirement. As noted earlier other liabilities in the present scheme of classification of government debts are residual items.

Our purpose is to examine the effect on private consumption and saving of the substitution of different components of government debt for taxation to finance a given level of government expenditure. First, consider monetised component of government debt. It increases the stock of money supply the magnitude of the increase depending on the value of money multiplier. When monetised debt is substituted for taxation, it is evident that personal disposable income will increase by an amount of the tax reduction. The additional disposable income gets divided between current consumption and saving, depending on the marginal propensity to consume. But, because of the monetised debt, the extent of the increase in current consumption depends on the private perception of the increase in money supply. If individuals perceive the increased money supply as an addition to private net wealth, the increased money supply would be absorbed in private saving. On the other hand, if the increase in money supply is perceived as future tax liabilities, the monetised debt would have a tax-like effect on private consumption and saving; in that case, substitution of monetised government debt for taxation would not cause any change in private consumption and saving.

In the Indian context, non-monetised debt is likely to have the same effect as taxation on private consumption and saving. This is for two

reasons. First, because individuals, by and large, do not hold directly non-monetised debt, it may not have a net wealth effect on private consumption. Second, individuals might rationally perceive future tax liabilities implicit in the current non-monetised debt for the reason that, even though it is the captive market which holds this debt, the future tax liability involved in servicing the debt finally falls on the individuals. These aspects suggest that a substitution of non-monetised government debt for taxes would not cause any change in the private consumption and saving.

Small savings and provident funds are components of government debt held directly by private sector. The effect of substitution of these components for taxation on current private consumption and saving depends on private perception of these forms of debt as net wealth or future tax liabilities. The same is true of other government liabilities in the residual category.

METHODOLOGY

Following some of the existing empirical studies mentioned earlier, the present study attempts to examine the effect of government debt on private consumption by testing the coefficient equivalence of debt and tax variables in a private consumption function. Free as well as restricted consumption function estimates are attempted and an F-test is used to test the null hypothesis that the coefficients of the debt and tax variables are not significantly different. If the computed F-statistic exceeds the appropriate F-distribution table value, the coefficient equivalence is rejected and if the computed F-statistic is less than the table value, the coefficient equivalence is not rejected [Rao and Miller, 1972].

Specifically, the study estimates the following consumption function:

$$C = f(Y, G, T, D_i)$$

Where C = per capita real private consumption
Y = per capita real net national product
G = per capita real government expenditure on goods and services
T = per capita real taxes net of transfer payments
D_i = per capita real government domestic debt (subscript i stands for the components of the debt)

Please note:
(i) Real private consumption is obtained from private final consumption expenditures in the domestic market (1980-81=100). Consumption expenditures on non-durables could not be separated from the consumption expenditure figures as the data are not available separately in this regard. Data source is *National Accounts Statistics* (NAS), Central Statistical Organization (CSO), Government of India.
(ii) Net national product at factor cost (1980-81=100) is obtained from NAS, CSO, Government of India.
(iii) Government expenditure on goods and services is deflated by net national product (at factor cost) implicit deflators (1980-81=100). Data source is NAS, CSO, Government of India.
(iv) Taxes net of transfers is derived as follows. Direct and indirect taxes are taken together and the two items (i) subsidies and (ii) transfer payments are deducted. The series is deflated by implicit price deflator (1980-81=100) derived from net national product at factor cost. Data source is NAS, CSO, Government of India.
(v) Monetised government debt is Reserve Bank of India's (RBI) net credit to Government less the ways and means advances sanctioned to State Governments by RBI. The series is deflated by implicit price deflator (1980-81=100) derived from net national product (at factor cost). Data source is *Report on Currency and Finance*, RBI.
(vi) Non-monetised marketable government debt is derived as the difference between total marketable debt (see Table 1) and monetised marketable government debt. The series is deflated by implicit price deflator (1980-81=100) derived from Gross Domestic Capital Formation (GDCF). Data source is *Report on Currency and Finance*, RBI.
(vii) Small savings, Provident Funds and other liabilities are computed as in Table 1. The time series on these variables are deflated by implicit price deflators (1980-81=100) derived from GDCF. Source of data is *Report on Currency and Finance*, RBI.
(viii) All debt variables are in flow terms.

The concept of income used in the consumption function is the net national product rather than disposable income. This is because of the following reason. The consumption function adopted for the present study should necessarily include tax variable in order to test for the coefficient equivalence of debt and tax variables so as to capture the effect of a substitution of government debt variable for taxation. Tax is conceptually a decrease in disposable income and, in a consumption function, it provides the same information as disposable income except for the algebraic sign of its coefficient. In this way the effect of disposable income could be subsumed in the tax variable even without explicitly including a disposable income variable in the estimated consumption function. Government expenditure is included in the consumption function in order to judge the effect of substitution of taxation by debt while government expenditure is held constant.

Altogether, we have tried 15 different equations. All equations are linear in the first differences of all the variables included therein and are corrected for first order autocorrelation. In all the equations, per capita real private consumption is the dependent variable. Equation (1) has three independent variables, namely, Net National Product at Factor Cost, Net Government Expenditure on Goods and Services, and Taxes net of subsidies and transfer payments. More specifically, equation (1) does not include any component or total of government debt as an independent variable. These are incorporated additionally, one at a time, in equations (2) to (7) as follows: (2) monetised debt, (3) non-monetised debt, (4) small savings, (5) provident funds, (6) other liabilities, and (7) total domestic debt. Each equations from (2) to (7) have two variations (a) and (b). Equations (a) are free, that is, without restrictions while equations (b) are restricted. As mentioned above, equation (2) includes monetised debt as an independent variable.

RESULTS

Table 2 gives the estimates of coefficients in all the 15 equations. It also gives the test-statistics, namely, $\bar{R}^2$ DWS and F. Statistically speaking, there are two important results. One, judged by the $\bar{R}^2$ test, equation (1) not involving any component or total of public debt seems to explain behaviour of private consumption fairly well. What is more, inclusion of any component or total of public debt does not improve this explanation. Second, in all cases, except one, the F values are greater than the table values, thus rejecting the null hypothesis that the coefficients of the debt and tax variables are not significantly different. In other words, there is evidence that the coefficients of the debt and tax variables are different so that we should reject the hypothesis of coefficient equivalence. However, we should note that the rejection of coefficient equivalence does not automatically ensure net wealth effect of the components of domestic debt because in all these cases, the estimates of the restricted coefficients are not statistically significant. Evidently, individuals do not perceive these components of domestic government debt - monetised and non-monetised debt, small saving, other liabilities, and total government debt - either as an addition to private net wealth or as future tax liabilities and, therefore, these forms of debt do not have any effect on current private consumption and saving.

The only exception is the Provident Fund. In Equation (5b), F is less than (but only marginally so) its table value at 95 per cent confidence level so that the hypothesis of coefficient equivalence is not rejected. The coefficient of Provident Fund variable is also statistically significant and has the negative sign. This suggests that individuals perceive provident fund as a tax and therefore it has a tax like effect of reducing current consumption and saving.

In sum, our main conclusions, in the Indian context are: First, when debt is substituted for taxation, leaving government expenditure unchanged, there is no change in the current private consumption and saving. In other words, this substitution does not enable the government to mobilise any additional real resources from the private sector. Second, a component wise analysis of domestic government debt shows that (a) monetised marketable debt, non-monetised marketable debt, small savings, and other liabilities do not mobilise additional real resources either from current private consumption or saving; (b) only provident fund draws additional real resources by inducing reduction in the private consumption and saving.

TABLE 1. TOTAL DOMESTIC PUBLIC DEBT OF CENTRAL AND STATE GOVERNMENTS IN INDIA

Years	Private Final Consumption Expenditure in Domestic Market	Net National Product at Factor Cost	Government's Net Purchase of Commodities and Services	Taxes Net of Subsidies and Transfers	Total Domestic Public Debt of the Central and State Governments	Marketable Debt of Central and State Governments	Small Savings	Provident Funds of Central and State Governments	Other Liabilities of Central and State Governments	RBI's Net Credit to Government less ways and means Advances to States	NNP (at factor cost) Deflator 1980-81 = 100	GDCF Deflator 1980-81 = 100	Population
	(1980-81 prices)	(1980-81 prices)	(1980-81 prices)	(Current Prices)	(As on end March)	(As on end March)	(As on end March)	(As on end March)	(As on end March)	(As on end March)			
	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)	(Rs crore)			(in crore)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1959-60					6,215	4,152	862	365	836	1,736			
1960-61	52,714	58,602	1,365	1,195	6,843	4,193	974	424	1,252	1,857	0.2416	0.2060	43.4
1961-62	53,631	60,168	1,432	1,351	7,407	4,458	1,061	478	1,410	2,018	0.2469	0.2153	44.4
1962-63	54,374	61,165	1,935	1,641	8,151	4,820	1,135	535	1,661	2,241	0.2590	0.2211	45.4
1963-64	56,695	64,216	2,777	2,066	8,943	5,173	1,262	605	1,903	2,426	0.2825	0.2354	46.4
1964-65	60,313	68,942	2,655	2,313	9,605	5,468	1,390	675	2,072	2,517	0.3082	0.2459	47.4
1965-66	60,206	65,734	2,963	2,585	10,517	5,898	1,541	759	2,319	2,833	0.3363	0.2599	48.5
1966-67	61,333	66,089	2,890	2,692	12,022	6,454	1,659	840	3,069	3,012	0.3793	0.3063	49.5
1967-68	64,780	71,519	2,838	2,906	12,552	6,793	1,782	956	3,021	3,159	0.4138	0.3287	50.6
1968-69	66,699	73,285	2,946	3,188	13,439	7,220	1,896	1,053	3,270	3,263	0.4252	0.3343	51.8
1969-70	69,028	78,177	3,225	3,582	14,214	7,507	2,024	1,207	3,476	3,335	0.4382	0.3575	52.9
1970-71	71,522	82,211	3,496	4,015	15,763	8,191	2,209	1,378	3,985	3,468	0.4423	0.3792	54.1
1971-72	73,206	82,675	4,014	4,550	17,429	8,937	2,432	1,567	4,493	4,068	0.4667	0.4013	55.4
1972-73	73,647	81,991	3,811	4,986	19,397	10,936	2,802	1,751	3,908	5,357	0.5169	0.4366	56.7
1973-74	75,654	86,010	3,420	5,843	21,402	11,999	3,276	1,973	4,154	6,050	0.6074	0.4997	58.0
1974-75	75,747	87,116	2,901	7,131	23,812	13,475	3,554	2,285	4,498	6,496	0.7024	0.6272	59.3
1975-76	80,063	95,433	3,472	9,002	26,693	15,044	3,946	2,646	5,057	6,628	0.6762	0.6728	60.7
1976-77	82,165	96,253	3,816	9,745	29,390	15,729	4,359	2,984	6,318	7,012	0.7211	0.6917	62.0
1977-78	88,706	103,670	3,793	10,019	36,146	20,447	4,904	3,377	7,418	7,013	0.7685	0.7132	63.4
1978-79	94,041	109,169	4,037	11,572	39,358	21,275	5,751	3,906	8,426	8,882	0.7788	0.7639	64.9
1979-80	91,379	102,937	4,274	13,207	46,121	26,098	6,856	4,416	8,751	11,634	0.8968	0.8900	66.4
1980-81	99,083	110,484	4,283	14,304	55,385	31,773	7,977	4,947	10,688	15,963	1.0000	1.0000	67.9
1981-82	103,574	117,027	4,625	17,617	64,507	33,389	9,375	5,851	15,892	18,354	1.0977	1.1190	69.4
1982-83	106,604	119,619	5,058	19,547	80,222	44,841	11,098	7,050	17,233	21,885	1.1815	1.2131	70.9
1983-84	114,533	129,344	5,286	21,559	91,071	47,862	13,506	8,174	21,529	25,958	1.2806	1.3340	72.4
1984-85	118,306	133,972	5,602	22,841	110,340	56,382	17,157	9,519	27,282	28,354	1.3755	1.4519	73.9
1985-86	122,488	140,647	6,604	27,983	133,834	68,823	21,449	10,934	32,628	38,634	1.4676	1.5847	75.5
1986-87	129,121	145,675	7,740	31,736	162,747	69,328	24,725	12,859	55,835	45,612	1.5721	1.7028	77.0

Note: Debt variables including RBI's Credit to Government are in current prices.

TABLE 2. PRIVATE CONSUMPTION FUNCTION ESTIMATES (1960-61 TO 1986-87)

Sr.No. of Equations	Number of Iterations Taken for Convergence	Intercept	Net National Product at Factor Cost	Net Government Expenditure on Goods and services	Taxes net of subsidies and Transfer payments	Monetised marketable Debt	Non monetised Marketable Debt	Small Savings	Provident Funds	Other Liabilities	Total Domestic Debt	$\bar{R}^2$	DWS	F-Statistic	SE of Regression	F-Value computed
(1)	3	6.4063	0.6193	1.4339	-0.8520							0.8488	1.9091	34.685	14.2233	
		(1.8021)	(11.5710)	(2.5079)	(-3.2233)											
(2a)	3	6.4228	0.6197	1.4451	-0.8565	-0.0090						0.8409	1.9136	26.3791	14.5884	
		(1.7467)	(11.3385)	(2.4084)	(-3.0766)	(-0.1118)										
(2b)	3	6.6421	0.5602	0.3095	-0.0353	-0.0353						0.7721	1.8551	21.3261	17.4632	9.66
		(1.3509)	(10.0005)	(0.5151)	(-0.3839)	(-0.3839)										
(3a)	2	6.4039	0.6219	1.4231	-0.8998		-0.0975					0.8526	1.9609	28.7654	14.0437	
		(1.7431)	(12.1755)	(2.4959)	(-3.3877)		(-1.2269)									
(3b)	3	6.4987	0.5627	0.3206	-0.1218		-0.1218					0.7895	1.9133	23.4997	16.7840	9.57
		(1.3995)	(10.3913)	(0.5776)	(-1.2986)		(-1.2986)									
(4a)	3	5.9293	0.6029	1.1456	-0.8017			0.4166				0.8475	1.9060	27.6781	14.2842	
		(1.6935)	(10.6138)	(1.7349)	(-2.9503)			(0.9184								
(4b)	2	7.3424	0.6150	1.2720	-0.5539			-0.5539				0.8097	1.8838	26.5310	15.9569	5.96
		(1.5757)	(10.5280)	(1.7388)	(-2.0436)			(-2.0436)								
(5a)	3	5.2139	0.5915	0.9184	-0.7913				1.5224			0.8548	1.9566	29.2507	13.9403	
		(1.3996)	(10.7644)	(1.3583)	(-3.0533)				(1.3588)							
(5b)	3	6.9623	0.6251	1.5239	-0.7547				-0.7547			0.8308	1.8803	30.4603	15.0468	4.30*
		(1.8355)	(10.7757)	(2.3141)	(-2.6698)				(-2.6698)							
(6a)	3	5.8742	0.5888	0.7383	-0.6921					0.1912		0.8699	2.0356	33.1027	13.1927	
		(1.7249)	(11.4069)	(1.1565)	(-2.7085)					(2.0470)						
(6b)	2	5.9186	0.5307	-0.3653	0.1643					0.1648		0.7919	1.9488	23.8377	16.6854	12.99
		(1.2653)	(9.2942)	(-0.5054)	(1.4314)					(1.4314)						
(7a)	3	7.0118	0.6126	1.5476	-0.9103						-0.0672	0.8383	1.9216	25.8925	14.7075	
		(1.848)	(10.7517)	(2.5208)	(-3.1436)						(-0.8435)					
(7b)	3	6.8895	0.5544	0.3501	-0.0486						-0.0486	0.7688	1.8610	20.9475	17.5901	9.61
		(1.4126)	(9.2390)	(0.5866)	(-0.5348)						(-0.5348)					

Notes: 1. All variables are in per capita real terms. 2. All estimates are linear estimates. 3. All variables are taken in first difference. 4. Equations are corrected for first-order autocorrelation using Cochrane-Orcutt method. 5. Within parenthesis are t-values. 6. Table values of F-statistic are 8.18 and 4.38 respectively at 99 per cent and 95 per cent level of confidence.

* Coefficient Equivalence not rejected. In all other cases Coefficient Equivalence rejected.

REFERENCES

Aschauer, David Alan, 1985; 'Fiscal Policy and Aggregate Demand,' *The American Economic Review*, March, Vol. 75, No. 1.

Bailey, Martin J, 1962, 1971; *National Income and the Price Level*, McGraw-Hill Inc, Tokyo.

Barro, Robert J, 1974; 'Are Government Bonds Net Wealth?' *Journal of Political Economy*, Vol. 82 November - December.

Buchanan, James M., 1958; *Public Principles of Public Debt*, Richard D. Irwin, Inc, Homwood, Illinois.

Buiter, Willem H. and James Tobin, 1979; 'Debt neutrality: A Brief Review of Doctrine and Evidence' in: Von Furstenberg, GM (ed.): *Social Security Versus Private Saving*, Ballinger Publishing Company. Cambridge M.A.

Carmichael, J and K. Hawtrey, 1981; 'Social Security, Government Finance and Savings', *Economic Record*, Vol. 57.

Carmichael, J. 1982; 'The National Debt Controversy: A Comment', *Kyklos*, Vol. 35.

Fieldstein, Martin 1982; 'Government Deficits and Aggregate Demand', *Journal of Monetary Economics*, Vol. 9.

Holcombe, Randall G., John D Jackson, and Asghar Zardkoohi, 1981; 'The National Debt Controversy', *Kyklos*, Vol. 34.

Holcombe, Randall G., John D. Jackson and Asghar Zardkoohi, 1982; 'The National Debt Controversy: A Reply', *Kyklos*, Vol. 35.

Kochin, Levis A, 1974; 'Are Future Taxes Anticipated by Consumers', *Journal of Money, Credit and Banking*, Vol. 6, August.

Kormendi, Roger C, 1983; 'Government Debt, Government Spending and Private Sector Behaviour', *American Economic Review*, Vol. 73, No. 5, December.

Koskela, Erkki and Matti Viren, 1983; 'National Debt Neutrality: Some International Evidence', *Kykos*, Vol. 36.

Pigou A. C., 1928; *A Study in Public Finance*, MacMillan and Co. Ltd. London.

Rao, Potluri and Roger L Miller, 1972; *Applied Econometrics*, Prentice - Hall of India Private Limited, New Delhi.

Report of the Committee to Review the Working of the Monetary System, RBI, 1985;

Seater, John J., 1982; 'Are Future Taxes Discounted?' *Journal of Money Credit and Banking*, Vol. 14, No. 3, August.

Shoup, Carl S. 1962, 'Debt Financing and Future Generations', *Economic Journal*, December, 1962.

Tanner, J. Ernest, 1979; 'An Empirical Investigation of Tax Discounting: A Comment', *Journal of Money, Credit and Banking*, Vol. 11.

Yawitz, Jess B. and Laurence H. Meyer, 1976; 'An Empirical Investigation of the Extent of Tax Discounting'. *Journal of Money, Credit and Banking*, Vol. 8, No. 1, May.

ANNEXURE

Captive Market for Government Securities in India

In India, Government borrows from a captive market, the major, constituents of which are the Reserve Bank of India, Commercial Banks, Life Insurance Corporation of India and various provident fund schemes. Apart from these major investors, investment in government securities is also made by the following institutions:

(i) Industrial Finance and State Financial Corporations;
(ii) Industrial Development Bank of India;
(iii) Unit Trust of India;
(iv) Agricultural Refinance and Development Corporation of India;
(v) Industrial Credit and Investment Corporation of India;
(vi) Joint Stock Companies;
(vii) Local Authorities;
(viii) Trusts; and
(ix) Post Trusts.

These institutions hold a negligible percentage of total government securities outstanding. A State government who has surplus funds may invest in Central government securities or other State governments' securities. Such investment by State governments are also very negligible. Table A. 1 shows the ownership pattern of government securities in the country.

Reserve Bank of India (RBI), undertakes market borrowing on behalf of government. RBI makes available to the investors a spectrum of government securities of various maturities and absorbs the unabsorbed part of the securities issued to the market. It needs mention that RBI absorbs only Central government securities in its issue department (by virtue of section 33 (3) of the Reserve Bank of India Act of 1934).

Investment of commercial banks in government securities is regulated by the requirement of Statutory Liquidity Ratio (SLR) laid down in section 24 of the Banking Regulation Act of 1949. SLR is a ratio of statutory liquid assets of a bank to its aggregate demand and time liabilities. Statutory liquid assets consist of cash on hand, gold, unencumbered approved securities, excess cash reserves with RBI over the statutory minimum and balances maintained with the State Bank of India or any other notified bank. Approved securities are those which are issued by the Central Government, authorized local bodies and securities guaranteed by Central Government. SLR applicable to scheduled Commercial banks was revised over the years in order to support the government borrowing. SLR revisions effected over the years are presented in Table A. 2.

Life Insurance Corporation of India was established in 1956 and according to the investment policy adopted by the Corporation in August 1958 it is mandatory to invest 25 percent of controlled funds in Central government securities and another amount of not less than 25 percent of the controlled funds in Central government securities or state government securities or government guaranteed securities.

Provident fund schemes were to invest the whole accruals in Central government securities until September 1967. Since then substantial relaxation was effected in provident fund investment in Central government securities with a view to diversify its investment portfolio. The investment policy changes in this regard are outlined in Table A. 3.

TABLE A. 1. OWNERSHIP OF CENTRAL AND STATE GOVERNMENT SECURITIES
(1961 TO 1986)

(Rs Crore)

Category of Holders	1961	1966	1971	1976	1979	1980	1981	1982	1983	1984	1985	1986
I State Governments	264	348	262	232	233	243	244	216	225	253	234	244
	(9.5)	(8.8)	(4.9)	(2.5)	(1.7)	(1.5)	(1.3)	(1.0)	(0.9)	(0.8)	(0.7)	(0.6)
II RBI own Account	707	1,218	1,486	2,257	2,213	2,629	3,858	5,126	6,334	7,791	9,819	10,423
	(25.4)	(30.8)	(28.0)	(24.5)	(16.2)	(16.7)	(20.6)	(23.3)	(24.2)	(25.3)	(27.6)	(25.2)
III Commercial Banks	563	804	1,338	3,192	6,033	7,320	8,523	9,688	11,021	12,645	15,366	19,918
	(20.2)	(20.3)	(25.2)	(34.7)	(44.3)	(46.5)	(45.6)	(44.1)	(42.2)	(41.1)	(43.1)	(48.1)
(a) Scheduled Commercial Bank	552	799	1,332	3,187	6,032	7,318	8,522	9,686	11,019	12,642	15,362	19,914
	(19.8)	(20.2)	(25.1)	(34.6)	(44.3)	(46.5)	(45.6)	(44.1)	(42.0)	(41.1)	(43.1)	(48.1)
(b) Non-Scheduled Commercial Banks	11	5	6	4	1	2	1	2	2	3	4	4
	(0.4)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
IV LIC of India	357	525	748	1,309	1,820	2,019	2,250	2,478	2,911	3,373	3,794	4,396
	(12.8)	(13.3)	(14.1)	(14.2)	(13.4)	(12.8)	(12.0)	(11.3)	(11.1)	(11.0)	(10.6)	(10.6)
V Employees' Provident Funds	81	218	412	878	774	862	856	860	890	962	977	1,036
	(2.9)	(5.5)	(7.8)	(9.5)	(5.7)	(5.5)	(4.6)	(3.9)	(3.4)	(3.1)	(2.7)	(2.5)
VI Provident Fund of Exempted Establishments	114	269	508	919	1,484	1,719	1,918	2,217	2,493	2,728	2,998	3,317
	(4.1)	(6.8)	(9.6)	(10.0)	(10.9)	(10.9)	(10.3)	(10.1)	(9.5)	(8.9)	(8.4)	(8.0)
VII Coal Mines Provident Fund	22	44	44	48	131	168	200	236	279	302	294	311
	(0.8)	(1.1)	(0.8)	(0.5)	(1.0)	(1.1)	(1.1)	(1.1)	(1.1)	(1.0)	(0.8)	(0.8)
VIII Assam Tea Plantations Provident Fund	(Convered under VI)		14	12	11	11	11	12	12	12	12	13
			(0.3)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)
IX Others	676	527	494	355	928	769	823	1,130	2,061	2,865	2,460	2,295
	(24.3)	(13.3)	(9.3)	(3.9)	(6.8)	(4.9)	(4.4)	(5.1)	(7.9)	(9.3)	(6.9)	(5.5)
Total	2,784	3,953	5,306	9,201	13,628	15,739	18,684	21,962	26,139	30,756	35,628	41,413

Note: 1. Figures relate to stock of securities as at the end March of each year.
2. Figures in parentheses are percentages of total.
3. Figures given are face values of interest bearing rupee securities excluding Treasury bills, expired loans, special securities, Special Bearer Bonds, Prize Bonds and National Rural Development Bonds.
4. Total for years 1983 to 1986 excludes the government guaranteed securities held by the Provident Fund of Exempted Establishments.
Source: Reserve Bank of India, *Report on Currency and Finance* (relevant Issues).

TABLE A. 2. STATUTORY LIQUIDITY RATIO APPLICABLE TO SCHEDULED COMMERCIAL BANKS
(1949 TO 1988)

With effect from	Statutory Liquidity Ratio (in Percent)*
1949	20.0
1964 September	25.0
1970 February	26.0
1970 April	27.0
1970 August	28.0
1972 August	29.0
1972 November	30.0
1973 December	32.0
1974 June/July	33.0
1978 December	34.0
1981 September	34.5
1981 October	35.0
1984 July	35.5
1984 September	36.0
1985 July	37.0
1987 April	37.5
1988 January	38.0

* As percent of total time and demand liabilities
Source: Reserve Bank of India, *Reserve Bank of India Bulletin* (relevant issues).

TABLE A. 3. STATUTORY INVESTMENT REQUIREMENTS FOR PROVIDENT FUNDS
(As percentage of accruals)

With effect from	Central Government Securities	State Government Securities	Others
Before			
1967 September	100		
1967 September	80[1]		
1968 August	65		
1969 April	50		
1971 April	45		
1972 October	Nil		
1973 March	45		
1973 October	Nil		
1974 March	45		
1975 July	25	25	30 percent in securities or bonds guaranteed by the Central Government or any State Government, 7-Year National Savings Certificates (Second and Third issues) or Post Office Time Deposits. 20 percent in the Special Deposit Scheme introduced in June 30, 1975.
1976-77	25	25[2]	30 percent in 7-Year National Savings Certificates (Second and Third issues) or Post Office Time Deposits. 20 percent in Special Deposit Scheme.
1979 January	40[3]		-do-
1981 January	30[3]		-do-

Notes: 1. During 1967 September to 1975 July the remaining collections may be invested in State government securities, Central & State government guaranteed securities, Post Office Time Deposits and Small Savings.
2. Inclusive of investments in securities or bonds guaranteed by the Central and State Governments.
3. Refers to the minimum prescribed in Central and State Government Securities and Government Guaranteed Securities.
Source: Reserve Bank of India, *Reserve Bank of India Bulletin* (relevant issues).

GROWTH OF MANUFACTURING INDUSTRIES IN INDIA 1975-76 TO 1985-86: A DISAGGREGATED STUDY

Sahana Ghosh

The fact that the mid-seventies was a watershed for Indian industries and that the growth rates, both in the aggregate and for many individual industries, picked up considerably is beyond doubt. However, on a close scrutiny of the data available, it becomes clear that the extent of the revival has been over-stated by some authors. The present study shows that, although there was acceleration in the aggregate manufacturing sector since 1975, and more so since 1981, the actual growth rates were lower than some earlier estimates. Moreover, the picture is very different at the disaggregate level and does not show revival uniformly across the sector.

Introduction

The well-documented phenomenon of industrial deceleration in India since the mid-sixties started showing signs of reversal from the mid-seventies.[1] The rate of growth of value-added in the manufacturing sector rose from 3.6 per cent per annum during the period 1964-65 to 1974-75 to 5.87 per cent per annum during the next eleven years, i.e., 1975-76 to 1985-86. In particular, Indian industry is believed to have moved up to a higher growth path in the 1980s. Nagaraj has gone as far as to state that the growth of manufacturing industries during the period 1980-81 to 1986-87 is "comparable to, if not better than, the growth rate achieved during 1959-60 to 1965-66" [Nagaraj, 1989, p. 1,484]. The fact that the mid-seventies was a watershed for Indian industries and that the growth rates, both in the aggregate and for many individual industries, picked up considerably is beyond doubt. However, on a close scrutiny of the data available, it becomes clear that the extent of the revival has been overstated by some authors.

It is well known that the value-added data as provided by the *Annual Survey of Industries* (ASI) is more reliable than the *Index of Industrial Production* (IIP) to analyse the growth performance of Indian industries[2]. The IIP is known to give an insufficient representation of the manufacturing industries because of its limited coverage of firms and its dependence on voluntary returns. Also, the change in the base year from 1970-71 to 1980-81 for the IIP construction has been subject to some criticism. In the new IIP, 96 new items have been included and 95 old ones dropped, supposedly to take into account the changing industrial structure. Chandrasekhar writes, "the higher growth rate that the new index throws up could be because of arbitrary changes in the items covered leading to increased value-added per unit of physical output in the more rapidly growing industries" [Chandrasekhar, 1988, p. 2,359).

Nagaraj, however, claims that the new IIP is still an underestimation although less so than earlier. Hence, the IIP growth rates, according to him, are quite reliable. This view is endorsed by Kelkar and Kumar [1990]. To prove his contention, Nagaraj points out that the IIP growth rate for the period 1980-81 to 1986-87 is even less than the growth in value-added for the same period. Therefore, it is asserted that the new IIP could not be an over-estimation. However, we should note that the new *National Accounts Statistics* (NAS) series for value added in registered manufacturing, on which Nagaraj depends for his comparison, is itself based on the IIP for last two years, namely, 1985-86 and 1986-87, because the ASI was not yet available. Therefore, the comparison of IIP with NAS, which itself incorporates IIP for the last two years, is not valid. Moreover, it seems that the high growth rates in the eighties as indicated by the NAS data, are partly the result of such statistical approximations. For instance, the value-added of output at current prices in 1985-86 as estimated by NAS was Rs 1,25,976 crore whereas the actual value of output as quoted in the ASI for the same year was Rs 1,20,155 crore. Obviously, the excess of Rs 5,821 crore is a result of using the IIP to construct the output series and also the NAS method of correcting for

Sahana Ghosh is a Research Scholar, Delhi School of Economics, New Delhi.

This paper is a part of the Macroeconomic and Industrial Policy Research programme at the National Institute of Public Finance and Policy, New Delhi and sponsored by the Ford Foundation.

The author thanks the participants of an internal seminar at the NIPFP and especially Dr. B.N. Golder for useful comments and suggestions. The responsibility of the remaining errors is, however, solely hers.

non-response.

In the following, we have computed growth rates of value added in manufacturing industries using directly the ASI data deflated by suitable price indices. This yields an exponential growth rate of 6.14 per cent per annum for the period 1980-81 to 1985-86. This is less than the rate of 7.6 per cent per annum achieved during 1959-60 to 1965-66 [as computed by Ahluwalia, 1985], which contradicts Nagaraj's assertion. Incidentally, the growth rate was only 5.87 per cent per annum during 1975-76 to 1980-81.

The aggregate growth rates give an overall picture of industrial performance. For a detailed analysis, disaggregation is necessary. Almost all studies of industrial growth since mid-seventies as also those which examined the deceleration period, used the data at the two digit level of *National Industrial Classification* (NIC) [Ahluwalia, 1987; Alagh, 1988; Chandrasekhar, 1988; Nagaraj, 1989; Kelkar and Kumar 1990]. In view of the diversified nature of the industrial sector and the structural changes that have occurred in recent years, a study at a more disaggregated level is necessary. This paper uses growth rates of major three-digit industry groups of the NIC to study the nature of growth in the manufacturing sector during 1975-76 to 1985-86.

Choice of Time Period and Data Base

The reference period chosen for this study is 1975-76 to 1985-86 in view of the fact that, after the prolonged stagnation since the mid-sixties, symptoms of revival in the Indian industrial sector were first noticed in 1975-76.[3] Not only did the aggregate manufacturing sector register a higher growth rate since 1975-76, but most of the two-digit industry groups also grew faster than in the previous decade (see Appendix Table A. 1).

To see if the liberalisation measures, initiated since the mid-seventies and intensified in the late seventies and early eighties, were at least partly responsible for this revival, the eleven-year period is divided into two sub-periods, 1975-76 to 1980-81 and 1980-81 to 1985-86, hoping that the positive effects, if any, of liberalisation begun in the first sub-period would appear in the second sub-period. It is true that such effects would show up only after a lag and hence that the post-1985 period would be more relevant. But, ASI data are at present available only upto 1985-86 and the study has to be limited to that.

The main purpose of this paper is to describe the pattern of growth and see whether the pick-up which started in 1975-76 was maintained in the eighties. It is also believed that the structural changes which had in fact started in the deceleration period became more pronounced in the eighties. A look at the first half of this decade therefore would be instructive.

From the three-digit NIC, 49 industry groups each with gross value-added of over Rs 100 crore in 1985-86 are chosen. Since we are here interested mainly in the manufacturing industries, electricity, gas and steam, water works and supply, storage and warehousing and repair services are not included. The 49 industries chosen accounted for 84.80 per cent of value-added in the manufacturing sector in 1985-86. The data are taken from the ASI.[4] The ASI covers all factories registered under the Factories Act, 1948, that is, factories employing 10 or more workers and using power or those employing 20 or more workers but not using power.

Gross value-added in an industry is the value of output minus the value of input. Value of input, as obtained from ASI, includes excise and transport costs but value of output does not. Admittedly, this may give rise to some bias in the measurement of growth in value-added in the industry. Moreover, the Wholesale Price Index (WPI), which is used for deflation, includes excise but output figures do not, which is yet another source of bias in estimate of growth.

The gross value-added of the selected manufacturing industries is deflated by the respective price indices.[5] As the product classification of the WPI series does not match exactly with the industrial classification of the ASI, deflation of value-added is done with the best available price indices.

Methodology

To compute the growth rates of real value-added during the entire period 1975-76 to 1985-86,

exponential trend lines are fitted by Ordinary Least Square (OLS) technique. We estimate the following regression equation:

$$\ln (Y_{it}) = a_i + b_i t + u_{it}$$

where Y_{it} is the real value-added in the i^{th} industry at time t and u_{it} is the error term. Estimated b_i gives the growth rate of the i^{th} industry.

For the growth rates in the sub-periods, the single kink model is used, following Poirier [1976] as the conventional method of estimating the semi-log equation with slope and intercept dummies is subject to errors due to fluctuations.[6] For the Indian manufacturing sector, Goldar and Seth [1989] found that the dummy method might lead to higher (or lower) growth rates for both sub-periods than the entire period. In the kink model, the growth rates of the entire period lie in between those of the sub-periods. This is so because, in this method, the entire series is taken instead of fitting piece-wise regression equations and the effects of fluctuations are thereby minimised.

To obtain estimates of growth rates for the periods 1975-76 to 1980-81 and 1980-81 to 1985-86, we estimate the equation:

$$\ln (Y_{it}) = a_{i1}D_1 + a_{i2}D_2 + (b_{i1}D_1 + b_{i2}D_2)\, t + u_{it} \quad (1)$$

where $D_1 = 1$ for 1975-76 to 1980-81,
$= 0$ otherwise
$D_2 = 0$ for 1975-76 to 1980-81,
$= 1$ otherwise

The trend line is kinked at 1980-81 (i.e., the 6th year) if $b_1 \neq b_2$. Thus, we impose the linear restriction that the trend lines depicting the two sub-periods intersect at 1980-81. Therefore, we have

$$a_{i1} + 6b_{i1} = a_{i2} + 6b_{i2} \quad (2)$$

Substituting for a_{i2} in equation (1), we get:

$$\ln (Y_{it}) = a_{i1} + b_{i1} (D_1 t + 6D_2) + b_{i2} (D_2 t - 6D_2) + u_{it} \quad (3)$$

The OLS estimates of b_{i1} and b_{i2} for equation (3) give the exponential growth rates, of the i^{th} industry, for the two sub-periods.

The sub-period growth rates for the 49 manufacturing industries are also calculated by the dummy method. Although the two sets of growth rates are similar in most industries, the anomaly that Golder and Seth had commented upon is evident in some cases. In industries where the value-added fluctuated widely, the sub-period growth rates by the dummy method do not average out to the growth of the entire period. Such industries are oil and vanaspati, petroleum and coal products, fertilisers and pesticides, turpentine and synthetic fibres, fabricated metal products and heavy industrial machinery. The kink method is, therefore, preferred for our purpose.

Pattern of Growth

The growth rates of the 49 manufacturing industries during 1975-76 to 1985-86 and those in the sub-periods (calculated by the kink method and the dummy method) are shown in Table 1. Considering the entire period, 28 industries grew faster than average and a number of them at more than 10 per cent per annum. These included grain mill products, bidi, spinning and weaving of synthetic textiles, cement, radio and television transmitting and receiving sets, electronic computers and control instruments, and two-wheelers. On the other hand, of the 21 industries which had less than average growth rates, many had very low or even negative growth rates. These results clearly bring out the wide divergence among industries in regard to their growth performance.

It may be noted that the leading industries were the typical sunrise industries while the sunset industries lagged behind. The phenomenon of growth being mostly concentrated in the new industries was, however, not sudden. Reorganisation of capital away from the traditional industries started in the stagnation period itself. Mundle [1981] noted that a large number of relatively new industries whose weights were then low grew fast during 1966-73. These were concentrated mostly in the chemical, machine building and electrical goods sectors and included electrical appliances, communication equipment,

motor cycles, etc., classified as consumer goods. (See Appendix Table A. 2 for a disaggregated picture of IIP growth rates during 1966-73). The transformation of the industrial structure took a more obvious form since 1975-76 and particularly in the eighties. The weights of the new industries increased and their fast growth contributed to the increase in the overall growth rate.

TABLE 1. GROWTH RATES OF GROSS VALUE ADDED OF SELECTED MANUFACTURING INDUSTRIES AT 1970-71 PRICES

(per cent)

Code	Industries	Kink method			Dummy method	
		1975/76 -85/86	1975/76 -80/81	1980/81 -85/86	1975/76 -80/81	1980/81 -85/86
201	Dairy products	4.33	6.06	2.59*	6.99	4.51
204	Grain mill products	13.69	17.07	10.26*	18.94	14.29
206	Refining of sugar	10.00	5.30	14.71	8.85	17.20
210&211	Edible oil & vanaspati	3.24	4.01	2.59*	6.19	7.21
212	Tea processing	2.49	-5.38	10.36	-0.37	12.27
226	Bidi	10.87	19.30	2.44*	20.87	5.86
227	Cigarettes, etc.	-2.85	-15.55	9.91	-14.42	12.24
231	Cotton textiles	1.38	5.87	-3.11*	8.32	-0.85
241	Woollen textiles	7.74	3.59	11.89	3.26	11.20
247	Synthetic textiles	12.83	15.66	10.74*	13.24	10.23
251	Jute textiles	-3.57	5.15	-12.29*	15.31	-14.00
280	Pulp & paper	1.09	1.12	1.06*	2.55	4.06
284&285	Printing & Publishing	5.71	7.46	3.97*	6.18	1.27
300	Tyre & tube industries	8.44	2.60	14.27	4.18	17.59
303	Plastic materials n.e.c.	11.94	8.34	15.60	10.60	20.33
304	Petroleum refineries	8.19	-3.51	19.89	-0.88	25.41
305&306&307	Petroleum & coal products n.e.c.	-5.86	4.71	-16.42*	9.64	-0.12
310	Basic industrial chemicals & gases	5.70	6.97	4.42*	6.79	4.03
311	Fertilisers & pesticides	11.66	13.71	9.60*	14.52	12.12
312	Paints, varnishes & lacquers	2.87	8.37	-2.64*	11.25	1.95
313	Drugs & medicines	6.76	6.29	7.24	6.08	6.80
314	Perfumes, cosmetics, etc.	3.42	5.83	1.01*	5.83	2.58
316	Turpentine, synth. resin, synth. fibres, etc.	6.05	4.37	7.74	8.94	17.33
319	Other chemicals	7.03	6.17	7.86	6.95	9.53
320	Structural clay products	4.68	5.11	4.25*	6.45	7.07
321	Glass & glass products	5.75	2.44	9.47	5.32	11.77
324	Cement, lime, plaster	11.41	1.34	21.49	1.12	21.03
329	Miscellaneous non-metallic mineral products	6.68	6.36	6.99	6.36	6.98
330	Iron & steel industries	3.53	6.07	0.98*	4.67	0.97
331	Casting & forging of iron & steel	1.26	2.83	-0.32*	2.60	-0.81
340	Fabricated metal products	8.99	13.51	4.47*	7.54	1.55
343	Hand tools & general hardware	-1.07	3.11	-5.24*	4.36	-2.20
350	Agricultural machinery & equipment	7.11	9.18	5.04*	10.49	6.14
351	Drills, coal cutting & other mach.	8.49	8.04	8.97	10.35	13.87
352	Prime movers, boilers, etc.	3.10	-5.57	11.76	-4.88	13.22
353	Machinery for food & textiles	0.65	3.21	-1.90*	5.19	2.26
354	Machinery for other industries	-0.45	3.06	-3.95*	1.94	-2.03
356	Non-electrical machinery n.e.c.	6.70	7.35	6.67*	7.40	6.89
357	Machine tools	7.24	4.79	10.48	1.94	10.01
360	Electrical industrial machinery	8.42	4.79	12.05	2.84	7.95
361	Insulated wires & cables	10.08	17.26	2.90*	16.00	0.28
362	Dry & wet battery	5.41	6.46	4.36*	5.19	1.72
363	Electrical apparatus, appliances & others	10.10	13.19	10.08*	11.28	6.07
364	Radio & television	13.11	1.73	24.49	7.67	26.46
366	Computer & other electronic equipment	19.35	18.82	19.89	18.10	18.37
370	Ship building & repairing	-0.85	12.59	-14.28*	8.89	-22.05
371&372	Locomotives, railway wagons & parts	6.10	12.53	-0.33*	14.23	1.92
374	Motor vehicles & parts	6.80	5.92	7.69	4.56	8.05
375&376	Motor cycles, bicycles, scooters	11.05	10.98	11.11	11.09	11.33

Source: Computed from *Annual Survey of Industries*, (various issues) and *Indices of Wholesale Prices in India*, Ministry of Industry.

* indicates industries that have decelerated.

Comparing growth rates in the two sub-periods, 1975/76-1980/81 and 1980/81-1885/86, in Table 1 (cols. 4 and 5), 28 industries are seen to have decelerated; they accounted for 50.15 per cent of the total value-added in the manufacturing sector in 1985-86 (this can be checked with Table 5). Moreover, while in the first sub-period the growth rates were negative for four industries, they were so for ten industries in the second sub-period. Thus, it is clear that although, in the aggregate, the growth rate of manufacturing industries rose from 5.59 per cent per annum in the first sub-period to 6.14 per cent per annum in the second, the performance of many individual industries worsened in the eighties. Singh and Ghosh [1988] also found that, for many two digit industry groups, the growth rates were lower during the eighties compared to the second half of the seventies.

In Chart A, each industry is represented by a point showing its growth rates for the two sub-periods, first sub-period on the vertical axis and second sub-period on the horizontal axis. When a 45 degree line is drawn through the origin, the industries showing deceleration appear above the line and those showing acceleration below the line. It will be seen that a large number of industries which grew at above the average rate (5.59 per cent per annum) during the first sub-period decelerated in the second sub-period. In fact, a few of them had negative growth rate during the second sub-period; for instance, cotton textiles, paints and varnishes, ship building, and locomotives and railway wagons. On the whole, 19 industries which grew faster than average in the first period decelerated and only 7 accelerated. Of the industries which accelerated in the second period, 14 were slow growing in the first period.

Quite a few industries which had above the average (5.87 per cent per annum) growth rates over the ten-year period, 1975-76 to 1985-86, decelerated in the second sub-period (Table 2). These were grain mill products, bidi, spinning and weaving of synthetic textiles, basic industrial chemicals and gases, fertilisers and pesticides, fabricated metal products, agricultural machinery, non-electrical machinery, wires and cables, electrical apparatus and appliances, locomotives and railway wagons. Thus, some industries, grew rapidly initially but the pace slackened subsequently although the overall growth rate in the entire period was still above average. An important example is spinning and weaving of synthetic textiles. The industry took shape in the early 1970s and maintained fairly high growth in that decade. But growth slowed down in the 1980s as a result of high capital and raw material costs [Chandrashekhar, 1987]. Other new industries like radio and TV, computers and electronic control equipment, motor vehicles and two-wheelers, however, grew faster in the second sub-period compared to the first sub-period.

TABLE 2. INDUSTRIES CLASSIFIED ACCORDING TO GROWTH PERFORMANCE, 1975-76 TO 1985-86

Growth over the whole period	Acceleration in 1981-86	Deceleration in 1981-86
High Growth (≥ 5.87%)	206, 241, 300, 303, 304, 313, 316, 319, 324, 329, 330, 351, 357, 360, 366, 364, 374, 375 & 376	204, 226, 247, 311, 340, 350, 356, 361, 363, 371 & 372
Low Growth (0 < 5.87%)	212, 321, 352	201, 210 & 211, 231, 280, 284 & 285, 310, 312, 314, 320, 331, 353, 362
Nagative Growth (< 0)	227	251, 305 to 307, 343, 354, 370

Note: Column 1 shows industries which accelerated in 1980-81 to 1985-86 and column 2 shows industries which decclerated in the same period as compared to 1975-76 to 1980-81.
Source: as in Table 1.

Use based and Input-Based Criteria

During 1975-76 to 1985-86 consumer durables grew the fastest, at the rate of 9 per cent per annum. Consumer non-durables and basic goods came next with growth rates of 6 per cent per annum. Capital goods grew at a rate of 5 per cent per annum (Table 3). All the consumer durables were in the fast-growing group and maintained relatively high shares in the manufacturing sector (Table 5). Of them, motor vehicles and electrical household goods each contributed over 3 per cent

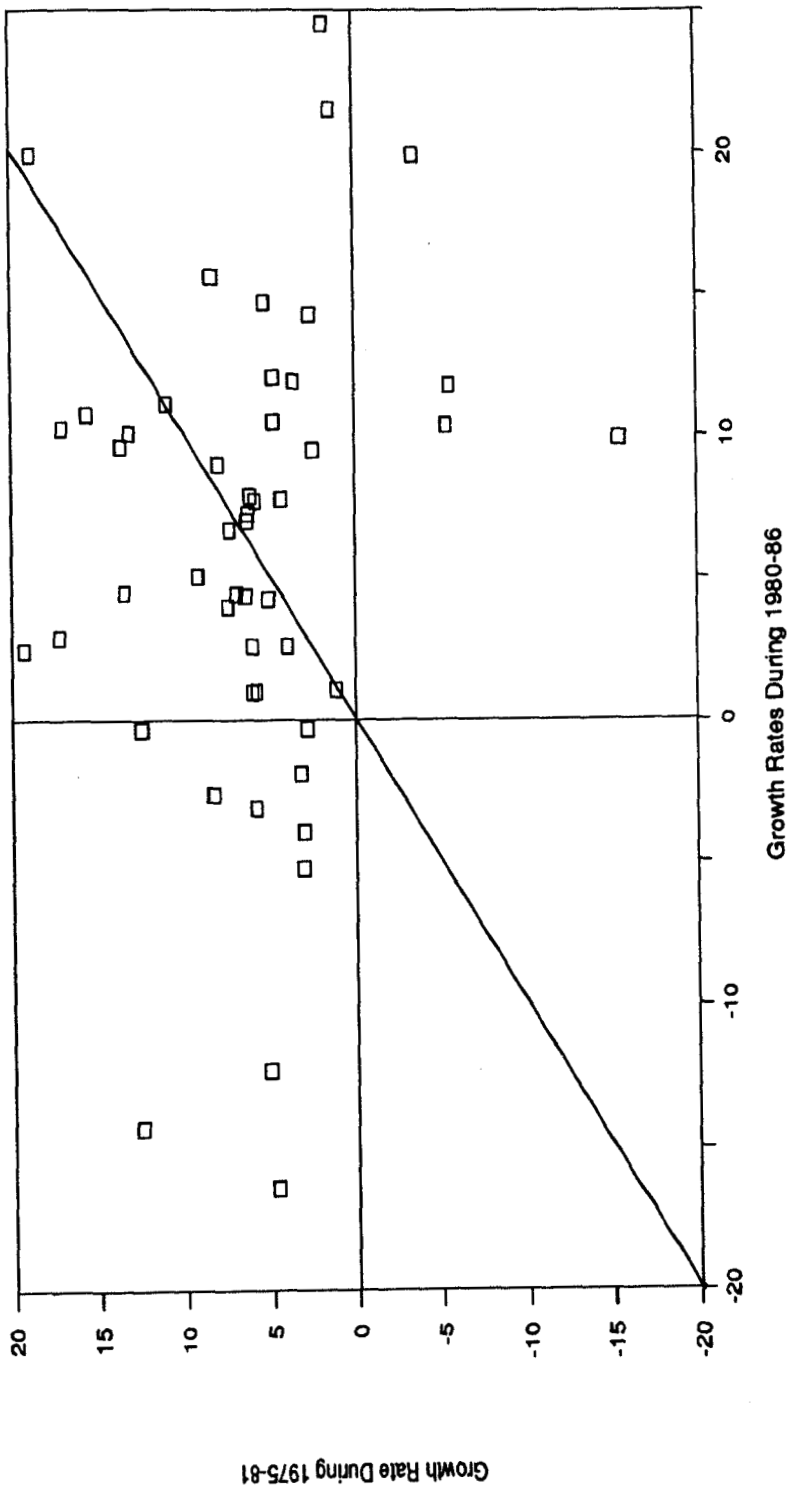


CHART A: GROWTH RATES OF SELECTED INDUSTRIES IN 1975-81 AND 1980-86

of total value added in manufacturing in 1985-86. Eight out of the 14 consumer non-durables grew fast. Significant among them were synthetic and woollen textiles, drugs and pharmaceuticals, grain mill products, and bidi. Cotton textiles, with a share of 6.36 per cent and pulp and paper with a share of 1.54 per cent in 1985-86, were the slowest growing industries. Cigarettes showed negative growth.

TABLE 3. GROWTH PROFILE OF MANUFACTURING INDUSTRIES UNDER USE-BASED CLASSIFICATION (1975-76 TO 1985-86)

High Growth Industries (Rate of Growth > 5.87%)	ROG	Low Growth Industries (Rate of Growth < 5.87%)	ROG	Negative Growth Industries	ROG
BASIC GOODS		BASIC GOODS		BASIC GOODS	
Fertilisers & pesticides	11.66	Iron & steel	3.53	None	
Cement, lime & plaster	11.41	Casting & forging of iron & steel	1.26		
Basic industrial chemicals & gases	5.70				
CAPITAL GOODS		CAPITAL GOODS		CAPITAL GOODS	
Drills, coal cutting & other mach.	8.86	Prime movers, boilers, etc.	3.10	Mach. for other industries	-0.45
Machine tools	7.24	Machinery for food & textiles	0.65	Ship building	-0.85
Non-electrical machinery, n.e.c.	6.70			Hand tools & hardware	-1.07
Electrical industrial machinery	8.42				
Agricultural machinery	7.11				
Wires & cables	10.08				
Locomotives & railway wagons	6.10				
INTERMEDIATE GOODS		INTERMEDIATE GOODS		INTERMEDIATE GOODS	
Tyres & tubes	8.44	Paints & varnishes	2.87	Jute textiles	-3.57
Petroleum refining	8.19	Dry & wet batteries	5.56	Petroleum & coal prod n.e.c.	-5.86
Turpentine, synth. resins, etc.	6.05				
Other chemicals	7.03				
Plastic products, etc.	12.68				
Structural clay products	4.68				
Misc. non-metallic mineral products	6.68				
Fabricated metal products	8.99				
CONSUMER DURABLES		CONSUMER DURABLES		CONSUMER DURABLES	
Electrical apparatus & appliances	10.10	None		None	
Radio, TV	13.11				
Motor vehicles & parts	6.80				
Computers & electronic equipment	19.35				
Motor cycles, bicycles, etc.	11.05				
CONSUMER NON-DURABLES		CONSUMER NON-DURABLES		CONSUMER NON-DURABLES	
Grain mill products	14.67	Dairy products	4.33	Cigarettes	-2.81
Sugar	10.00	Oil & vanaspati	3.30		
Bidi	10.87	Tea	2.49		
Drugs & medicines	6.76	Pulp & paper	1.09		
Woollen textiles	7.74	Printing & publishing	5.71		
Synthetic textiles	9.10	Perfumes, cosmetics, etc.	3.42		
Glass & glass products	6.11	Cotton textiles	1.38		

Source: As in Table 1.

Eight of the 12 intermediate goods grew fast but these did not have very high shares. Notable among these were plastic products, tyres and tubes, and fabricated metal products. The share of petroleum refining industry increased from 1.60 per cent in 1980-81 to 5.57 per cent in 1985-86. Jute textiles, and petroleum and coal products, had negative growth. Jute textiles had a relatively high, but declining, share in total value-added.

Basic goods showed reasonably high growth rates. Cement, lime and plaster grew very rapidly after the partial decontrol in 1982[7] and their share rose sharply from 1.10 per cent in 1981-82 to 3.18 per cent in 1985-86. Fertilisers and pesticides also grew faster than average over the period but its rate of growth declined during the second sub-period. Iron and steel, a major basic goods industry with a share of 8.81 per cent in 1985-86, grew much slower than average. So did casting and forging of iron and steel which had a share of 2.87 per cent. It should be noted that electricity, gas and steam, water works and supply, which are also usually classified as basic goods are not included in our set of industries.

Seven out of 12 industries in the capital goods sector grew faster than average and three industries had negative growth. Wires and cables, heavy non-electrical machinery, and electrical machinery were the leading industries. On the

other hand, machinery for food and textiles grew slowly and those for other industries had negative growth. Consequently, their shares declined. Share of food and textiles machinery declined from 1.25 per cent in 1975-76 to 0.93 per cent in 1985-86 and that for other machinery from 1.15 per cent to 0.75 per cent.

TABLE 4. GROWTH PROFILE OF MANUFACTURING INDUSTRIES UNDER INPUT-BASED CLASSIFICATION (1975-76 TO 1985-86)

High Growth Industries (Rate of Growth > 5.87%)	ROG	Low Growth Industries (Rate of Growth < 5.87%)	ROG	Negative Growth Industries	ROG
AGRO-BASED		AGRO-BASED		AGRO-BASED	
Sugar	10.00	Dairy products	4.33	Jute textiles	-3.57
Bidi	10.87	Tea	2.49	Cigarettes	-2.81
Woollen textiles	7.74	Cotton textiles	1.38		
Grain mill products	14.67	Pulp & paper	1.09		
Tyres & tubes	8.44	Edible oil & vanaspati	3.30		
CHEMICAL-BASED		CHEMICAL-BASED		CHEMICAL BASED	
Basic ind. chem. & gases	5.70	Paints & varnishes	2.87	None	
Fertilisers & pesticides	11.60	Perfumes, cosmetic, etc.	3.42		
Drugs & medicines	6.76	Dry & wet batteries	5.56		
Turpentine, synth. resins, etc.	6.05				
Other chemicals	7.03				
Plastic products n.e.c.	12.68				
METAL-BASED		METAL-BASED		METAL-BASED	
Fabricated metal products	8.99	Iron & steel	3.53	Handtools & hardware	-1.07
Agricultural machinery	7.11	Casting & forging of iron & steel	1.26	Mach.for other industries	-0.45
Drills, coal cutting & other machinery	8.86	Prime movers, boilers, etc.	3.10	Ship building	-0.85
Machine tools	7.24	Machinery for food & textiles	0.65		
Electrical industrial machinery	8.42				
Electrical apparatus & appliances	10.10				
Locomotives & railway wagons	6.10				
Motor vehicles & parts	6.80				
Motor cycles, bicycles & scooters	11.05				
Non-electrical mach n.e.c.	7.25				
MISCELLANEOUS INDUSTRIES		MISCELLANEOUS INDUSTRIES		MISCELLANEOUS INDUSTRIES	
Cement, lime & plaster	11.41	Structural clay products	4.68	Petroleum & coal prod n.e.c.	-5.86
Misc. non-metalic mineral products	6.68				
Petroleum refining	8.19				
Printing & publishing	5.71				
Glass & glass products	6.11				
Radio & TV	13.11				
Computers & electronic equipment	19.35				

Source: As in Table 1.

According to the input-based criterion (Table 4), the miscellaneous and chemical-based industries grew the fastest. Their growth rates were 8.6 per cent per annum and 8.2 per cent per annum, respectively. Metal-based industries grew at 4.8 per cent per annum while agro-based industries lagged behind with a rate of 3.4 per cent per annum. Among the miscellaneous industries, computer and electronic equipment, radio and television and cement grew the fastest. All the chemical-based industries, except paints and varnishes, perfumes and cosmetics, and dry and wet batteries grew fast. Most rapid growth was shown by plastic products, fertilisers and pesticides, and other chemicals. In the metal-based group, the leading industries were two-wheelers, electrical apparatus and appliances, electrical industrial machinery, fabricated metal products, and heavy non-electrical machinery.

TABLE 5. SHARE OF INDUSTRIES IN TOTAL MANUFACTURING VALUE-ADDED

(Per cent)

Code	Industries	1975-76	1980-81	1985-86
201	Dairy products	0.55	0.40	0.40
204	Grain mill products	0.64	0.94	1.20
206	Refining of sugar	2.54	1.83	2.55
210&211	Edible oil & vanaspati	0.96	1.09	0.96
212	Tea processing	1.79	1.14	1.88
226	Bidi	0.24	0.58	0.64
227	Cigarettes, etc.	1.33	0.43	0.43
231	Cotton textiles	10.68	11.27	6.36
241	Woollen textiles	0.61	0.47	0.64
247	Synthetic textiles	2.32	2.62	2.79
251	Jute textiles	2.64	2.58	1.06
280	Pulp & paper	2.67	2.12	1.54
284&285	Printing & Publishing	1.17	1.23	1.10
300	Tyre & tube industries	1.18	1.12	1.58
303	Plastic materials n.e.c.	0.47	0.72	1.03
304	Petroleum refineries	1.68	1.60	5.57
305&306&307	Petroleum & coal products n.e.c.	0.88	1.08	0.47
310	Basic industrial chemicals & gases	2.36	2.82	2.94
311	Fertilisers & pesticides	2.36	3.46	3.70
312	Paints, varnishes & lacquers	1.15	1.24	0.88
313	Drugs & medicines	3.57	3.00	3.03
314	Perfumes, cosmetics, etc.	1.39	1.31	1.19
316	Turpentine, synth. resin, synth. fibres, etc.	1.65	1.54	1.92
319	Other chemicals	0.89	0.92	0.80
320	Structural clay products	0.75	0.85	0.78
321	Glass & glass products	0.55	0.50	0.63
324	Cement, lime, plaster	1.34	1.10	3.18
329	Miscellaneous non-metallic mineral products	0.55	7.76	0.71
330	Iron & steel industries	8.07	8.29	8.81
331	Casting & forging of iron & steel	3.41	3.22	2.87
340	Fabricated metal products	0.82	0.86	0.78
343	Hand tools & general hardware	0.95	0.95	0.58
350	Agricultural machinery & equipment	0.59	0.82	0.80
351	Drills, coal cutting & other mach.	0.49	0.68	0.52
352	Prime movers, boilers, etc.	1.50	1.32	2.30
353	Machinery for food & textiles	1.25	1.39	0.93
354	Machinery for other industries	1.15	0.77	0.75
356	Non-electrical machinery n.e.c.	1.30	1.48	1.52
357	Machine tools	1.05	0.86	1.10
360	Electrical industrial machinery	3.98	3.51	2.84
361	Insulated wires & cables	0.95	1.26	0.67
362	Dry & wet battery	0.48	0.46	0.38
363	Electrical apparatus, appliances & others	0.56	0.66	0.65
364	Radio & television	1.19	0.98	1.54
366	Computer & other electronic equipment	0.33	0.45	0.63
370	Ship building & repairing	0.70	0.82	0.23
371&372	Locomotives, railway wagons & parts	1.80	2.46	1.45
374	Motor vehicles & parts	3.66	3.93	4.38
375&376	Motor cycles, bicycles, scooters	0.58	0.81	1.11
	Total of 49 industries	84.70	91.65	84.80

Source: Computed from *Annual Survey of Industries*, various issues.

Conclusion

It seems that, in some earlier studies, the extent of industrial revival has been over-estimated. The present study shows that although there was acceleration in the aggregate manufacturing sector since 1975, and more so since 1981, the actual growth rates were lower than some earlier estimates. Moreover, the picture is very different at the disaggregate level and does not show revival uniformly across the sector.

NOTES

1. Industrial deceleration since the mid-sixties has been analysed by a number of scholars. Nayyar [1978] Ahluwalia

[1985] and Krishna [1987] have surveyed the literature. The reversal in growth has been analysed by Alagh [1988], Raj [1984], Ahluwalia [1987], Chandrasekhar [1988], Nagaraj [1989], Kelkar and Kumar [1990].

2. The inadequacies of the IIP has been discussed at length by Ahluwalia [1985]. Not surprisingly, she found that the IIP trend diverges widely from the value-added trend.

3. Alagh [1985] suggests 1976-77 as the cut-off year. He gives three reasons for this. First, the Indian economy surmounted the severe balance of payments problems and low domestic savings and investments of the earlier years. Second, gross capital formation increased to 20 per cent in that year. Third, in that year the absolute level of public investment increased by Rs 900 crore and it has been rising since then. However, we have preferred 1975-76 as the benchmark, as the rate of industrial growth was about the average in 1975-76 while it was very high in 1976-77. Sandesara [1988] finds 1975 had a growth rate of 5.3 per cent whereas 1976 recorded 12.2 per cent.

4. A few related industries have been combined in groups and included in our data set although some or all items individually were below the cut-off level. Three industries viz, dairy products, ship building and parts and batteries had lower value-added in 1985-86 but are chosen considering that the cut-off point was crossed in 1984-85.

5. Since the WPI series with base 1980-81 is yet to be made available, we have to rely on the WPI series with 1970-71 base to deflate the value-added series.

6. In the dummy method, the growth rate is found by estimating the equation

$$\text{Ln } Y_t = a + a_1 D + bt + b_1 D_t + U_t$$

where D = 0 for the first period
= 1 otherwise

Estimated b gives the exponential growth rate in the first period and the estimate of $(b+b_1)$ that of the second period.

7. See *Studies on the Structure of the Industrial Economy*, Bureau of Industrial Cost and Prices, vol. 3, May 1987 for a survey of the cement industry. Installed capacity for the production of cement expanded from 33.17 million tonnes in 1982-83 to 42.26 million tonnes in 1985-86.

REFERENCES

Ahluwalia, I.J., 1982; *Industrial Performance in India: 1959-60 to 1978-79; An Analysis of Deceleration in Growth since the Mid-Sixties*, Indian Council for Research of International Economic Relations, Delhi.

Ahluwalia, I.J., 1985; *Industrial Growth in India: Stagnation Since the Mid-Sixties*, Oxford University Press, Delhi.

Ahluwalia, I.J., 1987; 'The Role of Policy in Industrial Development' in P.R. Brahmananda and V.R. Panchmukhi (ed.), *The Development Process of the Indian Economy*, Himalaya Publishing House, Delhi.

Alagh Y.K., 1985; "Some Aspects of Planning Policies in India" *Govind Vallabh Pant Memorial Lecture*.

Alagh Y.K., 1988; 'Indian Industrialisation in the Seventies' in Y.K. Alagh (ed.) *Processes of Industrial and Technological Alternatives*, Indian Council for Social Science Research Delhi

Boyce J.R., 1986; 'Kinked Exponential Models for Growth Rate Estimation', *Oxford Bulletin of Economics and Statistics*, Vol. 48, No. 4.

Chandrasekhar, C.P., 1987; 'Investment Behaviour, Economics of Scale and Efficiency under an Import Substituting Regime', *Economic and Political Weekly*, Annual Number, November, 1987.

Chandrasekhar, C.P., 1988; 'Aspects of Growth and Structural Change in Indian Industry', *Economic and Political Weekly*, Special Number, August.

Goldar, B.N. and V. Seth, 1989; 'Spatial variations in the Rate of Industrial Growth in India', *Economic and Political Weekly*, June 3, 1989.

Government of India, 1986; 'Trends in Industrial Production During the Sixth Five Year Plan, A Review', *Reserve Bank of India Bulletin*, May, 1986.

Kelkar, V.L. and R. Kumar, 1990; 'Industrial Growth in the Eighties: Emerging Policy Issues', *Economic and Political Weekly*, January 27, 1990.

Krishna, K.L., 1987; 'Industrial Growth and Productivity in India' in P.R. Brahmananda and V.R. Panchmukhi (ed.), *The Development Process of the Indian Economy*, Himalaya Publishing House, Delhi.

Mundle S., 1981; '*Some Speculations on Growth, Disparity and Capital Reorganisation in the Indian Economy*', Centre for Development Studies, Trivandrum (mimeo).

Nagaraj R., 1989; 'Growth in Manufacturing Output Since 1980s: Some Preliminary Findings', *Economic and Political Weekly*, July 1, 1989.

Nayyar, D., 1978; 'Industrial Development in India: Some Reflections on Growth and Stagnation', *Economic and Political Weekly*, Special Number, August, 1978.

Poirier, D.J., 1976; *Econometrics of Structural Change*, North Holland, Amsterdam.

Raj K.N., 1984; 'Some Observation on Economic Growth in India over the Period, 1952-53 to 1982-83, *Economic and Political Weekly*, October 13, 1984.

Sandesara, J.C., 1988; 'Indian Industrialisation: Tendencies Interpretations and Issues', in *India Since Independence*, Indian Council of Social Science Research, New Delhi.

Singh, A. and J. Ghosh, 1988; 'Import Liberalisation and the New Industrial Strategy: Analysis of their Impact on Output and Employment', *Economic and Political Weekly*, Special Number, November, 1988.

APPENDIX A. 1. GROWTH RATES OF VALUE-ADDED OF MANUFACTURING INDUSTRIES (TWO-DIGIT CLASSIFICATION)

Industries	1951/52-64/65	1964/65-74/75	1975/76-85/86
Food products	5.41	3.26	5.22
Beverages & tobacco	7.64	-0.58	2.9
Textiles	2.72	1.94	2.95
Wood products	14.39	-2.56	0.11
Paper, paper products, printing, etc.	8.57	4.93	1.33
Leather & leather prod. excl. footwear	5.92	-10.19	5.75
Rubber, petroleum & coal products	14.40	6.04	6.44
Chemicals & chemical products	9.88	8.10	6.53
Non-metallic minerals excl. petroleum	10.87	4.99	6.24
Basic metals	12.16	3.97	3.48
Metal products excluding machinery & transport equipment	10.12	1.71	2.86
Non-electrical machinery	23.24	4.43	5.71
Electrical machinery, apparatus & appliances	17.41	10.71	9.28
Transport equipment	11.94	-4.47	8.69
Miscellaneous manufactures	12.10	4.05	9.41
Net manufacturing value added	7.88	3.60	5.18

Source: C.P. Chandrasekhar, *EPW* Special Number, 1988, p. 2361-2362.

APPENDIX: A.2. COMPOUND ANNUAL GROWTH RATES AND WEIGHTS IN THE INDEX OF INDUSTRIAL PRODUCTION

Industry	Index of Industrial Production Annual Compound Rates of Growth				Weighting in the Index of Industrial Production	
	1961-73	1961-65	1966-68	1969-73	1960	1970
I. BASIC INDUSTRIES	6.72	10.4	5.9	5.2		
1. Mining & quarrying	3.48	5.7	3.1	2.6	9.72	9.69
2. Salt refining					0.19	0.21
3. Heavy organic chemicals	10.30	16.4	8.1	7.9	0.10	0.54
4. Heavy inorganic chemicals					0.60	1.01
5. Fertilizers	28.04	20.3	21.2	17.9	0.46	1.39
6. Cement	5.72	6.2	4.2	4.7	1.17	1.17
7. Iron & Steel Basic Industries	2.86	13.1	0.0	1.4	6.23	7.04
8. Aluminium manufacturing	14.57	78.7	18.3	5.5	0.57	1.30
9. Brass manufacturing					0.29	0.35
10. Electricity	11.13	13.8	11.8	7.6	5.37	9.28
II. CAPITAL GOODS INDUSTRIES	4.76	19.5	-4.8	5.4		
11. Machinery, apparatus and supplies for power transformers	11.24	33.8	-7.7	9.6	0.38	1.48
12. Electrical motor/furnaces	9.23	34.4	4.1	-1.7	0.27	0.35
13. Cables & insulated wires	7.54	14.7	-1.2	9.5	0.68	0.85
14. Railroad equipment	-8.20	21.0	-20.4	-7.7	3.50	2.99
15. Motor vehicles	4.68	6.3	3.2	3.5	2.51	3.03
III. INTERMEDIATE GOODS	3.89	7.0	1.9	3.4		
16. Cotton spinning	1.28	3.9	0.9	1.0	11.79	6.24
17. Jute manufactures	-1.79	3.8	-7.1	-1.2	3.97	2.71
18. Tyres & tubes	9.26	11.7	9.5	6.5	1.48	1.43
19. Synthetic fibres	5.97	11.7	9.8	0.1	0.64	1.19
20. Dye stuff and dyes	6.96	7.2	8.5	3.2	0.61	0.63
21. Paint, varnish and lacquer					0.32	0.30
22. Petroleum products	10.98	9.7	17.9	5.0	1.34	1.62
23. Structural clay products	11.77	4.4	23.3	11.0	0.77	0.65
24. Batteries					0.38	0.55
IV. CONSUMER GOODS	4.07	5.0	1.1	4.2		
V. CONSUMER NON-DURABLES	2.81	3.8	-0.9	4.1		
25. Sugar factories and refineries	3.24	4.5	-12.2	11.0	3.50	2.79
26. Hydrogenated oil (Vanaspati)	4.33	4.9	3.4	-0.3	1.09	0.68
27. Tea	2.10	2.7	-2.8	6.8	5.12	2.57
28. Cigarettes	4.43	7.9	3.8	0.7	2.15	2.21
29. Cotton textile weaving	-0.73	0.0	-1.3	-0.6	9.39	5.41
30. Woollen fabrics					0.36	0.31
31. Paper & paper products	7.32	8.0	7.9	5.3	1.61	2.24
32. Footwear					0.43	0.44
33. Fine & pharmaceutical chemicals	3.85	6.0	4.9	4.4	2.21	3.12
34. Soaps & detergents	8.65	3.9	8.5	8.5	0.95	0.65
35. Matches	-1.73	2.1	-4.1	-5.3	0.50	0.26
36. Glass & glass products	2.10	5.6	-2.7	3.5	0.57	0.50
VI. CONSUMER DURABLES	9.08	10.7	8.5	4.4		
37. Commercial office & household machines	3.27	6.6	2.0	3.7	0.53	0.52
38. Electrical appliances	7.78	8.8	3.8	8.8	0.56	0.97
39. Communication equipment	18.80	16.8	32.9	3.9	0.61	0.48
40. Motorcycles & bicycles	10.14	10.5	10.1	8.5	0.62	0.75
VII. GENERAL INDEX	4.88	9.0	1.6	4.5		

Source: *Studies on the Structure of Indian Economy and Planning for Development*, Planning Commission, Government of India, 1977, Table 9, Para 19.

DEVELOPMENT OF EDIBLE OILSEEDS IN INDIA: 1954-1985

K.N. Ninan

The present study attempts an analysis of the growth behaviour and factors influencing supply response of edible oilseeds in India. In particular, it examines (i) trends and pattern of growth of different edible oilseeds over time and across states and the sources of their growth; (ii) impact of the 'green revolution' on the growth and stability of their output; and (iii) behaviour of area under oilseeds relative to those under competing crops, across regions, and underlying factors. The study is based on secondary data covering the period 1954-55 to 1983-84/1984-85.

Oilseeds occupy over 10 per cent of the country's gross sown area. They account for about 10 per cent of the value of all agricultural products and about 5 per cent of the gross national product. They provide oil for cooking and non-edible uses and also as raw materials to a number of industries. However, during 1949-50 to 1985-86, the production, area, and yield rate of oilseeds increased at an annual rate of only about 2.0, 1.0, and 0.7 per cent respectively. On the other hand, domestic demand for vegetable oils and fats has been rising at the rate of about 4 per cent per annum. The gap is made up by imports which amounted to Rs 15 crore in 1975-76 and, within a decade, rose to over Rs 1,100 crore in 1984-85. They are proving a serious burden on the difficult balance of payments position of the country.

Lack of any technological breakthrough in oilseeds is one of the reasons for the dismal performance. Moreover, although improved varieties of oilseeds have been evolved which give about 20 to 30 per cent higher yields as compared to present strains, they have not made much impact on the oilseeds production. Short supply of quality seeds due to constraints in large scale production, high price of seeds due to heavy overheads, hesitation on the part of farmers to adopt improved varieties because of the investment required in terms of fertilisers, pesticides, etc., are some of the factors which explain this stagnation.

The wide year to year fluctuations in the output of oilseeds has also affected the pace and pattern of their growth. Fluctuations in yields seem to be more pronounced than fluctuations in area under oilseeds at the all-India level, though there are inter-regional differences. Almost 85 per cent of the crop is grown in rainfed areas, particularly regions having low or uncertain rainfall. Consequently there is a high element of uncertainty in oilseeds production associated with weather. Again, bulk of the crop is raised on marginal lands resulting in low yields and unstable production. There is also considerable speculative trading in oilseeds, resulting in high instability in prices, which has added further to their volatile economy.

Initially, oilseeds were accorded a low priority in the research and development programmes. During the Fourth Five Year Plan, the allocation for oilseeds research was only Rs 1.65 crore. It was raised to Rs 3.06 crore in the Fifth Plan and further to Rs 6.02 crore in the Sixth Plan. It was only in the Seventh Plan that provision for oilseeds research was raised to about Rs 105 crore. In the development programmes of oilseeds too, the amounts allocated initially were small. In the Fourth and Fifth Plans they were only a little over Rs 6 crore. Since then, they have been increased substantially; over Rs 90 crore in the Sixth Plan and about Rs 170 crore in the Seventh Plan.

Groundnut, and rapeseed-mustard are the principal oilseeds; sesamum, soybean, safflower, sunflower, and niger follow in that order. There are also some non-edible oilseeds. In Table 1, we give the share in the area and output, both of seeds and oil; side by side, is also shown their oil-content. It will be seen that groundnut and rapeseed-mustard account for around 60 per cent of area under oilseeds and of production of oil in the country. All other oilseeds each account for not more than 5 per cent of production of oil except that cotton-seed accounts for a little over 7 per cent. The oil content of soybean is the lowest and that of groundnut, sesamum, linseed and castor, the highest. Table 2 gives details by major producing States.

K. N. Ninan is Associate Professor at the Institute for Social and Economic Change, Bangalore.

The paper is based on the Author's book *Edible Oilseeds: Growth, Area Responses and Prospects in India*, Oxford & IBH Publishing Co., 1989.

TABLE 1. AREA AND PRODUCTION OF SELECTED OILSEEDS /OIL-YIELDING CROPS
AVERAGE FOR 1983-86

(per cent)

Oilseed	Area	Production		Oil content of seed
		Oilseed	Oil	
Edible				
Groundnut	38.7	52.3	39.6	44 to 50
Rapeseed-mustard	20.8	22.5	23.1	30 to 48
Sesamum	11.7	4.5	4.8	46 to 52
Soybean	6.0	6.8	3.0	15 to 20
Safflower	4.6	3.5	2.2	24 to 36
Sunflower	3.9	2.8	2.7	22 to 50
Niger	3.2	1.4	0.9	37 to 43
Non-Edible				
Linseed	7.6	3.3	3.5	38 to 45
Castor	3.5	3.0	4.1	48 to 56
Total	100.0 (18,689)	100.0 (12,286)	-	-
Others				
Cottonseed oil	-	-	7.2	
Coconut oil	-	-	5.0	
Solvent extracted oil	-	-	2.7	
Other oils	-	-	1.2	
Total	-	-	100.0 (3,723)	

Note: Other oils include minor oils, rice-bran oil, etc. Figures in parentheses give total area and production in thousand ha and thousand tonnes respectively.
Source: *Area and Production of Principal Crops in India*, Ministry of Agriculture, 1985-86; *Forward Markets Bulletin*, Vol. XXIX, No. 2, May 1987; and *Bulletin of Food Statistics*, Ministry of Agriculture, Govt. of India, 1985.

TABLE 2. MAJOR PRODUCING STATES FOR SELECTED OILSEEDS/OIL-YIELDING CROPS
AVERAGE FOR 1981-86

Crop	States	Crop	States
Groundnut	Gujarat (28.8; 27.4) Andhra Pradesh (20.6; 21.6) Tamil Nadu (13.4; 16.0) Karnataka (11.4; 9.8) Maharashtra (10.6; 10.5)	Soybean	Madhya Pradesh (72.4; 72.4) Uttar Pradesh (23.1; 23.8) Rajasthan (2;2)
Rapeseed-mustard	Uttar Pradesh (46.1; 38.2) Rajasthan (17.2; 21.7) Madhya Pradesh (7.1; 7.2) Punjab/Haryana (6.6; 8.5) Assam (6.4; 5.2)	Linseed	Madhya Pradesh (39.9; 34.1) Maharashtra (17.6; 15.1) Uttar Pradesh (16.8; 18.1) Rajasthan (6.9; 9.7) Bihar (6.1; 10.9) West Bengal (3.8; 3.8)
Sesamum	Uttar Pradesh (20.4; 16.1) Rajasthan (17.9; 8.9) Madhya Pradesh (11.3; 7.1) Orissa (10.4; 21.1) Maharashtra (8.3; 7.4)	Castorseed	Andhra Pradesh (45.9; 14.4) Gujarat (37.4; 70.5) Orissa (6;6) Karnataka (4; 5.6) Tamil Nadu (3.2; 1.4)
Safflower	Maharashtra (70.7; 75.7) Karnataka (22.3; 20.3) Andhra Pradesh (6; 3.3)	Coconut	Kerala (57.7; 47.7) Karnataka (16.4; 15.9) Tamil Nadu (12.7; 22.9) Andhra Pradesh (4; 3) Orissa (2.2; 1.7)
Sunflower	Maharashtra (44.1; 45.9) Karnataka (43.6; 42.2) Tamil Nadu (7.4; 7.5) Andhra Pradesh (3; 2.4)	Cottonseed	Maharashtra (35.6; 18.8) Gujarat (18.4; 22.4) Karnataka (11.1; 8.1) Punjab (7.4; 14) Madhya Pradesh (7.2; 3.6) Andhra Pradesh (7.1; 11.4) Rajasthan (4.8; 7) Haryana (4.6; 9.0)
Niger	Madhya Pradesh (39.8; 28.5) Orissa (25.8; 40.3) Maharashtra (17; 13.2) Karnataka (9.7; 6.3) Bihar (7; 9.9)		

Note: Figures in parentheses give the state's per cent share in all-India area and production respectively. Data for castorseed, linseed, coconut and cottonseed are based on 1983-84 to 1985-86 statistics; the rest are based on data for the period 1982-83 to 1983-84.

The southern states and Gujarat are the chief groundnut-producing states whereas rapeseed-mustard cultivation is mainly concentrated in the northern and eastern states. Sesamum is spread all over the country though Uttar Pradesh, Rajasthan, and Madhya Pradesh have a relatively larger share. Safflower and niger are mostly cultivated in the south and in parts of central India. Cultivation of soybean is highly localised and confined to Madhya Pradesh and Uttar Pradesh, whereas Kerala and the other southern States have the largest share in area and output of coconut. The major share of cottonseed output comes from Maharashtra, Gujarat, Andhra Pradesh, and Karnataka. There are also several oil-bearing tree crops of forest origin such as, mahua, neem, karanja, kusum and sal. Oil palm cultivation is being encouraged in Kerala, Karnataka, and the Andaman-Nicobar islands. Oils extracted from the by-products like rice-bran, mango kernel, and maize germ, are other sources of supply.

GROUNDNUT

Groundnut is believed to have been introduced in India during the first half of the sixteenth century. Although it is a tropical crop, it is cultivated in both tropical and sub-tropical regions lying between 45°N and 35°S and even at altitudes up to 1,000 m, provided the summers are long enough to permit the crop to reach maturity. It is grown both as a rainfed dry crop and also as an irrigated crop. It can be grown in regions with rainfall ranging from 500 mm to 1,250 mm. It has great value as a rotation crop since by virtue of its ability to synthesise atmospheric nitrogen, it can help improve soil fertility. The groundnut crop has tremendous value. It comes in a shell. The kernel, which is rich in protein, fat, and vitamins, is eaten raw, roasted or sweetened. When crushed, it yields an oil content of 44 to 50 per cent dependent on the varieties, agronomic conditions, and technology for oil extraction. The residual cake is used as manure, or as a protein supplement in cattle and poultry rations and also in manufacturing artificial fibre. The shell is used as fuel, or for manufacturing coarse boards, cork substitutes, etc. The plant stalks are used as cattle feed. The oil is edible and is used extensively as a cooking medium, both unrefined, refined and also hydrogenated and to mix with other costlier edible oils like gingelli oil and mustard oil. The oil has industrial uses in manufacturing soap, cosmetics, lubricants, olein, stearin and their salts.

In Table 3, we give estimates of area and production of groundnut in India for various periods from 1900-01 to 1984-85 though we should mention that the estimates of the pre-Independence period are not quite reliable.

TABLE 3. AREA AND PRODUCTION OF GROUNDNUT: 1900-85

Period	Area ('000 ha)	Production ('000 tonnes)
Pre-Independence Period		
1900-10	232.70	260.90
1910-20	606.24	746.76
1920-30	1,474.32	1,559.56
1930-40	2,791.62	2,765.55
1940-45	3,566.62	3,426.96
Post-Independence Period		
1949-52	4,463.33	3,368.66
1954-57	5,402.00	4,158.67
1969-72	7,320.33	5,807.33
1981-84	7,428.17	6,596.47
1984-85	7,168.00	6,435.90

Note: Estimates of production are of groundnut in shell.
Sources: 1. *Report on the Marketing of Groundnut in India*, Directorate of Marketing and Inspection, Ministry of Food and Agriculture, Government of India, 1953 (Marketing Series No. 73) 2. *Estimates of Area and Production of Principal Crops in India*, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India (various issues)

The average annual area under the crop was 232.7 thousand ha during 1900-10. It increased to 7,428.2 thousand ha in 1981-84; in 1984-85, it was 7,168 thousand ha. The average annual output was 260.9 thousand tonnes during 1900-10 and rose to 6,596.5 thousand tonnes during 1981-84; in 1984-85, it was 6,435.9 thousand tonnes. The bulk of the groundnut crop is sown as a rainfed crop during the *kharif* season. In some states, it is grown as a *rabi* crop with irrigation support.

TABLE 4. PERCENTAGE DISTRIBUTION OF GROUNDNUT AREA AND PRODUCTION IN MAJOR PRODUCING STATES IN DIFFERENT PERIODS

Period	Major groundnut producing states	
Pre-Independence Period		
1930-35	Madras	(50.0, 58.7)
	Bombay and Bombay States	(26.4, 27.8)
	Hyderabad	(15.5, 10.2)
1940-45	Madras	(40.7, 47.4)
	Bombay and Bombay States	(26.3, 24.7)
	Hyderabad	(23.7, 20.6)
Post-Independence Period		
1954-57	Andhra Pradesh	(23.7, 27.1)
	Maharashtra	(18.7, 17.8)
	Gujarat	(17.2, 11.1)
	Karnataka	(16.2, 13.9)
	Tamil Nadu	(13.7, 20.8)
1969-72	Gujarat	(24.1, 25.7)
	Andhra Pradesh	(19.9, 19.4)
	Tamil Nadu	(14.1, 17.8)
	Karnataka	(12.1, 10.7)
	Maharashtra	(12.1, 9.8)
1981-84	Gujarat	(28.8, 27.4)
	Andhra Pradesh	(20.6, 21.6)
	Tamil Nadu	(13.4, 16.0)
	Karnataka	(11.4, 9.8)
	Maharashtra	(10.6, 10.5)

Note: Figures in parentheses give percentage of area and production of groundnut in states respectively to all-India totals.
Source: As in Table 3.

Table 4 shows the distribution (per cent to all-India total) of groundnut area and production in major groundnut-producing states in different periods. During the pre-Independence period, Madras was the leading groundnut-producing state followed by Bombay and Bombay States, and Hyderabad, accounting for over 90 per cent of the area and output. The boundaries of these states conform roughly to the present day Andhra Pradesh, Gujarat, Maharashtra, Tamil Nadu and part of Karnataka and Madhya Pradesh. In the post-Independence period, Andhra Pradesh, which was the leading producer during 1954-55 to 1956-57, was relegated to the second place subsequently with Gujarat taking precedence.

Fuller details for the period 1981-84 are given in Table 5. During this period, Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, and Maharashtra accounted for almost 85 per cent of the area and production with Gujarat and Andhra Pradesh by themselves accounting for almost half the area and production. Other states reporting sizable areas are Madhya Pradesh, Uttar Pradesh, Orissa, Rajasthan, and Punjab together accounting for about 14 per cent of area and production of the crop.

TABLE 5. AREA AND PRODUCTION OF GROUNDNUT IN MAJOR PRODUCING STATES
AVERAGE FOR 1981-84

(per cent)

States	Area under groundnut	Production of groundnut	Share of groundnut in				Share of irrigated groundnut in	
			Gross cropped area	Area under all oilseeds	Area under edible oilseeds	Production of edible oil seeds	Gross irrigated area	Total area under groundnut
Gujarat	28.8	27.4	20.5	81.2	87.5	89.2	9.2	10.9
Andhra Pradesh	20.6	21.6	11.9	73.6	86.4	96.5	6.2	18.4
Tamil Nadu	13.4	16.0	15.7	83.6	84.9	94.5	6.8	20.2
Karnataka	11.4	9.8	7.6	57.8	61.5	75.7	6.7	13.9
Maharashtra	10.6	10.5	3.9	37.4	42.6	58.3	3.4	11.7
Madhya Pradesh	4.5	3.3	1.5	14.9	20.0	25.4	0.2	1.2
Uttar Pradesh	3.6	3.0	1.1	8.5	9.7	15.1	0.02	0.8
Orissa	3.4	5.1	3.0	29.0	31.8	57.0	2.3	18.5
Rajasthan	2.4	2.0	1.0	12.7	13.6	18.3	0.6	13.4
Punjab	1.0	1.0	1.1	41.5	41.7	47.1	0.5	39.5
Others	0.3	0.3	0.4	18.2	21.1	32.3	-	-
All India	100.0 (7,428.17)	100.0 (6,596.47)	4.3	40.2	45.5	60.6	2.0	13.9

Note: Other states include Bihar, Haryana, Himachal Pradesh, Kerala, Tripura, West Bengal and some Union Territories. Figures in parentheses give actual area and production in thousand ha and thousand tonnes, respectively.
Source: *Estimates of Area and Production of Principal Crops in India*, Ministry of Agriculture, Government of India (relevant issues).

Though, in the aggregate, groundnut occupies only about 4.3 per cent of the gross cropped area, in Gujarat, Andhra Pradesh, and Tamil Nadu it is more than 10 per cent. Again, in the aggregate, groundnut accounts for more than 40 per cent of the total area under all oilseeds, 45 per cent of area under edible oilseeds, and over 60 per cent of the production of edible oilseeds. It is the pre-eminent oilseed crop in Gujarat, Tamil Nadu, and Andhra Pradesh, accounting for 73.6 to 83.6 per cent of area under all oilseeds, 84.9 to 87.5 per cent of area of edible oilseeds, and 89.2 to 96.5 per cent of output of edible oilseeds. In Karnataka, it accounted for 61.5 per cent of area and 75.7 per cent of production of edible oilseeds. In Maharashtra, these percentages are 42.6 and 58.3 respectively; in Orissa, 31.8 and 57.0; in Punjab, 41.7 and 47.1; etc.

Only 13.9 per cent of the area under groundnut is irrigated. In Punjab, it is 39.5 per cent. In most other states, it varies from 10.0 to 20.0 per cent. In Madhya Pradesh and Uttar Pradesh, it is barely 1.0 per cent. Thus, groundnut is largely a rainfed crop. This fact has an important bearing on the growth and stability of groundnut economy in India.

An in-depth analysis of the growth behaviour of groundnut area and production is made for the period, 1954-84. For this purpose, linear trends with slope expressed as per cent of respective means are computed as

$$\left[\left(b \times \frac{\bar{X}}{\bar{Y}}\right) \times 100\right]$$

In Table 6 are presented growth rates thus computed for the periods 1954-82, 1954-84, and sub-periods 1954-65; 1967-82, 1967-84, 1973-82 and 1973-84. The reason to give two sets of growth rates such as one for 1954-82 and another for 1954-84 is that 1982-83 and 1983-84 were abnormal agricultural years for some states and they badly affect their growth rates. In what follows, we shall normally refer to growth rates for periods and sub-periods ending in 1983-84 and give, in brackets, growth rates for corresponding periods and sub-periods ending in 1981-82 wherever necessary.

TABLE 6. GROWTH OF GROUNDNUT IN DIFFERENT STATES: 1954-82, 1954-84 AND SUB-PERIODS

States	Average yield kg/ha 1954-84	Growth rates (per cent per annum)						
		1954-82	1954-84	1954-65	1967-82	1973-82	1967-84	1973-84
1	2	3	4	5	6	7	8	9
Kerala								
P		-0.28^{ns}	-0.86^{ns}	1.94^{ns}	-4.61*	-8.59*	-5.28*	-9.00*
A		-0.03^{ns}	-0.43^{ns}	1.15^{ns}	-0.69^{ns}	-5.77*	-1.71***	-6.19*
Y	1164	-0.34^{ns}	-0.61^{ns}	0.82^{ns}	-4.43*	-3.09**	-4.11*	-3.05*
Orissa								
P		8.74*	9.01*	14.51**	7.64*	9.30**	9.25*	11.88*
A		7.76*	8.04*	9.67*	8.31*	10.72*	9.21*	11.54*
Y	1083	2.23*	2.10*	4.31**	-0.56^{ns}	-2.13^{ns}	-0.13^{ns}	-0.46^{ns}
Tamil Nadu								
P		0.44^{ns}	0.33^{ns}	2.36**	0.74^{ns}	-0.03^{ns}	0.38^{ns}	-0.39^{ns}
A		0.94*	0.86*	2.60*	-0.04^{ns}	-1.04^{ns}	0.03^{ns}	-0.35^{ns}
Y	1071	-0.57**	-0.59**	-0.19^{ns}	0.89^{ns}	0.86^{ns}	0.44^{ns}	-0.09^{ns}
Punjab/ Haryana								
P		3.08*	1.89***	13.27*	-5.44*	-6.93**	-6.61*	-9.63*
A		2.77*	1.76***	9.19*	-5.67*	-8.12*	-6.34*	-9.15*
Y	932	0.83*	0.44^{ns}	3.70*	0.46^{ns}	1.53^{ns}	-0.49^{ns}	-1.04^{ns}
Andhra Pradesh								
P		0.96***	1.31**	-5.28**	0.38^{ns}	-1.46^{ns}	1.38*	1.54^{ns}
A		0.98**	1.14*	-3.80**	-0.51^{ns}	-0.08^{ns}	0.29^{ns}	1.62^{ns}
Y	813	-0.08^{ns}	0.08^{ns}	-1.56***	0.80^{ns}	-1.28^{ns}	0.97^{ns}	-0.08^{ns}
Uttar Pradesh								
P		0.79^{ns}	0.33^{ns}	8.94*	-2.97***	-9.14**	-3.20**	-7.49**
A		2.12*	1.65*	9.79*	-2.61**	-7.40*	-2.55*	-5.60*
Y	808	-1.84*	-1.81*	-2.03^{ns*}	-0.42^{ns}	-1.42^{ns}	-0.70^{ns}	-1.62^{ns}
Gujarat								
P		3.23*	2.93*	10.89*	4.45**	6.90***	3.42***	3.73^{ns}
A		1.20**	1.18*	8.53*	1.33**	4.73*	1.39*	3.46*
Y	691	2.16*	1.89*	3.21^{ns}	3.05^{ns}	2.73^{ns}	2.05^{ns}	0.66^{ns}
Maharashtra								
P		-1.36*	-0.98**	1.39**	0.04^{ns}	1.98^{ns}	0.86^{ns}	2.70***
A		-1.50*	-1.50*	1.14**	-1.19***	1.11^{ns}	-1.15**	0.22^{ns}
Y	679	0.23^{ns}	0.63^{ns}	0.47^{ns}	1.34^{ns}	0.88^{ns}	2.10**	2.44***
Karnataka								
P		0.05^{ns}	0.23^{ns}	-0.83^{ns}	0.63^{ns}	-0.85^{ns}	0.96^{ns}	0.56^{ns}
A		-0.26^{ns}	-0.27*	0.14^{ns}	0.31^{ns}	-1.35***	0.13^{ns}	-1.11**
Y	646	0.29^{ns}	0.50^{ns}	-0.96^{ns}	0.36^{ns}	0.50^{ns}	0.89^{ns}	1.71^{ns}
Madhya Pradesh								
P		0.21^{ns}	-0.6^{ns}	5.02**	-2.42***	-5.25^{ns}	-2.49**	-4.26^{ns}
A		0.23^{ns}	-0.04^{ns}	4.28*	-1.94**	-5.54*	-2.06*	-4.43*
Y	624	-0.04^{ns}	-0.05^{ns}	0.80^{ns}	-0.60^{ns}	0.67^{ns}	-0.52^{ns}	0.42^{ns}
Rajasthan								
P		4.45*	3.97*	11.94*	0.35^{ns}	-6.15^{ns}	0.34^{ns}	-3.61^{ns}
A		4.42*	3.54*	15.31*	-0.28^{ns}	-2.70^{ns}	-1.26^{ns}	-4.10***
Y	572	-0.67^{ns}	-0.07^{ns}	-4.21**	0.59^{ns}	-3.06^{ns}	-1.83^{ns}	1.30^{ns}
All India								
P		1.27*	1.27*	3.17*	1.21^{ns}	1.09^{ns}	1.25***	1.22^{ns}
A		0.75*	0.70*	3.22*	-0.12^{ns}	0.33^{ns}	0.04^{ns}	0.53***
Y	766	0.48***	0.53**	-0.07^{ns}	1.32***	0.69^{ns}	1.18***	0.64^{ns}

P: Production, A: Area, Y: Yield per ha.

Note: 1. Growth rates are linear trends with slope expressed as per cent at respective means.
2. *, **, *** - significant at 1,5 and 10 per cent levels of significance respectively; ns - not significant even at 10 per cent level of significance.

During the period of almost three decades 1954-84, groundnut production in the aggregate increased at an annual rate of 1.27 per cent (also 1.27 per cent per annum during 1954-82). During 1954-65, the growth rate was 3.17 per cent per annum. It declined to 1.25 per cent during 1967-84 (1.21 per cent in 1967-82). Even in the more recent period of 1973-84, the growth rate shows no signs of increase; it was 1.22 per cent (1.09 per cent in 1973-82) per annum.

The growth rates in different states during different periods are summarised in Table 7. For 1954-84, growth rates in Andhra Pradesh, Gujarat, Orissa, Punjab/Haryana, and Rajasthan are statistically significant. It is the highest in Orissa (9.01) followed by Rajasthan (3.97), Gujarat (2.93), Punjab/Haryana (1.89), and Andhra Pradesh (1.31). If we exclude 1982-83 and 1983-84 and consider the period 1954-82, growth rates turn out to be still higher: Rajasthan (4.45), Gujarat (3.23), and Punjab/Haryana (3.08). But it is lower in Andhra Pradesh (0.96). Maharashtra is the only state with statistically significant negative growth rate of -0.98 per cent during 1954-84 and -1.36 per cent during 1954-82. Groundnut production remained stagnant in Karnataka, Tamil Nadu, Uttar Pradesh, Madhya Pradesh, and Kerala. In Karnataka, Tamil Nadu, and Uttar Pradesh growth rates were positive but statistically not significant whereas in Madhya Pradesh and Kerala, they were negative though statistically not significant. (In Madhya Pradesh, during 1954-82, it is positive though statistically not significant). To sum up, growth was positive in six states, stagnant in five states, and negative in one state. A matter of concern is that the growth was stagnant or negative in major groundnut producing states, namely, Karnataka, Tamil Nadu, and Maharashtra.

TABLE 7. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN GROUNDNUT PRODUCTION: 1954-84 AND SUB-PERIODS

Growth	1954-82	1954-84	1954-65	1967-82	1967-84	1973-82	1973-84
Significant increase in production	Andhra Pradesh Gujarat Orissa Punjab/ Haryana Rajasthan	Andhra Pradesh Gujarat Orissa Punjab/ Haryana Rajasthan	Gujarat Madhya Pradesh Maharashtra Orissa Punjab/ Haryana Rajasthan Tamil Nadu Uttar Pradesh	Gujarat Orissa	Andhra Pradesh Gujarat Orissa	Gujarat Orissa	Andhra Pradesh Maharashtra Orissa
Significant decline in production	Maharashtra	Maharashtra	Andhra Pradesh	Kerala Madhya Pradesh Punjab/ Haryana Uttar Pradesh	Kerala Madhya Pradesh Punjab/ Haryana Uttar Pradesh	Kerala Punjab/ Haryana Uttar Pradesh	Kerala Punjab/ Haryana Uttar Pradesh
Stagnant production							
a) Positive trend but not statistically significant	Karnataka Madhya Pradesh Tamil Nadu Uttar Pradesh	Karnataka Tamil Nadu Uttar Pradesh	Kerala	Andhra Pradesh Karnataka Maharashtra Rajasthan Tamil Nadu	Karnataka Maharashtra Rajasthan Tamil Nadu	Maharashtra	Gujarat Karnataka
b) Negative trend but not statistically significant	Kerala	Kerala Madhya Pradesh	Karnataka	Nil	Nil	Andhra Pradesh Karnataka Madhya Pradesh Rajasthan Tamil Nadu	Madhya Pradesh Rajasthan Tamil Nadu

Source: Table 6

In the earlier period 1954-65, growth rates were positive and high in most states. In Gujarat, Orissa, Punjab/Haryana and Rajasthan they were above 10 per cent per annum; in Uttar Pradesh and Madhya Pradesh they were between 5 and 9 per cent. They were lower in Tamil Nadu (2.36) and Maharashtra (1.39). In Karnataka and Kerala, growth was more or less stagnant. Only in Andhra Pradesh growth was negative, -5.28 per cent per annum.

During 1967-84, Orissa continued to have high growth (9.25). In Gujarat, it slowed down from earlier 10.89 to 3.42. On the other hand, in Andhra Pradesh, it turned from the earlier negative (-5.28) to a positive 1.38. In Punjab/Haryana, Kerala, Uttar Pradesh, and Madhya Pradesh, production actually declined, growth rates ranging from -6.61 in Punjab/Haryana to -2.49 in Madhya Pradesh. In Karnataka, Maharashtra, Rajasthan, and Tamil Nadu, production remained more or less stagnant. The position was not much different in the latest period 1973-82 except that in Maharashtra, after a long period of decline or stagnation, production increased at 2.70 per cent per annum. To sum up, while during the earlier period 1954-65 production increased significantly in most states, in the later period 1967-84, barring two or three states, it declined or remained stagnant.

In Table 8, states are classified according to growth in area and yield in four periods and sub-periods, namely, 1954-65, 1954-82, 1967-82, and 1973-84. States are first (col. 1) classified into (a) high and low productivity states, that is, states with yields above or below the all India average. During 1954-84, the all-India average yield was 766 kg/ha (Table 6). In seven states, the yields were higher than this. For instance, in Kerala, Orissa, and Tamil Nadu, the yields were more than 1000 kg/ha; in Punjab/Haryana, between 900-1000 kg/ha; and in Andhra Pradesh and Uttar Pradesh, above 800 kg/ha. On the other hand, in Gujarat, Karnataka, Madhya Pradesh, and Maharashtra the yields were between 600-700 kg/ha and, in Rajasthan, below 600 kg/ha. This gives a classification into high and low productivity states. They are further classified according to (b) increase, decrease in area or stagnant area, that is, with statistically significant positive or negative growth in area or with statistically non-significant positive/negative growth in area.

The states are then (cols. 2, 3, 4, 5, 6, 7) cross classified according to statistically significant growth or decline in yield/ha or stagnant, that is, with statistically non-significant change in yield/ha. We should mention that a relatively low growth rate over a longer period may be judged statistically significant but a relatively high growth rate over a shorter period may be judged statistically non-significant because it is based on fewer years, that is, statistically speaking, fewer observations.

During the period 1954-82, among the high productivity states, yields/ha in Orissa and Punjab/Haryana increased at an annual rate of 2.23 and 0.83 per cent respectively; but, in Tamil Nadu and Uttar Pradesh, they declined at -0.57 and -1.84 per cent respectively; and in Andhra Pradesh and Kerala they remained more or less stagnant. On the other hand, in all the low productivity states, yields/ha remained stagnant except in Gujarat where they increased at the annual rate of 2.16 per cent per annum comparable to that in Orissa (2.23).

If we divide this into two sub-periods, namely, 1954-65 and 1967-82, in the earlier period, 1954-65, among the high productivity states, yields/ha increased in Orissa and Punjab/Haryana at an annual rate of 4.31 to 3.70 per cent respectively; in Andhra Pradesh, it declined at -1.56 per cent per annum; and in Kerala, Tamil Nadu, and Uttar Pradesh the yields/ha were stagnant. On the other hand, in all the low productivity states, except for Rajasthan, the yields/ha were stagnant; in Rajasthan, it declined at -4.21 per cent per annum. In the later period, 1967-82, in all the states, except Kerala, yields/ha were more or less stagnant; in Kerala, it declined. In the last sub-period 1973-84, again, the yields/ha remained stagnant except in Maharashtra where it increased at 2.44 per cent per annum.

Let us next turn to changes in area under groundnut. During 1954-82, area under groundnut increased in Orissa (7.76 per cent per annum), Rajasthan (4.42); Punjab/Haryana (2.77); Uttar Pradesh (2.12); Gujarat (1.20), Andhra Pradesh (0.98), and Tamil Nadu (0.94). Among these,

yield/ha also increased in Orissa (2.23 per cent per annum), Gujarat (2.16), and Punjab/Haryana (0.83). But it declined in Tamil Nadu (-0.57), and Uttar Pradesh (-2.84). In Andhra Pradesh and Rajasthan, the yields/ha remained more or less stagnant. Maharashtra was the only state in which the area under groundnut declined (-1.50 per cent per annum). In Karnataka, Madhya Pradesh, and Kerala, both area and yield/ha remained stagnant. Thus, at one extreme, in Orissa, Gujarat, and Punjab/Haryana both area and yield/ha increased and, at the other, in Karnataka, Madhya Pradesh, and Kerala both remained stagnant.

TABLE 8. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN AREA AND YIELD OF GROUNDNUT

State with	Increase in yield	Decline in yield	Stagnant yield	Increase in yield	Decline in yield	Stagnant yield
1	2	3	4	5	6	7
		1954-65			*1954-82*	
High Productivity Levels	Orissa Punjab/ Haryana	Andhra Pradesh	Kerala Tamil Nadu Uttar Pradesh	Orissa Punjab/ Haryana	Tamil Nadu Uttar Pradesh	Andhra Pradesh Kerala
Low Productivity Levels	Nil	Rajasthan	Gujarat Karnataka Madhya Pradesh Maharashtra	Gujarat	Nil	Karnataka Madhya Pradesh Maharashtra Rajasthan
Significant Increase in area	Orissa Punjab/ Haryana	Rajasthan	Gujarat Madhya Pradesh Maharashtra Tamil Nadu Uttar Pradesh	Gujarat Orissa Punjab/ Haryana	Tamil Nadu Uttar Pradesh	Andhra Pradesh Rajasthan
Significant Decline in area	Nil	Andhra Pradesh	Nil	Nil	Nil	Maharashtra
Stagnant area	Nil	Nil	Karnataka Kerala	Nil	Nil	Karnataka Kerala Madhya Pradesh
		1967-82			*1973-84*	
High Productivity Levels	Nil	Kerala	Andhra Pradesh Orissa Punjab/ Haryana Tamil Nadu Uttar Pradesh	Nil	Kerala	Andhra Pradesh Orissa Punjab/ Haryana Tamil Nadu Uttar Pradesh
Low Productivity Levels	Nil	Nil	Gujarat Karnataka Madhya Pradesh Maharashtra Rajasthan	Maharashtra	Nil	Gujarat Karnataka Madhya Pradesh Rajasthan
Significant Increase in area	Nil	Nil	Gujarat Orissa	Nil	Nil	Gujarat Orissa
Significant Decline in area	Nil	Nil	Madhya Pradesh Maharashtra Punjab/ Haryana Uttar Pradesh	Nil	Kerala	Karnataka Madhya Pradesh Punjab/ Haryana Rajasthan Uttar Pradesh
Stagnant area	Nil	Kerala	Andhra Pradesh Karnataka Rajasthan Tamil Nadu	Maharashtra	Nil	Andhra Pradesh Tamil Nadu

Source: Table 6

Again, if we divide the total period into two sub-periods, 1954-65 and 1967-82, in the earlier sub-period 1954-65, the area under groundnut increased in all states except in Andhra Pradesh, Karnataka, and Kerala. It was the steepest in Rajasthan (15.31 per cent per annum) followed by Orissa, Uttar Pradesh, Punjab/Haryana (over 9 per cent), Gujarat (8.53), Madhya Pradesh (4.38), Tamil Nadu (2.6), and Maharashtra (1.14). Among these, only in Orissa and Punjab/Haryana yield/ha increased. In Rajasthan, it declined (-4.21 per cent per annum). In other states, it remained more or less stagnant. Andhra Pradesh was the only state in which both area and yield/ha declined. In Karnataka and Kerala, both the area and yield/ha remained stagnant. In brief, during 1954-65, increase in groundnut production was mainly on account of expansion of area; in fact, except in Orissa and Punjab/Haryana, yields/ha declined or remained stagnant. The increase in area was largely in the northern states and Gujarat, whereas in the southern states, area increased to a smaller extent or actually declined.

In the later period, 1967-82, area under groundnut increased only in Orissa (8.31 per cent per annum) and Gujarat (1.33). It declined in Punjab/Haryana (-5.67), Uttar Pradesh (-2.61), Madhya Pradesh (-1.94), and Maharashtra (-1.19). In Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Rajasthan, area remained more or less stagnant. Yield/ha also remained stagnant in all the states except Kerala, in evidence of the absence of any technological progress in groundnut productivity.

Competing crops

Clearly, changes in area under groundnut and under competing crops have been different in different states. We may examine the situation in a few selected states, namely, Gujarat, and Orissa (area increasing states), Punjab/Haryana, Madhya Pradesh, and Uttar Pradesh (area declining states), and Karnataka and Tamil Nadu (area stagnant states). Correlation coefficients between area under groundnut crop and under competing crops over the period 1954-82 and growth rates of area under competing crops for the period 1954-82 and the sub-periods 1954-65 and 1967-82 are given in Table 9.

TABLE 9. CORRELATION BETWEEN AREA UNDER GROUNDNUT AND UNDER SUBSTITUTE CROPS AND GROWTH OF AREA OF SUBSTITUTE CROPS: 1954-82

State	Substitute crop	Correlation coefficient	Growth rates in area (in per cent per annum)		
		1954-82	1954-82	1954-65	1967-82
1	2	3	4	5	6
Gujarat	Bajra	-0.64*	-0.43ns	-3.45*	-2.12*
	Jowar	-0.34*	-1.76*	-0.91ns	-2.83*
	Cotton	0.12ns	0.03ns	1.09ns	-0.06ns
Orissa	Ragi	0.92*	5.90*	-5.60**	6.78*
	Maize	0.94*	7.85*	-0.65ns	7.29*
Punjab/Haryana	Jowar	-0.31ns	-2.89*	1.55**	-4.84*
	Cotton	0.20ns	2.32*	2.50*	3.73*
Madhya Pradesh	Maize	-0.04ns	2.30*	1.63*	2.04*
	Cotton	-0.10ns	-1.50*	-1.38ns	-1.27*
Uttar Pradesh	Bajra	-0.50*	-0.42*	-1.20*	-0.60**
	Jowar	-0.41**	-1.44*	-0.72ns	-1.39*
Karnataka	Maize	-0.15ns	10.09*	4.33*	7.30*
	Ragi	0.25ns	0.58**	2.81*	1.71**
	Cotton	0.41**	-0.14ns	-0.30ns	-0.19ns
Tamil Nadu	Bajra	-0.47**	-1.39*	-2.80*	-1.59**
	Cotton	-0.49*	-2.17*	-1.41**	-1.90**

Note: 1. *, **, *** - significant at 1, 5 and 10 per cent levels of significance respectively; ns: - not significant even at 10 per cent level of significance.
2. For trends in groundnut area, see Table 6.

Gujarat accounted for over 27 per cent of the area and output of groundnut in the country during 1981-84. Over 80 per cent of the production comes from Saurashtra region, particularly Rajkot, Jamnagar, Junagadh, Amreli and Bhavnagar districts. The region has low and highly erratic rainfall which, in the absence of adequate irrigation support, causes wide year to year fluctuations in output. The competing crops are mainly, bajra, jowar, and cotton. During 1954-82, the area under groundnut increased at the cost of area under bajra and jowar, while area under cotton remained more or less stagnant.

Orissa recorded the highest growth rate in the area under groundnut during 1954-84. Cuttack, Sambalpur, Ganjam, Dhenkanal and Puri districts account for almost 85 per cent of the state's groundnut output. The bulk of the crop in Cuttack and Puri is raised during the rabi season under both rainfed and irrigated conditions, whereas in the other three districts it is grown mostly during the kharif season as a rainfed crop. Coarse cereals, small millets, and pulses are the main competing crops. The areas under all these crops increased over the period but the growth in area under groundnut was much greater.

Punjab/Haryana: The main groundnut-growing districts in Punjab, are namely, Ludhiana, Sangrur, Patiala, Kapurthala and Jullunder accounting for almost 90 per cent of the crop's area and output. The reorganisation of the state in 1969 left Haryana with only a negligible share in the crop's area and output. The crop is raised only during the kharif season; almost 40 per cent of the area is irrigated. Coarse cereals, pulses, and cotton are the main substitute crops. During 1954-65, areas under groundnut, jowar, and cotton all increased but area under groundnut increased much faster; 9.19 per cent per annum for groundnut compared to 1.55 per cent for jowar and 2.50 per cent for cotton. However, during 1967-82, areas under both groundnut and jowar declined at -5.71 and -4.84 per cent per annum respectively while area under cotton increased at 3.73 per cent per annum.

Madhya Pradesh: West Nimar, Dhar, Mandsaur, Shajapur, Jhabua, Rajgarh, Chindwara, Khandwa, Shivapuri and Raigarh districts account for almost 75 per cent of the total groundnut output in the state. The crop is grown only during the kharif season and mostly as a rainfed crop. Irrigation goes to high yielding new crop varieties of rice and wheat. For groundnut, maize and cotton are the main competing crops. During 1954-65, area under maize increased (1.63 per cent per annum) but area under groundnut increased faster (4.38 per cent). During 1967-82, areas under both groundnut and cotton declined while area under maize continued to increase.

Uttar Pradesh: Groundnut is concentrated in Badaun, Hardoi, Sitapur, Bareilly, Kheri, Moradabad, Shajapur, Unnao, and Farrukabad districts, accounting for 80 per cent of total area and output in the state. It is grown only in kharif season and almost entirely under rainfed conditions. Bajra and jowar are the main competing crops. During 1954-65, area under groundnut increased while that under bajra and jowar declined. During 1967-82, area under all three crops declined but that under groundnut declined faster than under either bajra or jowar, their growth rates being -2.63, -0.60 and -1.39 per cent per annum respectively.

Karnataka: Main groundnut-growing districts are Dharwar, Belgaum, Raichur, Bijapur, Chitradurga, Gulbarga, Bellary, Mysore, Tumkur, and Kolar. These account for 80 to 90 per cent of the state's groundnut area and output. The area has remained more or less stagnant during 1954-84. The bulk of the crop is rainfed though rabi groundnut raised mostly with irrigation support constitutes over 20 per cent of the state's total groundnut output. Maize, ragi, and cotton are the main competing crops. Unlike area under groundnut, areas under maize and ragi increased but the area under cotton has remained more or less stagnant.

Tamil Nadu: Groundnut cultivation is concentrated in North and South Arcot, Salem, Chengalpattu, Coimbatore, Madurai, Tiruchirapalli and Thanjavur districts accounting for over 80 per cent of the crop in the state. Here, the crop is grown in relatively favourable conditions with over 20 per cent of crop irrigated though it is still basically a rainfed crop. On account of comparatively better distribution of rainfall in the state and availability of irrigation facilities, groundnut

is grown in all seasons; almost 30 per cent is sown during the rabi/summer season and the rest in the kharif season. In respect of output, the share of rabi/summer groundnut is about 42 per cent, the rest being the kharif crop. The area under groundnut increased during 1954-65 but since then has remained more or less stagnant. The main competing crops are bajra, jowar, ragi and cotton. In irrigated tracts groundnut is often grown in place of paddy if sufficient irrigation is not available.

RAPESEED - MUSTARD

Rapeseed-mustard crops are grown mainly in North India. They are grown in the rabi or winter season from September/October to February/March. Rapeseed-mustard yield an important edible oil, which is the main cooking medium in the northern states and Bengal. The oil content of seeds of different species ranges from 30 to 48 per cent. Other uses of mustard oil are as a salad oil, for making margarine and also as butter substitute after hydrogenation of the oil. It also finds limited application in medicine, for burning, lighting or as a lubricant either direct or in admixture with other vegetable or mineral oils. The use of mustard oil for industrial purposes is rather limited on account of its high cost. To a limited extent the seeds are used in preparing pickles, flavouring curries, feeding the cattle and as cosmetics. Rapeseed-mustard oilcake is used as cattle feed. Ghani cake is preferred because of its higher oil content. Inferior grades of oilcake are also used as manure for sugarcane in Bihar and tea in Assam. The leaves of young plants can be used as spinach.

The average annual area under rapeseed-mustard which was 2.358 m ha during 1900-10 rose to over 2.546 m ha in the next decade. It declined to 2.136 m ha during 1949-52 but thereafter increased to 4.090 m ha during 1981-84. It was 3.990 m ha in 1984-85. The average annual output of the crop was 1.018 m tonnes during 1900-10 and 1.173 m tonnes during 1910-20. Thereafter output declined until 1940-45 when it rose to 1.118 m tonnes. During 1949-52, it again declined but thereafter started rising. During 1984-85, it was 3.073 m tonnes (Table 10).

TABLE 10. AREA AND PRODUCTION OF RAPESEED-MUSTARD IN INDIA: 1900-85

Period	Area (000 ha)	Production (000 tonnes)
Pre-Independence Period		
1900-10	2,358.19	1,018.03
1910-20	2,546.37	1,173.48
1920-30	2,475.15	1,097.28
1930-40	2,503.07	1,057.66
1940-45	2,497.97	1,118.01
Post-Independence Period		
1949-52	2,135.67	837.00
1954-57	2,511.33	980.00
1969-72	3,369.66	1,657.67
1981-84	4,089.57	2,384.87
1984-85	3,989.90	3,073.00

Source: Pre-independence period data are taken from *Report on the Marketing of Rapeseed and Mustard in India*, Directorate of Marketing and Inspection, Ministry of Food and Agriculture, Government of India, 1949 (Marketing Series No. 60); remaining data are taken from various issues of *Estimates of Area and Production of Principal Crops in India*, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

TABLE 11. PERCENTAGE DISTRIBUTION OF RAPESEED-MUSTARD AREA AND PRODUCTION IN MAJOR PRODUCING STATES IN DIFFERENT PERIODS

Period	Major Rapeseed-Mustard Producing States/Regions		
Pre-Independence Period			
1920-25	Uttar Pradesh	(40.5;	43.7)
	Punjab	(18.7;	17.0)
	Bihar	(13.0;	14.9)
	Bengal	(13.0;	11.7)
	Assam	(5.3;	5.2)
1930-35	Uttar Pradesh	(46.1;	42.7)
	Punjab	(15.6;	13.7)
	Bengal	(11.5;	15.0)
	Bihar	(9.8;	13.4)
	Assam	(5.1;	5.1)
1940-45	Uttar Pradesh	(44.4;	48.8)
	Punjab	(15.4;	12.8)
	Bengal	(12.0;	12.1)
	Bihar	(7.9;	9.7)
	Assam	(5.7;	5.0)
Post-Independence Period			
1954-57	Uttar Pradesh	(58.3;	56.8)
	Punjab	(10.7;	11.2)
	Rajasthan	(9.7;	10.1)
	Madhya Pradesh	(5.7;	5.7)
	Assam	(4.7;	5.4)
1969-72	Uttar Pradesh	(64.6;	65.2)
	Rajasthan	(8.1;	9.1)
	Punjab and Haryana	(7.3;	9.0)
	Madhya Pradesh	(6.2;	4.3)
	Assam	(4.0;	3.4)
1981-84	Uttar Pradesh	(46.1;	38.2)
	Rajasthan	(17.2;	21.7)
	Madhya Pradesh	(7.1;	7.2)
	Punjab and Haryana	(6.6;	8.5)
	Assam	(6.4;	5.2)

Note: Figures in parentheses give percentages of area and production of rapeseed-mustard in states respectively to all-India totals.
Source: as in Table 10.

Table 11 shows the distribution of rapeseed-mustard area and production in major producing states in different periods. During the pre-Independence period, Uttar Pradesh, Punjab, Bihar, Bengal and Assam together accounted for about 90 per cent of area and production of rapeseed-mustard in the aggregate. After Independence, Rajasthan and Madhya Pradesh displaced Bengal and Bihar. Along with Uttar Pradesh, Punjab/Haryana and Assam, the combined share in area and output of rapeseed-mustard of these five states was between 80 and 90 per cent.

Fuller details for the period 1981-84 are given in Table 12. During this period, of the aggregate area and production of rapeseed-mustard, Uttar Pradesh and Rajasthan accounted for about 60 per cent and Madhya Pradesh, Assam, and Gujarat another about 20 per cent. Other states reporting sizable areas and production were West Bengal, Orissa, Punjab, Bihar, and Jammu & Kashmir accounting for over 17 per cent of area and 19 per cent of production.

TABLE 12. AREA AND PRODUCTION OF RAPESEED-MUSTARD: AVERAGE FOR 1981-84

(per cent)

States	Area under Rapeseed-Mustard	Production of Rapeseed-Mustard	Share of Rapeseed-Mustard in				Share of Irrigated Rapeseed-Mustard in	
			Gross cropped Area	Area Under all oilseeds	Area Under edible oilseeds	Production of edible oilseeds	Gross Irrigated area	Total area under Rapeseed-Mustard
Uttar Pradesh	46.1	38.2	7.5	58.9	67.4	69.0	1.7	11.1*
Rajasthan	17.2	21.7	3.8	49.7	53.2	73.0	8.5	48.8
Madhya Pradesh	7.1	7.2	1.3	12.9	17.3	19.9	2.5	23.1
Assam	6.4	5.2	7.4	92.4	95.3	95.2	2.3	5.0
Gujarat	4.3	7.3	1.7	6.7	7.2	8.7	6.5	93.2
Haryana	4.3	5.7	5.1	88.2	88.2	92.1	2.8	34.8
West Bengal	4.3	4.2	2.5	48.7	58.6	61.0	3.7	37.6
Orissa	3.5	2.7	1.7	16.3	17.8	10.9	0.7	10.0
Punjab	2.2	2.8	1.3	49.3	49.6	49.0	1.4	91.9
Bihar	2.1	1.9	0.8	34.7	56.2	62.8	-	-
Jammu & Kashmir	1.1	2.2	4.6	82.6	87.5	95.1	8.1	71.9
	1.4	0.9	0.1	0.8	0.9	0.5	0.02	3.5
Others	100.0	100.0	2.3	21.8	24.7	21.9	2.1	27.0
All-India	(4,039.57)	(2,384.87)						

Note: Other States include Himachal Pradesh, Maharashtra, Karnataka, Delhi, Meghalaya, Nagaland and Tripura. Figure in parentheses are actual area and production in thousand ha and thousand tonnes respectively.

* If only area under pure crop is taken into account then the share of irrigated area to total rapeseed-mustard area grown as pure crop rises to about 47.5 per cent. Area under pure crop accounts for almost half of the total area under rapeseed-mustard in Uttar Pradesh; the rest is raised as a mixed crop. Irrigation particulars of mixed crop are not available.

Source: *Estimates of Area and Production of Principal Crops in India.* Ministry of Agriculture, Government of India (relevant issues)

Though in the aggregate, rapeseed-mustard occupies only 2.3 per cent of the gross cropped area, in Uttar Pradesh and Assam it was more than 7.0 per cent and in Rajasthan, Haryana, and Jammu & Kashmir, it was between 3.8 and 5.1 per cent. Again, in the aggregate, rapeseed-mustard accounts for 21.8 per cent of area under all oilseeds, 24.7 per cent of area under edible oilseeds and 21.9 per cent of production of edible oilseeds. It is the pre-eminent oilseed crop in Assam, Haryana, and Jammu & Kashmir accounting for 82.6 to 92.4 per cent of area under all oilseeds, 87.5 to 95.3 per cent of area under edible oilseeds and 92.1 to 95.2 per cent of production of oilseeds. In Uttar Pradesh, it accounted for 67.4 per cent of area and 69.0 per cent of production of edible oilseeds; and in Rajasthan, 53.2 per cent of area and 73.0 per cent of output. In West Bengal, Bihar, and Punjab, these percentages were: 58.6, 61.0; 56.2, 62.8; and 49.6, 49.0 respectively.

Of the area under rapeseed-mustard, 27.0 per cent is irrigated (compared to 13.9 per cent under groundnut). Over 90 per cent of rapeseed-mustard area was under irrigation in Gujarat and Punjab, followed by Jammu & Kashmir (71.9) Rajasthan (48.8), West Bengal (37.6), Haryana (34.8), Madhya Pradesh (23.1), Uttar Pradesh (11.1) and Orissa (10.0)

In Table 13, we give growth rates for production (P), area (A) and yield/ha (Y) of rapeseed-mustard. The method of calculating the growth rates and the periods and sub-periods for which they are given are the same as for groundnut (Table 6). It will be noticed that, during the period of almost three decades 1954-84, the production in the aggregate increased at an annual rate of 2.94 per cent per annum (2.81 during 1954-82), area at the rate of 1.57 per cent and yield/ha at 1.43 per cent per annum. The growth in production was 3.49 per cent per annum during 1954-65; only 2.51 during 1967-84 but a little better during the more recent period of 1973-84 (2.99).

TABLE 13. GROWTH OF RAPESEED-MUSTARD IN DIFFERENT STATES: 1954-82, 1954-84 AND SUB-PERIODS

States	Average yield kg/ha	Growth rates (per cent per annum)						
	1954-84	1954-82	1954-84	1954-65	1967-82	1973-82	1967-84	1973-84
1	2	3	4	5	6	7	8	9
Jammu & Kashmir								
P		6.10*	5.97*	-0.67ns	7.51*	9.43**	6.88*	7.31*
A		3.48*	3.56*	-0.38ns	4.38*	4.84***	4.31*	4.39**
Y	769	2.70*	2.58*	-0.48ns	3.00*	4.46ns	2.60*	2.98ns
Punjab/Haryana								
P		1.85*	1.89*	3.57ns	2.21ns	0.02ns	2.24ns	1.10ns
A		0.09ns	-0.05ns	3.26ns	0.83ns	-0.24ns	0.28ns	-0.96ns
Y	551	1.76*	2.36*	0.87ns	1.31ns	0.53ns	3.10**	4.83***
Gujarat								
P		6.07*	9.76*	0.82ns	12.72*	12.42*	18.03*	23.17*
A		6.43*	6.95*	2.24ns	12.72*	12.78*	11.92*	11.61*
Y	519	-0.53ns	1.62***	-1.97ns	0.12ns	-0.73ns	5.76**	11.12**
Uttar Pradesh								
P		2.42*	1.87*	5.19**	-0.18ns	-1.55ns	-0.99ns	-2.90ns
A		1.41*	1.00*	3.45*	0.29ns	1.65**	-0.56ns	-0.77ns
Y	477	1.12*	0.98*	1.74ns	-0.48ns	-3.22ns	-0.45ns	-2.11ns
Rajasthan								
P		4.95*	6.57*	-2.28ns	8.18**	12.53***	10.90*	16.23*
A		2.04*	3.19*	0.31ns	6.04*	5.43ns	7.71*	9.32**
Y	463	2.52*	2.82*	-2.44ns	1.75ns	6.11***	2.65ns	6.45*
Bihar								
P		2.11*	1.92*	5.73ns	-0.87ns	-2.37ns	-0.59ns	-1.24ns
A		0.22ns	0.19ns	3.19***	0.29ns	-2.44***	0.21ns	-1.58***
Y	448	2.07*	1.89*	2.94ns	-1.16ns	0.28ns	-0.80ns	0.46ns
Assam								
P		2.84*	3.54*	-0.67ns	5.11*	5.48**	6.21*	7.60*
A		2.60*	3.03*	1.01*	4.21*	4.55*	4.84*	5.73*
Y	432	0.16ns	0.36ns	-1.67ns	0.85ns	0.72ns	1.24**	1.64ns
Orissa								
P		5.36*	5.21*	1.35ns	8.18*	9.66**	7.00*	6.75**
A		5.06*	4.80*	1.87ns	8.46*	11.03*	6.83*	6.75*
Y	414	0.38ns	0.47ns	-0.34ns	-0.14ns	-1.77ns	0.20ns	-0.25ns
West Bengal								
P		2.60*	3.64*	0.12ns	6.25*	11.90**	7.76*	12.44*
A		1.09*	1.73*	1.47ns	1.29ns	4.87ns	3.00**	6.29*
Y	399	1.22*	1.52*	-1.31ns	4.33*	6.31*	4.25*	5.40*
Madhya Pradesh								
P		4.09*	4.74*	0.13ns	5.14**	0.94ns	6.39*	5.59ns
A		2.61*	2.71*	2.54**	2.48**	0.03ns	2.76*	1.72ns
Y	386	1.31**	1.84*	-2.27***	2.87ns	0.81ns	3.74**	3.68ns
Himachal Pradesh								
P		3.95*	3.29*	4.27ns	2.57**	-0.30ns	1.25ns	-2.13ns
A		1.93**	2.13*	9.10ns	3.01*	3.02***	3.39*	3.74*
Y	261	2.02*	1.31*	-2.21***	-0.55ns	-3.28***	-1.94***	-5.45*
Maharashtra								
P		-1.06ns	0.06ns	-5.85ns	5.01*	6.86*	6.15*	8.40*
A		-0.77ns	-0.34ns	-2.11ns	0.82***	0.87ns	1.59*	2.52*
Y	249	-0.17ns	0.41ns	-4.94*	4.26*	6.02*	4.47*	5.72*
All India								
P		2.81*	2.94*	3.49**	1.90***	1.45ns	2.51*	2.99ns
A		1.63*	1.57*	2.64*	1.75*	2.57***	1.58*	1.91**
Y	474	1.28*	1.43*	0.90ns	0.28ns	-0.94ns	0.97ns	1.09ns

P: Production, A: Area, Y: Yield per ha.

Note: 1. Growth rates are linear trends with slope expressed as per cent at respective means.

2. *, **, *** - significant at 1, 5 and 10 per cent levels of significance respectively; ns - not significant even at 10 per cent level of significance.

In Table 14, the states are classified according to growth in area and yield in different periods. Taking the whole period 1954-84, Gujarat had the highest growth in production (9.76 per cent per annum), followed by Rajasthan (6.57), Jammu & Kashmir (5.97), Orissa (5.21), Madhya Pradesh (4.74), West Bengal (3.64), Assam (3.54) and Himachal Pradesh (3.29). Only Maharashtra showed a small and statistically not significant increase. During 1954-65, only in Uttar Pradesh production showed a statistically significant increase (5.19), while in all other states it was more or less stagnant. During 1967-84, again, Gujarat had the highest growth in production (18.03) followed by Rajasthan (10.90), West Bengal (7.76), Orissa (7.00), Jammu & Kashmir (6.88), Madhya Pradesh (6.39) and Maharashtra (6.15). In Uttar Pradesh, it declined (-0.99) though the decline was not statistically significant. In Bihar, Himachal Pradesh, and Punjab/Haryana, it was more or less stagnant. In the more recent period, 1973-84, in a number of states, production increased even at a faster rate: Gujarat (23.17), Rajasthan (16.23), West Bengal (12.44), Maharashtra (8.40), Assam (7.60), Jammu & Kashmir (7.31), and Orissa (6.75). The decline in Uttar Pradesh (-2.90) was also larger though, again, judged statistically, it is not significant.

TABLE 14. CLASSIFICATION OF STATES ACCORDING TO GROWTH TRENDS IN RAPESEED-MUSTARD PRODUCTION: 1954-84 AND SUB-PERIODS

Growth	1954-82	1954-84	1954-65	1967-82	1973-82	1967-84	1973-84
Significant increase in production	Assam Bihar Gujarat Himachal Pradesh Jammu and Kashmir Madhya Pradesh Orissa Punjab/ Haryana Rajasthan Uttar Pradesh West Bengal	Assam Bihar Gujarat Himachal Pradesh Jammu and Kashmir Madhya Pradesh Orissa Punjab/ Haryana Rajasthan Uttar Pradesh West Bengal	Uttar Pradesh	Assam Gujarat Himachal Pradesh Jammu and Kashmir Madhya Pradesh Maharashtra Orissa Rajasthan West Bengal	Assam Gujarat Jammu and Kashmir Maharashtra Orissa Rajasthan West Bengal	Assam Gujarat Jammu and Kashmir Madhya Pradesh Maharashtra Orissa Rajasthan West Bengal	Assam Gujarat Jammu and Kashmir Maharashtra Orissa Rajasthan West Bengal
Significant decline in production	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Stagnant production							
a) Positive trend but not statistically significant	Nil	Maharashtra	Bihar Gujarat Himachal Pradesh Madhya Pradesh Orissa Punjab/ Haryana West Bengal	Punjab/ Haryana	Madhya Pradesh Punjab/ Haryana	Himachal Pradesh Punjab/ Haryana	Madhya Pradesh Punjab/ Haryana
b) Negative trend but not statistically significant	Maharashtra	Nil	Assam Jammu and Kashmir Maharashtra Rajasthan	Bihar Uttar Pradesh	Bihar Himachal Pradesh Uttar Pradesh	Bihar Uttar Pradesh	Bihar Himachal Pradesh Uttar Pradesh

Source: Derived from Table 13.

TABLE 15. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN AREA AND YIELD OF RAPESEED-MUSTARD

States with	Increase in yield	Decline in yield	Yield stagnant	Increase in yield	Decline in yield	Yield stagnant
1	2	3	4	5	6	7
		1954-65			*1954-82*	
High Productivity levels	Nil	Nil	Gujarat Jammu and Kashmir Punjab/ Haryana Uttar Pradesh	Jammu and Kashmir Punjab/ Haryana Uttar Pradesh	Nil	Gujarat
Low Productivity levels	Nil	Himachal Pradesh Madhya Pradesh Maharashtra	Assam Bihar Orissa Rajasthan West Bengal	Bihar Himachal Pradesh Madhya Pradesh Rajasthan West Bengal	Nil	Assam Maharashtra Orissa
Significant increase in area	Nil	Madhya Pradesh	Assam Bihar Uttar Pradesh	Himachal Pradesh Jammu and Kashmir Madhya Pradesh Rajasthan Uttar Pradesh West Bengal	Nil	Assam Gujarat Orissa
Significant decline in area	Nil	Nil	Nil	Nil	Nil	Nil
Area stagnant	Nil	Himachal Pradesh Maharashtra	Gujarat Jammu and Kashmir Orissa Punjab/ Haryana Rajasthan West Bengal	Bihar Punjab/ Haryana	Nil	Maharashtra
		1967-82			*1973-84*	
High Productivity levels	Jammu and Kashmir	Nil	Gujarat Punjab/ Haryana Uttar Pradesh	Gujarat Punjab/ Haryana	Nil	Jammu and Kashmir Uttar Pradesh
Low Productivity levels	Maharashtra West Bengal	Nil	Assam, Bihar Himachal Pradesh Madhya Pradesh Orissa Rajasthan	Maharashtra Rajasthan West Bengal	Himachal Pradesh	Assam, Bihar Madhya Pradesh Orissa
Significant increase in area	Jammu and Kashmir Maharashtra	Nil	Assam, Gujarat Himachal Pradesh Madhya Pradesh Rajasthan	Gujarat Maharashtra Rajasthan West Bengal	Himachal Pradesh	Assam, Jammu and Kashmir Orissa
Significant decline in area	Nil	Nil	Nil	Nil	Nil	Bihar
Area stagnant	West Bengal	Nil	Bihar, Punjab/ Haryana Uttar Pradesh	Punjab/ Haryana	Nil	Madhya Pradesh Uttar Pradesh

Source: Derived from Table 13.

In Table 15, states are classified according to growth in area and yield in four periods and sub-periods, namely, 1954-65, 1954-82, 1967-82, 1973-84. During 1954-84, average yield of rapeseed-mustard in the aggregate was 474 kg per ha (Table 13). The yields were higher (high productivity states) in Jammu & Kashmir (769), Punjab/Haryana (551), Gujarat (519) and Uttar Pradesh (477). In eight states, namely, Assam, Bihar, Orissa, Rajasthan, Madhya Pradesh, West Bengal, Himachal Pradesh, and Maharashtra, yields were below the all-India average.

During 1954-82, out of the five high productivity states, in three states, namely, Jammu & Kashmir, Punjab/Haryana, and Uttar Pradesh, yields increased at 2.70, 1.76 and 1.12 per cent per annum, respectively. In Gujarat, yield declined but the trend was not statistically significant. Among the low productivity states, in Bihar, Himachal Pradesh, and Rajasthan, yields increased at above 2.0 per cent per annum and in Madhya Pradesh and West Bengal at over 1.2 per cent per annum. Yields were more or less stagnant in the remaining low productivity states of Assam, Maharashtra and Orissa.

If we divide the whole period into two sub-periods, namely, 1954-65 and 1967-82, yields did not increase during 1954-65 in any of the states, either with high or low productivity. On the other hand, during 1967-82 the yields did not decline in any state, either with high or low productivity. During the decade 1973-84, the yields improved in many states, particularly in Gujarat and Punjab/Haryana among the high productivity states, and in Maharashtra, Rajasthan, and West Bengal among the low productivity level states.

During 1954-82, growth in area was the highest in Gujarat (6.43 per cent per annum), followed by Orissa (5.06), Jammu & Kashmir (3.48), Madhya Pradesh (2.61), Assam (2.60), Rajasthan (2.04), Himachal Pradesh (1.93), Uttar Pradesh (1.41) and West Bengal (1.09). In Maharashtra and Punjab/Haryana, the area remained more or less constant.

TABLE 16. CORRELATION BETWEEN AREA UNDER RAPESEED-MUSTARD AND UNDER SUBSTITUTE CROPS AND GROWTH OF AREA OF SUBSTITUTE CROPS: 1954-82

State	Substitute crop	Correlation coefficient	Growth in area (per cent per annum)		
		1954-82	1954-82	1954-65	1967-82
1	2	3	4	5	6
Rajasthan	Wheat	0.48*	2.43*	1.59ns	3.20*
	Barley	-0.11ns	-0.23ns	-2.62*	-1.41ns
Madhya Pradesh	Wheat	0.67*	0.76*	2.28**	0.76ns
	Barley	0.49*	0.44ns	-0.24ns	1.09***
Orissa	Wheat	0.82*	9.45*	11.50*	9.74*
	Gram	0.80*	2.54*	3.15ns	6.36*
Assam	Wheat	0.91*	12.23*	6.26**	11.72*
Uttar Pradesh	Wheat	0.72*	3.10*	0.31ns	3.17*
	Barley	-0.73*	-3.20*	-2.35*	-5.30*
Bihar	Wheat	0.13ns	4.99*	0.94ns	-3.03*
	Gram	0.10ns	-4.52*	-0.49ns	-2.85*

Note: 1. *, **, *** - significant at 1, 5 and 10 per cent levels of significance respectively; ns: - not significant even at 10 per cent level of significance.
2. For trends in rapeseed-mustard area, refer to Table 13.

Competing crops

To study changes in area under rapeseed-mustard and under competing crops, we have chosen a few states, namely, Rajasthan, Madhya Pradesh, Orissa and Assam which had witnessed expansion of the crop's area during 1967-84 and are referred to as 'area increasing states' and Uttar Pradesh and Bihar referred to as 'area stagnant states'. In Table 16 are given correlation coefficients between area under rapeseed-mustard and under competing crops over the period 1954-82 and growth rates of area under competing crops for the period 1954-82 and the sub-periods 1954-65 and 1967-82.

Rajasthan accounted for 17 and 21 per cent of the crop's total area and output. The area under rapeseed-mustard was estimated at 10 lakh ha in 1984-85.Ganganagar, Bharatpur, Alwar, Sawai Madhopur and Jaipur districts account for almost two-third of the crop's area and output. Almost half of the crop's area is covered by irrigation. The competing crops are mainly wheat and barley. It was found that the correlation between the rapeseed-mustard area and the wheat area during the period under review was positive and significant (0.48), but in relation to the barley area it was negative, though not statistically significant (-0.11). There was not much expansion in the area under rapeseed-mustard and wheat during 1954-65, but a significant expansion in the area under the two crops took place thereafter. The rate of increase in the rapeseed-mustard area was higher than that of wheat, the growth rates being 6.0 and 3.2 per cent per annum, respectively.

Madhya Pradesh claimed over 7 per cent of the crop's total area and output in the country. The area occupied by rapeseed-mustard was estimated at over 3.5 lakh ha in 1984-85. Morena district had over 40 per cent of the crop's area and over 56 per cent of the crop's output. Bhind, Mandla, Sarguja, Bastar and Gwalior districts, along with Morena account for about three-fourth of the crop's area and output. Rapeseed-mustard is still basically a rainfed crop, the irrigated area covering about a quarter of the crop's total area. Wheat and barley are the two competing crops for the rapeseed-mustard area in the state. During 1954-82, rapeseed-mustard area increased at a faster rate than the wheat and barley areas.

Orissa accounted for 3-4 per cent of the crop's area and output in the country and claimed the ninth rank among the rapeseed-mustard producing states. Phulbani, Kalahandi, Cuttack, Koraput and Balasore districts together accounted for nearly 60 per cent of the crop's total area and output. The crop is mostly raised under rainfed conditions and only about a tenth of the crop's area receives irrigation support. The two competing crops of rapeseed-mustard in Orissa are wheat and gram. It was found that their area had moved in unison with the rapeseed-mustard area.

Assam with 6.4 per cent of the rapeseed-mustard area in the country, witnessed a spurt in rapeseed-mustard cultivation. The area devoted to rapeseed-mustard cultivation increased from about 1.2 lakh ha during 1954-57 to over 3 lakh ha in 1984-85. The crop's cultivation is concentrated in the riverine belt and also in the flood-prone low-lying areas having new alluvial soils which are most suited for the crop. Rapeseed is hardly grown in Assam and the area reported here is mostly under mustard. Lakhimpur, Nowgong, Jorhat, Dibrugarh, Darrang, Kokrajhar and Somitpur districts together accounted for between 70 and 80 per cent of the crop's area and output. The crop is mostly grown under rainfed conditions. Irrigation covers only about 5 per cent of the crop's area. If irrigation is available people of this region prefer to raise a second crop of paddy, which is the main crop of Assam. Wheat is the competing crop for area. Though the area under both crops recorded a significant expansion during 1954-82 the growth in the wheat area was faster than that of rapeseed-mustard. While the wheat area grew at the rate of over 12.2 per cent per annum, the rapeseed-mustard area grew at only 2.4 per cent per annum.

Uttar Pradesh accounted for over 46 per cent of the crop's area and over 38 per cent of the crop's output in the country. The rapeseed-mustard area in the state increased steadily from 1.4 m. ha in 1954-57 to around 2.2 m ha in the seventies. The crop's area fell in the eighties and the estimates for 1984-85 was about 1.02 m ha. Agra, Mathura, Aligarh, Kanpur, Kheri, Bulandsahar, Etah, Etawah and Mainpuri districts together accounted for

over a third of the crop's total area and output. Almost 46 per cent of the crop was under mixed cropping, while about 10 per cent was irrigated. Wheat and barley are the two competing crops for area. The area under rapeseed-mustard and barley moved in opposite directions during the period 1954-82, whereas the wheat area moved in the same direction as rapeseed-mustard. The rapeseed-mustard area expanded at a slower rate (1.4 per cent per annum) than the wheat area (3.1 per cent per annum) while the area under barley cultivation declined at the rate of about 3.2 per cent per annum during 1954-82. In the areas where rapeseed-mustard is grown as a mixed crop it was found that the combined gross income from wheat and rapeseed-mustard was higher than from other crop combinations like wheat and barley or wheat and gram. It is perhaps this factor which still favours rapeseed-mustard in Uttar Pradesh.

Bihar: Over 40 per cent of the crop's area and output comes from Purnea, Palamau, Katihar, East and West Champaran, Patna and Samastipur districts. Rapeseed-mustard is raised largely under rainfed conditions in the state. The two crops competing, for rapeseed-mustard area in Bihar, are wheat and gram. The area under rapeseed-mustard and wheat moved in the same direction during 1954-82 although wheat area increased at the rate of over 4.9 per cent annum, while the growth rate of rapeseed-mustard area was 0.26 per cent per annum.

SESAMUM

Sesamum is grown in both tropical and sub-tropical regions of the country. Its agro-climatic requirements are the same as of groundnut. It thrives best on light sandy loams. The cultivation in India is confined mostly to lighter soils; cultivation in heavy soils is limited to a few regions. The bulk of the crop is sown during the kharif season as a rainfed crop. The summer crop is raised with irrigation support. The duration of the crop varies from 85 to 140 days depending on the variety.

The sesamum seeds when crushed yield an oil content of 46 to 52 per cent. The oil is used mainly as a cooking medium, especially in south India, but also for anointing hair and body before bathing and as an ingredient in confectionery products and in the manufacture of soaps, cosmetics, perfumes, and pharmaceuticals. Being edible, sesamum seeds are also consumed directly; oilcake or meal is rich in protein and hence is directly consumed by the working classes or used for feeding livestock, especially milch cattle.

In 1936-39, average annual area under sesamum was 1.646 million ha; it rose to 2.006 million ha in 1940-45, to 2.218 million ha in 1949-52, and thereafter stayed around 2.300 million ha. Production increased from an average of 398.27 thousand tonnes in 1936-39 to 482.77 thousand tonnes in 1940-45 and further to 586.73 thousand tonnes in 1981-84 (Table 17).

TABLE 17. AREA AND PRODUCTION OF SESAMUM: 1936-85

Period	Area (000 ha)	Production (000 tonnes)
Pre-Independence Period		
1936-39	1,646.32	398.27
1940-45	2,006.10	482.77
Post-Independence Period		
1949-52	2,218.33	445.40
1954-57	2,363.67	502.67
1969-72	2,378.00	486.33
1981-84	2,330.77	586.73
1984-85	2,117.40	520.70

Source: Pre-Independence period data are taken from *Report on the Marketing of Sesamum and Nigerseed in India*. Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India, 1952 (Marketing Series No. 72); remaining data are taken from various issues of *Estimates of Area and Production of Principal Crops in India*, Directorate of Economics and Statistics, Ministry of Agriculture, Government on India.

During the pre-Independence period, Uttar Pradesh was the leading sesamum producing state followed by Madras, Bombay, Hyderabad, and Madhya Pradesh, accounting for 75 per cent of the area and output. In the post-Independence period, Uttar Pradesh continued to lead in area accounting for over 20 per cent of the area under the crop. But, during 1981-84, Orissa gained the dominant status in output accounting for 21.1 per cent of the output. During that period, Uttar Pradesh, Rajasthan, Madhya Pradesh, Orissa, and Maharashtra accounted for 68.3 per cent of area and 60.6 per cent of output. Andhra Pradesh, Tamil Nadu, Gujarat, West Bengal, and Karnataka had 28.0 per cent area and 33.8 per cent of output (Table 18).

TABLE 18. PERCENTAGE DISTRIBUTION OF SESAMUM AREA AND PRODUCTION IN MAJOR STATES IN DIFFERENT PERIODS

Period	Major sesamum producing states	
Pre-Independence Period		
1940-45	Uttar Pradesh	(26.9; 27.5)
	Madras	(14.7; 18.6)
	Bombay	(12.3; 14.6)
	Hyderabad	(11.7; 9.2)
	Madhya Pradesh	(9.0; 7.2)
	Rajasthan	(5.8; 4.0)
	Orissa	(5.8; 7.4)
	Madhya Bharat	(5.1; 4.2)
Post-Independence Period		
1954-57	Uttar Pradesh	(20.7; 17.6)
	Rajasthan	(19.8; 18.4)
	Madhya Pradesh	(17.6; 19.4)
	Andhra Pradesh	(11.4; 10.9)
	Gujarat	(7.7; 6.5)
1969-72	Uttar Pradesh	(25.5; 20.0)
	Rajasthan	(21.8; 14.8)
	Madhya Pradesh	(14.1; 10.2)
	Andhra Pradesh	(10.6; 9.8)
	Maharashtra	(6.3; 7.2)
1981-84	Uttar Pradesh	(20.4; 16.1)
	Rajasthan	(17.9; 8.9)
	Madhya Pradesh	(11.3; 7.1)
	Orissa	(10.4; 21.1)
	Maharashtra	(8.3; 7.4)

Note: Figures in parentheses are percentages of area and production of sesamum in states respectively to all-India totals.
Source: As in Table 17.

In 1981-84, about 1.3 per cent of total gross cropped area, 12.6 per cent of total area under all oilseeds, 14.3 per cent of total area under edible oilseeds was under sesamum; but it accounted for only 5.4 per cent of total output of all edible oilseeds. Sesamum's share of area under all edible oilseeds varied from West Bengal (39.7 per cent), Rajasthan (32.0), and Orissa (31.0) to 4.8 per cent in Assam and Gujarat. Its share in output of edible oilseeds varied from West Bengal (37.8 per cent) and Orissa (21.1) to 1.9 per cent in Andhra Pradesh and Gujarat. In Kerala, sesasam accounted for 59.5 per cent of area and 30.1 per cent of output of all edible oilseeds; but accounted for only 0.5 per cent of the State's gross cropped area. Only 5.0 per cent of the sesamum area was irrigated;

high percentages being West Bengal (36.2), Andhra Pradesh (16.3), Tamil Nadu (10.9), and Orissa (8.7). In Punjab, 87.6 percentage of the area under sesamum was irrigated but the total area accounted for only 0.7 per cent of the sesamum area in the country (Table 19).

TABLE 19. AREA AND PRODUCTION OF SESAMUM: AVERAGE FOR 1981-84

(per cent)

States	Area under Sesamum	Production of Sesamum	Share of Sesamum in				Share of Irrigated Sesamum in	
			Gross cropped area	Area Under all oilseeds	Area Under edible oilseeds	Production of edible oilseeds	Gross Irrigated area	Total area under Sesamum
Uttar Pradesh	20.4	16.1	1.9	15.1	17.2	7.2	0.01	0.2
Rajasthan	17.9	8.9	2.3	29.9	32.0	7.3	0.1	0.7
Madhya Pradesh	11.3	7.1	1.2	11.8	15.9	4.9	-	-
Orissa	10.4	21.1	2.9	28.3	31.0	21.1	1.1	8.7
Maharashtra	8.3	7.4	1.0	9.2	10.5	3.6	0.1	1.0
Andhra Pradesh	7.3	4.7	1.3	8.2	9.6	1.9	0.6	16.3
Tamil Nadu	5.5	6.5	2.1	10.9	11.0	3.4	0.5	10.9
Gujarat	5.2	6.7	1.2	4.6	4.9	1.9	0.04	0.8
West Bengal	5.1	10.5	1.7	32.9	39.7	37.8	2.4	36.2
Karnataka	4.9	5.4	1.1	7.8	8.3	3.7	0.03	0.4
Bihar	0.8	1.2	0.2	7.8	12.6	9.9	-	-
Punjab	0.7	0.9	0.1	8.6	8.7	3.9	0.1	87.6
Assam	0.6	1.1	0.5	4.6	4.8	4.8	-	-
Kerala	0.6	0.6	0.5	59.5	59.5	30.1	-	-
Others	1.0	1.8	0.3	7.3	7.4	4.4	-	-
All-India	100.0 (2,330.8)	100.0 (586.7)	1.3	12.6	14.3	5.4	0.2	5.0

Note: Other States include Himachal Pradesh, Haryana and Jammu and Kashmir. Figures in parentheses are actuals of average area and production in thousand ha and thousand tonnes respectively.
Source: *Estimates of Area and Production of Principal Crops in India.* Ministry of Agriculture, Government of India (relevant issues)

In Table 20, we give growth rates of production (P), area (A), and yield per ha (Y). Taking the trends of the period of three decades, viz., 1954-84 or 1954-82, production of sesamum shows a significant increase in Assam, Himachal Pradesh, Karnataka, Maharashtra, Orissa, Punjab/Haryana and West Bengal. In Gujarat, it remained stagnant during 1954-82, but shows an increase during 1954-84. During 1954-84 growth was highest in West Bengal (11.92 per cent per annum), followed by Himachal Pradesh (6.55) and Orissa (6.29), Karnataka (3.72), Assam (2.27) and Gujarat, Maharashtra and Punjab/Haryana at less than 2 per cent per annum. There was a significant decline in sesamum production in Andhra Pradesh, Madhya Pradesh, Rajasthan, and Kerala while the production was more or less stagnant in Uttar Pradesh, Bihar, and Tamil Nadu.

During 1954-65, sesamum production increased in Assam (2.26 per cent per annum), Bihar (4.45), Himachal Pradesh (19.56), Orissa (5.56), Punjab/Haryana (5.35), and Uttar Pradesh (6.12). In Andhra Pradesh, Gujarat, Kerala, Madhya Pradesh, Rajasthan, and Tamil Nadu, the production declined at rates ranging from -2.69 per cent per annum in Andhra Pradesh to -11.41 per cent per annum in Kerala. The production remained more or less stagnant in Karnataka, Maharashtra, and West Bengal.

During 1967-84, growth in sesamum production in West Bengal exceeded 15 per cent per annum followed by Orissa (7.36), Karnataka (4.74), Himachal Pradesh (2.40), Maharashtra (2.35), Assam (2.94) and Kerala (1.23). The growth rates continued to decline in Andhra Pradesh (-4.07) and Madhya Pradesh (-3.67). Bihar which had registered a rise in sesamum output in 1954-65, registered a decline (-3.69) during 1967-84. During this period, sesamum production was more or less stagnant in Gujarat, Tamil Nadu, Punjab/Haryana, Rajasthan and Uttar Pradesh. Thus, during 1967-84, in most of the major producing states, sesamum production either declined or was stagnant.

The national average yield of sesamum for the period 1954-84 was 194 kg/ha. In West Bengal, Assam, and Orissa, the yields were at 503 kg/ha, 491 kg/ha and 362 kg/ha, respectively; they were

between 300 and 331 kg/ha in Himachal Pradesh, Punjab/Haryana, and Tamil Nadu; between 200 and 300 kg/ha in Bihar, Gujarat, Karnataka, Kerala and Maharashtra; between 155 and 185 kg/ha in Andhra Pradesh, Madhya Pradesh and Uttar Pradesh; and a mere 128 kg/ha in Rajasthan. Uttar Pradesh, Rajasthan and Madhya Pradesh which claimed 49.6 per cent of the sesamum area, contributed 32.1 per cent of sesamum output, whereas Orissa and West Bengal with 15.5 per cent of the sesamum area contributed over 31.6 per cent of the output, reflecting higher yields in these two states.

During 1954-82, no state with high productivity levels reported any significant decline in per ha yields of sesamum, whereas all the low productivity level states registered a significant decline in sesamum yields. Gujarat, Karnataka, Punjab/Haryana, Orissa and West Bengal reported a significant rise in sesamum yield. Orissa reported a growth of 3.39 per cent per annum, Gujarat of 2.66 per cent per annum; in the remaining four states, growth was 1.3 to 2.0 per cent per annum. Yield levels remained stagnant in Assam, Bihar, Himachal Pradesh, Kerala, Maharashtra and Tamil Nadu. In Rajasthan, there was a steep decline in sesamum yield (-2.51 per cent per annum) followed by Uttar Pradesh (-2.30), Madhya Pradesh (-1.13) and Andhra Pradesh (-0.67).

During 1954-82, area under sesamum increased significantly in West Bengal (11.73 per cent per annum) followed by Himachal Pradesh (6.77), Orissa (2.46), Assam (2.29), Karnataka (2.04), Maharashtra (1.57) and Uttar Pradesh (1.53). During 1954-65 productivity increased significantly in Bihar, Karnataka, Orissa, and Punjab/Haryana. Assam and Kerala reported a significant decline in yield rates, while they were stagnant in Andhra Pradesh, Gujarat, Himachal Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal. Growth rate was the highest in Punjab/Haryana, at 8.33 per cent per annum, followed by Karnataka (5.76), Orissa (5.22) and Bihar (2.27). Rajasthan had the steepest decline in growth rates of productivity at - 12.60 per cent per annum, followed by Madhya Pradesh (-5.43), Kerala (-4.95) and Assam (-2.66).

During 1954-65 only four states witnessed a significant expansion of the area under sesamum cultivation. The growth rate of area in Uttar Pradesh was 5.48 per cent per annum, though yield levels remained stagnant. In Assam, Bihar and Himachal Pradesh the growth rates in sesamum area ranged from 2.22 per cent in Bihar to over 23 per cent per annum in Himachal Pradesh. Andhra Pradesh, Gujarat, Kerala, Madhya Pradesh, Punjab/Haryana and Tamil Nadu registered significant declines in the area under sesamum. The area under sesamum cultivation was more or less stagnant during this period in Karnataka, Maharashtra, Orissa, Rajasthan and West Bengal. Leaving aside Uttar Pradesh in respect of area and Orissa in respect of yield rates, the area under sesamum cultivation as well as its yield rates were either stagnant or declined significantly in all the important sesamum-producing states during 1954-65. Consequently, sesamum output in the country was stagnant during that period.

A look at the grouping of the states during 1967-82, reveals that all high as well as low productivity level states, excluding Himachal Pradesh, registered either a significant decline in per ha yields of sesamum or stagnation in yield levels. Himachal Pradesh alone recorded a significant rise of 2.57 per cent per annum in sesamum yield levels, whereas Uttar Pradesh (-3.88) and Kerala (-1.21) reported steep declines. A number of States registered a significant increase in the sesamum area during this period. The growth rate in sesamum area was the highest in West Bengal (17.57 per cent per annum) followed by Karnataka (5.09), Orissa (5.89), Kerala (3.45), Assam (2.70) and Maharashtra (2.39). A significant reduction in the sesamum area, was registered in Bihar, the growth rate declining to -4.04 per annum followed by Madhya Pradesh (-3.89), Andhra Pradesh (-3.35), Rajasthan (-3.31) and Gujarat (-1.74). Sesamum area was more or less stagnant in Himachal Pradesh, Tamil Nadu and Punjab/Haryana. The decade 1974-84 did not show any qualitative change in the above grouping of states, except for Bihar which recorded a significant rise in the sesamum yield rates and Himachal Pradesh reported stagnant yield levels (Table 20).

TABLE 20. GROWTH OF SESAMUM IN DIFFERENT STATES: 1954-82, 1954-84 AND SUB-PERIODS

States	Average yield (kg/ha) 1954-84	Growth rates (per cent per annum)						
		1954-82	1954-84	1954-65	1967-82	1973-82	1967-84	1973-84
West Bengal								
P		12.24*	11.92*	-1.71ns	17.18*	17.64*	15.81*	15.87*
A		11.73*	11.67*	-1.28ns	17.57*	19.56*	16.30*	17.34*
Y	503	1.31*	1.11*	-0.08ns	0.47ns	-1.06ns	0.12ns	-1.24ns
Assam								
P		2.12*	2.27*	2.26**	2.68*	2.31**	2.94*	3.04*
A		2.29*	2.47*	4.53*	2.70*	2.63**	3.11*	3.57*
Y	491	-0.31ns	-0.28ns	-2.66**	0.07ns	0.10ns	0.01ns	-0.06ns
Orissa								
P		5.78*	6.29*	5.56**	6.02*	11.26**	7.36*	11.62*
A		2.46*	3.19*	0.18ns	5.89*	11.03*	6.70*	10.38*
Y	362	3.39*	3.19*	5.22*	-0.03ns	-0.60ns	0.41ns	0.70ns
Punjab/Haryana								
P		1.67**	1.37**	5.35***	1.35ns	-5.63***	0.61ns	-4.56**
A		-0.53ns	-0.58ns	-4.19***	1.53ns	-5.63ns	0.72ns	-4.67***
Y	331	1.95*	1.54*	8.33*	-0.08ns	0.02ns	-0.62ns	-1.25ns
Tamil Nadu								
P		-0.27ns	-0.34ns	-3.37**	1.11ns	4.04ns	0.50ns	1.73ns
A		-0.36ns	-0.22ns	-3.60**	0.49ns	1.00ns	0.59ns	1.18ns
Y	315	0.02ns	-0.17ns	0.20ns	0.55ns	3.28ns	-0.13ns	0.76ns
Himachal Pradesh								
P		7.19*	6.55*	19.56**	2.31**	0.76ns	2.40*	1.65ns
A		6.77*	5.97*	23.92***	-0.13ns	-1.40ns	0.001ns	-0.46ns
Y	308	-1.25ns	-0.97ns	2.80ns	2.57*	2.21ns	2.43*	2.10ns
Bihar								
P		-0.41ns	-0.13ns	4.45**	-6.16*	-2.45ns	-3.69**	1.79ns
A		-0.86**	-1.04*	2.22***	-4.04*	-4.70*	-3.78*	-3.89*
Y	285	0.48ns	1.08**	2.27***	-1.69ns	2.25***	0.68ns	5.69*
Kerala								
P		-1.25ns	-1.17***	-11.41*	2.22*	-2.64ns	1.23***	0.34ns
A		-0.70ns	-0.63ns	-7.05*	3.45*	3.32***	2.38*	1.06ns
Y	273	-0.30ns	-0.33ns	-4.95*	-1.21***	-0.94ns	-1.20**	-0.93***
Karnataka								
P		4.02*	3.72*	3.94ns	6.10*	2.45ns	4.74*	1.06ns
A		2.04*	2.15*	-1.89ns	5.09*	4.47*	4.42*	3.29*
Y	272	1.88*	1.58*	5.76ns	1.31ns	-1.76ns	0.65ns	-2.26ns
Gujarat								
P		0.96ns	1.24***	-5.59*	-0.33ns	3.46ns	0.70ns	4.36ns
A		-1.82*	-1.39*	-6.47*	-1.74**	-0.13ns	-0.55ns	1.91ns
Y	243	2.66*	2.47*	1.24ns	1.51ns	4.15ns	1.32ns	2.83ns
Maharashtra								
P		1.71*	1.92*	1.76ns	1.88ns	0.56ns	2.35**	1.95ns
A		1.57*	1.71*	-1.01ns	2.39*	3.18***	2.48*	2.96*
Y	227	0.17ns	0.23ns	-0.65ns	-0.42ns	-2.59ns	-0.10ns	-1.08ns
Andhra Pradesh								
P		-2.31*	-2.34*	-2.69***	-4.57*	-5.22ns	-4.07*	-3.77***
A		-1.63*	-1.65*	-1.87***	-3.35*	-2.83ns	-2.93*	-1.88ns
Y	181	-0.67**	-0.70*	-0.79ns	-1.19ns	-2.55ns	-1.13ns	-2.00ns
Madhya Pradesh								
P		-2.91*	-2.77*	-9.21*	-4.38*	-5.40ns	-3.67**	-3.13ns
A		-1.69*	-1.66*	-3.26**	-3.89*	-2.30***	-3.22*	-1.39***
Y	159	-1.13***	-1.02***	-5.43**	-0.88ns	-3.04ns	-0.71ns	-1.58ns
Uttar Pradesh								
P		-0.83ns	-0.67ns	6.12**	-2.43ns	-4.87ns	-1.37ns	-1.58ns
A		1.53*	0.66ns	5.48*	1.54ns	1.47**	-0.91ns	-4.06ns
Y	155	-2.30*	-0.73ns	0.29ns	-3.88**	-6.43ns	1.50ns	6.50ns
Rajasthan								
P		-2.49**	-2.17**	-6.73***	-2.65ns	-3.21ns	-1.66ns	-0.53ns
A		-0.96*	-0.99**	2.01ns	-3.31*	-0.70ns	-2.64*	-0.15ns
Y	128	-2.51***	-1.98***	-12.60*	0.57ns	-3.08ns	1.07ns	-0.39ns
All India								
P		0.23ns	0.55ns	-1.47ns	0.54ns	1.38ns	1.35***	2.79***
A		0.15ns	0.03ns	0.45ns	-0.06ns	1.40**	-0.35ns	0.20ns
Y	194	0.09ns	0.56ns	-1.83ns	0.53ns	-0.09ns	1.70**	2.73ns

P: Production, A: Area, Y: Yield per ha.

Notes: 1. Growth rates are linear trends with slope expressed as per cent at respective means.

2. *, **, *** - significant at 1, 5 and 10 per cent levels of significance respectively; ns - not significant even at 10 per cent level of significance.

The growth rates in different states in different periods are summarised in Table 21. For 1954-84, production increased in eight states, the highest being in West Bengal (11.92 per cent per annum), followed by Himachal Pradesh and Orissa each at over 6.0 per cent, Karnataka (3.72), Assam (2.27), and Gujarat, Maharashtra, and Punjab/Haryana all below 2.0 per cent. Of the remaining seven states, in Andhra Pradesh, Kerala, Madhya Pradesh, and Rajasthan, the production declined while in Bihar, Tamil Nadu, and Uttar Pradesh, it remained more or less stagnant. Thus, in the three major producing states of Uttar Pradesh, Rajasthan, and Madhya Pradesh, the production either declined or remained stagnant.

During the earlier period, 1954-65, production increased in six states, namely, Assam, Bihar, Himachal Pradesh, Orissa, Punjab/Haryana, and Uttar Pradesh, ranging from 2.26 per cent per annum in Assam to 19.56 per cent per annum in Himachal Pradesh. In Andhra Pradesh, Gujarat, Kerala, Madhya Pradesh, Rajasthan, and Tamil Nadu, production declined while in Karnataka, Maharashtra, and West Bengal, it remained more or less stagnant.

In the later period, 1967-84, production increased in Assam, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Orissa, and West Bengal, declined in Andhra Pradesh, Bihar, and Madhya Pradesh, and remained stagnant in the remaining states. In the more recent period, 1973-84, production increased only in Assam, Orissa, and West Bengal while in all other states it either declined or remained stagnant.

TABLE 21. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN SESAMUM PRODUCTION: 1954-84 AND SUB-PERIODS

Growth	1954-82	1954-84	1954-65	1967-82	1973-82	1967-84	1973-84
Significant increase in production	Assam Himachal Pradesh Karnataka Maharashtra Orissa Punjab/ Haryana West Bengal	Assam Gujarat Himachal Pradesh Karnataka Maharashtra Orissa Punjab/ Haryana West Bengal	Assam Bihar Himachal Pradesh Orissa Punjab/ Haryana Uttar Pradesh	Assam Himachal Pradesh Karnataka Kerala Orissa West Bengal	Assam Orissa West Bengal	Assam Himachal Pradesh Karnataka Kerala Maharashtra Orissa West Bengal	Assam Orissa West Bengal
Significant decline in production	Andhra Pradesh Madhya Pradesh Rajasthan	Andhra Pradesh Kerala Madhya Pradesh Rajasthan	Andhra Pradesh Gujarat Kerala Madhya Pradesh Rajasthan Tamil Nadu	Andhra Pradesh Bihar Madhya Pradesh	Punjab/ Haryana	Andhra Pradesh Bihar Madhya Pradesh	Andhra Pradesh Punjab/ Haryana
Stagnant production							
a) Positive trend but not statistically significant	Gujarat	Nil	Karnataka	Maharashtra Punjab/ Haryana Tamil Nadu	Gujarat Himachal Pradesh Karnataka Kerala Maharashtra Tamil Nadu	Gujarat Punjab/ Haryana Tamil Nadu	Bihar Gujarat Himachal Pradesh Karnataka Kerala Maharashtra Tamil Nadu
b) Negative trend but not statistically significant	Bihar Kerala Tamil Nadu Uttar Pradesh	Bihar Tamil Nadu Uttar Pradesh	Maharashtra West Bengal	Gujarat Rajasthan Uttar Pradesh	Andhra Pradesh Bihar Madhya Pradesh Rajasthan Uttar Pradesh	Rajasthan Uttar Pradesh	Madhya Pradesh Rajasthan Uttar Pradesh

Source: Derived from Table 20

TABLE 22. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN AREA AND YIELD OF SESAMUM

States with 1	Increase in yield 2	Decline in yield 3	Yield stagnant 4	Increase in yield 5	Decline in yield 6	Yield stagnant 7
		1954-65			*1954-82*	
High Productivity Levels	Bihar Karnataka Orissa Punjab/ Haryana Orissa	Assam Kerala	Gujarat Himachal Pradesh Maharashtra Tamil Nadu West Bengal	Gujarat Karnataka Orissa Punjab/ Haryana West Bengal	Nil	Assam Bihar Himachal Pradesh Kerala Maharashtra Tamil Nadu
Low productivity levels	Nil	Madhya Pradesh Rajasthan	Andhra Pradesh Uttar Pradesh	Nil	Andhra Pradesh Madhya Pradesh Rajasthan Uttar Pradesh	Nil
Significant increase in area	Bihar	Assam	Himachal Pradesh Uttar Pradesh	Karnataka Orissa West Bengal	Uttar Pradesh	Assam Himachal Pradesh Maharashtra
Significant decline in area	Punjab/ Haryana	Kerala Madhya Pradesh	Andhra Pradesh Gujarat Tamil Nadu	Gujarat	Andhra Pradesh Madhya Pradesh Rajasthan	Bihar
Area stagnant	Karnataka Orissa	Rajasthan	Maharashtra West Bengal	Punjab /Haryana	Nil	Kerala Tamil Nadu
		1967-82			*1973-84*	
High Productivity Levels	Himachal Pradesh	Kerala	Assam Bihar Gujarat Karnataka Maharashtra Orissa Punjab/ Haryana Tamil Nadu West Bengal	Bihar	Kerala	Assam, Gujarat Himachal Pradesh Karnataka Maharashtra Orissa Punjab/Haryana Tamil Nadu West Bengal
Low Productivity Levels	Nil	Uttar Pradesh	Andhra Pradesh Madhya Pradesh Rajasthan	Nil	Nil	Andhra Pradesh Madhya Pradesh Rajasthan Uttar Pradesh
Significant increase in area	Nil	Kerala	Assam Karnataka Maharashtra Orissa West Bengal	Nil	Nil	Assam Karnataka Maharashtra Orissa West Bengal
Significant decline in area	Nil	Nil	Andhra Pradesh Bihar Gujarat Madhya Pradesh Rajasthan	Bihar	Nil	Madhya Pradesh Punjab/Haryana Uttar Pradesh
Area stagnant	Himachal Pradesh	Uttar Pradesh	Punjab/ Haryana Tamil Nadu	Nil	Kerala	Andhra Pradesh Gujarat Himachal Pradesh Rajasthan Tamil Nadu

Source: Derived from Table 20.

In Table 22, states are classified according to growth in area and yield in four periods and sub-periods, namely, 1954-65, 1954-82, 1967-82, and 1973-84. During 1954-84, the national average yield was 194 kg/ha. In 12 states, the average yields were above the national average, called the high productivity states, the highest being in the eastern states of West Bengal (503), Assam (491), and Orissa (362). In Andhra Pradesh, Madhya Pradesh, Rajasthan, and Uttar Pradesh, the yields were below the national average; the lowest being in Rajasthan (128). During 1954-82, of the 12 high productivity states, only in five states, yields increased; these are: Orissa (3.39 per cent per annum), Gujarat (2.66), and Karnataka, Punjab/Haryana, and West Bengal ranging between 1.3 and 2.0 per cent per annum. In the other high productivity states, the yields remained stagnant. The yields declined in Rajasthan (-2.51), Uttar Pradesh (-2.30), Madhya Pradesh (-1.13), and Andhra Pradesh (-0.67). Thus, in the three major producing states of Rajasthan, Uttar Pradesh, and Madhya Pradesh, the yields declined steeply.

If we consider the later sub-period, namely, 1967-82, the picture is gloomier still. Only in Himachal Pradesh yields increased (2.57 per cent per annum). In all other states, having high or low productivity, yields declined or remained stagnant. In the more recent period, 1973-84, yields increased statistically significantly, only in Bihar (5.69). In all other states, the yields declined or remained stagnant.

There appears to be little relation between the increase in area and increase in yield. For instance, during 1954-82, area increased in seven states, namely, West Bengal (11.73), Himachal Pradesh (6.77), and Assam, Karnataka, Maharashtra, Orissa, and Uttar Pradesh, ranging between 1.5 and 2.5 per cent per annum. But yields increased only in three, namely, Karnataka, Orissa, and West Bengal; in Uttar Pradesh, the yield declined; in Assam, Maharashtra, and Himachal Pradesh, the yields declined marginally or remained stagnant. Over the whole period, increase in area seems to be the main source of growth with increase in yields being secondary.

TABLE 23. CORRELATION BETWEEN AREA UNDER SESAMUM AND UNDER SUBSTITUTE CROPS AND GROWTH OF AREA OF SUBSTITUTE CROPS: 1954-82

State	Substitute crop	Correlation coefficient	Growth in area (per cent per annum)		
		1954-82	1954-82	1954-65	1967-82
1	2	3	4	5	6
Uttar Pradesh	Jowar	-0.48*	-1.44*	-0.72ns	-1.39*
	Bajra	-0.51*	-0.42*	-1.20*	-0.60**
Maharashtra	Groundnut	-0.58*	-1.50*	1.14**	-1.19***
	Jowar	0.64*	0.45*	1.16*	0.81**
Karnataka	Jowar	-0.73*	-1.66*	1.73	-3.58*
	Cotton	-0.03ns	-0.14ns	-0.30ns	-0.19ns
Madhya Pradesh	Maize	-0.61*	2.30*	1.63*	2.04*
	Cotton	0.67*	-1.50*	-1.38ns	-1.27*
Rajasthan	Bajra	0.33***	0.71**	3.06*	-0.61ns
	Cotton	-0.39***	1.98**	-1.07ns	3.33*
Andhra Pradesh	Jowar	0.60*	-0.45*	0.45ns	-1.64*
	Maize	-0.65*	2.35*	0.89***	2.22*
Tamil Nadu	Jowar	0.09ns	-0.37**	0.31ns	-0.51**
	Cotton	0.32ns	-2.17*	-1.41**	-1.90**

Note: 1. *, **, *** - significant at 1, 5 and 10 per cent levels of significance respectively; ns: - not significant even at 10 per cent level of significance.
2. For trends in sesamum area, see Table 20.

Competing crops

In order to study the changes in sesamum area vis-a-vis those of its competing crops, and factors behind them, a few status were selected for analysis. Uttar Pradesh, Maharashtra and Karnataka were selected as the 'area increasing states', Madhya Pradesh, Rajasthan and Andhra Pradesh as the 'area declining states', and Tamil Nadu was selected as the 'area stagnant state'. In Table 23 are given correlation coefficients between area under sesamum and under competing crops over the period 1954-82, and the growth rates of area under competing crops for the period 1954-82 and the sub-periods 1954-65 and 1967-82.

In **Uttar Pradesh,** Mirzapur, Lalitpur, Allahabad, Shahjahanpur. Bijnor, Jhansi, Pilibhit, Kanpur and Fatehpur districts had relatively greater area under sesamum cultivation. In these districts, sesamum is raised mostly as a mixed crop during the kharif season competing with maize, jowar, bajra, and redgram. Unlike sesamum area which witnessed a significant increase during 1954-82, the area under jowar and bajra recorded a significant decline. The increase in sesamum area was due to a significant improvement in the sesamum prices relative to jowar and bajra prices.

Maharashtra accounts for 7 to 8 per cent of the sesamum crop's area and output in the country. Almost half of the crop's output comes from Chandrapur, Jalgaon, Nagpur, Wardha and Yavatmal. Other districts with large area under sesamum are Amravati, Buldhana, Akola and Latur. The bulk of the crop is sown during the kharif season as a rain-fed crop. Coarse cereals like jowar, bajra and commercial crops like groundnut, cotton, are the main competing crops of sesamum in the state. Two substitute crops of sesamum namely, groundnut and jowar were selected to analyse the sesamum area response in Maharashtra. It was found that when sesamum area increased, groundnut area fell and *vice-versa*. However, jowar area maintained an increasing trend throughout 1954-82 although the growth in jowar area was slower than that of sesamum.

Karnataka had about 5 per cent of sesamum area and output of the country. Almost three-fourth of the crop's area and output comes from Gulbarga, Bidar, Raichur, Chitradurga, Mysore and Chikmagalur. It is mostly sown during the kharif season under rainfed conditions. Sesamum competes with jowar and cotton for area in Karnataka. During 1954-82, when jowar area increased the area under sesamum fell and *vice versa*. The area under cotton has, however, been falling over the same period. Sesamum price relative to jowar and cotton prices registered a significant rise during the period 1954-82.

Madhya Pradesh covers 11 per cent of the sesamum area and 7 per cent of sesamum output of the country. The districts of Hoshangabad, Sidhi, Chattarpur, Tikamgarh, Shahdol, Narsimpur, Morena, Raison and Panna account for more than half of the crop's area and output. The crop is mostly sown during the kharif season under rainfed conditions. It is grown both as a pure and mixed crop. Maize and cotton are the substitute crops for sesamum area. During 1954-82, while the area under sesamum and maize moved in opposite directions, cotton area moved in unison with sesamum area. The area under maize increased at the rate of about 2.3 per cent per annum while the sesamum and cotton areas declined.

Rajasthan ranks after Uttar Pradesh as the largest sesamum-growing state in India, with nearly 18 per cent of the crop's area, but only about 9 per cent of the output. The districts of Nagaur, Pali, Jodhpur, Bhilwara, Bundi, Tonk, Chittaur, Jaipur, and Siroli account for nearly three-fourth of the crop's area and two-third of the crop's output. It is mostly raised during the kharif season under rainfed conditions. Bajra and cotton are the competing crops in the State. While the area under bajra moved in unison with sesamum area during 1954-82, cotton area increased when sesamum area declined and *vice versa*. Over the period as a whole sesamum prices relative to bajra and cotton prices rose significantly, but sesamum yields fell considerably in relation to those of bajra and cotton. The gross income from sesamum relative to that of bajra and cotton too declined during the period.

Andhra Pradesh: Nearly three-fourth of the crop's output comes from Adilabad, Warrangal,

Visakhapatnam, East and West Godavari, Srikakulum, Prakasam and Rangareddy districts. The two crops competing with sesamum for area are jowar and maize. While maize area increased during 1954-82, jowar area declined like that of sesamum. As in the case of Rajasthan, although prices of sesamum in relation to jowar and maize registered an increase, the fall in yield levels of sesamum resulted in a decline in gross incomes from sesamum vis-a-vis its competing crops.

Tamil Nadu claims between 5 and 7 per cent of the sesamum area and output in the country. The area under the crop has been more or less stagnant during the last three decades. The crop's cultivation is concentrated in Tiruchirapalli, S. Arcot, Thanjavur, Tirunelveli, Periyar, Dharmapuri, Madurai and Salem districts. The kharif crop accounts for the bulk of the crop's output. Irrigation covers only about a tenth of the state's sesamum area for the rabi and summer crops. Jowar and cotton are the two competing crops of sesamum. The area under sesamum, jowar and cotton were observed to have moved in unison falling over the period as a whole. Prices of sesamum relative to jowar and cotton registered a rise during the period under review, but decline in sesamum yields, resulted in gross income showing significant declines in relation to cotton.

SAFFLOWER

Safflower is of commercial significance for its products of safflower oil and safflower dye. With the development of synthetic dyes its importance as a dye crop has declined. It is now primarily cultivated for its oil-bearing seed (known locally as *kardi* seed). Safflower is grown as a rabi crop and in rainfed conditions. It thrives best on water-retentive black cotton soils and alluvial loams. The crop is grown mostly as a mixed crop along with wheat, rabi jowar, barley or gram. It also figures in crop rotations involving wheat, gram, rabi jowar and cotton. The spiny varieties of the crop are often sown to fence a field to protect other crops from cattle menace.

The dye of the crop is obtained from its flowers whereas the oil is extracted from the seeds. The seeds which possess an oil content of 24 to 36 per cent are edible and hence are also directly consumed after frying and flavouring. The bulk of the seed is retained for oil extraction purposes. The cold pressed oil, golden yellow in colour, is used for cooking purposes or for making soap, whereas the oil obtained by dry hot distillation which is black and sticky is used only for greasing well ropes and leather goods exposed to water. On account of its good drying properties, safflower oil is also used for the manufacture of paints, varnishes, linoleum, glass cement, etc. Its oil has medicinal value particularly for treating sores, rheumatism and preventing heart diseases. The oilcake is put to the same uses as of other oilseed crops, either as cattle feed or manure.

As a minor crop, it was excluded from the list of forecast crops until the mid-sixties for the purposes of estimating area and output. However, some *ad hoc* estimates on the crop's area and output for a few years from 1957-58 to 1961-62 are available. Regular annual forecasts of its area and output commenced from 1965-66 (Table 24).

TABLE 24. AREA AND PRODUCTION OF SAFFLOWER: 1957-85

Period	Area ('000 hectares)	Production ('000 tonnes)
1957-60	519.39	96.72
1969-72	588.67	142.33
1981-84	781.00	429.50
1984-85	918.10	515.20

Source: Estimates for 1957-58 to 1959-60 are taken from *Report on the Marketing of Safflower Seed in India*. Directorate of Marketing and Inspection, Ministry of Food and Agriculture, Govt. of India, 1967 (Marketing Series No. 168); remaining data are taken from various issues of *Estimates of Area and Production of Principal Crops in India*, Directorate of Economic and Statistics, Ministry of Agriculture, Government of India.

The area under safflower cultivation was 519.39 thousand ha during 1957-60 and the bulk of it was in the black cotton soils of peninsular India. The area increased to 781.00 thousand ha during 1981-84 and to 918.1 thousand ha in 1984-85. Output of the crop increased from 96.72 thousand tonnes in 1957-60 to 515.20 thousand tonnes in 1984-85.

Taking the period from 1965-84, area under safflower increased at 2.82 per cent per annum while production increased at 9.59 per cent per annum; this was because yield per ha increased at 7.17 per cent per annum. Unlike other oilseeds, in the case of safflower, yield seems to be the main source of growth in crop output, with area playing a secondary role. During 1973-84, area, yield, and production rose at 2.33, 7.10, and 9.50 per cent per annum respectively. Yield continued to be the main source of growth in output, followed by area.

The relative position of the crop in different states during 1981-84 is indicated in Table 25. Maharashtra, Karnataka and Andhra Pradesh account for virtually the entire area and output of the crop, their combined share being 99 per cent or so. The remaining area is spread over Orissa, Madhya Pradesh and Bihar. Maharashtra is the leading safflower-producing state in the country, its share in area and output being 70.7 and 75.7 per cent, respectively, followed by Karnataka (22.3 and 20.3), and Andhra Pradesh (6.0 and 3.3). These states contain black cotton soil and many of their districts are drought-prone. For the country as a whole, the crop's share in the gross cropped area is only 0.4 per cent. In Maharashtra and Karnataka, the crop's share in the gross cropped area is 2.8 and 1.6 per cent, respectively. Safflower's share in the total oilseeds area is a little over 4 per cent and in the edible oilseeds area, 4.8 per cent. In Maharashtra 26 and 30 per cent of the area under all oilseeds (total oilseeds) and edible oilseeds output is accounted for by safflower. In Karnataka its share in the total oilseeds/edible oilseeds area and edible oilseeds output ranges between 10 and 13 per cent.

TABLE 25. AREA AND PRODUCTION OF SAFFLOWER: AVERAGE FOR 1981-84

(per cent)

States	Area	Production	Share of safflower in			
			Gross cropped area	Area under all oilseeds	Area under edible oilseeds	Production of edible oilseeds
Maharashtra	70.7	75.7	2.8	26.3	30.0	27.4
Karnataka	22.3	20.3	1.6	11.9	12.6	10.2
Andhra Pradesh	6.0	3.3	0.4	2.3	2.6	1.0
Orissa	0.7	0.5	0.1	0.6	0.7	0.4
Madhya Pradesh	0.2	0.1	0.01	0.1	0.1	0.04
Bihar	0.1	0.1	0.004	0.2	0.3	0.2
All India	100.0 (781)	100.0 (430)	0.4	4.2	4.8	3.9

Note: Figures in parentheses are actual area and production in thousand ha and thousand t respectively.
Source: *Estimates of Area and Production of Principal Crops in India*, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India (relevant issues).

In Table 26 are presented growth rates in different states in different periods. Taking the whole period 1965-84, production increased in Maharashtra (9.96 per cent per annum) and Karnataka (9.76). In Andhra Pradesh, it remained stagnant. These rates are summarised in Table 27.

TABLE 26. GROWTH OF SAFFLOWER IN DIFFERENT STATES 1965-84 AND SUB-PERIODS

	States		Average yield kg/ha 1965-84	Growth rates (per cent per annum)					
				1965-82	1965-84	1967-82	1973-82	1967-84	1973-84
1.	Bihar	P		-6.00^{ns}	-5.43^{ns}	-10.25**	-9.47**	-8.67**	-5.65***
		A		-6.12^{ns}	-5.66^{ns}	-11.65***	-10.21*	-9.96***	-5.96**
		Y	424	-2.70^{ns}	-2.13^{ns}	0.51^{ns}	-0.40^{ns}	0.50^{ns}	-0.22^{ns}
2.	Maharashtra	P		10.15*	9.96*	9.82*	7.66**	9.77*	8.68*
		A		3.89*	3.63*	3.79*	3.11*	3.51*	2.70*
		Y	336	6.85*	6.96*	6.43*	4.22^{ns}	6.70*	5.81*
3.	Karnataka	P		9.88*	9.76*	10.87*	16.74*	10.48*	13.44*
		A		1.54*	1.55*	1.31**	0.50^{ns}	1.37*	0.90^{ns}
		Y	259	8.30*	8.33*	9.51*	16.06*	9.21*	12.58*
4.	Madhya Pradesh	P		-2.60**	0.28^{ns}	-3.52**	-4.74^{ns}	0.29^{ns}	4.44^{ns}
		A		-1.87^{ns}	0.65^{ns}	-2.41***	-2.97^{ns}	0.85^{ns}	4.33^{ns}
		Y	223	-0.55^{ns}	-0.42^{ns}	-0.93^{ns}	-0.03^{ns}	-0.68^{ns}	0.36^{ns}
5.	Andhra Pradesh	P		-0.99^{ns}	2.35^{ns}	-3.09^{ns}	-7.16^{ns}	1.52^{ns}	5.13^{ns}
		A		-3.33***	-1.49^{ns}	-4.99^{ns}	-3.29^{ns}	-2.32^{ns}	2.66^{ns}
		Y	222	2.97**	3.68*	2.46^{ns}	-1.06^{ns}	3.44*	2.50^{ns}
	All-India	P		9.61*	9.59*	9.48*	8.96*	9.56*	9.50*
		A		2.87*	2.82*	2.65*	2.26*	2.65*	2.33*
		Y	311	7.10*	7.17*	7.04*	6.56**	7.17	7.10*

P-Production; A-Area; Y-Yield per ha.
Note: 1. Growth rates are linear trends with slope expressed as per cent at respective means.
2. *, **, *** - Significant at 1,5 and 10 per cent levels of significance respectively; ns-not significant even at 10 per cent level of significance.

TABLE 27. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN SAFFLOWER PRODUCTION 1965-84 AND SUB-PERIODS

Growth	1965-82	1965-84	1967-82	1973-82	1967-84	1973-84
Significant increase in production	Karnataka Maharashtra Madhya Pradesh	Karnataka Maharashtra Nil	Karnataka Maharashtra Bihar Madhya Pradesh	Karnataka Maharashtra Bihar	Karnataka Maharashtra Bihar	Karnataka Maharashtra Bihar
Significant decline in production						
Stagnant production						
a) Positive trend but not statistically significant	Nil	Andhra Pradesh Madhya Pradesh Bihar	Nil	Nil	Andhra Pradesh Madhya Pradesh	Andhra Pradesh Madhya Pradesh
b) Negative trend but not statistically significant	Bihar Andhra Pradesh		Andhra Pradesh	Andhra Pradesh Madhya Pradesh	Nil	Nil

Source: Derived from Table 26.

In Table 28, states are classified according to growth in area and yield in different periods. During the period 1965-84, the all-India average yield was 311 kg/ha. Only Bihar (424) and Maharashtra (336) had higher yields (high productivity states). The other three states, namely, Andhra Pradesh, Karnataka and Madhya Pradesh had yields ranging between 221 and 260 kg/ha (low productivity states). Growth in yield was the highest in Karnataka (8.33 per cent per annum) followed by Maharashtra (6.96) and Andhra Pradesh (3.68). The area increased both in Maharashtra (3.63 per cent per annum) and Karnataka (1.55). In Andhra Pradesh, Bihar and in Madhya Pradesh, area remained more or less stagnant.

In the last decade, 1973-84, growth in yield was higher in Karnataka (12.58 per cent per annum) than in Maharashtra (5.81). But while the area increased in Maharashtra (2.70 per cent per annum), it remained stagnant in Karnataka. In Bihar, Andhra Pradesh and Madhya Pradesh the

yields were more or less stagnant. In Andhra Pradesh and Madhya Pradesh, area also remained stagnant. Bihar was the only state where the area under safflower declined.

TABLE 28. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN AREA AND YIELD OF SAFFLOWER

States with	Increase in yield	Decline in yield	Yield stagnant	Increase in yield	Decline in yield	Yield stagnant
		1965-84			1967-84	
High Productivity levels	Maharashtra	Nil	Bihar	Maharashtra	Nil	Bihar
Low Productivity levels	Andhra Pradesh Karnataka	Nil	Madhya Pradesh	Andhra Pradesh Karnataka	Nil	Madhya Pradesh
Significant increase in area	Karnataka Maharashtra	Nil	Nil	Karnataka Maharashtra	Nil	Nil
Significant decline in area	Nil	Nil	Nil	Nil	Nil	Bihar
Area stagnant	Andhra Pradesh	Nil	Bihar Madhya Pradesh	Andhra Pradesh	Nil	Madhya Pradesh
		1967-82			*1973-84*	
High Productivity levels	Maharashtra	Nil	Bihar	Maharashtra	Nil	Bihar
Low Productivity levels	Karnataka	Nil	Andhra Pradesh Madhya Pradesh	Karnataka	Nil	Andhra Pradesh Madhya Pradesh
Significant increase in area	Karnataka Maharashtra	Nil	Nil	Maharashtra	Nil	Nil
Significant decline in area	Nil	Nil	Andhra Pradesh Bihar Madhya Pradesh	Nil	Nil	Bihar
Area stagnant	Nil	Nil	Nil	Karnataka	Nil	Andhra Pradesh Madhya Pradesh

Source: Derived from Table 26.

NIGER

Niger can be raised as a *kharif* or a *rabi* crop, but bulk of the crop in India is sown during the kharif season as a rainfed crop. It is grown mainly on marginal and sub-marginal lands, on hill tops and slopes, or on poor soils of coarse texture. The crop is grown either as a pure crop or as a mixed crop with coarse cereals, pulses, or cash crops like cotton, groundnut, castor, etc.

The crop is primarily cultivated for the sake of its oil content of about 37 to 43 per cent of the seed weight. The seeds can also be directly consumed after frying or for making condiments. However, the bulk of nigerseed in the country is retained for oil. The oil is primarily used for culinary purposes. Lower grades of the oil are used for making soaps and for lighting. Being cheap, it is also used to adulterate more expensive vegetable oils. The nigerseed oilcake is used either as a cattle feed or manure.

No systematic efforts were made to compile data on the crop until the mid-sixties when the crop was included among the list of forecast crops. Some *ad hoc* estimates are available for a few years from 1946-47 to 1948-49 (Table 29).

TABLE 29. AREA AND PRODUCTION OF NIGER, 1946-85

Period	Area ('000 ha)	Production ('000 tonnes)
1946-49	322.99	71.95
1969-72	488.33	114.00
1981-84	555.40	148.33
1984-85	590.00	148.00

Source: Estimates for 1946-47 to 1948-49 are taken from *Report on the Marketing of Sesamum and Nigerseed in India*, Directorate of Marketing and Inspection, Ministry of Food and Agriculture, Government of India, 1952 (Marketing Series No. 72); remaining data are taken from various issues of *Estimates of Area and Production of Principal Crops in India*, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

In 1946-49, about 323 thousand ha were under niger cultivation in the country. The area increased to about 590 thousand ha by 1984-85. Nigerseed production was estimated at about 71.95 thousand tonnes in 1946-49. It increased to 148.00 thousand tonnes by 1984-85.

Table 30 presents the distribution of the crop in different states in 1981-84. Madhya Pradesh, Orissa, and Maharashtra together accounted for over 80 per cent of the area and output. Madhya Pradesh accounted for about 40.0 per cent of area and Orissa for over 40 per cent of output. In the aggregate, Niger occupied barely 0.3 per cent of the gross cropped area, 3.0 per cent area under all oilseeds, 3.4 per cent of area under edible oilseeds and 1.4 per cent of output of edible oilseeds. But, in Bihar, it accounted for 26.3 per cent of the area and 20.1 per cent of output of edible oilseeds. In Orissa, it accounted for 17.7 per cent of area and 10.2 per cent of output of edible oilseeds. For Madhya Pradesh, the corresponding figures are 13.4 and 4.9 per cent respectively. In other states, it accounts for only a small proportion of area and output of edible oilseeds.

TABLE 30. AREA AND PRODUCTION OF NIGER: AVERAGE FOR 1981-84

(per cent)

States	Area under niger	Production of nigerseed	Share of niger to			
			Gross cropped area	Area under all oilseeds	Area under all edible oilseeds	Production of all edible oilseeds
Madhya Pradesh	39.8	28.5	1.0	10.0	13.4	4.9
Orissa	25.0	40.3	1.6	16.1	17.7	10.2
Maharashtra	17.0	13.2	0.5	4.5	5.1	1.6
Karnataka	9.7	6.3	0.5	3.7	3.9	1.1
Bihar	7.0	9.9	0.4	16.3	26.3	20.1
Andhra Pradesh	1.4	1.7	0.1	0.4	0.5	0.2
Others	0.1	0.1	0.001	0.01	0.01	0.002
All India	100.0 (555.4)	100.0 (148.3)	0.3	3.0	3.4	1.4

Note: 1) Figures in parentheses give actual area and production in thousand ha and thousand t respectively.
2) Other states include Uttar Pradesh, Rajasthan, West Bengal and Dadra-Nagar Haveli, etc.
Source: Estimates of Area and Production of Principal Crops in India, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India (relevant issues).

In Table 31 are presented growth rates for production, area, and yield in different states in different periods. In the aggregate, over the whole period 1965-84, production, area, and yield increased at the rate of 2.95, 1.48, and 1.66 per cent per annum respectively. Nigerseed production was more or less stagnant during 1973-84.

TABLE 31. GROWTH OF NIGER IN DIFFERENT STATES: 1965-84 AND SUB-PERIODS

States		Average yield kg/ha 1965-84	Growth rates (per cent per annum)					
			1965-82	1965-84	1967-82	1973-82	1967-84	1973-84
1. Andhra Pradesh	P		8.05**	4.24ns	7.12***	-2.29ns	2.76ns	-8.17ns
	A		-2.27**	-2.92*	-1.43ns	4.30ns	-2.43***	-0.20ns
	Y	478	8.39*	5.04***	6.92**	-6.42ns	3.28ns	-9.23*
2. Orissa	P		6.72*	6.45*	6.39*	5.03**	6.18*	5.46**
	A		6.30*	5.68*	7.15*	6.38*	6.19*	4.90**
	Y	388	0.73ns	0.89ns	-0.51ns	-1.62ns	-0.01ns	0.12ns
3. Bihar	P		1.52ns	0.63ns	1.46ns	0.16ns	0.38ns	-1.73ns
	A		0.05ns	-0.90ns	0.11ns	-4.41*	-1.08ns	-5.34*
	Y	326	1.40ns	1.57***	1.11ns	4.18***	1.38ns	3.41**
4. Karnataka	P		8.02*	6.75*	7.91*	2.79***	6.44*	1.88***
	A		8.18*	6.90*	8.05*	4.64**	6.58*	3.01**
	Y	181	-0.54ns	-0.51ns	0.22ns	-2.20**	0.10ns	-1.43**
5. Madhya Pradesh	P		-0.70ns	-0.28ns	-1.71ns	-6.54***	-0.97ns	-2.96ns
	A		-0.55ns	-0.84*	-0.38ns	-3.81*	-0.77ns	-3.41*
	Y	161	-0.27ns	0.55ns	-1.45ns	-2.70ns	-0.17ns	0.71ns
6. Maharashtra	P		3.21**	2.94**	3.67**	6.41**	3.25**	4.27***
	A		2.60*	1.94*	2.76*	1.54ns	1.91*	0.12ns
	Y	161	0.56ns	0.99ns	0.85ns	4.52ns	1.33ns	3.91ns
All-India	P		3.21*	2.95*	2.85*	0.60ns	2.63*	1.08ns
	A		1.97*	1.48*	2.43*	-0.0001ns	1.72*	-0.57ns
	Y	224	1.47**	1.66*	0.75ns	0.61ns	1.16***	1.62ns

P-Production; A-Area; Y-Yield per ha.
Note: 1. Growth rates are linear trends with slope expressed as per cent at respective means.
2. *, **, *** - Significant at 1,5 and 10 per cent levels of significance respectively; ns-not significant even at 10 per cent level of significance.

Growth rates in different states in different periods are summarised in Table 32. Considering the whole period 1965-84, production increased in Karnataka and Orissa at rates over 6 per cent per annum; in Maharashtra it increased at 2.94 per cent per annum. There was no significant decline in production in any state. If we take the period 1965-82, in Andhra Pradesh, production increased at 8.05 per cent per annum. Considering the period 1973-84, production increased in Karnataka, Maharashtra and Orissa at 1.88, 4.27 and 5.46 per cent per annum respectively. In Madhya Pradesh which accounted for about 40 per cent of the aggregate area under nigerseed, production declined at -2.96 per cent per annum. Production remained more or less stagnant in Andhra Pradesh and Bihar during 1973-84.

TABLE 32. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN NIGER PRODUCTION: 1965-84 AND SUB-PERIODS

Growth	1965-82	1965-84	1967-82	1973-82	1967-84	1973-84
Significant increase in production	Andhra Pradesh Karnataka Maharashtra	Karnataka Maharashtra Orissa	Andhra Pradesh Karnataka Maharashtra	Karnataka Maharashtra Orissa	Karnataka Maharashtra Orissa	Karnataka Maharashtra Orissa
Significant decline in production	Nil	Nil	Nil	Madhya Pradesh	Nil	Nil
Stagnant Production						
a) Positive trend but not statistically significant	Bihar	Andhra Pradesh Bihar	Bihar	Bihar	Andhra Pradesh Bihar	Nil
b) Negative trend but not statistically significant	Madhya Pradesh	Madhya Pradesh	Madhya Pradesh	Andhra Pradesh	Madhya Pradesh	Andhra Pradesh Bihar Madhya Pradesh

Source: Derived from Table 31.

TABLE 33. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN AREA AND YIELD OF NIGER

States with	Increase in yield	Decline in yield	Yield stagnant	Increase in yield	Decline in yield	Yield stagnant
		1965-84			*1967-84*	
High Productivity Levels	Andhra Pradesh Bihar	Nil	Orissa	Nil	Nil	Andhra Pradesh Bihar, Orissa
Low Productivity Levels	Nil	Nil	Karnataka Madhya Pradesh Maharashtra	Nil	Nil	Karnataka Madhya Pradesh Maharashtra
Significant increase in area	Nil	Nil	Karnataka Maharashtra Orissa	Nil	Nil	Karnataka Maharashtra Orissa
Significant decline in area	Andhra Pradesh	Nil	Madhya Pradesh	Nil	Nil	Andhra Pradesh
Area stagnant	Bihar	Nil	Nil	Nil	Nil	Bihar Madhya Pradesh
		1967-82			*1973-84*	
High Productivity Levels	Andhra Pradesh	Nil	Bihar Orissa	Bihar	Andhra Pradesh	Orissa
Low Productivity Levels	Nil	Nil	Karnataka Madhya Pradesh Maharashtra	Nil	Karnataka	Madhya Pradesh Maharashtra
Significant increase in area	Nil	Nil	Karnataka Maharashtra Orissa	Nil	Karnataka	Orissa
Significant decline in area	Nil	Nil	Nil	Bihar	Nil	Madhya Pradesh
Area stagnant	Andhra Pradesh	Nil	Bihar Madhya Pradesh	Nil	Andhra Pradesh	Maharashtra

Source: Derived from Table 31.

In Table 33, states are classified according to growth in area and yield in different periods. During 1965-84, the all-India average yield of nigerseed for the country was about 224 kg/ha. The yields in Andhra Pradesh (478), Orissa (388), and Bihar (326) were above the all-India average (high productivity states) whereas Karnataka, Madhya Pradesh and Maharashtra, they ranged between 161 and 181 kg/ha (low productivity level states). Taking the 19 year period 1965-84, among the three high productivity states, yields increased in Andhra Pradesh at 5.04 per cent per annum, in Bihar at 1.57 per cent per annum but, in Orissa, they remained stagnant. Among the low productivity states, the yields declined in Karnataka but increased in Madhya Pradesh, and Maharashtra; however, the trends were not statistically significant. On the other hand, area increased in Karnataka (6.90 per cent per annum), Orissa (5.68) and Maharashtra (1.94). The area declined in Andhra Pradesh (-2.92), and Madhya Pradesh (-0.84). In Bihar too area declined but the trend was not statistically significant.

In the recent period, 1973-84, the yields increased in Bihar at 3.41 per cent per annum, but declined in Andhra Pradesh (-9.23 per cent) and remained stagnant in Orissa. They also declined in Karnataka (-1.43) and remained more or less stagnant in Madhya Pradesh and Maharashtra. Area increased in Karnataka (3.01) and Orissa (4.90) but declined in Bihar (-5.34) and Madhya Pradesh (-3.41) and remained stagnant in Andhra

Pradesh and Maharashtra.

SUNFLOWER

Cultivation of sunflower as an oilseed crop began in 1969 when some exotic varieties, mostly Russian, were introduced into the country. Sunflower can be grown all the year round. It requires warm climate with moderate rainfall but can adjust to a wide range of wet and dry conditions, is drought resistant and can withstand several degrees of frost. There are three distinct varieties, giant, semi-dwarf, and dwarf. The dwarf varieties are generally preferred since they mature early and the seeds have higher oil content than other varieties. The crop generally requires 90 to 100 days to mature but some new varieties have been evolved which mature within 75 days.

The oil content of sunflower seed generally varies from 22 to 36 per cent but can go up to 50 per cent in oil-rich varieties. Sunflower oil is valued for its high percentage of polyunsaturated fatty acids (60 per cent) which controls cholesterol and hence is useful to heart patients. It is mostly used for cooking and other edible purposes. The seeds can be eaten directly after frying and flavouring or fed directly to cattle and poultry. The cake is a good protein supplement for livestock. The stalks are useful as fodder.

TABLE 34. AREA AND PRODUCTION OF SUNFLOWER 1970-85

Period	Area ('000 ha)	Production ('000 tonnes)
1970-73	116.8	76.3
1973-76	297.3	204.3
1978-81	120.9	66.3
1981-84	480.0	229.5
1984-85	834.6	439.8

Source: Estimates of Area and Production of Principal Crops in India, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India (various issues).

In Table 34 are given estimates of area and production of sunflower for a few selected years. Sunflower cultivation covered 116.8 thousand ha during 1970-73. During the first decade of its introduction, 1970-81, the area fluctuated but then increased steeply to 480.0 thousand ha in 1981-84 and further to 834.6 thousand ha in 1984-85. Production amounted to 439.8 thousand tonnes in 1984-85.

TABLE 35. AREA AND PRODUCTION OF SUNFLOWER: AVERAGE FOR 1981-84

States	Area	Production	Share of sunflower to			
			Gross cropped area	Area under all oilseeds	Area under all edible oilseeds	Production of all edible oilseeds
Maharashtra	44.1	45.9	1.1	10.1	11.5	8.9
Karnataka	43.6	42.2	1.9	14.2	15.1	11.3
Tamil Nadu	7.4	7.5	0.6	3.0	3.0	1.5
Andhra Pradesh	3.0	2.4	0.1	0.7	0.8	0.4
Uttar Pradesh	0.8	1.1	0.01	0.1	0.1	0.2
Rajasthan	0.5	0.3	0.01	0.2	0.2	0.1
West Bengal	0.3	0.3	0.02	0.4	0.5	0.5
Orissa	0.2	0.2	0.01	0.1	0.1	0.1
Bihar	0.1	0.1	0.01	0.3	0.4	0.3
All India	100.0 (480.0)	100.0 (229.5)	0.3	2.6	2.9	2.1

Note: Figures in parentheses give actual area and production in thousand ha and t respectively.
Source: Estimates of Area and Production of Principal Crops in India, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India (relevant issues).

Table 35 shows the distribution (per cent to all India total) of sunflower area and production in major producing states during 1981-84. Maharashtra and Karnataka together accounted for over 87 per cent of area and output and Tamil Nadu and Andhra Pradesh another 10 per cent. Sunflower occupies only about 0.3 per cent of the aggregate gross cropped area, 2.6 per cent of area under all oilseeds, 2.9 per cent of area under edible oilseeds and 2.1 per cent of production of oilseeds. However, in Karnataka it accounted for 15.1 per cent of area and 11.3 per cent of production of edible oilseeds; the corresponding percentages in Maharashtra were 11.5 and 8.9.

TABLE 36. GROWTH OF SUNFLOWER IN DIFFERENT STATES: 1970-84

States	Average yield kg/ha 1970-84	Growth rate (per cent per annum)		
		Production	1970-84 Area	Yield
1. Uttar Pradesh†	770	-5.61^{ns}	-5.73***	-0.15^{ns}
2. Karnataka	640	12.39**	18.51*	1.50^{ns}
3. Orissa†	576	-24.66*	-24.67*	-3.30^{ns}
4. Tamil Nadu	575	-11.39*	-6.32^{ns}	-6.63*
5. Maharashtra†	495	25.04*	24.71*	0.71^{ns}
6. Bihar†	468	-27.08*	-28.34*	-3.28^{ns}
7. Andhra Pradesh	452	-11.33^{ns}	-9.54***	-0.05^{ns}
8. West Bengal†	334	-13.14^{ns}	-21.47*	10.60***
All India	584	4.54^{ns}	8.55*	-3.01*

Note: 1. † Based on data for 1973-84.
2. Growth rates are linear trends with slope expressed as per cent at respective means.
3. *, **, *** - Significant at 1,5 and 10 per cent levels of significance respectively; ns-not significant even at 10 per cent level of significance.

In Table 36 are given growth rates of production, area, and yield of sunflower in different states during the period 1970-84 (1973-84 for some states). Growth rates in production are summarised in Table 37. In the aggregate, area increased at 8.55 per cent per annum but production only at 4.54 per cent per annum because the yield declined at -3.01 per cent per annum. Only in Karnataka and Maharashtra, the area, production and yield increased; in all other states, they declined. In Karnataka, the growth rates in area, production, and yield were 18.51, 12.39, and 1.50 per cent per annum respectively. In Maharashtra, the corresponding growth rates were 24.71, 25.04, and 0.71 respectively. In Bihar, Orissa, and Tamil Nadu, production declined at rates ranging from -27.08 per cent per annum in Bihar to -11.39 per cent per annum in Tamil Nadu. In Andhra Pradesh, Uttar Pradesh, and West Bengal production was more or less stagnant.

TABLE 37. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN SUNFLOWER PRODUCTION: 1970-84

Growth	1970-84*
Significant increase in production	Karnataka, Maharashtra
Significant decline in production	Bihar, Orissa Tamil Nadu
Production is stagnant:	
a) Positive trend but not statistically significant	Nil
b) Negative trend but not statistically significant	Andhra Pradesh Uttar Pradesh West Bengal

Note: * Trends for Andhra Pradesh, Karnataka and Tamil Nadu are for the period 1970-84. For other states they are for the period 1973-84.
Source: Derived from Table 36.

In Table 38, states are classified according to growth in area and yield during 1970-84 or 1973-84 as the case may be. The all India average yield during 1970-84 was 584 kg/ha. The yields were higher in Uttar Pradesh (770) and Karnataka (640) but they remained more or less stagnant. In Orissa and Tamil Nadu, yields were about 575 kg/ha, and in Andhra Pradesh, Bihar, and Maharashtra between 450 and 495 kg/ha. In West Bengal, the yields were the lowest (334) but, during the decade 1973-84, they increased at 10.6 per cent per annum. In Tamil Nadu they declined at the rate of -6.63 per cent per annum. In Andhra Pradesh, Bihar, Maharashtra, and Orissa, they were more or less stagnant.

Area increased in Karnataka (18.51 per cent per annum) and Maharashtra (24.71). It declined in Bihar, Orissa, and West Bengal, at rates varying from -28.34 per cent per annum in Bihar to -21.47 per cent per annum in West Bengal. In Uttar Pradesh and Andhra Pradesh also, area declined at -9.54 and -5.73 per cent per annum respectively. In Tamil Nadu, it remained more or less stagnant.

TABLE 38. CLASSIFICATION OF STATES ACCORDING TO GROWTH IN AREA AND YIELD OF SUNFLOWER: 1970-84

States with	Increase in yield	Decline in yield	Yield stagnant
High Productivity Levels	Nil	Nil	Karnataka Uttar Pradesh
Low Productivity Levels	West Bengal	Tamil Nadu	Andhra Pradesh Bihar, Maharashtra, Orissa
Significant increase in area	Nil	Nil	Karnataka Maharashtra
Significant decline in area	West Bengal	Nil	Andhra Pradesh Bihar, Orissa Uttar Pradesh
Area stagnant	Nil	Tamil Nadu	Nil

Source: Derived from Table 36.

SOYBEAN

Soybean has been cultivated in the plains and foothills of India for several decades. Efforts to cultivate the crop on a large scale with institutional support commenced in the late sixties. Soybean can be raised either independently or as a mixed crop with maize or autumn paddy. Being a leguminous crop, soybean enhances soil fertility and hence is useful as a rotation crop. Soybean seeds possess an oil content of 15 to 20 per cent and protein content of around 40 per cent. However, generally, when the protein content is high the oil content is poor. Black seeded varieties of soybean generally contain a higher percentage of protein content and lower percentage of oil than the yellow or chocolate seeded varieties. In terms of protein content, soybean outstrips other foodstuffs, such as, groundnut, pulses, mutton, beef and fish. Being protein rich, soybeans are used as a protein supplement in a cereal-based diet which is important in the context of the low per capita availability of pulses in India, the main source of proteins for vegetarians in the country. Soybean can also be processed to make flour, milk substitutes, curd and other fermented products. Refined oil is used as salad or cooking medium whereas other brands are used for making paints, varnishes, enamels, etc. The soybean meal/cake is used as food for humans and for livestock/poultry.

Estimates of the area and production of soybean for selected years during 1970-85 are presented in Table 39. Area increased from 32.83 thousand ha during 1970-73 to 1,242.70 thousand ha. during 1984-85. Production increased from 18.40 thousand tonnes during 1970-73 to 954.80 thousand tonnes during 1984-85.

TABLE 39. AREA AND PRODUCTION OF SOYBEAN 1970-85

Period	Area ('000 hectares)	Production ('000 tonnes)
1970-73	32.83	18.40
1975-78	137.57	132.43
1981-84	692.88	487.67
1984-85	1,242.70	954.80

Source: Estimates of Area and Production of Principal Crops in India, (various issues), Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

The relative position of states in respect of soybean area and production during 1981-84 is given in Table 40. Madhya Pradesh alone accounts for over 72 per cent of area and production and Uttar Pradesh another 23 per cent. The remaining area and production is distributed over Rajasthan, Gujarat, Sikkim, West Bengal and the north-eastern states. Soybean accounts for only 4.2 and 4.5 per cent of area and production of all edible oilseeds in the aggregate. However, in Madhya Pradesh, these percentages were 22.6 and 30.3 respectively. It is also an important oilseed crop in Sikkim accounting for 37.1 per cent of area and production of all edible oilseeds. In Nagaland too, it accounted for 11.5 per cent of area and production of all edible oilseeds. But, of course, these constitute a small proportion of the area and production in the aggregate.

TABLE 40. AREA AND PRODUCTION OF SOYBEAN AVERAGE FOR 1981-84

States	Area under soybean	Production of Soybean	Share of soybean to			
			Gross cropped area	Area under all oilseeds	Area under all edible oilseeds	Production of all edible oilseeds
Madhya Pradesh	72.4	72.4	2.3	22.6	30.3	41.1
Uttar Pradesh	23.1	23.8	0.6	5.1	5.8	8.8
Rajasthan	2.0	2.0	0.1	1.0	1.1	1.3
Gujarat	1.6	0.9	0.1	0.4	0.4	0.2
Sikkim	0.4	0.6	3.4	37.1	37.1	45.8
Arunachal Pradesh	0.1	0.1	0.01	7.3	7.3	6.7
Meghalaya	0.1	0.1	0.3	9.0	9.0	14.2
West Bengal	0.1	0.04	0.01	0.1	0.2	0.2
Nagaland	0.1	0.04	0.3	11.5	11.5	12.8
Himachal Pradesh	0.1	0.02	0.04	2.1	2.6	2.1
All-India	100.0 (692.9)	100.0 (485.7)	0.04	3.7	4.2	4.5

Note: Figures in parentheses give actual area and production in thousand ha and thousand t respectively.
Source: Estimates of Area and Production of Principal Crops in India, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India (relevant issues).

CONCLUSIONS

The above discussion suggests that area has been the main source of growth in output of most edible oilseeds, yield being of secondary importance. Only in safflower and rapeseed-mustard, yields seem to have played a relatively important role. Nevertheless, the current safflower yields are just half that of groundnut. In the case of rapeseed-mustard, the increase in yields may be due to the fact that, being mostly a mixed crop raised with wheat, it is able to benefit from the residual effects of the inputs applied to the main crop (wheat).

The Green Revolution appears to have worked to the detriment of most edible oilseeds. In the post Green Revolution period (1967-84), their production has either declined or stagnated or growth decelerated compared to the pre Green Revolution period (1954-65). Yields of some edible oilseeds had shown improvements in some states during 1954-65 but they had been more or

less stagnant in most states during 1967-84. Unlike most edible oilseeds, the area under rapeseed-mustard expanded significantly in most states during 1967-84. But this was due to the fact that being a mixed crop grown with wheat, area under rapeseed-mustard grew as area under wheat expanded rapidly in the wake of the Green Revolution.

The growth of production of edible oilseeds has varied from region to region and even from state to state. This has affected the overall national performance depending upon the weightage of the states in respect of production of each edible oilseed. The overall good performance of groundnut, for instance, was solely due to its good performance in Gujarat and Orissa. Similarly, safflower's good performance was solely due to its good performance in Maharashtra and Karnataka.

BIBLIOGRAPHY

Common Abbreviations Used:

EPW-Economic and Political Weekly, Bombay
IJAE-Indian Journal of Agricultural Economics, Bombay
ASI - Agricultural Situation in India, New Delhi.

1. Achaya, K.T., 1975; Tackling the Edible Oil Famine, *EPW*, May 10, 1975.
2. Agro-Economic Research Centre, 1979; *Report on the Study of Intensive Oilseed Development Programme in Newly Irrigated Areas*, 1977-78, AERC, Andhra University, Waltair, 1979.
3. Agro-Economic Research Centre, 1983; *Problem of Growth of Oilseeds: A Study of Mustard in West Bengal*, AERC Santiniketan 1983.
4. Agro-Economic Research Centre, 1984; *Problems in Growth of Oilseeds - Groundnut in Tamil Nadu*, AERC, Madras (Study No. 78).
5. Askari, Hossein and J.T. Cummings, 1976; *Estimating Agricultural Supply Response: A Survey of Econometric Evidences*. Praeger Publishers, New York.
6. Behrman, J.R., 1968; *Supply Response in Underdeveloped Agriculture-A Case Study of Four Major Annual Crops in Thailand, 1937-1963*. North Holland Publishers.
7. Chandrachud, M.G., 1966; Co-operativization of Groundnut Processing, *IJAE*, Vol. 20(4), October-December 1966.
8. Chandrasekharan, S. and K.T. Achaya, 1980; Profile of Indian Vegetable Oil Industry, *EPW*, Vol. 15(8) February 23, 1980 and Vol. 15(9) March 1, 1980.
9. Chattrapati, A.C., 1980; Trends in Oilseeds Production, *EPW* September 13, 1980.
10. Chattrapati, A.C., 1985; *The Vanaspati Oil Industry-Historical Review*, Popular Prakashan, Bombay.
11. Chattrapati, A.C., 1986; Oilseeds Development: Evaluating the Thrust Mission, *Economic Times* Bangalore, June 16, 1986.
12. Desai, D.K. and A.G.K. Murthy, 1968; *A Study of Solvent Extraction and Expeller Oil Industries*, C.M.A., Indian Institute of Management, Ahmedabad.
13. Development Board 1979; *Oilseeds and Edible Oils Sector:* Status Report, 1979.
14. Directorate of Oilseeds Research, 1984; *Rapeseed and Mustard, Safflower, Linseed-Package of Practices for Increasing Production*, Extension Bulletin No. 1, DOR, Hyderabad.
15. Directorate of Oilseeds Research, 1985; *Groundnut, Sesamum, Niger, Sunflower, Castor-Package of Practices for Increasing Production*, Extension Bulletin No. 2, July 20, 1985.
16. East India Oil Millers Asociation, 1970; *A Special Publication on Vegetable Oilseeds, Oils and Industry*, Eloma, Calcutta.
17. Ford Foundation, 1974; *Report of an Integrated Study Team of Oilseed Research in India*, New Delhi.
18. Ganguly, A.S., 1970; A Perspective on Edible Oils, Chairman's statement, 25 June 1982, Hindustan Lever, *EPW*, February 21, 1970, p. 385; and also The Hindu, June 27, 1982.
19. George, P.S., U.K. Srivastava and B.M. Desai, 1978; *The Oilseeds Economy of India-An Analysis of Past Supply and Projections for 1985*, Macmillan, (India), Madras.
20. Goswami, H.G., 1979; *Economic Analysis of Constraints to Oilseeds Production in Uttar Pradesh*, AERC, Allahabad (Study No. 81).
21. Indian Agricultural Research Institute, 1979; *National Symposium on Research and Development Strategies for Oilseeds Production in India*, IARI, New Delhi, November 7-10, 1979.
22. Indian Council of Agricultural Research, 1980; *Handbook of Agriculture*, ICAR, New Delhi, 1980 (Section on Commercial Crops).
23. Indian Institute of Public Administration, 1977; *Impact of Edible Oils under Free Licensing Scheme*, IIPA, New Delhi.
24. Jeswani, L.M., 1980; *Status Paper on Oilseeds*, ICAR, New Delhi.
25. Jhala, M.L., 1974; Econometric Models of Edible Oil Prices Behaviour, *Anvesak*, Vol. V, No. 2, December 1974.
26. Jhala M.L., 1977; The Inter-Relationship between Farm Prices and Wholesale Prices in the Context of Commodity Models of Edible Oil and Oilseeds in India, in *Proceedings of XVII Indian Econometric Conference*, Trivandrum, December 19-21, 1977.
27. Jhala M.L., 1979; *Supply and Demand Aspects of Edible Oil and Oilseeds in India*, 1951-71 (Ph.D. Dissertation) Gujarat University, (Unpublished).
28. Jhala M.L., 1979; 'Farmers' Response to Economic Incentives: An Inter-Regional Groundnut Supply Response in India', *IJAE*, Vol. XXXIV. No. 11, January-March 1979.
29. Jhala, M.L., 1981; 'Groundnut Farm Price: Are They Cost Determined', IJAE, Vol. XXXVI, No. 4, October-December, 1981 (Conference Number).

30. Jhala M.L., 1984; 'Restructing Edible Oil and Oilseeds Economy of India', in Review of Agriculture, *EPW*, Vol. XIX No. 39, September 29, 1984.
31. Jhala M.L., 1986; 'Static Demand Models of Individual Edible Oils in India, 1951-71', *Anvesak*, Vol. X, No. 1, June 1986.
32. Kahlon, A.S. and Singh, B., 1966; Market Margins of Processed Groundnut in Khanna Market, Ludhiana, 1964-65, *Asian Economic Review*, May 1966.
33. Kahlon, A.S. and Singh, B., 1968; *Marketing of Groundnut in Punjab*, Dept. of Economics and Sociology, Punjab Agricultural University, Ludhiana, 1968.
34. Kahlon, A.S., and Gurumurthi K., 1981; 'Role of Price Policy in Expanding Oilseeds Production', *ASI*, August 1981.
35. Kamala Devi, P. and Rajagopalan, 1985; 'Price and Acreage Response (A Case Study of Groundnut in North Arcot District)', *IJAE*, Vol. XX, No. 1, January-March 1985.
36. Kapila, Uma, 1982; *Oilseed Economy of India: A Case Study of Groundnut*, Agricole, New Delhi.
37. Karamathullah, N. and Bisaliah, S., 1983; *Dynamics of Soyabean Innovation in India-Spatial and Temporal Analysis*, University of Agricultural Sciences, Bangalore, April 1983.
38. Karamathullah, N. and Bisaliah, S., 1981; *Economics of Farm Production Innovation (A Study of Soyabean in Karnataka)*, UAS, Hebbal, April 1981.
39. Kulkarni, A.P., 1965; *Price Spread for Groundnut in Two Regulated Markets*, Seminar Report on Marketing of Agricultural Commodities, Indian Society of Agricultural Economics, Bombay.
40. Kurien, V., 1986; *Oils and Fats: Beyond Nutrition*, Tenth Gopalan Oration, Nutrition Society of India, Hyderabad, November 27, 1986.
41. Kurian, V., 1987; *Achieving Professor Kane's Dream (Oilseeds)*, Kane Memorial Lecture, NDDB, Anand, February 10, 1987.
42. Madappa, P.P., 1966; 'Growth and Location of the Groundnut Solvent Extraction Industry', *IJAE*, vol. 21 (4), October-December 1966.
43. Mariwala, C.V., 1973; *Oilseeds Production and Industry in India*, Journal of the Indian Merchants Chamber, Vol. 67 (7), July 1973.
44. Mathur, M.M., 1981; *Vanaspati Industry in India*, Concept Publishers, New Delhi.
45. Ministry of Agriculture; *Bulletin on Commercial Crop Statistics*, (various issues), Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.
46. Ministry of Agriculture; *Field Manual on Oilseed (20 Point Programme)*, Ministry of Agriculture, Government of India, New Delhi.
47. Ministry of Agriculture; *Estimates of Area and Production of Principal Crops in India* (various issues), Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.
48. Ministry of Agriculture; *Farm Harvest Prices in India* (various issues), New Delhi.
49. Ministry of Agriculture 1949; *Report on the Marketing of Rapeseed-Mustard in India*, Marketing Series No. 60, Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India, New Delhi.
50. Ministry of Agriculture 1952; *Report on the Marketing of Sesamum and Nigerseed in India*, Marketing Series No. 72, Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India, New Delhi.
51. Ministry of Agriculture 1967; *Report on the Marketing of Safflower Seed in India*, Marketing Series No. 168, Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India, New Delhi.
52. Ministry of Agriculture 1973; *Report on the Marketing of Groundnut in India* Marketing Series No. 73, Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India, New Delhi.
53. Ministry of Agriculture 1975; *All-India Agricultural Census*, 1970-71, Ministry of Agriculture, Government of India, New Delhi.
54. Ministry of Agriculture 1976; *Bulletin on Groundnut Statistics in India* (Districtwise), 1976, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.
55. Ministry of Agriculture, 1976; *Reports of the National Commission on Agriculture (various volumes)*, Government of India, New Delhi.
56. Ministry of Agriculture 1985; *Agricultural Census, 1976-77*, Ministry of Agriculture, Government of India, New Delhi.
57. Ministry of Agriculture 1986; *Agriculture Statistics at a Glance*; April 1986, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.
58. Ministry of Finance; *Economic Survey* (various years), Government of India, New Delhi.
59. Misra, V.N. and Radhakrishna, R., 1971; Econometric Models for Acreage Response: A Case Study of Groundnut and Bajra in Gujarat, *Anveshak*, Vol. I, No. 2, December 1971.
60. Mukunda Das. V., 1987; *Co-operative Oilseeds Marketing in India*, IRMA, Anand, 1987.
61. Nadkarni, M.V., 1983; 'Grower on Weak Wicket' (Review of book-Groundnut Marketing by C.G. Ranade et al.) *EPW*, 25 June, 1983.
62. Narain, Dharm, 1965; *Impact of Price Movements on Area under Selected Crops in India*, 1900-1939, Cambridge University Press, London.
63. Narain, Dharm, 1977; Growth of Productivity in Indian Agriculture, *IJAE*, January-March 1977.
64. Narag, A.S., 1981; *Marketing Strategy for Vegetable Oils in India*, K.P. Bagchi & Co. Ltd., Calcutta.
65. National Council of Applied Economic Research, 1965; *Export of Vegetable Oils and Oilseeds*, NCAER, New Delhi, August 1965.
66. National Dairy Development Board, 1977; *Restructuring Edible Oil and Oilseed Production and Marketing*, Techno-Economic Feasibility Report, NDDB, Anand, October 1977.
67. National Dairy Development Board, 1978; 'NDDB to Co-ordinate Oilseeds Production Efforts', *Oils and Oilseeds Journal*, Vol. 31 (2) October-December 1978.

68. National Dairy Development Board 1970; 'Operation Flood in Vegetable Oil', *Oils and Oilseeds Journal*, Vol. 32 (2), October-December 1979.
69. National Agricultural Co-operative Marketing Federation, 'Major Oilseeds', *NAFED Committee Bulletin* 1 (3-4), March-April 1978.
70. Nerlove, Marc, 1958; *The Dynamics Supply Estimation of Farmers' Response to Price*, John Hopkins, Baltimore.
71. Ninan, K.N., 1987; 'Edible Oilseeds-Growth and Area Responses in Review of Agriculture', *EPW*, September 26, 1987.
72. Ninan K. N., 1988; *Factors Influencing Growth and Instability in Oilseeds Production-The Case of Groundnut and Rapeseed-Mustard*, in Proceedings of National Symposium on Growth and Instability in Indian Agriculture, IASRI, New Delhi, August 19-21, 1987 and also *ASI* Vol. XLII, No. 12, March 1988.
73. Nowshirvani, V.,1968; *Agricultural Supply in India, Theoretical and Empirical Studies*, MIT Ph.D. Thesis, Cambridge, Massachusetts, USA.
74. Pavaskar, Madhoo, 1970; 'Futures Trading and Price Variations', *EPW*, February 28, 1970.
75. Pavaskar Madhoo, 'Behaviour of Oilseeds Prices', *Economic Scene*, Tata Economic Consultancy Services, Special Report, Bombay.
76. Pavaskar Madhoo, 1979; *Demand for Oils and Oilseeds*, Tata Economic Consultancy Services, Popular Prakashan, Bombay.
77. Patel, B.B., 1971; 'Price Spread and Farmers Share in Oil and Groundnut in Gujarat', *EPW*, July 17, 1971.
78. Patil S.P., 1973; 'Economics of Oilseeds', *Yojana*, 17 (11), July 1, 1973.
79. Patnaik, K., Uma Shankar, 1987; *Marketing Channels, Trade Structure and Groundnut Farm Economy: Effects of Government Intervention*, CES, Hyderabad, 1987 (W. Paper No. 106).
80. Purkayastha, Dipankar and Subramanian, Alka, 1986; 'Price and Income Stabilisation Issues in the Indian Groundnut Market, *EPW*, Vol. XXI, No. 8, February 22, 1986.
81. Raj Krishna, 1963; 'Farm Supply Response in India-Pakistan-A Case Study', *The Economic Journal*, Vol. LXXIII, No. 291, September 1963.
82. Ranade, C.G., *et al*, 1981; 'Groundnut System: Behaviour of Farmers' Share', *Economic Times*, February 16, 1981.
83. Ranade, C.G. *et al*, 1982; *Groundnut Marketing*, IIM, Ahmedabad.
84. Rao, N.G.P., 1976; *Groundnut Breeding in India: Present Status and Future Strategy*, IARI.
85. Reddy, J.M., 1970; 'Supply Response of Groundnut', *IJAE*, October-December 1970.
86. Sah, Abhay and Srivastava, U.K., 1984; *Rice Bran Oil Industry*, Concept, New Delhi.
87. Sah, D.C. and Rao, K.H., 1979 'Price Spread in Groundnut Marketing at Macro Level', *IJAE*, Vol. 34 (4) October-December, 1979.
88. Sahay, K.K., 1971; 'Acreage Response of Groundnut in Major Groundnut Zones-A Study in Dynamics of Supply', *ASI*, Vol. XXVI, No. 7, October 1971.
89. Shah, Navin R., 1986; *Groundnut Development Programme in Gujarat*, AERC, Vallabh Vidya Nagar, Gujarat, 1986.
90. Sharma, K.G., 1982; *Economics of Soyabean Cultivation*, AERC, Jabalpur.
91. Shetty, S.A., 1970; *Trends in Prices and Production of Oilseeds in India*, Department of Economics, University of Madras, 1970 (Monograph)
92. Shukla, P.C., 1983; *Problems of Growth of Oilseed-Mustard in U.P.*, AERC, Allahabad.
93. Srivastava, H.C. *et al*, 1985; *Oilseed Production: Constraints and Opportunities*, Oxford & IBH, New Delhi.
94. Srivastava, U.K. and Mukunda Das, V., 1976; *The Economics of Sunflower Cultivation and Processing*, CMA Monograph No. 61, IIM, Allahabad.
95. Tyagi, S.S., 1986; *Economics of Soyabean Cultivation*, Study No. 80/3, AERC, Delhi-7.
96. Vanaspati Manufacturers Association of India, *Report on Groundnut Extension* (various issues).
97. Vanaspati Manufacturers Association of India, 1977; Groundnut Research and Development Report, 1977.
98. Vyas, N.R., 1985; Oils and Oilseeds: Self-Sufficiency, *Economic Scene*, December, 1985.

APPENDIX

In the following, we give data on Area, Production, and Yield of Groundnut, Rapeseed- Mustard, Sesamum, Safflower, Niger, Sunflower, and Soybean for the period 1949-50 to 1987-88 and for the states covered by Dr. Ninan. All available data from the following sources are compiled. The compilation is done by the Editor and it is possible that there are minor differences between the data given here and those used by Dr. Ninan.

Sources:

1. *Area and Production of Principal Crops in India* (various years), Directorate of Economics and Statistics, Ministry of Agriculture, Government of India
2. *Agricultural Statistics of Reorganised States, 1956,* Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India.
3. *Gujarat and Maharashtra Agricultural Statistics,* 1969, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India.
4. *Haryana, Punjab, Chandigarh and Himachal Pradesh Agricultural Statistics,* 1966, Directorate of Economics and Statistics, Ministry of Food, Agriculture, CD and Cooperation, Government of India.

TABLE 1. AREA, PRODUCTION & YIELD OF GROUNDNUT

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Andhra Pradesh			Gujarat			Haryana*			Karnataka			Kerala			Madhya Pradesh			Maharashtra		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	970.4	983.5	1,013.4	466.6	239.7	513.8	*			605.4	521.2	860.9	10.5	13.2	1,257.1	172.8	112.8	652.8	930.4	738.3	793.5
1950-51	1,154.7	1,005.1	870.4	696.3	382.8	549.7	*			680.2	571.5	840.1	9.7	13.7	1,338.5	335.1	166.0	495.4	777.9	472.4	607.4
1951-52	1,182.4	968.7	819.2	759.3	143.8	189.3	*			909.5	553.9	609.1	10.1	12.7	1,284.9	379.6	171.0	450.5	832.0	465.0	558.9
1952-53	1,141.3	955.4	837.1	725.8	241.2	332.3	*			852.0	368.8	432.8	10.1	12.7	1,284.9	414.8	166.0	400.2	890.0	379.8	426.7
1953-54	931.6	863.7	927.2	715.2	465.0	650.2	*			837.5	530.7	633.7	9.7	13.7	1,338.5	405.1	222.0	548.0	858.2	644.4	750.9
1954-55	1,262.6	1,073.4	850.0	1,097.8	612.0	557.5	*			853.5	452.3	530.0	13.8	19.3	1,403.0	327.9	208.2	635.0	981.8	772.6	737.0
1955-56	1,240.0	1,087.3	877.0	832.4	346.4	416.1	*			837.8	618.1	738.0	14.3	14.5	1,013.0	259.5	156.5	604.0	1,006.7	719.0	714.2
1956-57	1,336.0	1,221.8	915.0	862.4	428.0	496.3	2.1	1.3	626.0	938.5	657.0	700.0	13.4	15.9	1,191.0	332.9	201.2	604.0	1,047.9	732.2	699.0
1957-58	1,280.3	1,070.4	826.0	1,515.3	841.0	555.0	2.1	1.5	735.0	978.7	716.0	732.0	13.7	11.2	816.0	371.5	233.2	628.0	1,141.6	667.3	585.0
1958-59	965.4	912.6	945.0	1,570.7	1,311.0	835.0	2.2	1.7	776.0	943.6	700.7	743.0	14.4	15.9	1,108.0	441.7	355.9	806.0	1,161.3	678.7	584.0
1959-60	823.0	753.9	916.0	1,874.8	941.7	502.0	2.9	2.4	826.0	962.7	562.5	584.0	12.9	12.9	998.0	436.0	233.2	535.0	1,138.6	751.2	660.0
1960-61	802.2	694.3	865.0	1,981.6	1,213.7	612.0	3.2	2.8	867.0	914.9	448.4	490.0	16.0	13.8	861.0	385.9	274.9	712.0	1,082.8	799.9	739.0
1961-62	783.7	527.6	673.0	2,265.3	1,479.7	653.0	4.1	3.4	837.0	902.2	449.3	498.0	15.9	13.7	860.0	434.6	282.2	649.0	1,117.5	782.2	700.0
1962-63	898.3	663.5	739.0	2,344.4	1,166.9	498.4	4.2	3.5	827.0	869.5	499.5	574.0	16.0	13.5	844.0	490.4	270.4	551.0	1,144.6	806.9	705.0
1963-64	981.6	754.0	768.0	1,847.1	1,266.6	685.7	6.3	5.3	839.0	891.8	539.5	605.0	14.0	20.8	1,486.0	433.5	290.6	670.0	1,135.9	780.5	687.0
1964-65	1,091.9	910.6	834.0	2,046.3	1,561.2	762.9	6.9	8.2	1,196.0	871.0	629.0	722.0	14.5	21.8	1,503.0	464.5	342.6	738.0	1,071.4	805.1	751.0
1965-66	1,239.4	630.0	508.0	2,061.7	943.0	457.0	15.8	16.8	1,063.0	903.3	432.7	479.0	15.2	25.2	1,658.0	595.1	266.1	447.0	1,117.3	473.1	423.0
1966-67	1,187.0	819.2	689.0	1,992.0	925.9	464.8	11.1	11.0	991.0	779.0	440.1	565.0	13.7	23.6	1,723.0	477.8	159.3	330.0	1,057.5	470.5	445.0
1967-68	1,370.1	1,037.2	757.0	2,009.1	1,457.7	725.5	14.5	17.4	1,200.0	777.7	422.6	543.4	13.7	24.7	1,803.0	404.8	335.4	829.0	1,044.4	743.9	712.3
1968-69	1,187.3	889.5	749.0	1,798.0	806.2	448.4	15.4	9.2	597.4	808.2	555.9	687.8	13.1	24.0	1,832.0	496.4	230.4	464.0	914.5	647.5	708.0
1969-70	1,374.6	1,063.4	774.0	1,747.6	1,106.2	633.0	11.7	9.6	820.5	833.1	509.7	612.0	13.1	19.3	1,473.0	407.3	285.9	702.0	945.0	614.7	650.5
1970-71	1,480.5	1,142.7	772.0	1,758.3	1,835.9	1,044.1	10.2	8.5	833.3	837.1	613.1	732.0	14.7	16.1	1,095.0	464.4	334.0	719.0	952.7	616.6	647.2
1971-72	1,523.5	1,164.2	764.0	1,778.4	1,540.7	866.3	8.7	7.4	850.6	985.1	745.1	756.0	14.7	16.8	1,143.0	489.5	294.4	601.0	750.5	467.7	623.2
1972-73	1,415.1	997.8	705.0	1,741.2	349.5	200.7	7.6	6.4	842.1	720.1	434.4	603.0	16.0	16.5	1,031.0	436.0	292.1	670.0	762.7	196.7	257.9
1973-74	1,387.5	1,375.7	991.0	1,581.6	1,241.4	784.9	7.2	6.2	861.1	924.6	641.6	694.0	17.2	18.0	1,047.0	439.4	210.6	479.0	674.5	495.2	734.2
1974-75	1,471.0	1,413.0	961.0	1,493.3	465.0	311.4	11.1	9.9	891.9	895.2	664.0	742.0	17.5	19.5	1,114.0	448.3	298.6	666.0	754.6	548.3	726.6
1975-76	1,330.5	1,119.4	841.0	1,640.7	2,034.6	1,240.1	11.3	12.2	1,079.6	961.0	629.8	655.0	17.5	23.1	1,320.0	491.8	407.1	828.0	839.4	663.2	790.1
1976-77	1,051.3	583.2	555.0	1,886.7	1,898.4	1,006.2	10.0	10.9	1,090.0	838.1	366.6	437.0	16.6	17.5	1,054.0	521.1	326.0	626.0	925.3	605.2	654.1
1977-78	1,099.4	1,023.4	931.0	1,971.2	1,763.3	894.5	8.8	10.6	1,204.5	863.3	570.8	661.0	12.7	13.3	1,047.0	437.1	247.6	566.0	848.3	578.4	681.8
1978-79	1,276.9	1,160.4	909.0	2,047.4	1,823.2	890.5	10.1	12.1	1,198.0	885.6	609.8	689.0	13.3	13.0	977.0	409.7	220.2	537.0	814.1	505.4	621.0
1979-80	1,345.7	1,118.9	831.0	2,040.1	1,813.0	888.7	6.8	7.8	1,147.1	878.7	636.1	724.0	13.9	13.7	986.0	319.7	168.9	528.0	747.2	568.0	760.2
1980-81	1,304.0	860.5	660.0	2,124.9	1,644.6	774.0	6.1	7.8	1,278.7	765.2	444.2	581.0	13.0	11.1	854.0	296.2	180.3	609.0	833.4	611.0	733.1
1981-82	1,451.0	1,437.2	990.0	2,207.8	2,198.2	995.7	7.9	7.4	936.7	871.9	658.1	755.0	9.4	8.3	883.0	300.4	226.8	755.0	823.8	694.4	842.9
1982-83	1,504.4	1,133.4	753.0	2,057.7	1,312.8	638.0	7.1	5.0	704.2	830.5	541.6	652.0	9.7	8.6	887.0	349.2	179.0	513.0	715.6	550.5	769.3
1983-84	1,664.9	1,716.2	1,031.0	2,149.6	1,810.1	842.1	7.4	5.9	797.3	878.2	738.9	841.0	10.7	9.3	869.0	311.7	231.9	744.0	810.1	807.3	996.5
1984-85	1,676.2	1,258.1	751.0	2,061.1	1,572.3	762.8	8.7	7.1	816.1	594.8	897.1	1,508.0	11.8	11.8	1,000.0	301.6	160.3	531.0	737.1	730.7	991.3
1985-86	1,665.8	1,325.0	795.0	1,793.5	448.2	249.9	6.2	5.6	903.2	1,012.5	707.1	698.0	11.0	6.0	545.5	256.7	169.7	661.0	663.5	468.7	706.4
1986-87	1,570.6	1,308.2	833.0	1,824.5	1,291.7	708.0	6.9	7.8	1,130.4	1,033.9	738.1	714.0	11.1	6.1	549.5	244.2	188.8	773.0	653.8	435.2	665.6
1987-88	1,787.4	1,708.2	956.0	1,050.5	140.0	133.3	4.7	3.2	680.9	1,090.1	924.5	848.0	9.5	4.7	494.7	250.5	229.8	917.0	654.5	617.8	943.9

* Included in Punjab.

(Contd.)

TABLE 1. AREA, PRODUCTION & YIELD OF GROUNDNUT (Concld.)

Year	Orissa			Punjab*			Rajasthan			Tamil Nadu			Uttar Pradesh			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	25.5	22.4	878.4	36.0	25.4	705.6	19.0	11.2	589.5	658.0	676.7	1,028.4	84.2	88.4	1,049.9	3,979	3,433	863
1950-51	24.3	15.0	617.8	39.7	26.4	665.0	27.9	14.2	509.0	794.0	763.1	961.1	89.0	102.6	1,152.8	4,494	3,481	775
1951-52	25.1	17.0	678.0	48.2	27.4	568.5	21.0	8.1	385.7	763.2	766.1	1,003.8	113.7	116.8	1,027.3	4,917	3,192	649
1952-53	24.3	16.0	659.0	50.2	36.6	729.1	28.7	13.2	459.9	729.6	685.8	940.0	107.2	118.9	1,045.7	4,795	2,929	611
1953-54	25.5	17.0	667.0	47.3	33.5	708.2	25.1	14.2	565.7	528.5	605.6	1,145.9	100.8	121.9	1,209.3	4,247	3,445	811
1954-55	24.8	17.3	697.0	55.0	39.6	720.0	51.5	39.5	767.0	755.2	867.2	1,148.0	117.8	144.8	1,229.0	5,541	4,245	766
1955-56	23.0	16.8	732.0	54.2	37.6	693.7	43.0	36.7	853.0	727.9	842.9	1,158.0	118.3	134.9	1,141.0	5,133	3,862	752
1956-57	22.1	15.9	720.0	58.5	47.5	812.0	68.2	38.7	567.0	736.6	883.6	1,200.0	153.9	178.7	1,161.0	5,532	4,369	783
1957-58	22.5	16.0	712.0	56.4	44.3	785.0	70.1	37.3	531.0	776.9	925.5	1,191.0	191.4	144.2	753.0	6,420	4,710	734
1958-59	22.6	15.1	667.0	59.8	51.7	865.0	67.3	46.9	697.0	808.2	941.6	1,165.0	193.5	144.8	749.0	6,251	5,178	828
1959-60	23.8	19.2	806.0	58.0	50.2	866.0	85.7	54.4	635.0	835.9	999.0	1,195.0	185.2	181.3	979.0	6,442	4,562	708
1960-61	24.2	19.2	792.0	68.0	62.4	919.0	102.6	51.0	497.0	870.9	1,056.9	1,217.0	210.0	175.4	832.0	6,463	4,812	745
1961-62	26.1	20.3	780.0	72.3	65.4	904.0	120.8	62.9	520.0	887.6	1082.2	1,219.0	259.1	225.1	869.0	6,889	4,994	725
1962-63	31.1	31.8	1,023.0	81.6	73.1	896.0	181.2	120.8	667.0	944.8	1,145.4	1,212.0	272.2	264.3	971.0	7,283	5,064	695
1963-64	56.9	70.4	1,237.0	109.5	94.5	863.0	193.2	94.7	490.0	913.6	1,108.5	1,213.0	297.9	267.4	898.0	6,886	5,298	769
1964-65	54.8	45.8	836.0	128.2	161.1	1,257.0	197.9	94.4	477.0	929.4	950.7	1,023.0	328.7	343.0	1,044.0	7,376	6,004	814
1965-66	61.9	58.4	943.0	135.0	165.0	1,220.0	217.0	69.8	322.0	955.0	822.9	862.0	370.8	349.9	944.0	7,698	4,263	554
1966-67	68.3	75.3	1,102.0	181.6	194.5	1,071.0	198.9	75.8	381.0	911.0	896.6	984.0	409.8	312.0	761.0	7,299	4,411	604
1967-68	66.0	83.3	1,262.0	222.4	239.9	1,079.0	281.4	163.6	581.0	908.7	884.7	974.0	427.8	358.0	722.0	7,553	5,731	759
1968-69	70.7	83.6	1,182.0	240.3	222.6	926.0	294.4	62.0	211.0	822.6	837.4	949.0	308.7	253.9	709.0	7,088	4,631	653
1969-70	71.2	83.3	1,170.0	188.8	159.5	845.0	203.1	98.7	486.0	982.4	910.2	927.0	339.0	260.5	768.0	7,125	5,130	720
1970-71	70.3	87.3	1,242.0	173.8	168.5	970.0	213.6	142.1	665.0	1,000.4	916.7	916.0	341.1	221.7	650.0	7,326	6,111	834
1971-72	94.6	132.7	1,403.0	173.5	183.0	1,055.0	235.9	158.8	673.0	1,117.0	1,273.0	1,140.0	327.8	183.4	559.0	7,510	6,181	823
1972-73	86.1	120.1	1,395.0	160.4	153.0	954.0	259.0	125.6	485.0	1,061.3	1,103.0	1,039.0	314.9	286.6	910.0	6,990	4,092	585
1973-74	93.5	138.0	1,476.0	154.7	150.0	970.0	243.1	142.0	584.0	1,136.0	1,212.0	1,067.0	352.8	286.4	812.0	7,024	5,932	845
1974-75	103.4	141.8	1,371.0	164.0	141.0	860.0	301.0	180.9	601.0	976.8	862.1	883.0	415.1	351.4	847.0	7,063	5,111	724
1975-76	109.0	134.7	1,236.0	168.4	176.0	1,045.0	280.0	172.8	617.0	934.7	1,053.4	1,127.0	424.7	313.2	738.0	7,222	6,755	935
1976-77	104.7	118.6	1,133.0	164.0	150.0	915.0	235.5	157.3	668.0	890.0	785.0	882.0	388.6	232.7	599.0	7,043	5,264	747
1977-78	119.1	144.7	1,215.0	156.0	154.0	987.0	243.9	174.6	716.0	926.0	1,149.7	1,242.0	328.8	244.0	742.0	7,028	6,087	866
1978-79	143.9	191.8	1,333.0	129.0	114.0	884.0	383.6	236.9	618.0	983.3	1,128.5	1,148.0	324.5	180.7	557.0	7,433	6,208	835
1979-80	174.6	122.7	703.0	91.0	81.0	890.0	292.2	71.4	244.0	998.2	1,060.7	1,063.0	246.3	96.0	390.0	7,165	5,768	805
1980-81	172.4	231.0	1,340.0	83.0	104.0	1,253.0	212.1	85.9	405.0	788.5	679.8	862.0	190.5	133.5	701.0	6,801	5,005	736
1981-82	216.1	292.1	1,352.0	92.0	90.0	978.0	161.0	107.7	669.0	1,013.1	1,237.9	1,222.0	261.4	253.8	971.0	7,429	7,223	972
1982-83	252.9	333.1	1,317.0	78.0	63.0	808.0	185.8	106.3	572.0	911.6	853.3	936.0	297.0	184.9	623.0	7,215	5,282	732
1983-84	258.5	399.4	1,545.0	58.0	42.0	724.0	183.3	173.9	949.0	956.2	981.8	1,027.0	233.0	151.1	648.0	7,539	7,085	940
1984-85	312.9	484.8	1,549.0	45.2	45.0	996.0	252.5	172.6	684.0	960.0	986.3	1,027.0	185.1	88.5	478.0	7,168	6,436	898
1985-86	348.4	493.8	1,417.0	45.0	43.3	962.0	245.1	149.7	611.0	932.0	1,176.0	1,262.0	124.3	105.3	847.0	7,125	5,121	719
1986-87	348.4	496.0	1,424.0	43.0	42.0	977.0	201.8	130.5	647.0	897.0	1,092.6	1,218.0	122.8	110.6	901.0	6,982	5,875	841
1987-88	382.9	542.5	1,417.0	31.0	22.0	710.0	227.2	112.5	495.0	1,099.9	1,259.0	1,145.0	115.8	71.0	613.0	6,735	5,673	842

* Figures for 1949-50 - 1955-56 refer to the erstwhile State of Punjab before Reorganisation in 1966.

TABLE 2. AREA, PRODUCTION & YIELD OF RAPESEED-MUSTARD

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Assam@			Bihar			Gujarat			Haryana			Himachal Pradesh			Jammu & Kashmir			Madhya Pradesh		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	128.3	59.9	466.9	139.6	46.7	334.5	11.2	3.3	294.6		*		8.1	2.0	246.9	n.a.	+	-	121.0	51.8	428.1
1950-51	126.7	55.9	441.2	121.4	29.5	243.0	15.9	8.2	515.7		*		4.5	1.0	222.2	n.a.	+	-	121.8	39.6	325.1
1951-52	121.0	51.8	428.1	115.7	37.6	325.0	25.5	12.6	494.1		*		4.5	1.0	222.2	13.8	+	-	139.2	51.8	372.1
1952-53	118.6	45.7	385.3	118.2	44.7	378.2	22.0	9.6	436.4		*		4.0	1.0	250.0	13.8	+	-	125.9	45.7	363.0
1953-54	116.1	45.7	393.6	91.5	37.6	410.9	25.9	11.6	447.9		*		3.2	1.0	312.5	12.9	+	-	127.5	46.7	366.3
1954-55	117.3	46.2	394.0	90.5	33.5	370.0	25.0	15.8	632.0		*		3.6	1.0	277.8	20.4	9.1	445.0	130.1	49.9	384.0
1955-56	116.3	53.2	457.0	76.5	21.2	277.0	25.5	13.6	534.0		*		3.6	1.0	277.8	22.5	13.6	604.0	144.1	60.5	420.0
1956-57	122.3	60.2	492.0	57.2	12.1	213.0	24.9	13.8	552.0	190.3	69.9	367.0	5.7	1.2	206.0	18.4	10.8	590.0	152.6	56.5	370.0
1957-58	119.8	55.7	465.0	61.8	19.0	308.0	39.8	14.3	360.0	201.6	77.4	384.0	5.3	1.3	237.0	20.0	10.8	540.0	93.2	25.7	276.0
1958-59	124.1	64.3	518.0	86.0	35.5	413.0	44.2	21.3	483.0	198.7	87.5	440.0	5.5	1.3	245.0	14.2	8.1	573.0	152.7	55.4	363.0
1959-60	121.9	41.7	342.0	93.7	27.2	290.0	41.0	24.1	587.0	149.5	62.5	418.0	5.1	1.1	222.0	25.0	16.5	659.0	145.6	50.1	344.0
1960-61	118.6	45.2	381.0	87.9	31.9	363.0	36.9	11.8	319.0	145.4	76.8	529.0	3.1	1.0	307.0	13.7	10.4	763.0	147.7	57.3	388.0
1961-62	121.2	41.9	346.0	117.7	45.1	383.0	34.6	14.3	414.0	201.2	114.0	567.0	5.0	1.3	257.0	21.6	12.7	586.0	168.6	47.5	282.0
1962-63	129.4	48.0	371.0	106.3	55.8	525.0	35.8	18.2	508.0	260.9	153.7	589.0	5.6	1.5	264.0	5.8	2.5	441.0	152.6	41.9	275.0
1963-64	129.4	54.8	423.0	92.6	27.5	297.0	37.4	19.0	508.0	223.6	136.9	612.0	5.5	1.4	245.0	25.6	15.9	621.0	162.7	53.3	328.0
1964-65	122.1	50.5	414.0	86.4	32.0	370.0	32.7	16.8	514.0	155.7	77.9	501.0	11.9	1.6	136.0	23.3	9.4	405.0	169.1	57.2	338.0
1965-66	129.8	57.4	442.0	82.7	33.4	404.0	33.2	15.7	473.0	156.0	69.0	442.0	..	..	..	25.7	19.8	770.0	149.4	44.6	299.0
1966-67	131.6	59.7	454.0	70.7	21.8	308.0	25.2	9.4	374.0	198.0	80.0	404.0	..	..	..	26.4	21.1	799.0	97.3	19.8	203.0
1967-68	133.9	60.0	448.0	79.1	54.0	683.0	27.9	13.2	473.0	245.0	102.0	416.0	5.1	1.2	235.3	28.1	22.7	808.0	144.0	40.0	278.0
1968-69	134.8	48.4	359.0	79.3	39.6	499.0	27.5	11.2	407.0	66.0	33.0	500.0	3.8	1.0	263.2	30.2	21.4	709.0	156.7	52.7	336.0
1969-70	134.2	49.5	369.0	87.1	51.5	591.0	28.6	11.7	409.0	120.0	78.0	650.0	4.0	1.2	300.0	26.2	20.9	798.0	183.2	60.9	332.0
1970-71	137.1	56.5	412.0	84.7	49.0	579.0	34.6	16.3	471.0	129.0	88.0	682.0	3.9	1.4	359.0	24.9	18.6	747.0	204.5	60.3	295.0
1971-72	135.6	63.6	469.0	78.2	34.9	446.0	35.2	16.1	457.0	163.0	90.0	552.0	4.8	1.5	312.5	21.0	17.0	810.0	234.1	91.4	390.0
1972-73	157.8	65.0	412.0	84.0	44.0	524.0	43.3	18.9	436.0	211.0	99.0	469.0	4.2	1.4	333.3	25.3	19.5	771.0	213.2	99.5	467.0
1973-74	165.4	90.5	547.0	89.3	43.3	485.0	54.7	31.2	570.0	168.9	53.0	314.0	5.1	1.7	333.3	36.5	34.1	934.0	236.1	113.6	481.0
1974-75	168.2	64.9	386.0	91.3	48.2	528.0	73.9	28.3	383.0	197.7	137.0	693.0	5.0	1.8	360.0	25.4	22.4	882.0	265.4	142.1	535.0
1975-76	164.1	63.7	388.0	101.9	54.7	537.0	64.4	26.4	410.0	136.9	65.0	475.0	4.8	1.5	312.5	27.9	24.3	871.0	242.1	126.8	524.0
1976-77	167.5	60.0	358.0	90.3	47.4	525.0	77.0	37.3	484.0	105.0	66.0	629.0	4.1	1.3	317.1	31.6	26.6	842.0	179.9	46.7	260.0
1977-78	181.5	72.7	401.0	102.1	52.8	517.0	99.6	39.9	401.0	177.1	84.8	479.0	5.7	1.9	333.3	47.6	44.3	931.0	252.5	85.1	337.0
1978-79	196.4	85.8	437.0	91.3	38.3	419.0	104.5	51.0	488.0	118.5	81.0	684.0	5.7	2.1	368.4	47.2	31.4	665.0	238.6	92.5	388.0
1979-80	210.0	95.6	455.0	80.2	35.2	439.0	108.1	49.6	459.0	126.0	63.0	500.0	5.4	1.3	240.7	39.9	39.2	982.0	184.5	47.2	256.0
1980-81	213.0	102.4	481.0	85.7	39.4	460.0	119.2	55.0	461.0	301.0	179.0	595.0	5.0	1.8	360.0	42.3	59.8	1,414.0	236.0	143.2	607.0
1981-82	224.0	102.7	458.0	74.9	46.4	619.0	179.7	78.3	486.0	202.0	141.0	698.0	6.5	1.9	292.3	43.1	64.0	1,485.0	291.3	158.9	545.0
1982-83	267.8	125.4	468.0	86.5	45.3	524.0	171.4	211.2	1,232.0	165.0	111.0	673.0	7.0	1.6	228.6	46.6	47.6	1,021.0	278.2	139.6	502.0
1983-84	286.1	142.5	498.0	89.3	67.6	757.0	173.6	235.9	1,359.0	195.0	157.0	805.0	6.5	0.7	107.7	61.4	51.8	1,008.0	311.9	232.0	744.0
1984-85	319.8	123.5	386.0	90.1	66.9	743.0	195.3	239.3	1,225.0	311.0	296.0	952.0	6.1	0.5	82.0	55.1	54.5	989.0	355.1	242.5	683.0
1985-86	291.0	137.7	473.0	85.8	62.4	727.0	192.4	208.9	1,086.0	342.0	274.0	801.0	6.9	2.0	289.9	61.7	63.8	1,034.0	338.2	182.0	538.0
1986-87	309.6	149.0	481.0	83.8	55.2	659.0	181.1	234.9	1,293.0	276.0	216.0	783.0	6.9	1.7	246.4	52.1	54.0	1,036.0	331.2	207.7	627.0
1987-88	337.5	167.5	496.0	82.1	61.0	743.0	182.7	184.4	1,009.0	328.0	329.0	1,003.0	8.1	1.1	135.8	38.1	34.1	895.0	357.4	253.7	710.0

@ Figures for Assam include Meghalaya and Mizoram until 1969-70. * Included in Punjab. n.a. not available. + below 500 tonnes.

(Contd.)

TABLE 2. AREA, PRODUCTION & YIELD OF RAPESEED-MUSTARD (Concld.)

Year	Maharashtra			Orissa			Punjab*			Rajasthan			Uttar Pradesh			West Bengal			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	3.0	0.8	277.6	27.5	11.2	407.3	126.3	50.8	402.2	86.6	27.4	316.4	1,192.2	513.1	430.4	81.7	35.6	435.7	1,935	806	417
1950-51	3.1	0.9	277.5	33.2	11.2	337.3	186.6	75.2	403.0	108.5	35.6	328.1	1,242.0	458.2	368.9	95.9	43.7	455.7	2,071	762	368
1951-52	2.4	0.6	226.4	50.6	21.3	420.9	336.7	102.6	304.7	134.4	35.6	264.9	1,346.8	574.1	426.3	93.9	41.7	444.1	2,401	943	393
1952-53	2.7	0.6	207.5	50.2	19.3	384.5	170.4	59.9	351.5	77.7	26.4	339.8	1,297.4	547.7	422.2	91.5	44.7	488.5	2,105	858	408
1953-54	3.2	0.6	187.1	51.4	21.3	414.4	203.6	85.3	419.0	112.9	34.5	305.6	1,400.6	538.5	384.5	82.6	29.5	357.1	2,244	872	389
1954-55	4.3	1.2	278.8	51.0	20.7	406.0	255.4	109.7	429.5	215.2	86.9	404.0	1,424.3	625.2	439.0	87.3	35.9	411.0	2,439	1,037	425
1955-56	3.5	1.0	289.6	51.4	21.3	414.4	270.7	107.7	397.9	250.4	98.3	393.0	1,496.0	432.8	289.0	95.1	35.9	377.0	2,556	860	336
1956-57	4.2	1.4	324.0	51.4	20.9	407.0	95.0	45.7	481.0	265.9	112.3	422.0	1,468.4	612.7	417.0	80.0	27.7	347.0	2,539	1,043	411
1957-58	7.2	2.1	296.0	45.4	18.5	406.0	98.2	40.0	407.0	346.0	117.5	340.0	1,280.1	518.6	405.0	81.7	28.8	352.0	2,412	933	387
1958-59	7.6	2.2	294.0	32.9	12.0	365.0	81.7	36.8	450.0	300.9	81.6	271.0	1,282.7	593.3	463.0	97.2	42.9	441.0	2,447	1,042	426
1959-60	6.4	1.7	272.0	34.7	12.8	368.0	76.8	35.5	462.0	206.2	56.2	272.0	1,865.9	702.7	377.0	108.9	27.6	254.0	2,910	1,063	365
1960-61	6.8	2.0	301.0	45.6	18.8	412.0	114.4	57.3	501.0	204.1	74.5	365.0	1,852.2	921.5	497.0	88.6	35.1	396.0	2,883	1,347	467
1961-62	4.2	1.1	263.0	43.9	17.4	396.0	91.7	52.1	568.0	266.7	107.6	404.0	1,958.2	853.1	436.0	115.5	34.1	296.0	3,168	1,346	425
1962-63	3.4	0.8	234.0	52.4	27.2	519.0	89.5	51.0	570.0	320.5	132.2	412.0	1,855.8	728.7	393.0	95.3	37.5	393.0	3,127	1,303	417
1963-64	3.6	0.6	167.0	60.0	16.3	272.0	93.9	54.9	585.0	305.2	43.4	142.0	1,805.8	583.1	323.0	87.1	28.6	328.0	3,046	915	300
1964-65	3.4	0.6	176.0	61.5	25.7	418.0	91.0	52.2	574.0	207.8	79.2	381.0	1,808.8	1,024.9	567.0	103.4	36.2	350.0	2,910	1,474	507
1965-66	3.9	0.7	179.5	51.6	16.8	326.0	84.0	50.0	595.0	222.3	72.0	324.0	1,856.3	871.8	470.0	98.4	41.3	420.0	2,913	1,298	446
1966-67	3.8	0.7	184.0	69.1	25.1	363.0	116.0	61.0	526.0	251.5	54.3	216.0	1,894.5	826.6	436.0	107.4	44.1	411.0	3,006	1,228	408
1967-68	3.8	0.7	184.2	64.6	24.0	372.0	143.0	66.0	462.0	198.2	65.6	331.0	2,050.8	1,080.4	527.0	119.9	35.3	315.0	3,244	1,568	483
1968-69	3.9	0.7	179.5	63.7	23.8	374.0	69.8	36.1	517.0	120.7	54.8	454.0	1,991.5	985.4	495.0	111.9	35.3	315.0	2,870	1,347	469
1969-70	4.5	1.0	222.2	62.2	27.5	442.0	92.0	54.2	589.0	183.3	82.7	451.0	2,119.5	1,083.6	511.0	111.9	35.3	315.0	3,172	1,564	493
1970-71	4.5	0.9	200.0	55.1	25.7	466.0	103.0	57.0	553.0	253.7	246.6	972.0	2,136.7	1,313.5	607.0	108.2	35.7	330.0	3,323	1,976	594
1971-72	4.6	1.0	217.4	60.7	27.8	458.0	127.9	82.0	641.0	383.4	122.7	320.0	2,244.2	844.2	376.0	107.0	34.8	325.0	3,614	1,433	396
1972-73	3.6	0.6	166.7	65.3	31.0	475.0	172.0	106.8	621.0	294.1	215.5	733.0	1,935.2	1,057.9	547.0	95.5	42.6	446.0	3,319	1,808	545
1973-74	4.3	0.8	186.0	72.3	34.5	477.0	178.8	136.2	762.0	374.1	110.7	296.0	1,932.6	1,004.2	520.0	122.6	44.3	361.0	3,457	1,704	493
1974-75	4.2	0.9	214.3	85.9	38.1	444.0	179.0	140.0	782.0	424.3	254.6	600.0	2,035.3	1,323.9	650.0	102.7	39.7	387.0	3,680	2,252	612
1975-76	4.0	1.1	275.0	95.0	44.7	471.0	122.0	78.0	639.0	252.6	127.3	504.0	2,008.1	1,274.7	635.0	95.3	39.3	412.0	3,339	1,936	580
1976-77	4.7	1.2	255.3	66.5	26.2	394.0	67.0	46.0	687.0	230.5	101.2	439.0	2,014.7	1,056.7	524.0	72.2	25.5	353.0	3,128	1,550	496
1977-78	4.5	1.1	244.4	109.7	48.4	441.0	128.0	64.0	500.0	353.3	163.2	462.0	2,007.2	939.5	468.0	96.6	42.8	443.0	3,584	1,650	460
1978-79	4.7	1.2	255.3	152.0	68.4	450.0	83.0	57.0	687.0	314.8	203.7	647.0	2,058.3	1,088.8	529.0	110.0	46.8	425.0	3,544	1,860	525
1979-80	4.4	1.3	295.5	144.6	39.3	272.0	88.0	63.0	716.0	349.0	149.0	427.0	1,994.4	781.7	392.0	115.6	53.4	462.0	3,471	1,428	411
1980-81	4.3	1.3	302.3	162.1	72.4	447.0	146.0	77.0	527.0	362.5	248.5	686.0	2,276.2	1,229.2	540.0	131.1	79.2	604.0	4,113	2,304	560
1981-82	4.6	1.6	347.8	162.1	72.4	447.0	108.0	72.0	667.0	651.2	458.3	704.0	2,258.0	1,073.6	475.0	163.3	94.7	580.0	4,399	2,381	541
1982-83	5.3	1.7	320.8	123.7	56.9	460.0	85.0	64.0	753.0	607.0	443.5	731.0	1,776.0	848.9	478.0	170.9	91.0	532.0	3,827	2,207	577
1983-84	5.8	2.2	379.3	106.5	50.7	476.0	83.0	73.0	880.0	820.0	648.2	790.0	1,519.1	813.8	536.0	189.3	113.0	597.0	3,874	2,608	673
1984-85	5.1	1.7	333.3	117.4	52.6	448.0	137.6	148.0	1,076.0	1,080.6	874.0	809.0	1,027.5	785.0	764.0	244.7	164.0	670.0	3,987	3,073	771
1985-86	4.8	1.4	291.7	146.5	80.6	550.0	146.0	148.0	1,014.0	1,014.8	664.9	736.0	1,069.3	658.9	600.0	231.6	163.4	706.0	3,980	2,681	674
1986-87	4.9	2.7	551.0	173.6	65.1	375.0	128.0	118.0	922.0	851.7	691.3	812.0	973.5	594.6	611.0	294.9	176.9	600.0	3,719	2,605	700
1987-88	3.6	1.0	277.8	142.8	64.8	454.0	208.0	209.0	1,005.0	1,372.8	1,031.7	752.0	1,018.6	662.6	651.0	379.9	334.0	879.0	4,508	3,370	748

* Figures for 1949-50 to 1955-56 relate to Punjab prior to its Reorganisation in 1966.

TABLE 3. AREA, PRODUCTION & YIELD OF SESAMUM

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Andhra Pradesh			Assam@			Bihar			Gujarat			Haryana			Himachal Pradesh		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	344.4	70.1	203.5	-	-	-	17.0	4.1	241.1	198.0	40.2	203.2		*		0.4	+	
1950-51	314.9	53.8	170.8	-	-	-	14.2	4.1	288.7	208.2	41.8	201.0		*		0.4	+	
1951-52	334.6	57.7	172.4	5.7	-	-	22.3	5.1	228.7	190.5	15.5	81.3		*		0.8	+	
1952-53	351.6	60.6	172.4	5.7	3.0	526.3	23.1	5.1	220.8	207.7	26.6	128.0		*		0.8	+	
1953-54	325.8	57.0	175.1	5.7	4.1	719.3	19.4	5.1	262.9	229.4	44.6	194.4		*		0.8	+	
1954-55	273.1	58.0	213.0	5.4	3.7	683.0	23.5	6.3	267.0	205.3	41.8	204.0		*		0.8	+	
1955-56	270.1	53.1	196.0	7.7	4.5	580.0	25.5	5.8	229.0	177.5	31.1	175.2		*		0.8	+	
1956-57	265.8	52.9	200.0	7.8	3.7	468.0	25.9	6.7	261.0	160.0	24.9	155.7	3.5	0.9	256.0	5.0	0.8	156.0
1957-58	261.5	47.1	180.0	7.7	3.7	479.0	19.5	3.9	201.0	138.9	21.4	154.0	4.0	1.3	324.0	5.2	0.9	173.0
1958-59	228.1	45.1	198.0	7.9	3.8	480.0	28.3	6.2	217.0	146.6	27.3	186.0	3.4	1.0	306.0	5.1	0.9	185.0
1959-60	213.5	37.4	175.0	7.9	3.7	468.0	32.9	9.1	277.0	104.9	17.6	168.0	2.6	0.9	357.0	6.3	1.1	179.0
1960-61	201.6	34.1	169.0	8.1	3.8	470.0	27.4	6.0	220.0	106.1	17.0	160.0	2.1	0.7	324.0	6.0	1.3	213.0
1961-62	256.2	45.2	176.0	8.7	4.0	462.0	27.5	7.2	263.0	100.3	20.5	205.0	2.3	1.0	423.0	6.6	2.1	316.0
1962-63	254.3	53.8	212.0	9.5	4.6	480.0	27.7	8.2	296.0	103.5	21.7	209.7	2.0	0.8	388.0	6.8	1.6	234.0
1963-64	221.5	42.1	190.0	10.2	5.1	496.0	32.5	9.6	294.0	121.1	22.9	189.1	1.4	0.6	423.0	7.8	2.0	257.0
1964-65	225.5	40.5	180.0	9.7	4.5	462.0	27.2	7.8	285.0	114.1	23.8	208.6	1.3	0.6	422.0	7.5	1.9	256.0
1965-66	224.2	39.0	174.0	10.0	4.6	460.0	25.6	8.2	320.3	121.0	22.0	182.0	1.0	0.3	300.0	..	..	..
1966-67	261.2	54.2	208.0	9.8	4.8	493.0	22.6	4.5	193.0	123.4	25.5	206.6	1.7	0.5	294.1	6.4	1.4	218.8
1967-68	233.4	43.2	185.0	9.6	4.7	489.6	32.3	15.7	486.0	126.7	31.2	246.3	1.8	0.5	277.8	6.4	1.4	218.8
1968-69	207.6	36.9	178.0	9.1	4.5	494.5	34.1	9.9	290.3	121.8	25.7	211.0	1.7	0.5	294.1	7.6	1.8	236.8
1969-70	236.4	53.2	225.0	9.4	4.5	478.7	30.2	8.3	274.8	117.6	29.2	248.3	1.9	0.8	421.1	7.5	1.8	240.0
1970-71	253.1	50.6	200.0	9.3	4.5	483.9	32.4	10.8	333.3	124.0	52.1	420.2	1.8	0.5	277.8	9.0	2.0	222.2
1971-72	266.9	38.6	145.0	10.3	4.9	475.7	21.5	4.7	218.6	120.7	42.7	353.8	3.0	0.9	300.0	8.4	2.0	238.1
1972-73	217.7	29.1	134.0	11.2	5.4	482.1	24.3	7.0	288.1	101.5	20.1	198.0	2.4	0.8	333.3	7.1	1.8	253.5
1973-74	244.0	39.5	162.0	10.6	5.2	490.6	25.6	6.1	238.3	103.3	30.9	299.1	6.3	2.3	365.1	7.2	1.8	250.0
1974-75	227.1	46.3	204.0	10.0	4.8	480.0	24.6	6.2	252.0	80.0	11.4	142.5	4.8	1.5	312.5	7.9	2.0	253.2
1975-76	136.1	26.4	194.0	10.1	4.9	485.1	25.2	7.3	289.7	106.9	41.7	390.1	4.8	2.0	416.7	9.0	2.6	288.9
1976-77	113.3	23.3	206.0	11.6	5.7	491.4	24.9	6.5	261.0	123.6	31.4	254.0	3.5	1.6	457.1	8.2	2.0	243.9
1977-78	162.2	28.2	174.0	10.9	5.3	486.2	22.7	5.7	251.1	110.1	23.3	211.6	3.4	1.5	441.2	7.8	2.6	333.3
1978-79	173.3	24.6	142.0	11.4	5.6	491.2	23.2	6.8	293.1	101.5	30.4	299.5	2.7	1.3	481.5	7.5	2.7	360.0
1979-80	169.9	24.7	145.0	11.8	5.8	491.5	17.5	4.5	257.1	92.9	33.1	356.3	2.0	1.2	600.0	6.4	1.9	296.9
1980-81	184.6	30.7	166.0	12.0	6.0	500.0	19.6	6.0	306.1	91.5	25.7	280.9	3.4	1.5	441.2	7.4	2.3	310.8
1981-82	172.0	29.0	169.0	12.6	6.1	484.1	17.8	5.2	292.1	105.2	40.2	382.1	4.5	1.9	422.2	8.2	2.3	280.5
1982-83	164.4	26.1	159.0	13.1	6.3	480.9	17.8	6.4	359.6	128.0	31.6	246.9	2.7	1.1	407.4	7.9	2.1	265.8
1983-84	173.9	26.9	155.0	13.3	6.4	481.2	20.9	10.1	483.3	126.8	46.1	363.6	3.6	1.7	472.2	7.9	2.9	367.1
1984-85	142.1	25.2	177.0	16.3	8.0	490.8	19.3	7.3	378.2	144.0	49.9	346.5	5.7	2.6	456.1	8.0	1.4	175.0
1985-86	152.3	30.7	202.0	15.1	7.4	490.1	18.2	6.6	362.6	126.8	19.6	154.6	5.9	2.7	457.6	6.2	1.5	241.9
1986-87	177.4	31.2	176.0	14.2	6.9	485.9	16.2	6.7	413.6	132.5	12.2	92.1	6.2	2.4	387.1	7.2	1.7	236.1
1987-88	154.9	21.3	138.0	15.4	7.7	500.0	17.0	5.8	341.2	86.8	3.9	44.9	2.9	0.8	275.9	8.4	1.1	131.0

@ Figures for Assam include Meghalaya and Mizoram until 1969-70. + Less than 500 tonnes. * Included in Punjab.

(Contd.)

TABLE 3. AREA, PRODUCTION & YIELD OF SESAMUM (Contd.)

Year	Karnataka			Kerala			Madhya Pradesh			Maharashtra			Orissa			Punjab*		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	110.1	24.4	221.6	2.8	1.0	357.1	346.4	76.2	220.0	94.6	18.6	196.3	96.3	22.4	232.6	24.3	8.1	333.3
1950-51	80.5	15.2	188.8	3.2	1.0	312.5	407.1	89.4	219.6	115.2	25.0	216.8	95.9	22.4	233.6	30.8	6.1	198.1
1951-52	90.6	17.3	190.9	3.6	1.0	277.8	449.2	88.4	196.8	143.5	31.3	218.1	110.9	23.4	211.0	24.3	7.1	292.2
1952-53	88.6	14.2	160.3	3.2	1.0	312.5	420.5	89.4	212.6	143.3	25.8	180.0	110.5	21.3	192.8	26.7	7.1	265.9
1953-54	102.8	17.3	168.3	3.6	1.0	277.8	492.1	122.9	249.7	146.7	36.4	248.4	110.1	21.3	193.5	29.9	8.1	270.9
1954-55	86.0	18.2	211.0	21.0	7.1	338.0	494.7	118.2	239.0	155.8	36.5	234.0	103.8	20.9	201.0	25.9	7.1	274.1
1955-56	89.0	17.9	201.0	20.2	6.1	301.0	434.2	107.1	247.0	119.6	25.7	215.0	103.6	20.2	195.0	26.3	4.1	155.9
1956-57	62.0	11.6	187.0	19.8	6.5	326.0	321.4	67.6	210.0	119.9	26.9	224.1	99.3	20.1	203.0	11.2	1.1	98.0
1957-58	69.2	15.8	228.0	20.4	6.5	320.0	322.4	45.9	142.0	127.1	29.8	234.0	97.2	20.5	208.0	11.2	2.3	206.0
1958-59	68.8	13.8	201.0	19.7	5.8	296.0	363.3	70.1	209.0	146.4	32.5	222.0	95.0	19.4	204.0	14.4	3.9	271.0
1959-60	68.3	12.4	182.0	17.6	4.4	248.0	355.8	47.9	135.0	117.6	24.4	208.0	89.6	18.2	203.0	10.2	3.9	379.0
1960-61	63.7	11.0	173.0	12.1	4.3	361.0	304.6	35.2	115.0	128.2	28.3	221.0	92.5	19.3	209.0	8.3	3.0	355.0
1961-62	66.5	13.5	204.0	11.9	2.6	216.0	295.1	40.4	137.0	118.6	23.8	201.0	92.8	20.1	217.0	12.1	4.6	376.0
1962-63	67.2	24.7	368.0	11.9	2.6	216.0	333.4	59.8	179.0	133.4	28.1	210.6	110.6	31.4	284.0	16.9	6.3	373.0
1963-64	73.1	22.7	310.0	12.0	2.6	216.0	333.1	52.6	158.0	126.3	27.1	214.6	103.4	27.2	263.0	10.9	4.7	428.0
1964-65	64.8	20.6	318.0	12.0	2.4	200.0	337.7	48.1	142.0	125.4	29.6	236.0	103.4	37.1	359.0	12.7	5.1	402.0
1965-66	64.1	13.6	212.0	12.0	2.4	198.0	346.5	53.7	155.0	126.0	27.1	215.0	88.0	24.5	278.0	10.1	3.5	346.0
1966-67	66.7	15.8	237.0	12.1	2.4	199.0	470.8	53.7	114.0	128.2	29.6	231.0	116.1	40.8	351.0	17.9	6.6	370.0
1967-68	62.6	19.7	315.0	11.2	2.6	232.1	431.8	48.5	112.0	141.4	33.2	234.8	103.4	41.6	402.0	13.5	5.1	377.8
1968-69	64.4	12.5	194.0	12.0	4.0	333.3	386.1	71.5	185.0	150.0	34.4	229.3	109.1	41.4	379.0	11.7	4.3	367.5
1969-70	70.9	19.5	275.0	11.8	3.8	322.0	347.8	59.2	170.0	159.4	36.6	229.6	122.1	54.6	447.0	11.1	4.2	378.4
1970-71	71.0	23.1	325.0	11.8	3.9	330.5	351.6	49.3	140.0	159.7	38.2	239.1	90.8	44.4	488.0	14.6	5.7	390.4
1971-72	77.6	23.1	298.0	11.8	3.7	313.6	308.1	40.2	130.0	127.4	30.1	236.3	93.9	46.1	491.0	15.3	6.2	405.2
1972-73	63.1	13.6	216.0	11.8	3.4	288.1	284.0	62.3	219.0	122.5	23.2	189.4	101.8	51.5	506.0	16.4	6.4	390.2
1973-74	79.6	23.9	300.0	11.8	3.5	296.6	302.3	56.6	187.0	153.6	37.5	244.1	93.6	47.0	502.0	20.5	7.4	361.0
1974-75	88.3	30.9	350.0	11.8	3.3	279.7	302.2	50.6	167.0	137.1	33.0	240.7	104.3	46.4	445.0	22.3	8.0	358.7
1975-76	103.5	41.0	396.0	16.4	4.1	250.0	259.5	40.5	156.0	171.1	39.3	229.7	119.4	53.8	451.0	23.0	7.8	339.1
1976-77	87.8	24.2	276.0	16.0	4.5	281.3	258.8	36.8	142.0	176.6	42.6	241.2	112.1	43.2	385.0	16.0	5.8	362.5
1977-78	117.7	44.9	381.0	17.5	4.4	251.4	250.1	42.5	170.0	175.1	44.2	252.4	140.6	64.7	460.0	13.1	5.5	419.8
1978-79	116.8	41.9	359.0	17.1	4.5	263.2	232.8	29.2	125.0	179.3	52.1	290.6	162.5	78.0	480.0	10.1	3.5	346.5
1979-80	114.9	34.2	298.0	17.5	4.7	268.6	242.2	15.2	63.0	205.3	48.3	235.3	181.0	47.5	262.0	11.5	3.9	339.1
1980-81	118.4	39.7	335.0	17.3	4.5	260.1	250.0	39.0	156.0	191.4	36.0	188.1	156.5	73.8	472.0	17.3	5.6	323.7
1981-82	112.1	30.1	269.0	14.6	3.8	260.3	270.4	49.8	184.0	178.2	31.8	178.5	230.4	123.4	536.0	19.4	6.1	314.4
1982-83	118.3	29.5	249.0	14.2	3.6	253.5	257.2	28.4	110.0	198.5	46.6	234.8	236.9	123.3	520.0	14.3	5.2	363.6
1983-84	125.4	39.6	316.0	14.0	3.6	257.1	258.9	47.0	182.0	204.9	51.0	248.9	314.0	143.2	456.0	13.8	4.8	347.8
1984-85	114.2	33.6	294.0	14.4	3.6	250.0	259.6	43.7	168.0	220.9	52.0	235.4	236.9	106.7	450.0	13.8	4.8	347.8
1985-86	124.4	39.7	319.0	14.3	3.7	258.7	233.0	46.7	200.0	227.2	49.9	219.6	278.3	144.5	519.0	13.7	5.5	401.5
1986-87	127.6	37.1	291.0	13.5	3.3	244.4	209.0	19.8	95.0	216.0	49.3	228.2	282.9	144.0	509.0	13.3	5.8	436.1
1987-88	162.4	69.9	430.0	13.1	3.2	244.1	201.9	41.9	208.0	255.8	64.7	252.9	265.1	129.8	490.0	11.1	4.1	369.4

* Figures for 1949-50 to 1955-56 relate to Punjab prior to its Reorganisation in 1966.

(Contd.)

TABLE 3. AREA, PRODUCTION & YIELD OF SESAMUM (Concld.)

Year	Rajasthan			Tamil Nadu			Uttar Pradesh			West Bengal			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1949-50	210.0	36.6	174.3	143.3	43.7	305.0	446.8	88.4	197.9	7.3	3.0	411.0	2,046	438	214
1950-51	288.5	53.9	186.8	124.2	32.5	261.7	505.0	84.3	166.9	9.7	4.1	422.7	2,204	445	202
1951-52	322.5	28.4	88.1	170.4	43.7	256.5	526.9	114.8	217.9	8.5	4.1	482.4	2,405	452	188
1952-53	347.2	67.1	193.3	116.1	29.5	255.0	515.6	97.5	189.1	5.3	3.0	566.0	2,377	471	198
1953-54	428.2	97.5	227.7	174.4	53.9	309.0	483.6	84.3	174.3	4.5	2.0	444.4	2,570	563	219
1954-55	535.3	109.9	363.0	162.3	51.6	318.0	522.8	118.7	227.0	6.5	2.9	456.0	2,626	603	230
1955-56	389.2	75.0	193.0	149.9	46.1	308.0	472.3	68.7	146.0	6.5	2.9	456.0	2,293	467	204
1956-57	478.9	92.0	192.0	119.1	38.5	323.0	469.9	78.3	167.0	5.7	3.0	538.0	2,172	438	202
1957-58	443.0	53.8	121.0	112.5	36.5	324.0	451.5	62.6	139.0	4.0	1.5	363.0	2,094	359	171
1958-59	490.6	116.0	236.0	152.6	47.8	313.0	471.9	110.3	234.0	4.8	1.9	394.0	2,250	514	228
1959-60	554.5	67.2	121.0	115.1	37.4	325.0	459.3	80.9	176.0	4.2	1.6	394.0	2,136	370	173
1960-61	420.6	25.0	59.0	127.8	41.8	327.0	652.4	82.8	127.0	3.8	1.6	407.0	2,169	318	147
1961-62	514.1	68.2	133.0	111.0	35.9	324.0	621.2	81.0	130.0	4.3	1.8	427.0	2,252	372	165
1962-63	625.8	82.2	131.0	130.2	41.2	316.0	699.0	118.1	169.0	4.9	2.2	453.0	2,552	492	193
1963-64	484.4	29.4	61.0	110.0	35.2	320.0	746.5	149.2	200.0	5.5	2.4	443.0	2,412	439	182
1964-65	578.6	59.9	104.0	120.4	38.5	320.0	755.1	165.1	219.0	5.8	3.0	506.0	2,486	484	195
1965-66	630.1	51.4	82.0	118.0	38.2	324.0	708.0	126.9	179.0	8.2	4.1	500.0	2,509	424	169
1966-67	728.5	63.2	87.0	107.3	34.7	323.0	704.5	71.3	101.0	8.2	3.7	454.0	2,794	416	149
1967-68	666.0	82.5	124.0	108.5	34.5	318.0	687.2	73.9	108.0	8.5	3.9	458.8	2,654	445	168
1968-69	525.4	22.5	43.0	108.5	33.8	312.0	656.4	111.7	170.0	8.2	4.5	548.8	2,423	422	174
1969-70	427.6	20.9	49.0	118.1	37.8	320.0	618.5	106.2	172.0	9.0	4.9	544.4	2,309	448	194
1970-71	499.2	114.1	229.0	120.1	38.6	321.0	662.4	115.1	174.0	10.2	5.9	578.0	2,433	562	231
1971-72	630.2	81.3	129.0	134.2	43.4	323.0	537.9	70.2	131.0	14.2	8.1	570.0	2,392	449	188
1972-73	454.6	27.0	59.0	136.2	43.6	320.0	710.5	80.1	113.0	11.1	5.5	495.0	2,288	385	168
1973-74	475.8	58.9	124.0	130.8	38.4	294.0	692.5	113.2	163.0	14.9	7.5	503.0	2,386	485	203
1974-75	398.5	22.3	56.0	97.2	17.9	184.0	678.1	87.6	129.0	25.9	15.1	583.0	2,234	392	176
1975-76	366.9	64.9	177.0	97.5	30.9	317.0	674.2	86.2	128.0	33.3	20.7	622.0	2,170	479	221
1976-77	377.5	59.2	157.0	112.3	38.7	345.0	790.9	70.7	89.0	33.4	21.4	641.0	2,279	422	185
1977-78	363.1	50.1	138.0	162.0	54.5	336.0	765.9	105.0	137.0	52.0	34.4	662.0	2,384	520	218
1978-79	423.2	75.3	178.0	131.6	46.3	352.0	730.2	80.5	110.0	56.0	27.8	496.0	2,389	514	215
1979-80	317.9	11.7	37.0	123.6	43.3	350.0	793.1	32.6	41.0	56.1	30.3	540.0	2,377	348	146
1980-81	427.7	33.8	79.0	100.8	33.2	329.0	751.2	55.2	73.0	108.1	47.7	441.0	2,472	446	180
1981-82	425.1	49.9	117.0	131.7	45.2	343.0	754.1	96.1	127.0	122.5	63.8	521.0	2,593	590	228
1982-83	448.7	40.7	91.0	110.0	26.8	244.0	356.1	109.1	67.0	114.4	60.2	526.0	2,217	552	249
1983-84	377.4	65.4	173.0	121.3	35.9	296.0	319.8	12.8	40.0	94.8	54.4	574.0	2,204	559	254
1984-85	418.4	73.2	175.0	99.8	35.7	358.0	310.6	16.7	54.0	76.4	47.1	616.0	2,117	520	246
1985-86	520.0	27.0	52.0	113.7	45.6	401.0	278.0	16.8	60.0	74.8	44.0	588.0	2,217	501	226
1986-87	341.0	7.0	21.0	107.7	32.4	301.0	391.1	13.8	35.0	86.9	62.5	719.0	2,164	448	207
1987-88	212.5	5.8	27.0	137.2	41.9	305.0	369.5	12.7	34.0	165.8	139.1	839.0	2,097	562	268

TABLE 4. AREA, PRODUCTION & YIELD OF SAFFLOWER

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Andhra Pradesh			Bihar			Karnataka			Madhya Pradesh			Maharashtra			Orissa			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y			
1962-63																					
1963-64																					
1964-65																					
1965-66	35.2	5.3	150.6				125.5	18.6	148.0	0.9	0.2	222.2	299.5	44.3	148.0				462	69	149
1966-67	44.4	6.4	144.1	0.2	-	-	129.8	19.7	152.0	1.4	0.3	214.3	301.7	45.9	152.0				478	72	151
1967-68	48.1	6.6	137.2	1.0	0.4	400.0	138.6	21.6	156.0	1.4	0.3	214.3	323.4	48.8	151.0				513	78	152
1968-69	51.9	7.9	152.2	0.7	0.3	428.6	137.5	23.4	170.0	1.4	0.3	214.3	386.2	61.8	160.0				578	94	162
1969-70	52.5	8.6	163.8	4.0	1.2	300.0	148.5	25.6	172.0	1.4	0.3	214.3	373.8	106.7	285.0				580	142	245
1970-71	52.2	16.1	308.0	1.0	0.4	400.0	153.5	26.9	175.0	0.7	0.2	285.7	380.5	110.3	290.0				588	154	262
1971-72	52.3	8.4	161.0	0.7	0.3	428.6	157.8	26.8	170.0	0.7	0.2	285.7	386.2	94.8	245.0				598	131	218
1972-73	56.8	10.7	188.0	0.5	0.1	200.0	110.7	12.9	117.0	1.3	0.3	230.8	254.0	57.8	228.0				423	82	193
1973-74	62.7	13.9	222.0	0.6	0.2	333.3	149.9	23.1	154.0	1.2	0.3	250.0	399.4	153.5	384.0				614	191	311
1974-75	40.7	13.2	324.0	0.8	0.3	375.0	159.9	25.7	161.0	1.1	0.3	272.7	445.3	172.4	387.0				648	212	327
1975-76	17.1	3.9	228.0	0.7	0.3	428.6	178.9	41.5	232.0	1.1	0.2	181.8	471.3	190.4	404.0	4.5	2.0	444.4	674	238	354
1976-77	9.5	1.8	189.0	0.5	0.2	400.0	160.8	35.8	223.0	0.8	0.1	125.0	509.9	181.0	355.0	1.5	0.7	466.7	683	220	322
1977-78	26.4	6.5	246.0	0.6	0.3	500.0	159.7	37.1	232.0	1.2	0.2	166.7	515.0	142.2	276.0	3.6	1.5	416.7	707	188	266
1978-79	33.2	7.9	238.0	0.4	0.2	500.0	150.1	29.4	196.0	0.9	0.2	222.2	513.9	169.2	329.0	4.5	2.1	466.7	703	209	297
1979-80	35.3	9.1	258.0	0.5	0.2	400.0	160.4	75.0	468.0	0.9	0.2	222.2	533.4	193.7	363.0	2.8	1.2	428.6	733	280	381
1980-81	34.9	5.5	158.0	0.3	0.1	333.3	157.8	80.9	513.0	1.0	0.2	200.0	519.9	245.6	472.0	6.0	2.8	466.7	720	335	465
1981-82	43.1	14.9	346.0	0.5	0.2	400.0	157.1	79.6	507.0	1.1	0.2	181.8	542.2	324.4	598.0	4.5	2.2	488.9	748	422	563
1982-83	55.1	18.6	338.0	0.5	0.2	400.0	172.7	96.9	561.0	1.6	0.3	187.5	547.2	277.6	507.0	5.0	2.3	460.0	782	396	506
1983-84	56.3	15.7	279.0	0.5	0.3	600.0	200.0	108.8	544.0	1.7	0.4	235.3	568.1	373.3	657.0	4.7	2.4	510.6	831	501	603
1984-85	51.4	13.7	267.0	0.4	0.3	750.0	250.2	135.0	540.0	1.1	0.2	181.8	610.5	364.1	596.0	4.5	1.9	422.2	918	515	561
1985-86	44.6	10.8	242.0	0.5	0.3	600.0	241.8	85.8	355.0	1.4	0.3	214.3	619.0	248.7	402.0	4.0	2.0	500.0	911	348	382
1986-87	33.8	9.4	278.0	0.3	0.2	666.7	268.3	143.2	534.0	1.4	0.3	214.3	583.7	197.5	338.0	4.7	1.9	404.3	892	353	395
1987-88	33.2	7.5	226.0	0.3	0.2	666.7	320.2	113.8	355.0	2.0	0.4	200.0	708.0	327.8	463.0	3.5	1.6	457.1	1067	451	423

TABLE 5. AREA, PRODUCTION & YIELD OF NIGERSEED

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Andhra Pradesh			Bihar			Karnataka			Madhya Pradesh			Maharashtra			Orissa			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1962-63																					
1963-64																					
1964-65	13.3	1.8	134.0	53.3	15.5	291.0	23.7	3.4	141.0	278.3	51.1	184.0	74.5	10.5	141.0	46.6	14.8	318.0	487	97	199
1965-66	14.1	1.8	127.7	56.3	18.5	329.0	22.5	2.9	128.9	282.2	42.6	151.0	71.3	9.2	129.0	75.9	15.6	206.0	522	91	173
1966-67	16.2	1.8	111.1	44.9	9.3	207.0	10.8	3.3	305.5	264.5	27.5	104.0	78.0	14.9	191.0	59.0	21.8	369.0	473	79	166
1967-68	12.6	1.6	127.0	34.6	13.6	393.0	22.1	4.4	199.1	263.0	44.5	169.0	80.0	14.0	175.0	55.6	19.7	354.0	468	98	209
1968-69	10.8	1.2	111.1	46.6	14.9	320.0	21.5	2.7	125.6	232.8	39.1	168.0	75.6	12.7	168.0	53.6	18.8	351.0	441	89	203
1969-70	15.0	1.9	126.7	52.1	12.5	240.0	24.1	3.4	141.1	237.9	39.9	168.0	80.7	13.6	169.0	72.6	26.8	369.0	482	98	203
1970-71	13.9	7.8	561.2	51.9	22.2	428.0	24.5	3.4	138.8	238.6	44.0	184.0	81.9	14.0	171.0	77.8	36.3	467.0	489	128	261
1971-72	8.2	1.4	107.7	54.2	13.0	240.0	29.8	6.8	228.2	250.7	48.1	192.0	77.5	13.3	172.0	68.4	33.2	485.0	494	116	235
1972-73	7.4	5.6	682.9	50.8	13.6	268.0	15.4	3.2	207.8	257.2	34.5	134.0	61.4	3.5	57.0	73.8	32.1	435.0	467	93	198
1973-74	6.2	5.5	743.2	56.8	12.4	218.0	35.6	7.6	213.5	284.4	55.5	195.0	83.9	15.9	190.0	84.2	39.1	464.0	552	136	246
1974-75	9.4	4.4	709.7	60.2	17.6	292.0	42.9	7.8	181.8	311.0	48.1	155.0	91.6	13.7	150.0	109.1	40.4	370.0	621	132	213
1975-76	10.9	7.9	840.4	64.8	19.5	301.0	47.4	9.3	196.2	275.9	52.6	191.0	104.5	13.4	128.0	112.9	47.6	422.0	615	151	245
1976-77	13.8	11.2	1027.5	50.8	18.6	366.0	47.4	7.9	166.7	254.8	29.8	117.0	106.3	10.2	96.0	97.5	35.4	363.0	568	113	199
1977-78	11.3	14.3	1036.2	52.6	20.7	394.0	57.3	10.0	174.5	265.1	47.7	180.0	107.7	12.9	120.0	111.9	42.2	377.0	609	148	243
1978-79	10.6	7.0	619.5	53.4	22.5	421.0	60.3	10.2	169.2	254.2	37.2	146.0	102.4	18.0	176.0	129.8	51.3	395.0	612	147	239
1979-80	10.6	5.9	556.6	40.3	11.2	278.0	62.0	10.7	172.6	224.9	21.0	93.0	102.9	17.5	170.0	142.3	38.8	273.0	584	105	181
1980-81	9.0	2.5	235.8	47.9	17.7	370.0	54.8	9.6	175.2	224.7	32.5	145.0	102.0	17.9	175.0	158.1	65.8	416.0	599	146	244
1981-82	7.0	3.1	344.4	45.1	16.6	368.0	57.7	10.1	175.0	225.1	40.7	181.0	101.0	24.1	239.0	163.9	64.6	394.0	604	160	265
1982-83	8.4	2.2	314.3	32.9	12.6	383.0	54.4	9.6	176.5	218.0	38.4	176.0	86.7	14.2	164.0	98.0	40.5	413.0	498	118	236
1983-84	11.3	2.7	321.4	37.4	14.4	385.0	59.8	10.7	178.9	212.9	45.4	213.0	95.1	20.3	213.0	180.6	81.2	450.0	599	176	294
1984-85	12.6	1.3	115.0	36.0	13.7	381.0	64.5	11.4	176.7	219.1	34.3	157.0	96.8	22.6	233.0	156.5	62.3	398.0	590	148	251
1985-86	13.7	2.7	214.3	37.1	13.6	367.0	54.8	9.8	178.8	227.8	49.2	216.0	95.9	20.7	216.0	201.2	94.0	467.0	635	192	303
1986-87	13.7	3.1	226.3	36.1	13.5	374.0	51.0	9.0	176.5	220.9	32.1	145.0	87.3	10.8	124.0	171.5	60.5	353.0	587	131	224
1987-88		5.1	372.3	33.7	10.9	323.0	67.0	12.2	182.1	218.3	44.1	202.0	121.9	26.2	215.0	192.0	74.4	388.0	652	175	268

TABLE 6. AREA, PRODUCTION & YIELD OF SUNFLOWER

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Andhra Pradesh			Bihar			Karnataka			Maharashtra			Orissa		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1962-63															
1963-64															
1964-65															
1965-66															
1966-67															
1967-68															
1968-69															
1969-70															
1970-71	23.6	9.6	407.0				15.6	2.5	160.0						
1971-72	23.6	9.6	407.0				15.6	2.5	160.0						
1972-73	23.6	9.6	407.0				15.6	2.5	160.0						
1973-74	38.0	19.0	500.0	10.7	5.2	486.0	39.4	39.4	1000.0	26.5	16.0	604.0	8.2	5.0	609.8
1974-75	62.9	53.4	849.0	9.2	2.2	239.1	62.9	59.9	952.0	64.6	14.0	207.0	7.4	2.4	324.3
1975-76	46.0	18.4	400.0	6.4	4.2	656.3	65.2	65.2	1000.0	37.5	18.8	501.0	5.4	4.2	777.8
1976-77	22.3	11.2	502.0	6.4	4.2	656.3	29.9	29.9	1000.0	24.4	24.4	1000.0	4.4	4.2	954.5
1977-78	19.0	4.7	247.0	3.2	..	..	51.6	51.6	1000.0	21.1	1.1	52.0	2.0	..	..
1978-79	14.0	2.2	157.0	1.6	..	..	52.2	51.6	989.0	20.9	9.3	445.0	1.2	0.9	750.0
1979-80	1.0	0.5	500.0	0.8	0.3	375.0	19.9	15.3	769.0	30.0	12.0	400.0	1.0	0.3	300.0
1980-81	1.9	0.9	474.0	1.0	0.3	300.0	37.7	16.5	438.0	63.3	39.9	630.0	1.3	0.5	384.6
1981-82	5.9	2.9	492.0	0.7	0.2	285.7	97.7	50.2	514.0	142.7	92.1	645.0	0.9	0.5	555.6
1982-83	12.7	4.0	314.9	0.6	0.2	333.3	195.6	79.6	407.0	193.5	115.0	594.0	0.9	0.5	555.6
1983-84	24.9	9.3	373.5	0.4	0.2	500.0	333.8	161.0	482.0	299.5	109.0	364.0	0.9	0.4	444.4
1984-85	29.4	11.3	384.4	0.5	0.2	400.0	445.0	237.2	533.0	324.9	170.0	523.0	1.1	0.5	454.5
1985-86	26.8	14.0	522.4	0.4	0.1	250.0	376.0	120.1	319.0	324.8	135.5	417.0	0.7	0.4	571.4
1986-87	85.7	34.4	401.4	0.4	0.2	500.0	597.8	120.1	485.0	313.8	83.6	266.0	0.7	0.3	428.6
1987-88	126.0	51.8	411.1	0.4	0.1	250.0	1155.7	409.3	354.0	338.0	129.0	382.0	0.6	0.2	333.3

(Contd.)

TABLE 6. AREA, PRODUCTION & YIELD OF SUNFLOWER (Concld.)

Year	Rajasthan*			Tamil Nadu			Uttar Pradesh			West Bengal*			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1962-63															
1963-64															
1964-65															
1965-66															
1966-67															
1967-68															
1968-69															
1969-70															
1970-71				77.6	64.2	827.0							117	76	653
1971-72				77.6	64.2	827.0							117	76	653
1972-73				77.6	64.2	827.0							117	76	653
1973-74				102.0	80.9	793.0				11.8	3.0	254.2	237	169	712
1974-75				113.8	91.9	808.0	6.8	3.4	500.0	11.9	0.5	42.0	340	228	671
1975-76				137.8	93.6	679.0	8.3	8.3	1,000.0	9.1	4.0	439.6	316	217	686
1976-77	1.5	..	..	149.0	52.1	350.0	7.4	7.4	1,000.0	9.2	4.2	456.5	255	138	541
1977-78				159.3	74.5	468.0	9.3	9.3	1,000.0	4.6	0.2	45.5	270	141	523
1978-79				85.3	30.0	352.0	4.4	4.4	1,000.0	2.3	0.4	173.9	182	99	543
1979-80	0.1	0.1	1,000.0	3.9	1.1	282.0	2.6	1.8	692.0	2.0	0.4	200.0	61	32	519
1980-81	0.2	0.1	500.0	5.5	2.6	473.0	6.3	4.4	698.4	2.2	1.1	500.0	119	67	555
1981-82	0.6	0.4	666.7	25.1	7.4	295.0	6.3	4.4	698.4	1.9	0.9	473.7	282	159	564
1982-83	2.1	0.6	285.7	53.6	28.0	522.0	2.5	1.7	680.0	0.7	0.1	142.9	462	230	497
1983-84	4.2	1.3	309.5	27.6	15.4	558.0	2.5	1.7	680.0	2.1	1.3	619.0	696	300	431
1984-85	4.2	1.3	309.5	25.3	16.6	656.0	2.5	1.9	760.0	1.7	0.8	470.6	835	440	527
1985-86	5.2	1.1	211.5	13.9	7.0	504.0	2.5	1.9	760.0	1.3	0.8	615.4	752	281	374
1986-87	4.1	0.4	97.6	16.2	8.2	506.0	2.5	1.9	760.0	1.3	0.8	615.4	1,023	420	411
1987-88	5.3	1.5	283.0	26.5	14.8	558.0	2.5	1.9	760.0	1.6	1.1	687.5	1,657	610	368

* Yield figures computed for these States at ISPE.

TABLE 7. AREA, PRODUCTION & YIELD OF SOYABEAN

A - Area in '000 hectares
P - Production in '000 tonnes
Y - Yield per hectare in kgs.

Year	Gujarat			Himachal Pradesh			Karnataka			Madhya Pradesh			Maharashtra		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1962-63															
1963-64															
1964-65															
1965-66															
1966-67															
1967-68															
1968-69															
1969-70															
1970-71	0.6	0.3	500.0							7.7	7.7	1000.0	18.2	2.3	126.0
1971-72	0.6	0.3	500.0							7.7	7.7	1000.0	18.2	2.3	126.0
1972-73	1.3	0.1	77.0							16.0	12.0	750.0	1.3	0.4	308.0
1973-74	0.6	0.1	167.0				0.2	@		25.3	22.0	870.0	1.1	0.4	364.0
1974-75	0.8	0.2	250.0				0.5	@		39.7	34.9	879.0	0.6	0.2	333.0
1975-76	0.2	0.1	500.0				0.1	@		55.5	62.2	1121.0	0.4	0.1	250.0
1976-77	-	-	-				1.0	@		80.9	89.0	1100.0	-	-	-
1977-78	-	-	-	3.8	5.7	1500.0	1.2	@		136.0	135.7	998.0	-	-	-
1978-79	-	-	-	3.9	5.8	1487.0	1.3	@		232.6	232.6	1000.0	-	-	-
1979-80	-	-	-	3.9	5.9	1513.0				414.3	240.0	579.0	-	-	-
1980-81	11.0	4.5	409.0	0.4	..	..				454.8	350.0	770.0	-	-	-
1981-82	11.0	4.5	409.0	0.4	..	..				307.3	235.1	765.0	-	-	-
1982-83	11.0	4.5	409.0	0.3	..	..				584.1	358.6	614.0	-	-	-
1983-84	11.0	4.5	409.0	0.5	0.1	200.0				613.8	461.6	752.0	-	-	-
1984-85	11.0	4.5	409.0	0.6	0.1	166.7				986.6	769.6	780.0	-	-	-
1985-86	1.2	1.0	833.3	0.5	0.1	200.0				1096.5	829.0	756.0	-	-	-
1986-87	22.4	6.0	267.9	0.5	0.1	200.0	13.0	4.0	307.7	1209.6	677.4	560.0	54.6	19.8	363.0
1987-88	10.2	3.1	303.9	0.6	0.1	166.7	16.0	5.0	312.5	1319.4	741.5	562.0	76.7	24.6	321.0

@ Below 500 tonnes.

(Contd.)

TABLE 7. AREA, PRODUCTION & YIELD OF SOYABEAN (Concld.)

Year	Rajasthan			Uttar Pradesh			West Bengal			All India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1962-63												
1963-64												
1964-65												
1965-66												
1966-67												
1967-68												
1968-69												
1969-70												
1970-71				5.9	3.5	593.0				32	14	426
1971-72				5.9	3.5	593.0				32	14	426
1972-73				15.1	15.1	1000.0				34	28	819
1973-74				20.5	16.9	824.0				48	39	829
1974-75				22.4	15.9	626.0				67	51	768
1975-76				36.1	28.3	784.0				93	91	975
1976-77				43.9	34.4	784.0				125	123	988
1977-78				54.0	41.8	774.0				195	183	940
1978-79				68.7	60.3	878.0				306	299	975
1979-80				76.9	36.1	469.0				496	282	568
1980-81	4.8	2.5	521.0	135.0	84.0	622.0	0.5	0.4	800.0	608	442	728
1981-82	9.8	6.5	663.0	141.2	101.8	721.0	0.7	0.5	714.3	475	352	741
1982-83	11.7	6.3	538.0	157.2	117.4	747.0	0.6	0.2	333.3	770	491	637
1983-84	22.6	15.6	690.0	181.7	127.4	701.0	0.3	0.1	333.3	836	614	735
1984-85	30.5	26.1	856.0	207.0	148.0	715.0	0.3	0.2	666.7	1,243	955	768
1985-86	42.7	31.8	745.0	192.0	154.0	802.0	0.3	0.2	666.7	1,340	1,024	764
1986-87	52.0	39.2	754.0	167.4	135.5	809.0	0.5	0.3	600.0	1,527	892	584
1987-88	83.6	61.3	733.0	167.4	135.5	809.0	0.6	0.4	666.7	1,681	980	583

DEMAND FOR LABOUR IN INDIAN MANUFACTURING INDUSTRY: 1960-84

Vijay K. Seth and Ashok K. Seth

The objective of the present paper is to study the demand for labour in the Indian manufacturing industry during the period 1960 to 1984. For this purpose, it uses labour demand function based on CES production function estimated for four major groups of industries, as also for the aggregate manufacturing industry for three sub-periods 1960-65, 1966-75, and 1976-84 as also for the entire period 1960-84 and analyses shifts in the pattern of demand for labour over the three sub-periods representing three phases of industrialisation experienced by the Indian economy since Independence.

The objective of the present paper is to study the labour absorption capacity of the Indian manufacturing sector for the period 1960 to 1984. This long period may be divided into three sub-periods corresponding to the three phases of industrialisation experienced by the Indian economy, namely, (a) the phase of acceleration from 1950 to 1965, (b) the phase of deceleration or relative stagnation from 1966 to 1975, and finally (c) the period of recovery from 1975 onwards [Ahluwalia 1985, 1988, Goldar and Seth, 1989, Pp. 1,237-40]. It will be of interest to study any shifts in the labour absorption capacity of the manufacturing sector during these three phases. The paper is divided into three sections: Section I deals with the data base and methodology. In section II, we present the results of the labour demand function estimated by pooling of cross section and time series data for aggregate manufacturing and for four major groups of industries. Finally, in section III, the main conclusions are reported.

METHODOLOGY AND DATA BASE:

To estimate the labour absorption capacity of the manufacturing sector, labour demand functions are derived either from Cobb-Douglas or from the Constant Elasticity of Substitution function (CES) production function. Sometimes, demand for factors are also estimated from the share equations of translog functions. The reduced form of equations used by different authors are presented in Table 1.

TABLE 1. REDUCED FORMS OF ESTIMATED EQUATIONS

Author	Estimated Equations
Erikson (1969)	$\dot{L} = f(Y, W)$
	$\dot{L} = f(Y, W, K)$
Gupta (1975)	$L = f(Y, U/W, L\text{-}1)$
Kumar (1982)	$L = f(Y, L\text{-}1)$
Kwon and Williams (1982)	trans-log cost function with three inputs.
Lumas and Williams (1981)	trans-log cost function with three inputs
Maitha (1973)	$L = f(Y, L\text{-}1, t)$
Gupta (1989) and Sethuraman (1971)	$L = f(K, Wp, Wnp, L\text{-}1)$
Van Rijckenghem (1969)	$L = f(Y, W)$
Williamson (1971) and Krishna (1974)	$L = f(Y, W, L\text{-}1, t)$
Diwan & Gujarati (1968) and Goldar (1986, 87)	$L = f(Y, W, L\text{-}1, t)$

Note: L stands for rate of growth of employment, Y for output, W for wage rate, K for capital, L-1 for lagged employment, t for time and Wnp and Wp for wage rate of non-production and production workers respectively.

Vijay K. Seth is a Reader in the Faculty of Management Studies, University of Delhi, South Delhi Campus, New Delhi.
Ashok K. Seth is a Reader in the Department of Economics, Swami Shradhanand College, University of Delhi and a Research Scholar of the Faculty of Management Studies, University of Delhi, Delhi.

The study is a part of a larger study by the authors on "Structural Changes in the Labour Absorption in Indian Manufacturing Sector" (mimeo), Faculty of Management Studies, University of Delhi, South Delhi Campus, New Delhi.

We propose to use labour demand function based on CES production function which is specified as:

(1) $Q = A[\delta K - p + (1-\delta) L - p] - \mu/p$

where Q refers to value-added, K to capital input and L to labour inputs; p is the substitution parameter determining the elasticity of substitution between capital and labour and 'μ' refers to returns to scale. $\mu >\leq 1$ imply increasing, decreasing, and constant returns to scale. 'δ' can be regarded as a measure of non-neutral technological change. The elasticity of substitution, (σ), as per the above production function is given as:

(2) $\sigma = 1/(1+p)$

Profit maximisation requires that the level of employment is such that the value of the marginal product of labour services is proportional to real wages, that is,

(3) $dQ/dL = aw$

where dQ/dL stands for marginal product of labour and 'w' for the real wage-rate given by the nominal wage-rate divided by the price of product of the firm; in other words, 'w' is expressed in terms of the product of the firm. 'a' is determined by the market structure of the industry and is given by

(4) $a = (1+e_s)/(1+e_d)$

where $1/e_s$ stands for elasticity of supply of labour and captures the market imperfections in the labour market, and $1/e_d$ stands for elasticity of demand for output and measures the imperfections in the product market. For instance, $a = 1$ implies that market is perfect and $a \neq 1$ that market is imperfect.

Substituting the values of marginal product of labour (dQ/dL) from (1) in (3) we have,

(5) $aw_t = A'Q_t[(p/\mu) + 1] L_t - (p+1)$

where $A' = [\mu(1-\delta)/A_p/\mu]$

This may be rearranged into,

(6) $L_t = A^* w_t^{-\sigma} Q_t^{\beta}$

where

$A^* = (A'/a)^{\sigma}$ and $\beta = [(p+\mu)/\mu]^{\sigma}$

Equation (6) provides a demand function for labour based on the assumptions of (a) CES production function, (b) certain conditions regarding marginal productivity and factor market, and (c) an instantaneous adjustment in factor and commodity markets. This is a long run demand function for labour and 'β' and 'σ' are long run elasticities; 'β' is the elasticity of employment with respect to output while 'σ' is the elasticity of employment with respect to wage rate. In the long run, 'σ' also gives elasticity of substitution between capital and labour [Williamson, 1971]. The model can be specified in its testable form as:

(7) $L_t = A^* w_t^{-\sigma} Q_t^{\beta} u_t$

where 'u_t' is a random term assumed to be log-normally distributed with zero mean and unit standard deviations. The model states that the change in output and real wage rate are exogenously determined and that they in turn determine demand for labour in the firm or industry.

The nature of demand for labour varies from industry to industry depending on the skill composition and relative scarcity of skills. The function estimates demand for average labour at average wage rate in each industry. As mentioned above, the model is based on the assumption that there is instantaneous adjustment in the labour and product market, that, in particular, there are no supply side bottlenecks in the labour market implying that average labour in each industry is available in abundant supply.

The elasticities embodied in the demand function (7) are the long run elasticities. To distinguish between the short and long run elasticities and to understand the process of adjustment of actual levels of employment to the desired levels, we adopt partial adjustment model. In logarithmic form it, may be written as:

(8) $[L_t/L_{t-1}] = [L_t^*/L_{t-1}]^{\theta}$

here 'L^*' stands for the desired level of employment and 'θ' stands for adjustment parameter. This process of adjustment can also be looked as the lagged adjustment between supply and demand of labour. In logarithmic form this can be expressed as:

(8a) $[L_d(t)/L_d(t-1)] = [L_s(t)/L_s(t-1)]^{\theta}$

Where $L_d(t)$ and $L_s(t)$ refer to demand and supply of labour respectively at time 't'. This equation assumes that labour supply gets adjusted to its demand with the speed 'θ' or with an elasticity 1/θ. We should note that equations (8) and (8a) are two different processes of adjustment in labour market. Equation (8) is a process of partial adjustment between actual and desired level of employment whereas equation (8a) is a process of adjustment between demand and supply of labour. If we incorporate either of these adjustment processes in the model (6), with the conditions that $L_t = L_t^*$ or $L_t = L_s$

we get:

(9) $\ln(L_t) = a + b \ln(W_t) + c \ln(Q_t) + d \ln(L_{t-1}) + u_t$

The coefficient of $\ln(W_t)$ is expected to be negative since an increase in the real cost of labour should reduce demand for labour. The coefficient of ln(Qt) is expected to be positive because increases in output would increase demand for labour. The coefficient of ln(Lt-1) is expected to be positive fraction because partial adjustment process requires $0 < \theta < 1$. In this functional form the short-run elasticity of employment with respect to real wage rate is given by 'b' and long-run elasticity by b/(1-d). Similarly, the short-run elasticity of employment with respect to output is given by 'c'and long-run elasticity of employment with respect to output is given by c/(1-d). An explanation may be useful.

If we specify the desired level of employment as a function of wage rate and output as:

(A) $\text{Log } L^* = \alpha + \beta \text{ Log } W + \gamma \text{Log } Q$

The partial adjustment scheme specified in equation (8) of the paper is:

$$\left[\frac{L_t}{L_{t-1}}\right] = \left[\frac{L_t^*}{L_{t-1}}\right]^{\theta}$$

Taking logs of both sides

$\text{Log } L_t - \text{Log } L_{t-1} = \theta [\text{Log } L_t^* - \text{Log } L_{t-1}]$

which on solving gives:

$\text{Log } L_t = \theta \text{ Log } L_t^* + (1 - \theta) \text{ Log } L_{t-1}$

Substituting the value of $\text{Log } L_t^*$ from (A) we have

$\text{Log } L_t = \theta (\alpha + \beta \text{ Log } W + \gamma \text{Log } \theta) + (1 - \theta) \text{ Log } L_{t-1}$

or $\text{Log } L_t = \theta \alpha + \theta \beta \text{ Log } W + \theta \gamma \text{Log } Q + (1 - \theta) \text{ Log } L_{t-1}$

or (B) $\text{Log } L_t = a + b \text{ Log } W + C \text{ LogQ} + (1 - \theta) \text{ Log } L_{t-1}$

where $a = \theta \alpha$, $b = \theta \beta$, $c = \gamma \theta$ and $d = 1 - \theta$

The estimates that we get by estimating (B) are products of long run parameters and 'θ' the speed of adjustment. To get long run parameters, the obtained estimates are to be divided by θ = (1 - d). Thus, the long run elasticities are given by b/1-d and c/1-d.

To examine shifts in labour absorption during different phases of industrialisation, time-series and cross-section data are pooled. Since different groups of industries have different production structure in the sense of level of technology and the technological requirement of factors of production per unit of output, heteroscedasticity across groups (and some times even within group or within a time series data) may be expected. Similarly, different slope and intercept coefficients for each group or for each industry may also be expected. Pooling of time series and cross-section data requires the testing of significance of these behavioral parameters. However, in this study, homoscedasticity of the error terms was assumed along with the commonality of the slope coefficients across groups and within groups. With these assumptions, we use a covariance model which assumes that each cross-sectional unit and each time period is characterised by its own particular intercept. This is incorporated in the model by introducing dummy (binary) variables. The regression equation (9), to be estimated, is then written as:

(10) $\text{Log}(L_t) = a_1 + \sum_i a_{2i} DI_i + a_3 \text{Log}(W_t^*) + a_4 \text{Log}(Q_t)$

$$+ (1 - \theta) \text{Log}(L_{t-1}) + \sum_q a_{5q} DT_q$$

where i=1, 2, ..., N-1, q=1, 2, ..., T-1, N = number of industries, T = Number of observations DI_i = ith industry dummy, DT_q = qth time dummy and 'θ'is the adjustment parameter. Number of parameters to be estimated is M+N+T-1 where M is the total number of explanatory variables.

For the purpose of our study, data on employment, wages and value-added for 20 major industries are taken from a study of the Central Statistical Organisation (CSO) which is based on the data reported in the Annual Survey of Industries 1984-85 [CSO, 1988] for the factory sector for the period 1960 to 1980. The 20 industries along with their classification into four

major industrial groups is given in Appendix A. To extend the series to 1984 (the latest year for which ASI data are available), we have used comparable ASI industrial classification as reported in the study of CSO. To arrive at real wages, we have deflated the nominal wage rate reported in the CSO study by the wholesale price index of the concerned product as given by Chandhok upto the period 1978 and, for the subsequent period, as reported in the Index Number of Wholesale Prices [Chandok, 1978, and Economic Advisor, Government of India].

LABOUR DEMAND FUNCTIONS

To see whether labour absorption shows changes during different phases of industrialisation, we begin by estimating gross employment output elasticities (Eg) for each major group of industries for the three sub-periods 1960-65, 1966-75 and 1976-84. The value of Eg is computed by dividing the growth rate in employment by the growth rate in the output (value added). These are given in Table 2. Thus, taking all manufacturing industry together and the entire period 1960-84, the output grew at 6.40 per cent per annum while employment at 3.50 per cent per annum giving Eg = 0.543. During the three sub-periods, the output of all industries together grew at the rate of 9.90, 5.30, and 10.80 per cent per annum respectively confirming our characterisation of the three sub-periods as phases of acceleration, relative stagnation, and recovery respectively. The Eg in the three sub-periods is 0.575, 0.679, and 0.564 respectively. It may be noted that the Eg in the periods of acceleration and recovery is not very different but in the period of relative stagnation it is much higher (0.679).

TABLE 2. ANNUAL GROWTH RATE OF GROSS VALUE-ADDED AND OF EMPLOYMENT AND GROSS EMPLOYMENT OUTPUT ELASTICITIES: 1960-1984

Industry/Period	1960-1965			1966-1975			1976-1984			1960-1984		
	Rv	Re	Eg	Rv	Re	Eg	Rv	Re	Eg	Rv	Re	Eg
Basic Industries	17.00	10.80	0.635	6.80	5.20	0.764	7.60	4.40	0.579	7.60	4.94	0.650
Capital Goods Ind.	13.40	8.10	0.604	3.50	2.30	0.657	5.20	2.56	0.492	4.80	2.30	0.480
Intermediate Goods Ind.	5.32	3.19	0.582	2.50	2.10	0.840	12.40	6.30	0.508	5.61	3.60	0.641
Consumer Goods Ind.	6.20	4.10	0.661	3.40	1.30	0.382	8.41	3.20	0.382	5.10	2.50	0.490
Aggregate Industries	9.90	5.70	0.575	5.30	3.60	0.679	10.80	6.10	0.564	6.40	3.50	0.543

Note: Rv, Re and Eg stands respectively for rate of growth of value-added, of employment, and gross employment output elasticity.

The Eg is also different in different groups of industries. Considering the whole period 1960-84, the Eg is highest (0.650) in the Basic industries and lowest (0.480) in the Capital Goods industries. It is 0.641 in the Intermediate Goods industries and 0.490 in the Consumer Goods industries. The Eg is also different in different sub-periods, in three industry groups, namely, the Basic, Capital and Intermediate Goods industries, is the highest in the period of relative stagnation but, unlike in the aggregate, the Eg is not nearly equal in the periods of acceleration and recovery; it is higher in the former than in the latter period. In the Consumer Goods industries, the Eg was as high as 0.661 in the period of acceleration but came down to a mere 0.382 in the period of relative stagnation and did not improve in the period of recovery.

In view of these differences in the Eg between industry groups and between sub-periods, it seems advisable to estimate the labour demand functions separately for the industry groups and for the sub-periods. The results are given in Tables 3 to 7: All Manufacturing Industry (Table 3), Basic Goods (Table 4), Capital Goods (Table 5), Intermediate Goods (Table 6), and Consumer Goods (Table 7). In Table 8, we give averages of coefficients of Time Dummies.

ALL MANUFACTURING INDUSTRY

In Table 3 are given the results for All Manufacturing Industry. Note that all R^2 values are very large implying that the explanatory variables explain a very high proportion of variation in the of demand for labour in each sub-period. Further, all regression coefficients have proper signs and, except for the coefficient of value added (Q) for the period 1976-84, all the coefficients are significant at 5 percent level of significance. Hence, the results corroborate the proposed hypothesis. Considering the entire period 1960-84, the speed

of adjustment is 0.252 implying that the desired employment would be achieved within four years. In the period 1976-84, the speed of adjustment was the highest (0.499) meaning that the desired employment would be achieved in about two years.

TABLE 3. DEMAND FOR LABOUR IN AGGREGATE MANUFACTURING INDUSTRY

Time Period	No. of Obser-vations	Constant	Coefficient of			$\bar{R}^2$	H-Statistic for Auto-corre-lation	Speed of Adjust-ment	Wage Elasticities		Output Elasticities	
			$\ln(W_t^*)$	$\ln(Q_t)$	$\ln(L_{t-1})$				SR	LR	SR	LR
1960-84	480	3.966	-0.152	0.063	0.748	0.9928	1.921	0.252	-0.152	-0.603	0.053	0.210
		(10.153)	(-5.783)	(3.424)	(31.256)							
1960-65	100	10.715	-0.939	0.052	0.648	0.9965	1.427	0.352	-0.939	-2.668	0.052	0.148
		(8.795)	(-7.848)	(1.583)	(12.485)							
1966-75	180	8.039	-0.489	0.243	0.503	0.9951	3.327	0.477	-0.489	-1.025	0.243	0.458
		(8.145)	(-7.376)	(6.694)	(9.904)							
1976-84	160	7.504	-0.141	0.015	0.501	0.9900	*	0.499	-0.141	-0.283	0.015	0.030
		(5.899)	(-3.028)	(0.510)	(6.278)							

Remarks: Magnitudes of the intercept/industry dummies are not given for reasons of space. However, wherever industry dummies have important implications, these are discussed in the text.
H-Statistic adjusted and calculated as per suggestions of Kmenta (1986) p 510
* H-statistic could not be calculated because T. Var(β) > 1, where 'β' is the coefficient of lagged dependent variable and 'T' are the number of observations. Durbin Watson Statistic = 1.8362.

In order to study the role of individual industry on aggregate labour demand, we relied on intercept dummies in the equation for the entire period 1960-84. For total manufacturing, intercept dummies for Sugar Factories and Refineries, Manufacturing of Machines and Apparatus, Rail Road Equipment, and Miscellaneous. Food Products are insignificant suggesting that these industries did not affect labour demand significantly. On the other hand, time dummies up to the period 1973 are significant and, for the period 1974 to 1980 and 1982, they are insignificant. One may therefore say that Indian manufacturing industry experienced a shift in labour demand or a structural break after 1973. This is discussed in greater detail in a later section.

It should be noted that both the short and long term negative elasticities with respect to wages are numerically higher than the corresponding short and long term positive elasticities with respect to output, suggesting that the positive effect of output on employment generation is outweighed by negative effect of wages. Even if we assume that the elasticities with respect to wage are not negative, the output elasticities are so small that they cannot generate much demand for labour.

The elasticity with respect to wage rate was numerically the highest during 1960-65 (-2.668), that is, during the period of acceleration. During the period of acceleration of production, there is an additional demand for labour which causes wages to rise which in turn affects the demand for labour. It is thus that we have a high negative elasticity of demand for labour with respect to wages. As mentioned earlier, this elasticity is also a measure of elasticity of substitution between capital and labour. It seems that the process of substitution began during 1960-65. During periods of stagnation, the demand for labour is stagnant if not actually reduced. But, because of government policy, retrenchment and layoff of workers is not possible. Further, because of pressure from the labour unions, wages also cannot be reduced. During the period of recovery, whatever be the prevailing wage, firms try to use surplus workers carried over from the period of stagnation. Hence, during periods of stagnation and recovery, the elasticity of demand for labour with respect to wages is small. For instance, from its value of -2.668 in 1960-65, the elasticity came down to -1.025 in 1966-75 (period of stagnation) and to -0.283 in 1976-84 (period of recovery).

On the other hand, the elasticity of demand for labour with respect to output was the highest during 1966-75, which was the period of relative stagnation, implying that during this period output rather than wages influenced the demand for labour. During 1976-84 (period of recovery), both short and long run elasticities with respect

to both wage rate and output were lower than in earlier periods. Presumably, as suggested above, the industry carried over the surplus manpower of the previous period (stagnation) and neither wage nor output had much influence on demand for labour.

BASIC GOODS INDUSTRIES

The regression equations pertaining to basic goods industries are given in Table 4. Considering the entire period 1960-84, the coefficients of explanatory variables have proper signs and these are significant, thus supporting the proposed hypothesis. The coefficients of wage rate have consistently negative signs in all the sub-periods, but the coefficients of output have adverse signs in 1960-65 and 1976-84 though, in both these periods, the coefficients are statistically not significant. The coefficient of wage rate is significant in 1960-65 and that of value added is significant in 1966-75. But in 1976-84, the coefficient of only lagged dependent variable is significant. Thus, in the basic goods industry, the factors affecting the level of employment appear to be different in the three phases of industrial development: In 1960-65, it was the wage rate; in 1966-75, it was the value added; and, in 1976-84, it was the lagged value of the dependent variable in an auto-regressive manner.

Overall speed of adjustment in the basic goods industry was 0.237 implying that the actual levels of employment adjusted to the desired levels within four years. The maximum speed of adjustment was in 1966-75 being 0.670 which meant that the actual levels of employment adjusted to the desired levels within two years.

TABLE 4. DEMAND FOR LABOUR IN BASIC GOODS INDUSTRIES

Time Period	No. of Obser-vations	Constant	Coefficient of			$\bar{R}^2$	H-Statistic for Auto-corre-lation	Speed of Adjust-ment	Wage Elasticities		Output Elasticities	
			$\ln(W_t)$	$\ln(Q_t)$	$\ln(L_{t-1})$				SR	LR	SR	LR
1960-84	120	3.843	-0.135	0.056	0.763	0.9968	0.302	0.237	-0.135	-0.570	0.056	0.236
		(5.738)	(-2.061)	(2.320)	(21.520)							
1960-65	25	21.484	-1.747	-0.040	0.350	0.9965	0.602	0.650	-1.747	-2.688	-0.040	-0.062
		(8.029)	(-7.626)	(-1.119)	(4.073)							
1966-75	45	8.003	-0.083	0.150	0.330	0.9985	3.024	0.670	-0.083	-0.124	0.150	0.224
		(4.641)	(-0.779)	(2.732)	(2.327)							
1976-84	40	4.324	-0.069	-0.018	0.733	0.9989	*	0.267	-0.069	-0.258	-0.018	-0.067
		(1.584)	(-0.721)	(-0.042)	(4.089)							

Remarks: Magnitudes of the intercept/industry dummies are not given for reasons of space. However, wherever industry dummies have important implications, these are discussed in the text.
H-Statistic adjusted for pooling of time-series and cross-section data as suggested by Kmenta (1986), p 510.
* H-statistic could not be calculated because $T^*Var(\beta) > 1$, where 'T' is the total number of observations and 'β' is the coefficient of lagged dependent variable. In this case the DW = 1.8762.

The maximum wage elasticity is noticed in 1960-65 (-1.747 in the short run and -2.688 in the long run) and maximum output elasticity in 1966-75 (0.150 in the short run and 0.224 in the long run). These elasticities suggest that, in basic goods industry, the process of acceleration was accompanied by the process of substitution of capital for labour (1960-65) and that the period of stagnation (1966-75) reduced the importance of wage rate and increased the importance of output as a determinant of labour demand.

To identify the role of individual industries in this group we used industry dummies. The industry dummy of Iron and Steel industry is insignificant implying that Iron and Steel did not significantly influence the demand for labour in basic goods industry.

CAPITAL GOODS INDUSTRIES

Table 5 gives the estimated regression equations for the Capital goods industries. In all the periods, the coefficients of output and the lagged dependent variable have proper signs. The coefficients of value added are significant in all the

periods, but the coefficients of lagged dependent variable is statistically not significant in 1966-75. The coefficient of wage rate has adverse sign in equation for the entire period (1960-84) and also for 1976-84 which is probably due to multicolinearity in the explanatory variables. Although in this case the Klein's Rule is satisfied, there is high correlation between wage rate and value added, and wage rate and the lagged dependent variable. But, in both cases, the coefficients are statistically not significant. Hence, it seems that in capital goods industry the demand for labour may be looked mainly as a function of value added except that, in 1960-65, the proposed hypothesis was fully supported.

TABLE 5. DEMAND FOR LABOUR IN CAPITAL GOODS INDUSTRIES

Time Period	No. of Obser-vations	Constant	Coefficient of			$\bar{R}^2$	H_sStatistic for Auto-corre-lation	Speed of Adjust-ment	Wage Elasticities		Output Elasticities	
			$\ln(W_t^*)$	$\ln(Q_t)$	$\ln(L_{t-1})$				SR	LR	SR	LR
1960-84	168	2.085	0.088	0.138	0.659	0.9909	2.966	0.341	0.088	0.258	0.138	0.405
		(2.556)	(1.214)	(5.115)	(13.811)							
1960-65	35	9.072	-0.683	0.436	0.358	0.9965	-1.176	0.642	-0.683	-1.064	0.436	0.679
		(4.721)	(-3.558)	(4.910)	(3.284)							
1966-75	63	6.076	-0.050	0.663	0.044	0.9954	*	0.956	-0.050	-0.052	0.663	0.694
		(5.059)	(-0.442)	(11.463)	(0.547)							
1976-84	56	0.991	0.221	0.037	0.731	0.9924	0.126	0.269	0.221	0.822	0.037	0.138
		(0.456)	(1.674)	(0.926)	(6.484)							

Remarks: Magnitudes of the intercept/industry dummies are not given for reasons of space. However, wherever industry dummies have important implications, these are discussed in the text.
H-statistic is adjusted for the pooling of cross-section and time series as suggested by Kmenta (1986), p-510.
* H-statistic could not be calculated because $T*var(\beta) > 1$, where 'β' is the coefficient of the lagged dependent variable, in this case the D.W. = 1.6083.

Considering the entire period 1960-84, the speed of adjustment was 0.341 implying that the actual employment adjusted to the desired level within three years. The speed of adjustment was the highest in 1966-75 but then the coefficient of lagged dependent variable was statistically not significant. It will be noticed that during this period the short and long run elasticities tended to be equal implying that only the long run model held good.

Considering the entire period (1960-84), intercept dummies are statistically not significant in the case of Manufacturing of Machinery, Apparatus, Appliances and Supplies, Rail Road Equipment, and Repair of Motor Vehicle. The wage elasticity was highest (-0.683 short run and -1.069 long run) in 1960-65, while output elasticity was the highest (0.663 short run and 0.694 long run) in 1966-75. This suggests that the demand for labour in capital goods industries was similar to that in the basic goods industries.

INTERMEDIATE GOODS INDUSTRIES

The regression equations for the Intermediate goods industries are given in Table 6. Only the coefficients of value added have proper signs in all the periods. The coefficients of lagged dependent variables are statistically not significant in all the periods. In fact, even when the nonsignificant variables are dropped, the significance of the coefficients of wage rate and lagged dependent variable do not improve up to 5 per cent level of significance in all periods except the entire period 1960-84. But, in 1960-84, the coefficient of lagged dependent variable exceeds unity which violates the basic assumptions of partial adjustment frame work. Thus, like in the capital goods industries, in intermediate goods industries too, the demand for labour is chiefly determined by the output. The coefficients of wage rate have adverse signs in the entire period 1960-84 and also in 1966-75 and 1976-84.

The coefficient of lagged dependent variable also has an adverse sign in 1976-84. These adverse signs of coefficients may be due to multicolinearity; although Klein's rule is satisfied, the correlation coefficients between the explanatory variables are high.

In all the period, the speeds of adjustment are very high and the short and long run elasticities are not very different. In fact, in 1976-84, the speed of adjustment exceeds unity (1.023) and the short and long term elasticities are equal implying instantaneous adjustment.

TABLE 6. DEMAND FOR LABOUR IN INTERMEDIATE GOODS INDUSTRIES

Time Period	No. of Obser-vations	Constant	Coefficient of			$\bar{R}^2$	H-Statistic for Auto-corre-lation	Speed of Adjust-ment	Wage Elasticities		Output Elasticities	
			$\ln(W_t^*)$	$\ln(Q_t)$	$\ln(L_{t-1})$				SR	LR	SR	LR
1960-84	72	6.919	0.034	0.282	0.193	0.9826	*	0.807	0.034	0.042	0.282	0.349
		(4.204)	(0.402)	(3.477)	(1.380)							
1960-65	15	14.187	-1.287	0.420	0.069	0.9944	*	0.931	-1.287	-1.382	0.420	0.451
		(11.297)	(-1.778)	(1.026)	(0.211)							
1966-75	27	4.476	0.036	0.362	0.351	0.9912	*	0.649	0.036	0.055	0.362	0.558
		(1.010)	(2.283)	(2.283)	(1.395)							
1976-84	24	8.389	0.993	0.360	-0.023	0.9649	*	1.023	0.993	****	0.360	****
		(2.757)	(0.614)	(2.364)	(-0.081)							

Remarks: Magnitudes of the intercept/industry dummies are not given for reasons of space. However, wherever industry dummies have important implications, these are discussed in the text.
H-Statistic calculated after making necessary adjustment required in the case of pooling of time series and cross-section data as suggested by Kmenta (1986), p-510.
* H-statistic could not be calculated because $T*var(\beta) > 1$, where 'β' is the coefficient of the lagged dependent variable. The Durbin Watson statistics in these cases were 1.9293, 1.2241, 2,2362 and 1.8798 respectively.
**** Long run elasticities are the same as the short run elasticities implying instantaneous adjustment in the labour market.

Considering the entire period (1960-84), all the intercept dummies are significant indicating that each industry contributes to the demand for labour in the group. In this group of industries, the wage elasticity were the highest in 1960-65 (-1.287 short run and -1.382 long run). The long run output elasticity was the highest in 1966-75 (0.558). This suggests that the demand for labour in the intermediate goods industries also follows the same pattern as in the case of groups of industries earlier considered.

CONSUMER GOODS INDUSTRIES

The results pertaining to Consumer goods industries are given Table 7. All coefficients, except for the coefficients of value added and lagged dependent variable in 1976-84, have proper signs and the ones with the adverse signs are statistically not significant. The coefficients of wage rate have proper signs and are significant in all the periods. The proposed hypothesis is fully maintained for the entire period 1960-84 and for the sub-periods except 1976-84.

TABLE 7. DEMAND FOR LABOUR IN CONSUMER GOODS INDUSTRIES

Time Period	No. of Obser-vations	Constant	Coefficient of			$\bar{R}^2$	H-Statistic for Auto-corre-lation	Speed of Adjust-ment	Wage Elasticities		Output Elasticities	
			$\ln(W_t^*)$	$\ln(Q_t)$	$\ln(L_{t-1})$				SR	LR	SR	LR
1960-84	120	7.023	-0.469	0.098	0.686	0.9896	3.0826	0.314	-0.469	-1.494	0.098	0.312
		(5.324)	(-4.675)	(2.432)	(11.181)							
1960-65	25	12.360	-1.465	0.233	0.702	0.9990	0.5910	0.298	-1.465	-4.916	0.233	0.782
		(4.535)	(-4.009)	(3.880)	(7.085)							
1966-75	45	13.992	-0.957	0.207	0.346	0.9960	3.0530	0.654	-0.957	-1.463	0.207	0.317
		(3.798)	(-8.983)	(4.075)	(3.054)							
1976-84	40	14.527	-0.342	-0.071	0.156	0.9855	*	0.844	-0.342	-0.405	-0.071	0.084
		(3.462)	(-1.717)	(-0.968)	(0.679)							

Remarks: Magnitudes of the intercept/industry dummies are not given for reasons of space. However, wherever industry dummies have important implications, these are discussed in the text. Remarks: Magnitudes of the intercept/industry dummies are not given for reasons of space. However, wherever industry dummies have important implications, these are discussed in the text.
H-Statistics have been adjusted as required for pooling of time series and cross-section data as suggested by Kmenta (1986), p-510.
$ In these regression equations all the intercept and time dummies were significant.
* H-statistic could not be calculated because $T*var(\beta) > 1$, where 'β' is the coefficient of lagged dependent variable.

Considering the entire period (1960-84), the speed of adjustment is 0.314 so that the adjustment of actual level of employment to the desired level would take about three years. The speed of adjustment was low in 1960-65 (0.298), improved to 0.654 in 1966-75, and reached 0.844 in 1976-84 thus expediting the process of adjustment of actual to desired level of employment over the years.

The industry dummy was not statistically significant in the case of Paper Pulp and Paper Product industry implying that it did not significantly influence the demand for labour. Unlike all other groups of industries, in the consumer goods industry, wage and output elasticities in the short and long run were the highest in 1960-65. Hence, despite the fact that the process of substitution of capital for labour was quite powerful during 1960-65, its negative impact on demand for labour was compensated by the positive impact of output. The different pattern of demand for labour in these industries is possibly due to the fact that the industries are largely in the private sector. Here, demand for labour is significantly affected by the wage rate. A part of the labour force consists of casual and temporary workers who can be laid off more easily when their continued employment at the prevailing wage rate is not justified.

PRINCIPAL RESULTS OF DEMAND FOR LABOUR FUNCTION

(1) Considering the entire period 1960-84, the partial adjustment model seems to fit well for the total manufacturing sector as also for the major groups of industries; the real wage rate is negatively related and the output is positively related to the demand for labour. Coefficients of wage rate or value added with adverse sings could be due to multicolinearity. In all such cases, they are statistically not significant and may be dropped.

(2) The partial adjustment model does not work well for all the industry groups and for all the sub-periods. This is especially true of the Intermediate goods industries as a whole. With Capital goods industries, the model did not work well for 1966-75; here, the demand for labour was largely influenced by output only. With Basic goods industries, the model did not work well for 1976-84; here, the demand for labour followed an auto-regressive scheme. For 1960-65, the model, by and large, explained the demand for labour in the total manufacturing industry as also in the major groups of industries, with expected signs and significance of the coefficients. Among the industry groups, apart from total manufacturing, the model worked particularly well for Consumer goods industries.

(3) In some cases, coefficients of wage rate have correct signs but are small in magnitude indicating that the influence of wage rate on employment is not large. The reasons may be the following:

(a) Retrenchment and layoff is not possible because of trade union or government policies; (b) When an industry is highly capital intensive, as for instance are some of the Capital goods and Intermediate goods industries, wages form a small fraction of total value added and wage rate does not so much affect employment; (c) With mark-up pricing profitability is not affected by an increase in the cost of production and wage rate does not affect employment; of course, mark-up pricing has its own limits; (d) Technological rigidities often make it difficult to reduce labour even in the face of rising wages; (e) Where workers are highly skilled, particularly when skills are acquired on the job, it is not economic to retrench workers even in the face of rising wages because of costs involved in the search for new workers; (f) With possibilities of promotion within the firm, workers tend to stay on the job even on relatively low wages and therefore wage rate does not so much affect employment.

(4) In 1976-84, the coefficient of value added for Consumer goods industries is statistically not significant even after dropping the other variables with statistically not significant coefficients. This is because of high correlation between the value added and the lagged dependent variable. In the same period, the coefficient of lagged dependent variable for the Intermediate goods industries is negative. The speed of adjustment is also greater than unity. These results violate the basic assumption of partial adjustment model.

(5) In 1960-65, the elasticities with respect to wage rate are maximum for all the major groups of industries. Being a period of acceleration, this is to be expected.

(6) In 1966-75, the output elasticities are maximum for all groups of industries except the Consumer goods industries. Being a period of stagnation, producers try to rationalise the labour against output thereby making the demand for labour responsive to output. Wage rate also was an important determinant of employment but, of the two, the output elasticities were relatively more dominant. However, in Consumer goods industries, the wage elasticities were the maximum and dominant during this period.

STRUCTURAL BREAK

To examine structural changes in the manufacturing industry over the period 1960-84, averages of the coefficients of time dummies were calculated for the quinquennial periods 1960-65, 1965-70, 1970-75, 1975-80, and the residual four years 1980-84. These are given in Table 8.

TABLE 8. AVERAGES OF COEFFICIENTS OF TIME DUMMIES

Industry	1960-65	1965-70	1970-75	1975-80	1980-84
Basic Goods	-0.286	-0.232	-0.140	-0.044	-0.022
Capital Goods	0.166	0.143	0.100	0.087	0.021
Intermediate Goods	-0.210	-0.064	-0.068	0.028	0.134
Consumer Goods	-0.622	-0.530	-0.324	-0.113	0.025
Total Manufacturing	-0.176	-0.132	-0.068	0.015	0.021

It will be noticed that the coefficients steadily increased over the period for total manufacturing as also for all major groups except the Capital goods industries; for the Capital goods industries, the coefficients steadily declined. The change in the coefficients is very slow because of various production conditions prevailing in these industries. For example, in Basic goods industries, technology remained largely unchanged. The same is true of Consumer goods industries. In Capital goods industries, technological obsolescence was faster than modernisation. These circumstances would cause no more than a slow change in the coefficients. Moreover, in capital goods industries, none of the coefficients were statistically significant. In basic, intermediate, and consumer goods industries as also in total manufacturing, the coefficients were largely not significant after 1975.

In basic goods and consumer goods industries, the maximum change in the coefficients is seen in 1975-80 suggesting that a structural change occurred during this period. In this period, new technologies were adopted which had energy saving bias and hence, presumably, more capital intensive and labour saving.

In intermediate goods industries, the maximum change in coefficients occurred in 1966-70. Thus, here, technological change leading to structural break appears to have occurred before it happened in other industries. This group comprises three industries, namely, Rubber and its Products, Petroleum Refineries, and Structural Clay Products. Petroleum Refineries is by far the most important where, beginning with 1966, heavy investments has been made. In 1970-75, there was no change in the coefficients. Then in 1975-80 there was a large change and a somewhat larger one in 1980-84 probably implying another structural break.

BROAD CONCLUSIONS AND POLICY IMPLICATIONS

The analysis shows that, over the whole period 1960-84 and for the total manufacturing industry, actual level of employment adjusted to the desired level within four years (speed of adjustment is 0.252),that is with a three year lag. In the major sub-groups of industries, the lag is either three years or less than three years. For the Intermediate goods industries, the partial adjustment model fails in the sub-periods 1960-65, 1966-75 and 1976-84. The model also fails for the Basic and Consumer goods industries for the period 1976-84. This most probably is because of the occurrence of structural break in the manufacturing industry. These findings are in line with the

findings of Krishna (1974) and Goldar (1986, 1987).

Considering the entire period 1960-84, the industry dummies are statistically not significant for Machine Apparatus and Supplies, Rail Road Equipment, Miscellaneous Food Products, Iron and Steel, Repair of Motor Vehicles, Sugar, Refineries, and Paper and Pulp. It means that, except for the difference in the technology of production, the demand for labour per unit of capital is the same in these industries. Table-XIV shows that during 1960-65 the short-run and long-run wage elasticities were very high. These were also high in 1966-75. The consequences are (a) capital substitution for labour (b) over capitalisation of industries and (c) creation of excess capacity during the 1960-75.

There is evidence, in the coefficients of time dummies, of a structural break in several industries with two distinct trends: In Basic, Intermediate, and Consumer goods industries, the coefficients increased, where as in Capital goods industries the coefficients declined; the former implies a technological change leading to greater demand for labour while the latter implies a smaller demand for labour. In all the four groups of industries, the changes in the average coefficients were sharp in 1975-80.

The study demonstrates that, in most of manufacturing industries, wages play an important role in determining the demand for labour. This fact needs further analysis. In the literature on development economics, associated with the concept of technological dualism, it is generally accepted that, in the case of developing countries, though there are ex-ante possibilities of substitution between capital and labour, they do not exist ex-post. The prevailing evidence suggest that the demand for capital and labour do respond to relative factor prices even in the case of developing countries [Bruton, 1972 and Diaz Alejandro, 1972, Bhasin and Seth, 1977, Pp 32-49]. Therefore, it seems that, not only the ex-ante but the ex-post substitution possibilities also exist in these countries. To understand the phenomenon, one may argue on the lines of Winston [1974, Pp 145-55] who divides factor elasticities in two parts: (a) elasticities of substitution ex-ante and (b) elasticities of substitution ex-post. Ex-ante substitution takes place in the choice of product mix and in the choice of size of plant where as the ex-post substitution takes place through the choice of crew size and level of utilisation of plant [Winston, 1974 Pp. 145-55]. This decomposition of the elasticities of substitution into two parts, when analysed in the context of India, where the government is following the policy of over-priced labour and under-priced capital, explains the low demand for labour in the Indian manufacturing industry. The under-priced capital leads to a choice of capital intensive large plants making ex-ante substitution in favour of capital, while the over-priced labour causes smaller employment and under-utilisation of plant ex-post. The two processes together explain the low demand for labour. To correct the situation, the overt and covert subsidies have to be removed so that capital is priced according to its social opportunity cost. In public sector industries, wage rate seems to have little influence on demand for labour. Greater output should improve demand for labour in these industries.

APPENDIX A

Industry Group	Constituent Industries.
1. Basic	1.1 Chemical and Chemical Products
	1.2 Cement
	1.3 Iron and Steel
	1.4 Non-ferrous Basic Metals
	1.5 Electric Light and Power
2. Capital Goods	2.1 Machinery except electrical
	2.2 Electric machinery
	2.3 Ship Building and Repairing
	2.4 Rail-road Equipment
	2.5 Motor Vehicles
	2.6 Repair of Motor Vehicles
	2.7 Metal Products
3. Intermediate Products	3.1 Rubber Products
	3.2 Petroleum Refinery Products
	3.3 Structural Clay Products
4. Consumer Goods	4.1 Spinning, Weaving And Finishing of Textiles
	4.2 Pulp, Paper and Paper-board
	4.3 Misc. Food-Products
	4.4 Tobacco Products
	4.5 Sugar

REFERENCES

Ahluwalia, I.J., 1985; *Industrial Growth in India-Stagnation Since Mid-sixties;* Oxford University Press, New Delhi.

Ahluwalia, I.J., 1988; 'Industrial Policy and Industrial Performance in India' in E.B. Lucas and G.F. Papanek(eds.) *The Indian Economy Recent Development and Future Prospects;* Oxford University Press, New Delhi.

Baer, Warner and Michel Harvey, 1966; 'Employment and Industrialiastion in Developing Countries'; *Quarterly Journal of Economics,* vol. 80.

Banerji, Asit, 1975; *Capital Intensity and Productivity in Indian Industry;* Macmillan Co. New Delhi.

Berchling, F.P.R., 1965; 'Relationship Between Output and Employment in British Manufacturing Industries'; *Review of Economic Studies,* vol. 32.

Berchling, F.P.R. and Peter O. Brien, 1967; 'Short-run Employment Functions in Manufacturing Industries-An International Comparison'; *Review of Economics and Statistics,* vol. 49.

Bhasin, V. K. and Vijay K. Seth, 1980; 'Estimation of Production Functions for Indian Manufacturing Industries'; *Indian Journal of Industrial Relations,* vol. 15.

Bhasin, V. K. and Vijay K. Seth, 1980a; 'Non-production Workers, Technological Change and Factor Substitution-A Case Study of Indian Manufacturing Sector'; *Indian Economic Journal,* vol. 28.

Bruton, H. J., 1972; *The Elasticity of Substitution in Developing Countries;* Research Memorandum No. 45, Williams College, Williamson (Mass).

Chandhok, H.L., 1978; *Wholesale Price Statistics, India 1947 to 1978;* Economic and Scientific Research Foundation, New Delhi.

CSO, 1988; Annual Survey of Industries, 1984-85. Summary Results for factory Sector, Central Statistical Organisation, Government of India.

Delhanty, G.D., 1968; *Non-Production Workers in U. S. Manufacturing Industries;* North Holland Publishing Company, Amsterdam.

Diaz, Alejandro, C. F., 1972; 'Labour Productivity and other Characteristics of Cement Plants - An International Comparison'; in J. N. Bhagawati and R. S. Eckaus (eds.); *Development and Planning: Essays in Honour of Rosenstein Rodan,* George Allen & Unwin, London.

Diwan, R.K. and D.N. Gujrati, 1968; 'Employment and Productivity in Indian Industries - Some Questions of Theory and Policy'; *Artha Vijnana,* vol. 10.

Eckaus, R.S., 1955; 'The Factor Proportion Problem in Underdeveloped Areas'; *American Economic Review,* vol. 45.

Economic Advisor; *Index Number of Wholesale Prices,* Government of India (various years).

Eriksson, J.R., 1969; *Wage Policy and Economic Development in Latin American Countries;* Tidjschrift voor Sociale Wetenschappan, vol. 14.

Fukuoka, M., 1955; 'Full Employment and Constant Coefficient of Production'; *Quarterly Journal of Economics,* vol. 69.

Goldar, Bishwanath, 1986; *Productivity Growth in Indian Industries;* Allied Publishers, New Delhi.

Goldar, Bishwanath, 1986a; 'Labour Demand in Indian Industries'; *The School of Economics;* vol. 1.

Goldar, Bishwanath, 1987; 'Employment Growth in Indian Industries'; *Indian Journal of Industrial Relations;* vol. 22.

Goldar, Bishwanath and Vijay K. Seth, 1975; 'Some Economic Aspects of Non-Production Workers in Indian Manufacturing Sector'; *Indian Journal of Industrial Relations,* vol. 11.

Goldar, Bishwanath and Vijay K. Seth, 1989; 'Spatial Variations in the Rate of Industrial Growth in India'; *Economic and Political Weekly;* June 3.

Govt. of India, 1984; 'Principal Characteristics of Selected Industries in India'; *C.S.O. Bulletin No.* ISD/9/1984.

Gupta, K.L., 1975; 'Factor Prices, Expectations and Demand for Labour'; *Econometrica*, vol. 43.

Gupta, K.L., 1989; *Industrialisation and Employment in Developing Countries- A Comparative Study;* Routledge, New York.

Hazeldine, T., 1973; 'Employment and Output Functions for Newzeland Manufacturing Industries'; *Journal of Industrial Economics;* vol. 22.

Hirschman, A.O., 1958; *Strategy of Economic Growth;* Yale University Press New Haven and Connecticut.

Kmenta, Jan, 1986; *Elements of Econometrics;* Macmillan, New York.

Krishna, K.L., 1974; 'A Model for Manufacturing Sector - Some Preliminary Results', in N.K. Choudhry et. al. (eds.); *Towards an Econometric Model of Indian Economy;* part III, Indian Council of Social Science Research, New Delhi.

Kumar, R., 1982; 'Employment Elasticities and Speed of Adjustment - The Implication of Different Estimation Methods for Malaysian Commercial Agriculture and Forestry'; *Journal of Development Studies*; vol. 11.

Kwon, J.K. and M. Williams, 1982; 'The Structure of Production in South Korea's Manufacturing Sector'; *Journal of Development Economics;* vol. 9.

Laumas, P.S. and M. Williams, 1981; 'Elasticity of Substitution in Indian Manufacturing Sector'; *Journal of Development Economics;* vol. 8.

Leibenstein, H., 1957; *Economic Backwardness and Economic Growth;* John Wiley, New York.

Lewis A., 1954; 'Economic Development with Unlimited Supply of Labour'; *The Manchester School of Social Science's Journal;* vol. 22.

Maitha, J.K., 1973; 'A Short-Term Employment Function for Keynyan Manufacturing'; *East African Economic Review;* vol. 5.

Morawetz, D., 1952; *Some Aspects of Capital Formation in Underdeveloped Countries;* Oxford University Press, New York.

Morawetz, D., 1974; 'Emolument Implications of Industrialisation in Developing Countries - A Survey'; *Economic Journal*, vol. 84.

Nurkse, R., 1970; 'Balanced Growth' in G.M. Mier(ed.); *Leading Issues in Economic Development;* Oxford University Press, New York.

Okun, A.M., 1962; *Potential G.N.P., its Measurement and Significance;* Proceedings of the Business and Economic Statistics Unit of the American Statistical Association, reprinted as Cowles Foundation Paper.

Paish, T.W., 1962; *Studies in Inflationary Economy;* Macmillan, London.

Ranis, G., 1973; 'Industrial Sector Labour Absorption'; *Economic Development and Cultural Change;* vol. 21.

Rosentein-Rodan, P.N., 1943; 'Problems of Industrialisation of Eastern and South Eastern Europe'; *Economic Journal;* vol. 53.

Rosentein-Rodan, P.N., 1961; 'Notes on Big Push' in E. Ellis Howard(ed.) *Economic Development of Latin America;* Macmillan, London.

Rostow, W.W., 1957; *Stages of Economic Growth - A Non Communist Manifesto;* Cambridge University Press, Cambridge(Mass).

Scitovsky, T., 1959; 'Growth Balanced or Unbalanced' in M.Abranovitz(ed.) *Allocation of Economic Resources,* Stanford University Press, Stanford, U.S.A.

Seth, Vijay K., (ed.) 1989; *Themes on Spatial Perspective - Manufacturing Sector of India;* Commonwealth Publishers, New Delhi.

Seth, Vijay K., 1986; 'State and Spatial Aspect of Industrialisation in Post-Independence India'; *Political Geography Quarterly;* vol. 5.

Seth, Vijay K., 1987; *Industrialisation in India - Spatial Perspective;* Commonwealth Publishers, New Delhi.

Seth, Vijay K. and Ashok K. Seth, 1990; 'Labour Absorption in the Indian Manufacturing Sector'; (Communicated), *Economic and Political Weekly,* Bombay.

Seth, Vijay K. and Vijay Bhasin, 1977(a); 'Estimation of Production Functions for Indian Manufacturing Sector - Pooling Cross-section and Time Series Data'; *Artha Vijanana;* vol. 19.

Seth, Vijay K. and Vijay Bhasin, 1977; 'Economics of Transfer of Technology Through Multinational Corporations and Problem of Factor Proportions in Developing Countries' in P.K. Ghosh *et. al. (eds.) Global Giants;* Sultan Chand and Sons, New Delhi.

Seth, Vijay K. and Vijay Bhasin, 1978; 'Economics of Non-production Workers in Indian Manufacturing Industries'; *Review of Commerce Studies;* vol 7.

Sethuraman, S.V., 1971; 'Prospects of Increasing Employment in the Indian Manufacturing Sector'; in R.G. Ridker and H. Lubell(eds.), *Employment and Unemployment Problem of the Near East and South Asia;* Vikas Publication, Delhi.

Smyth D.J. and N.J. Irland, 1967; 'Short Run Employment Functions in Australian Manufacturing'; *Review of Economics and Statistics;* vol. 49.

Squire, lyn, 1981; *Employment Policy in Developing Countries - A Survey of Issues and Evidence;* Published for World Bank by Oxford University Press, N.Y.

Van Rijckenghem, W., 1969; *An Econometric Model of Minimum Wages and Employment in a Dual Economy - the case of Pureto Rico;* Tidjschrift voor Sociale Wentenschappen; vol. 14.

Williamson J.G., 1971; 'Capital Accumulation, Labour Saving and Labour Absorption Once More'; *Quarterly Journal of Economics;* vol. 85.

Winston, Gordon C., 1974; 'Factor Substitution, Ex-post and Ex-Ante'; *Journal of Development Economics,* Vol. 1.

DOCUMENTATION

The purpose of this section is to make available to the readers official documents such as reports of committees, commissions, working groups, task forces, etc., appointed by various ministries, departments, and agencies of central and state governments which are not readily accessible either because they are old, or because of the usual problems of acquiring governmental publications, or because they were printed but not published, or because they were not printed and remained in mimeographed form. It will be difficult and probably not worthwhile to publish the documents entirely. We shall publish only such parts of them as we think will interest our readers. The readers are requested to send their recommendations of official documents or parts thereof for inclusion in this section.

In the present issue, we publish parts of the following documents.

1. Report of Steering Committee,
   Perspective Planning for Transport Development,
   Planning Commission, Government of India, 1988:
   Part I. Transport Sector

PERSPECTIVE PLANNING FOR TRANSPORT DEVELOPMENT

In 1988, Planning Commission, Government of India had set up a Steering Committee for Transport Planning. In the following is Part I of the Report entitled Transport Sector.

I. INTRODUCTION

The Steering Committee for Transport Planning was constituted vide Planning Commission's notification dated 24 October, 1985 and was entrusted with the following tasks:

(i) to study traffic flows and resource costs of transportation;
(ii) to develop a transport planning model, i.e. a methodology for traffic forecasting;
(iii) to generate transportation demand forecasts consistent with macro-economic model for the period ending 2000 AD, and
(iv) to develop a long-term technological perspective with a view to incorporating technological advancements in transport planning.

1.2 The Committee was expected to organise and monitor these studies and to prepare a perspective plan for the transport sector on an integrated basis. The Committee, in addition, was expected to make recommendations on policy and institutional measures to systematise work on long-term transport planning on a continuing basis.

1.3 The raison d'etre for the Committee's establishment was the growing concern in the Planning Commission to institute planning procedures to provide a basis for a balanced development of the country's transport system consistent with the needs of overall economic and social growth. The investments in transport infrastructure being capital intensive and of long gestation, it was considered necessary to systematise and institutionalise long-term planning for the transport sector.

1.4 As stipulated in the Planning Commission's notification establishing the Committee, the following arrangements were to be made for the more important studies to provide inputs for perspective transport plans:

(i) The studies of traffic flows and resource costs and those relating to development of transport demand forecasts were to be entrusted to consultants. Rail India Technical and Economic Services (RITES) was later assigned these studies.
(ii) The work on transport model development was to be carried out in Committee for which a specialised group was constituted under the chairmanship of one of the members of the Steering Committee; and
(iii) for development of technological forecasts, specialised groups were constituted, to be serviced by the respective Ministries, one each for railways roads and road transport, shipping, ports, civil aviation and pipelines. Studies relating to inland water transport were entrusted to Consulting Engineers (India) Ltd.

1.5 Following a review of the data availability and of the methodologies applied for transport planning in the past, the consensus reached in the Committee was that for a transport system of the size and complexity of that of India, an all-purpose model could not be relied upon to determine investment needs for the sector. In view of the numerous parameters determining transport investments and inherent imbalances between supply and demand situations arising from indivisible nature of investments modelling exercises even in much smaller countries have been found to be of limited use. The Committee, after identification of high priority issues in transport planning, adopted an alternative approach based on the development of a series of models/sub-models to project distribution patterns and transport demands of certain bulk commodities and long distance inter-city passenger traffic and determination of capacity needs on heavy density routes corridors of critical importance along the transport network in the country.

1.6 Based on an extensive survey of the emerging technologies, the Committee is able to present a technological perspective for principal transport modes in the country making specific recommendations for technology upgradation which should help promote productivity and efficiency of transport services.

1.7 Although the Committee for the various reasons explained in the Report is not able to present a perspective investment plan for the transport sector, it is recommending in the light

of the results of its studies broad development priorities in the various transport modes and the policy directions to be adopted for the future.

1.8 The approach adopted by the Committee for integrating transport development with development of basic industries should provide a basis for a systematic effort at preparation of a long-term transport plan for the country. As the Planning Commission proceeds to develop a strategy for the Eighth Plan, this should provide a perspective plan for development of important sectors of the economy. It should then be possible to carry further the work already initiated by the Committee towards development of an integrated plan for the transport sector.

1.9 For systematisation of work on perspective planning, it is important to bring about institutional changes and establish well organised planning units in the respective Ministries, Departments and other organisations. The present exercise should serve a useful purpose in-so-far as it has demonstrated the application of appropriate methodologies of planning and brought out inadequacies of the data base as also institutional deficiencies which hamper planning on a sound basis.

1.10 And now a few words on the structures of the Committee's Report. The Report is divided in two parts: Part I deals with transport sector as a whole while Part II presents the results of the technical studies pertaining to specific transport modes. Part I starts with the presentation of the broad economic and social perspective for the year 2000 in Chapter II which is followed by a brief discussion of the policy framework for perspective planning of the transport sector in Chapter III. Chapter IV discusses the methodologies of long-term planning for the sector, while Chapters V and VI present detailed data on the present and projected transport demands. Chapter VII discusses perspective technological developments and Chapters VIII and IX deal with issues relating to energy and environmental aspects respectively. Chapter X sets out estimates of investments and broad sectoral priorities while Chapter XI discusses institutional measures for systematic planning of the transport sector in future. Chapter XI discusses institutional measures for systematic planning of the transport sector in future. Chapter XII presents brief concluding observations on transport planning. Part II of the Report has seven chapters (XIII to XIX) which cover detailed discussions of perspective developments for specific transport modes including technical, economic and operational aspects and are based largely on the reports of the corresponding technical groups although, where necessary, the Committee has used its own discretion and judgement in presenting issues or making recommendations.

Paragraphs 1.11 to 1.13 relating to Committee formalities are omitted.

II. ECONOMIC AND SOCIAL PERSPECTIVE FOR THE YEAR 2000

The formulation of a correct approach to transport planning needs to be in the context of socio-economic objectives and priorities it has to serve, so that development in transport sector proceeds in close conformity with the needs of the economy. In this Chapter, we outline in broad terms the perspective developments in the Indian economy by the turn of the century.

Demographic Perspective

2.2 The country's population recorded an annual growth rate of 2.25 per cent in the decade 1971-81 as compared to the growth rate of 2.22 per cent per annum between 1961-71. The Seventh Plan perspective protected a population of 986 million for the year 2001. The Seventh Plan perspective projected a population of 986 million for the year 2001. The projection was based on the assumption that birth rate would decline to 23.7 per thousand and death rate to 8.4 per thousand during the period 1996-2001 (mid year). If the birth rate does not decline as projected, the population would be still higher.

Urbanisation Trends

2.3 In this context, it is essential to consider the recent trends in urban growth pattern. Of the total population of 761 million, the urban population presently accounts for 192 million or about 25 per

cent of the total. The urban population in the year 2001 is estimated at nearly 326 million i.e. about 33 per cent of the total. It has been observed that the configuration of urban population has been changing over time. The proportion of urban population in class I cities (having a population of more than 100,000) increased from about 44 per cent in 1951 to about 60 per cent in 1981. In the same period, the share of small towns of less than 50,000 people came down from about 46 per cent to 28 per cent as shown in Table 2.1.

TABLE 2.1: TRENDS IN URBANISATION

Census Year	Percentage of urban population to total	Percentage distribution between different classes of towns		
		Class I above 100,000	Class II 50,000-100,000	Others
1951	17.38	44.3	10.0	45.7
1961	17.98	50.8	11.0	39.2
1971	19.91	56.2	11.2	32.6
1981	23.73	60.4	11.7	27.9

Source: Census Reports. 1981 figures exclude Assam.

It would be observed that the absolute population of small towns has declined in the last three decades. Unless deliberate policy measures are taken to decelerate the growth of large cities and encourage small towns, the urban population in class I and II cities may continue to grow at the current rate with the result that the available infrastructure of these cities will be greatly strained.

2.4 With the present growth rate of population India's demographic future is of grave concern. Considering the complexity and magnitude of the problems generated by rapid growth of population and urbanisation against the background of inadequacies in the existing infrastructure, planning strategies have to be evolved to raise investment on the scale needed to finance necessary infrastructure for maintaining the tempo of economic growth.

Structural Changes in Economy

2.5 The Planning Commission at the time of the formulation of the Seventh Five Year Plan reviewed the long-term development profile taking into account the performance of economy in the period of the Sixth Plan. Table 2.2 below gives the sectoral composition of gross value added at factor cost in 1984-85, 1989-90 and 1999-2000.

TABLE 2.2. SECTORAL COMPOSITION OF GROSS DOMESTIC PRODUCT (GDP)

(Per cent)

Sr. No.	Sector	1984-85	1989-90	1999-2000
1.	Agriculture	36.9	32.7	25.5
2.	Mining & Manufacturing	18.1	19.8	23.6
	a) Mining	3.5	4.8	3.8
	b) Manufacturing	14.6	15.0	19.8
3.	Electricity, gas and water supply	2.0	2.3	2.9
4.	Construction	6.2	6.2	6.1
5.	Transport	5.6	6.2	6.4
6.	Services	31.2	32.9	35.5
	Total	100.0	100.0	100.0

Source: Planning Commission, *Seventh Five Year Plan*, 1985-90, Vol. I, p. 14.

It would be observed that while the share of manufacturing is expected to increase from 14.6 per cent of the total GDP in 1984-85 to around 20 per cent in 1999-2000, the share of infrastructural sectors including electricity, gas , water supply and transport will have only marginal increases. The share of services will, however, increase from 31.2 per cent to 35.5 per cent.

2.6 It will be some time before detailed objectives and investment strategies for the Eighth Plan are formulated. However, the current thinking appears to be in favour of stepping up industrialisation with a view to stimulate exports and employment in the country. The target for overall growth of economy for the Eighth and Ninth Plans may be increased over the 5 per cent level assumed in the Seventh Plan. Correspondingly, transport demands in the country may tend to increase faster than stipulated at present.

Long-Term Considerations in Transport Planning

2.7 The pattern of growth envisaged for 2000 AD is expected to contribute towards reduction of inter-regional disparities in the level of development. The pattern of regional development and locational factors have a key role in determining the pattern of transport plan. Thus, the location of growth centres to be selected all over the country for intensive efforts at industrialisation will necessitate parallel development of transport infrastructural facilities. The future growth of urbanisation and changes in locational pattern of industries will be important factors influencing the pattern of transport development. On the other hand, the development pattern of transport network itself may influence the pattern of urbanisation and location of industries. This requires bold vision for the development of new corridors of transport.

2.8 In planning transport, it is particularly important to consider the future pattern of energy generation - fuel mix and locations of major sources of coal, oil, etc. If, as is presently envisaged, the share of thermal power based on coal in the total energy generation is likely to increase significantly, and coal for power generation is to be supplied mainly from new sources e.g. Talcher and Karanpura coalfields, this will require creation of entirely new transport infrastructure involving massive investments. If, on the other hand, the natural gas could replace coal on a significant scale, as indeed is shown by the first results of energy modelling exercises, the transport demands for coal may not increase in the measure envisaged at present. Planning of transport thus has to be integrated closely with planning of energy in the long-term perspective.

III TRANSPORTATION POLICY FRAMEWORK

Policy Objectives

Planning of transport development, as for any other sector, must necessarily be considered within a policy framework for the sector. Planning objectives and tools will depend a great deal on the policy directions to be adopted for the future. In this Chapter, we discuss broad policy directions for the transport sector, leaving the policy issues for specific transport modes to be dealt with in the related chapters to follow later.

3.2 The principal objectives of a national transportation policy should be to ensure an optimal development of the transport system of the country. This requires that: (a) transport development moves in step with the overall economic growth to ensure a proper balance between transport and other sectors of the economy; and (b) within the transport sector, there is a well coordinated and integrated development of the various transport modes to minimise transport costs to the economy. In the final analysis, a national transport policy should ensure an optimum allocation of resources to the transport system of the country.

Past Development

3.3 In the past over 35 years, since India embarked upon planning in 1950-51, there has been a phenomenal expansion of transportation system of the country. Thus, during the period from 1950-51 to the end of the Sixth Plan i.e. 1984-85, the road length of the country increased four and a half times, from 4 lakh kms to 18 lakh kms, including more than five-fold increase in the surfaced roads, from 1.6 lakh kms to 8.3 lakh kms; while there was a nine-fold increase in the number of trucks and buses, from 1.16 lakh to 9.70 lakh. As regards railways, although the expansion of its route length was considerably less-from 54 thousand kms to 62 thousand kms (about 15 per cent), freight traffic carried by the railways increased more than four times - from 44 billion tonne kms to 196 billion tonne kms, while passenger traffic increased more than three times - from 66 billion to 240 billion passenger kms. Impressive as this progress is, the transportation network of the country is still far from adequate, considering its large area of 3.3 million sq. kms and vast population of 750 millions. Table 3.1 compares certain key indicators of transport growth for India and some developed countries.

TABLE 3.1 KEY INDICATORS OF TRANSPORT GROWTH, 1980

Country	Area million sq. kms	Population (million people)	Railway			Road Transport		
			Route length per Sq. km of area	Net tonne kms per capita	Passenger kms per capita	Road length per Sq. km of area	Number of vehicles per 1000 people	
							Cars	Commercial vehicles
1. India	3.29	664	0.019	23.7	30.5	0.20	2.0	2.0
2. Australia	7.68	15	0.005	2,488.1	-	0.11	397	100
3. Japan	0.37	117	0.060	336.6	2,683.1	3.00	203	115
4. West Germany	0.25	62	0.127	1,050.8	631.3	1.94	377	26
5. Italy	0.30	57	0.67	322.3	694.0	0.98	310	30
6. U.K.	0.24	56	0.071	315.3	566.6	1.39	281	34
7. France	0.55	54	0.063	1,281.2	739.3	2.78	343	50
8. Canada	9.97	24	0.009	9,894.6	137.0	0.09	428	123
9. U.S.A.	9.36	228	0.055	5,893.6	77.7	0.68	520	147

Note: Rail and Road data are from the *UN Statistical Year book for Asia and the Pacific, 1982* (for Asian countries) and from *Europa Year Book*, 1983 (for Europe and North America)
Source: *United Nations Statistical Year Book*, 1981.

Notwithstanding the vastly different geographical and demographic characteristics of the countries which make comparisons difficult, it is quite clear that the transport loads per capita in India are much less than those in developed countries and should be, therefore, expected to increase significantly as the country attains higher levels of growth in the coming years. Indeed, the country has a long way to go in extending and strengthening its transport network.

Inadequacies of Existing Transport System

3.4 The country's transport system suffers at present from several inadequacies which should be rectified as a matter of high priority as part of a systematic long term development plan for the sector. Thus the railway network of the country has some 20,000 kms (or 20 per cent) of its total track length which is overdue for renewal and to this will be added another 11,000 kms to become due for renewal by 1990. The available motive power with the railways is not merely numerically inadequate but is also getting obsolete with designs of three decades ago. The rolling stock designs in use are also deficient in several respects particularly considering the requirements of traffic in bulk commodities. The incidence of failures of rolling stock and track wear and tear are much beyond tolerable levels. Obsolete terminals and yards prevent optimum use being made of railway assets and affect their productivity adversely.

3.5 Road network of the country is deficient in several respects: about one-third of the villages in the country are still without any road connection, while two-thirds do not have all-weather roads. Only about one half of the total road network is surfaced. National highways constitute only 2 per cent of the total network and nearly 30 per cent of these have a single lane road pavement. About 91 per cent of the State highways are of single lane width and 60 per cent have poor riding quality and sub-standard geometrics. Most district roads in the country are poorly maintained. The inadequate capacity, insufficient paving thickness and poor riding quality of the country's road network result in reduced speeds, traffic hazards and high costs of operations.

3.6 Ports and shipping in the country again are not equipped to handle the growing bulk traffic at competitive costs and need technological upgradation. Coastal shipping particularly has been stagnant and does not have a meaningful role in the country's transport system.

Economic Perspective and Transport Development

3.7 The past growth of transport system of India might be considered in two parts viz. the period

before and after the first energy shock in 1973. Table 3.2 below gives the annual rates of growth in national income and transport demands. It would be observed that during the period 1950-51 to 1972-73, the rates of growth of both freight and passenger traffic were almost double the rate of growth of national income. However, in the seventies while the passenger traffic relative to national income continued to grow twice as fast, the growth of freight traffic decelerated slightly. Freight traffic again has registered an accelerated growth in more recent years.

TABLE 3.2 AVERAGE ANNUAL RATES OF GROWTH (PER CENT) IN NATIONAL INCOME AND TRANSPORT DEMANDS

	Variable	1950/51 to 1972/73	1972/73 to 1980/81	1980/81 to 1986/87
1.	**National Income** (at constant prices)	3.52	4.15	4.68
2.	**Passenger Traffic**			
	Rail	3.72	6.58	2.83
	Road	9.79	9.95	8.64
	Total	6.72	8.84	7.19
3.	**Freight Traffic**			
	Rail	5.54	2.84	4.94
	Road	11.82	7.82	12.81
	Total	6.77	4.45	8.37

Source: These estimates are based upon data supplied by the Transport Division of the Planning Commission.

In interpreting these figures, allowance has to be made for the fact that while the data for the railways is invoice based that for road transport is a rough estimation based mainly upon the growth of number of vehicles registered in the country.

3.8 Transport demands are expected normally to keep pace with the growth of national income, but are influenced significantly by the pattern of economic growth. In the early stages of economic development, transport is often a leading sector stimulating growth in other sectors like agriculture, industry, trade, etc. During this phase, transport demands tend to grow much faster than the gross national product. However, as the economy gets diversified with a shift from agriculture and mining to manufacturing and services sectors, the rate of growth of freight transportation demands tends to slow down in relation to gross national product. This trend gets further accentuated as, within the manufacturing sector, there is a shift from high-volume low-value to low-volume high-value product. The growth of urbanisation and rise in the income levels of people give impetus to diverse transport demands and particularly to demands for passenger services - suburban as well as inter-city services. These developments in the economy also have a vital impact on the structure of transport systems. In particular the railways which are inherently suited for long distance bulk traffic, assume a declining role while road transport tends to grow at a much faster pace for freight as well as passenger traffic.

3.9 These broad trends can be discerned in the country's transport development over the last 35 years. Transport capacities have generally lagged behind the growing requirements of the national economy and transport constraints in one form or other, have continued to impede economic and social development in various parts of the country. The railway capacity has frequently fallen short of the demands particularly for bulk commodities while over-crowding of passenger trains on main lines has continued unabated. There has been a growing congestion of traffic on important national highways and other arterial roads, while rural economy has suffered in the absence of all-weather road links for a majority of Indian villages. In general, expansion of road transport services has fallen short of the needs. It would be no exaggeration to say that transport development has not kept pace with overall economic development.

3.10 This may, in some measure, be ascribed to under-investment in the country's transport system in successive five year plans. Transport's share of public investment expenditures declined steadily from 23 per cent under the Third Plan (1961-66) to 12 per cent under the Sixth Plan

(1980-85). In real terms, annual transport investment over the fifteen years 1966-1979 was less than in the Third Plan (1961-65). This decline in real investment was to some extent reversed in the Sixth and Seventh Plans (See Table 3.3 below). However, the cumulative effect of past under-investment has continued with the essential transport services frequently operating under considerable strain.

TABLE 3.3 PUBLIC INVESTMENT IN TRANSPORT SECTOR - 1951-90 ANNUAL AVERAGE OF ACTUAL EXPENDITURE PER PERIOD
(Rs Crore, 1971 Prices)

	First Plan 1951-56	Second Plan 1956-61	Third Plan 1961-66	Annual Plan 1966-69	Fourth Plan 1969-74	Fifth Plan 1974-78	Sixth Plan 1980-85	Seventh Plan 1985-90 (Outlay)	Anticipated
1. Railways	100	285	411	198	167	231	413	652	861
2. Road & Road Transport	68	96	145	141	177	237	320	380	465
3. Ports & I.W.T.	13	13	31	24	47	57	76	79	111
4. Shipping	9	21	12	12	28	54		44	63
5. Civil Aviation	10	19	16	26	32	32	59	40	105
6. Total Transport	200	434	615	401	451	611	868	1,195	1,605
7. Transport in total Plan (%)	22.1	23.5	23.1	15.6	15.9	14.1	12.7	12.6	14.0

3.11 Indian economy is undergoing important structural changes and over the last 35 years, there has been a decline in the share of agriculture in the total national product while that of industry and services has been increasing. While these broad trends are likely to continue in the coming decade, they are not likely to result in any deceleration of growth of transport demands. If the strategy to be adopted for the Eighth and Ninth Plans would be for a higher growth rate of national income than was achieved hitherto, with emphasis on modernisation of agriculture and accelerated growth of industries, this will inevitably lead to a faster growth of freight traffic demands. With the current trend in growth of urbanisation and with an accent on raising employment levels in the country, passenger transport demands are likely to grow significantly. All this is bound to strain the country's transport system which because of the past backlogs of obsolete and overaged assets, has little resilience to deal with unforeseen increases or changes in pattern of transport demands.

Investment Optimisation

3.12 There are two alternative approaches to investment optimisation: (a) leave the supply and demand of transport services to be determined through market forces; and (b) rely on effective planning and appropriate regulatory measures to complement planning tools. Developments in the last about two decades in many countries have led to a visible change in the role of regulatory measures and there has, thus, been a marked trend in favour of liberalisation of transport policies, introducing a large measure of flexibility in transport pricing and investment policies. This is particularly true in developed countries where the basic transport networks are already in place and investment priorities are directed to maintenance and rehabilitation and augmentation of capacity rather than extension of road or rail networks. Even in these countries, however, there has been some concern for proper policy planning for transport systems with a view to achieving optimum use of transport investments. This concern increased particularly after the energy crisis of the seventies as the need was felt to conserve energy used in transportation.

3.13 In India, bulk of the transportation infrastructure is publicly owned and operated and directly or indirectly financed by the Government. It is, therefore, imperative for the government: (i) to determine how much investment in capacity augmentation is required at any given stage of the economy; and (ii) how to finance such investment. The first involves

careful and detailed planning based on economic and technical analysis of investment projects and the second involves the issue of pricing of transport services.

3.14 For optimum resource allocation, it is important not merely to be able to realistically forecast transport demands but also, to the extent possible, influence and manage these demands through appropriate industrial locations. This is particularly true of the major industries like coal mining, iron and steel, cement and steel, fertiliser plants and energy (power generation and transmission) projects. Industrial locations and urbanisation have a major influence on transportation demands and policies in these areas should be so formulated and implemented as to minimise demands on transportation, other things being equal. Thus, in considering new industrial projects, alternative options must be evaluated giving full consideration to their transportation needs and investments on transportation facilities taken into account in the evaluation of total investments.

3.15 Special importance is attached in this context to integration of energy and transport planning. Transport accounts for nearly 1/3rd of the total commercial energy consumption in the country. Energy supply on the other hand, depends considerably on coal: about 42 per cent of the total coal supply is used up in power generation and as presently projected, this is likely to increase to 69 per cent by 2000 AD. Presently, as much as 86 per cent of coal movements require transportation by rail. Accordingly, it is necessary to optimise power generation from coal, on the one hand, and use of energy in transport, on the other. Pithead generation of power and use of alternative fuels, particularly oil and gas, if justified on economic considerations should help reduce the transport loads for the energy sector.

3.16 Transportation should form an integral part of all urban development programmes. Rational policies towards urbanisation with planned and well-directed moves to decelerate the growth of metropolitan cities should contribute significantly to efficient transport development. The studies of traffic flows done by RITES indicate that the rail and road links to metropolitan cities are fully saturated and the stage is already reached when, for any relief of overcrowding of these routes, opening up of alternative routes would be necessary involving huge investments which it may be difficult to finance with the current financial constraints continuing in the next 10 to 15 years.

3.17 All major transport capacity augmentation projects must be identified on the basis of detailed studies of transport demands along specific routes/corridors, adopting a systems approach to the development of the needed capacities and all such projects should be subjected to detailed economic evaluation. While evaluating these projects, care has to be taken to avoid the almost universal temptation of underestimating costs and overestimating benefits (e.g. in terms of contributions to national defence, regional development and national integration, etc.).

Transport Pricing

3.18 For optimisation of investments in transport sector, it is important that transport pricing should reflect long-run incremental costs. It is difficult, however, to enforce this principle in practice. There is a great deal of ambiguity with respect to private marginal costs which obviously vary as between different transportation situations. Thus, the unit costs of services will differ, depending upon the density of traffic and conditions of haulage, etc. There are also real difficulties in quantifying social costs such as pollution or congestion costs.

3.19 Transport demands are influenced significantly by behavioural factors which cannot be quantified. The actual transport demands and their intermodal allocation, therefore, would seldom conform to the pattern suggested by comparative costs considerations - financial or economic. The deviation of actual demands from what might be regarded as optimum on costs considerations could give rise to serious shortfalls or excesses of transport capacities.

3.20 Market forces cannot be relied upon to bring about equilibrium between supply and demand for transport services and have, therefore, to be tempered by regulatory measures. Perfect market conditions do not obtain in the transport

sector in any country, much less in India. The conditions of competition are far from being equal between different transport modes e.g. railways bear their track costs while, in the case of road transport, contribution to track costs is indirect through taxation which, is not related to costs of infrastructure provided by the Government. The railways, as a public enterprise in India, are called upon to undertake certain social service obligations and do not have the desired freedom to set their prices depending upon costs of services. In some countries, as, for example UK, railways are free to negotiate price contracts with private users. The cost data made available to the Committee by the Railway Board indicate that while, on the broad gauge, freight rates for almost all commodities exceed the costs of haulage, on the meter gauge, the railways have to subsidise haulage of quite a number of commodities. Again, the passenger traffic does not recover costs of haulage particularly for suburban and second class inter-city services. Although there is considerable scope to reduce and, in certain cases, eliminate subsidies - and we have made some recommendations in Chapter XIII, it will be unrealistic, on the whole, to conceive of the Indian Railways being allowed the freedom to adjust their rates according to incremental costs which would vary considerably, depending upon different transport situations. At the same time, the railways must increasingly orient their operations on a sound commercial basis to be able to remain financially viable.

3.21 As for road transport, except for public sector passenger services, the operations particularly for goods transport, continue to be in a disorganised state and price setting for the industry is difficult to enforce. If prices are to be regulated to conform to social costs of providing services, reliance has to be placed on to the users of transport. Taxation of road transport industry or, for that matter, of important materials and fuel used by different modes of transport, has been almost completely divorced from consideration of developing an optimal growth of transportation sector as a whole. If we have to rely on fiscal tools to influence transport pricing in conformity with marginal cost pricing principle, it will be necessary to establish an appropriate system of taxation, based on scientific studies of such factors as the usage of road space by different types of vehicles and wear and tear caused to roads. With proper studies of incidence of taxes on costs of services, it should be possible to introduce uniform taxation policies across the country notwithstanding the present division of responsibility in the matter of levy of taxes between the Centre and the States.

3.22 It may be noted, in this context, that with the emerging pattern of traffic in the country, the respective roles of railway, road transport and coastal shipping, are getting better defined. The railways, to overcome capacity problems, are increasingly concentrating on long distance movement of bulk commodities and other goods in full rakes. This will leave a large part of such traffic to road transport as that mode of transport is inherently more suited to carry. Thus, the actual traffic split between rail and road might not present any conventional problems of competition between these two major transport modes in the country. On the other hand, perspective developments in the coming years should open up possibilities of collaborative arrangements between not merely rail and road transport but also rail and coastal shipping to provide integrated services.

Broad Policy Directions

3.23 Thus, the broad policy parameters for transport development in future are to ensure optimum investments in transport on the basis of an approach aimed at achieving integrated development of transport with other sectors of the national economy. This involves, at every stage, a careful assessment of transport demands and evaluation of all investment projects on an objective consideration of various possible alternatives. Transport pricing should conform closely to costs and transport services should be enabled as far as possible to function on a commercial basis and be financially self-sufficient. Fiscal policies and measures bearing on transport need to be rationalised with a view to induce price setting for transport services based upon costs of

services.

3.24 It is within this broad policy framework that we need to consider detailed policy issues pertaining to each transport mode and, indeed, for the transport sector as a whole. As discussed later (see Chapter X), any significant increase in resource availability for the transport sector, howsoever strong the case for such an increase, will be difficult to achieve. Planning and management of transport system must, therefore, have the overriding objective of promoting the efficiency of transport services and enabling them to finance their maintenance as well as development programmes, from self-generated services to the maximum extent possible. Basically, the following three objectives must be achieved in the future development of transport sector:

(a) More efficient planning to achieve a well-balanced, integrated transport system incorporating emerging technologies;

(b) Increased productivity and operational efficiency of services through better maintenance, improved management and modernisation of services; and

(c) Greater orientation of services to function on a sound commercial basis, with a view particularly to promote generation of internal resources and to reduce their dependence on government budgetary support, to the extent possible.

3.25 In this context, it is necessary to underline the important role to be played by the private sector. Transport services in the private sector should be integrated into the total transport system of the country and measures taken to increase their efficiency and productivity. As the economy undergoes structural changes and as the country moves to a more balanced regional development, road transport, and where potential exists, inland water transport have an increasing role and must be developed in an organised way and the existing policies and practices must be re-oriented to facilitate their development.

3.26 In the final analysis, for optimisation of transport investment, it is important to have sound investment and pricing and fiscal policies. To minimise transport costs, it is important not only to promote coordinated transport services as between transport modes but also to closely integrate planning of transport with planning of other important sectors of economy. This requires development of a sound data base and analytical capabilities and institutional development for investment planning and policy formulation on a sound and scientific basis. Later in this report, we discuss institutional issues and offer some suggestions for institutional build up for the sector (see Chapter XI).

IV. TRANSPORT PLANNING METHODOLOGY

Transport planning involves the following different stages:

i) Macro economic forecasting of national supplies and demands;
ii) Development of regional supply and demand vectors compatible with national forecasts;
iii) Construction of national transport networks;
iv) Optimal linking of production and demand locations for the target years (with simultaneous optimisation of land use and locations);
v) Determination of optimal allocation of traffic flow between different competing modes;
vi) Optimal route assumptions on different modes; and
vii) Evaluation of alternative transport projects and policies.

4.2 According to the methodologies adopted traditionally in the successive five year plans, transport demand forecasts were derived from Planning Commission's macro economic supplies and demands through application of transport co-efficient method; transport co-efficient being defined as the ratio of the originating tonnage to the total production of a commodity. Projected rail transport coefficients were assumed mainly on a judgmental basis keeping in view expected shifts in demand and supply locations of various commodities. The originating tonnage by rail was later converted into tonne kms assuming perspective average leads based on past trends. These estimates were exogenous to the input-output model and gave no consideration to inter-modal allocation. Passenger demand forecasts were based mainly on past trends. Since the macro-economic model is not disaggregated into regional sub-models, transport forecasts based on

the model did not take into account spatial distribution and the lead of traffic was determined exogenously based on observed trends.

Transport Planning Model

4.3 Under the UNDP Transport Policy Planning Project of the Planning Commission (1978-82), a multi-regional, multi-sectoral transport planning model* was developed, which was a modified version of the Leontief-Strout Model and combined inter-regional input-output models, linear programming and gravity models. Given the forecasts for national and sectoral outputs and demands and input-output table of the Planning Commission, the model produced regional allocation of sectoral outputs and demands, traffic distribution, and modal split. National supplies were allocated into regional supplies by using the so-called "shift and share technique". National demands were allocated among regional demands by using regional input-output relations for estimation of intermediate demands, and various econometric techniques for regional allocation of final demands (consisting of private and public consumption, investment, inventories, exports and imports). However, the regional allocation attempted under the model could not produce realistic estimates for want of dependable data on systems parameters. The model also did not take into account technological innovations or changes in the transport sector. Because of these limitations, the model developed after five years of laborious efforts failed to yield realistic results.

Approach Adopted by the Committee

4.4 The Committee after a great deal of reflection on the state of data availability in the transport sector came to the view than an all-purpose model to determine optimal investment on each link of the transport network on the basis of analysis of perspective economic developments and their spatial distribution would be a highly ambitious undertaking. Experience with such modelling even in much smaller countries had not been quite productive. There is an additional difficulty in India arising from the lack of reliable data to feed the model. In fact, imbalances between supply and demand situations are inherent in any transport system due mainly to indivisible nature of investments. It is, therefore, neither practical nor quite necessary to develop sophisticated all-purpose models to determine investment needs for the sector.

4.5 The Committee, therefore, decided to focus on specific high priority issues in transport planning and develop relatively simpler techniques for handling these issues. Transport capacity constraints particularly on the railways have been traditionally felt in respect of movement of bulk commodities. Nine bulk commodities, namely, coal, steel, iron ore, POL, fertilisers, foodgrains, cement, salt and lime-stone & dolomite account for over 85 per cent of rail traffic. Again these constraints have been in high density corridors which are four sides and diagonals of the so called "Golden Quadrilateral" that links up metropolitan cities of Delhi, Calcutta, Madras and Bombay. The national highways and trunk roads linking up metropolitan cities are also over-crowded. Apart from developing additional capacities on these high density corridors, there is the need to develop alternative routes including, where possible, coastal shipping and inland water services. For an assessment of incremental capacity needs on the high density corridors, the Committee decided to have detailed studies undertaken of the present and future distribution patterns of bulk commodities and develop models to forecast traffic flows in these commodities and also long-distance inter-city passenger traffic demands.

4.6 The objective of these models is to assess the additional capacity requirements on the critical rail and road corridors for the horizon years 1989-90, 1994-95 and 1999-2000. To this end, sectoral transport models comprising the submodels were developed and calibrated for 9 bulk commodity groups consisting of 35 homogeneous commodities.

a) Regional Demand/Supply Projection Submodel;

b) Modal Transport Network Construction

*Transport Planning Model for India, Vols. I & II, Planning Commission, December 1982.

Sub-model;
c) Traffic Distribution Sub-model;
d) Modal Split Sub-model; and
e) Optimal Route Assignment leading to Section Loadings.

The model starts with the forecasts of outputs, exports and imports of major commodities at the macro level. These forecasts are then allocated among the specified transport zones by adopting suitable econometric techniques. Transport networks along with estimates of modal costs generate mode-wise least-cost trees. Given the estimates of regional supplies and demands and minimum cost matrices, linear programming model is used to optimise flows of bulk commodities, while a modified trend method has been adopted for forecasting transport flows of "other commodities" combined together. These sub-models are described below:

Supply and Demand Forecast

4.7 Various government departments, public undertakings and organisations dealing with bulk commodities were requested to undertake detailed studies on the perspective planning of their respective sectors. RITES was assigned the task of coordinating these studies and critically examining the forecasts of sectoral supplies and demands in close consultation with the Perspective Planning Division of the Planning Commission. Regionalisation of national supplies was determined by demand-based production plans of the individual plants at the various locations, mines or fields as indicated by the concerned departments. In the case of foodgrains, however, the regional production forecasts were based on the past trend moderated in the light of likely impact of area-specific agricultural development programmes. Regionalisation of national demands for various commodities was done on the basis of location-specific end-use and/or final demands with the exception of iron and steel and POL products, which were determined on the basis of base year regional shares. While the intermediate demands are estimated by the end-use method on the basis of suitable consumption norms and output projections of the user industries, the components of final demands have been estimated by either modified time trend technique or multiple regression model or regional share approach.

Network Assignment

4.8 Comprehensive transport networks for rail and road have been constructed in terms of nodes and link distances along with link characteristics e.g. gauge (BG/MG), track (single line/double line), traction (steam/diesel/electric), gradient (non-ghat/ghat) and road type (National Highway, State Highway, other roads), lane width (single, double, etc.), terrain (plains/rolling/hilly) and link capacity. Rail network so constructed comprises 1,391 nodes and 1,390 links. Similarly, road network includes 3,262 nodes and 3,261 links. On the basis of the railways and highways networks referred to above and economic costs, commodity-specific least transport costs matrices have been constructed using Moore's Algorithm.

Traffic Distribution

4.9 In view of the homogeneous nature of the 35 commodities referred to above, traffic distribution for each of the three horizon years: 1989-90, 1994-95 and 1999-2000 has been made by using linear programming (LP) model. Keeping in view (i) the committed movements of POL through the existing or expected pipeline systems; (ii) captive/dedicated flows of coal, iron ore, limestone and dolomite; and (iii) location-specific advantages of coastal shipping, the relevant linkages and flows have been considered exogenously in the model and the regional production/supply vectors have been modified accordingly.

4.10 For other commodities, moderated growth factor approach has been adopted to forecast future transport flows. More specifically, route-wise growth factors have been worked out on the basis of inter-regional flows for the years 1978-79 and 1986-87. The resultant growth factors have been suitably modified by the estimated elasticity of transport demand with respect to the State Domestic Product (SDP). It may be mentioned

here that data on transport flows of commodities for the year 1978-79 were available from the First RITES Survey (1978-79) on traffic flows.

Modal Split

4.11 The following approaches have been adopted for the purpose of rail/road modal split separately for each of the 9 bulk commodities and non-bulk commodities taken together:
(i) For horizon years 1989-90 & 1994-95, modal allocation was worked out on the basis of regression relationship between the base year observed modal shares and the related distance levels for various commodities.
(ii) For the year 1999/2000, modal allocation is attempted on the basis of all-or-nothing principle as determined by minimum economic costs.

Optimal Route Assignment and Section Loadings

4.12 Projected rail/road commodity-specific traffic flows have been converted into their train/truck equivalents taking into account the extent of commodity-specific loadability and empty-return ratios. These O-D pair-wise trains/trucks taken together for all commodities have been loaded on to the least-cost paths. Since the projected flows and, in turn, the section loadings relate to inter-regional flows, the same have been appropriately adjusted for intra-regional flows. Adding these goods-section loadings to the corresponding passenger-section loading, total section loadings on each relevant rail/road link have been worked out. The resultant section loadings have been compared with the existing and expected capacity to identify critical sections.

Rail Passenger Traffic

4.13 Forecasting of rail passenger travel demand needs the following basic inputs:
- regional estimates of rural, urban and total population employment for the base year (1986-87) and horizon years 1989-90, 1994-95 and 1999-2000.
- rail network including inter-nodal distances; and
- base year section loadings.

Basically, a modified version of the gravity model has been used to generate future O-D matrix for passenger flows on the basis of projected population and link volumes.

Road Passenger Transport Demand

4.14 On the basis of traffic count surveys by RITES and the Ministry of Surface Transport, link volumes on the National and State Highways, in terms of number of buses, have been constructed for the year 1986-87. On the basis of the State level growth rates of bus population duly adjusted for elasticity of transport demand with respect to the state domestic products, link volumes have been projected for the years 1989-90, 1994-95 and 1999-2000.

Regional Demarcation

4.15 The present model has been calibrated at the level of RITES survey zones of 421 regions which are broadly coterminus with the districts. Regions consist of 354 districts, 26 regions formed by grouping 60 districts of low traffic potential, and 41 regions formed by subdividing 18 districts with high traffic potentials.

Commodity Disaggregation

4.16 Goods have been classified into 44 commodity groups as indicated in Annexure 4.2. This sectoral classification corresponds broadly with the 50 sector input-output table of the Planning Commission.

Inter-regional Commodity Flow Matrices

4.17 As mentioned earlier, the principal source of data on inter-regional flows is the RITES' Survey of traffic flows and modal costs. The flow data for the commodities were collected for three main modes of transport viz. railways, highways and coastal shipping. Whereas for the railways and coastal shipping, census data have been used, for road transport a detailed origin-destination survey was conducted to obtain inter-regional commodity flows. Two rounds of survey were conducted during 1986-87 and for each round the survey was organised round the clock for seven

days in a week in metropolitan cities and for two days in a week in all other regions. Altogether 551 check-posts were identified covering the entire country.

Study of Modal Costs

4.18 The RITES' Survey provides commodity-wise transport costs by distance slabs for rail, road and coastal shipping. An attempt has been made to calculate resource costs comprising operator costs, user costs and social costs. The operator costs consist mainly of capital cost, overhead expenditure, terminal costs, salaries of crew, repair and maintenance costs, and vehicle/rolling stock operation costs. The user cost comprises charges relating to packing, handling, local cartage, inventory, storage, transit losses (and value of time spent for passenger traffic). In this study, social costs include only accident costs and exclude costs for pollution, noise and loss of public property. Financial costs have been converted into resource costs on the basis of the following norms used by the Project Appraisal Division of the Planning Commission.

i) All tradeable commodities have been valued at border prices;
ii) A premium of 25 per cent has been applied to foreign change rates for imported components;
iii) Economic cost of electric power has been taken as Rs. 1 per Kwh;
iv) Social rate of discount has been taken as 12 per cent.
v) Rents for land have been estimated on the basis of agricultural output foregone for rural areas and market prices for urban areas.

4.19 In the Study, railways' operator costs were estimated separately for broad and metre guage and distinguished by the type of track (BG/MG), and traction (diesel/electric). They were also computed separately for block load or full train load and wagon load movements. For highways, separate costs were estimated for national highway/state highways, single lane/double-lane, plain and hilly terrains.

4.20 For the estimation of financial and economic costs, all the commodities moving by rail and road were grouped into 13 broad categories represented by wheat, raw cotton, potatoes, fertilisers, coal, sugar, petroleum oil, tea, cotton textiles, cement, livestock, iron and steel and small machinery. In the case of coastal shipping, costs were estimated for coal, salt and POL.

Linear Programming Model

4.21 The user costs and the operator costs for 13 commodities were calculated for the distance slabs up to 1,250 kms for both railways and highways. For the purpose of model calibration, it was necessary to fit continuous cost functions by regressing cost on average length of haul.

4.22 Given the regional supply and demand vectors and minimum cost matrices, the standard LP model was used to generate inter-regional flows for specified homogeneous commodity groups constituting nine bulk commodities (Annexure 4.1). The results of the model and traffic forecasts are discussed in Chapter V.

Limitations of Data

4.23 As explained above, the methodology adopted for developing future transport demand projections was directed to the central problem of capacity development in high density transport corridors of critical importance. While for the railways and coastal shipping, actual invoice based data were available on the existing traffic flows, for data relating to road transport, reliance was placed mainly on *ad hoc* origin destination surveys conducted by RITES which attempted a country-wide coverage of all inter-regional road traffic flows. There are obvious limitations of this exercise. Intra-regional movements were left out from traffic counts. According to the Ministry of Surface Transport, traffic volumes recorded by RITES on many national highways were much lower than those reflected in the biannual vehicular counts conducted by the State Public Works Department.

4.24 Transport cost studies too had to be limited to a few commodity-categories and transport situations and may not necessarily provide representative results to be applied for inter-modal allocation of traffic between different modes along various routes.

4.25 Moreover, cost comparison analysis does not take into account perspective technological improvements such as may have major impact on productivity of rail, road and shipping services in future. These, therefore, do not provide a realistic basis for future inter-modal traffic allocations.

4.26 As for projected traffic flows in bulk commodities, these were to be based upon systematic studies of the future locational patterns for the respective industries which could not be attempted and projections thus may not be quite reliable except in cases where major projects had already been identified or were under active consideration.

4.27 Freight traffic projections on the whole could not take into account the emerging locational patterns of development of industries which may be influenced significantly by the strategies to be adopted in the Eighth and Ninth Plans for balanced regional development in future.

4.28 Inter-city passenger traffic forecasts also at this stage could not take into account the likely impact of the emerging urbanisation pattern in future.

4.29 The data for road transport, in particular, are far from complete to provide a realistic basis for future forecasts along important road links in the country. The Ministry of Surface Transport, therefore, have proposed their own projections of road transport demands based on vehicle counts undertaken biannually.

4.30 As for coastal shipping demands, RITES' projections were not realistic as they did not take into account specific locations of future thermal plants and other industries along the coast and were not based on any detailed studies of comparative economics of alternative transport modes. RITES has separately done a detailed study based on the proposed future projects for coal based thermal plants as supplied by the Central Electricity Authority.

V. SURVEY OF TRAFFIC FLOWS AND MODAL COSTS

RITES Study

The following table summarises the estimated traffic moved by three modes as obtained from the RITES Survey during 1986-87:

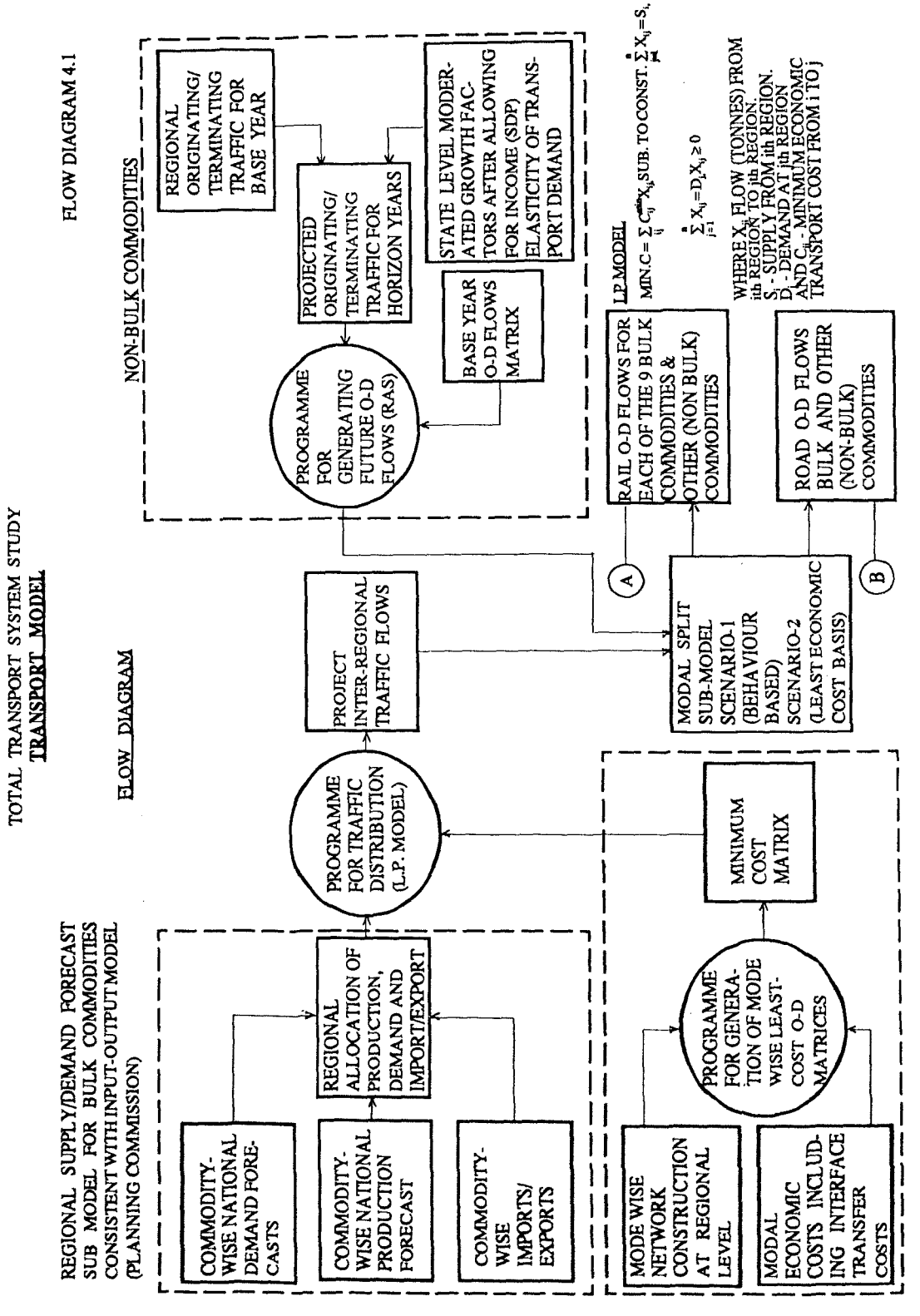
TABLE 5.1 MODE-WISE INTER-REGIONAL TRAFFIC (1986-87)

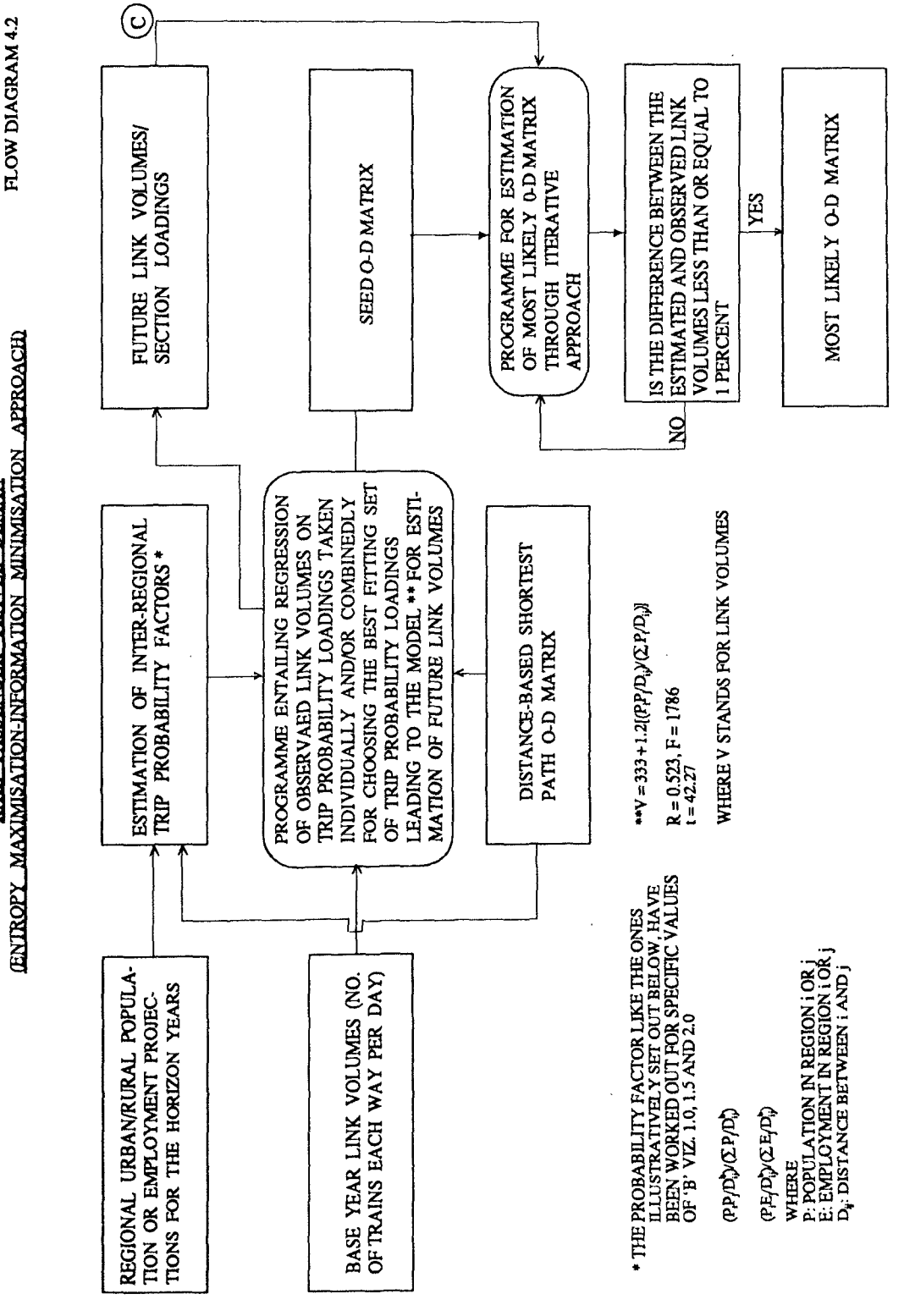
Mode	Originating Tonnage		Tonne-Kilometres		Average
	Quantity (million)	Modal Share(%)	Quantity (billion)	Modal Share(%)	Lead (km)
Railways	255.4	52.7	198.7	66.5	778
Highways	224.0	46.2	91.0	30.5	406
Coastal Shipping	5.5	1.1	9.1	3.0	1,650
Total	484.9	100.0	298.8	100.0	616

Composition of Traffic

5.2 On the basis of originating tonnage, top 12 commodities, namely, coal, foodgrains, iron ore, mineral oils, cement, chemical manures, iron & steel, limestone & dolomite, salt, sugar & khandsari, other stones and bamboo, timber, etc., accounted for about 90 per cent of the originating tonnage and above 86 per cent of tkms on rail. Their average leads ranged between 325 kms (iron ore) and 1,388 kms (salt). The remaining share was contributed by 32 commodities with the average lead ranging between 133 (sugarcane) and 200 kms (tea and coffee).

5.3 More than 71 per cent of originating tonnage and 64 per cent of kms on road were contributed by top 15 commodities viz. foodgrains, coal, building material, fruits and vegetables, other stones, cement, iron & steel, chemical manures, provisions & household goods, bamboo, timber, etc., mineral oils, sugar & khandsari, fodder, chemicals & drugs and oilseeds. Their average leads ranged between 242 (other stones) and 487 kms (iron and steel). The balance of road traffic was contributed by 29 commodities with the average lead ranging between 207 kms for sugar cane and 856 kms for cycle and cycle parts.

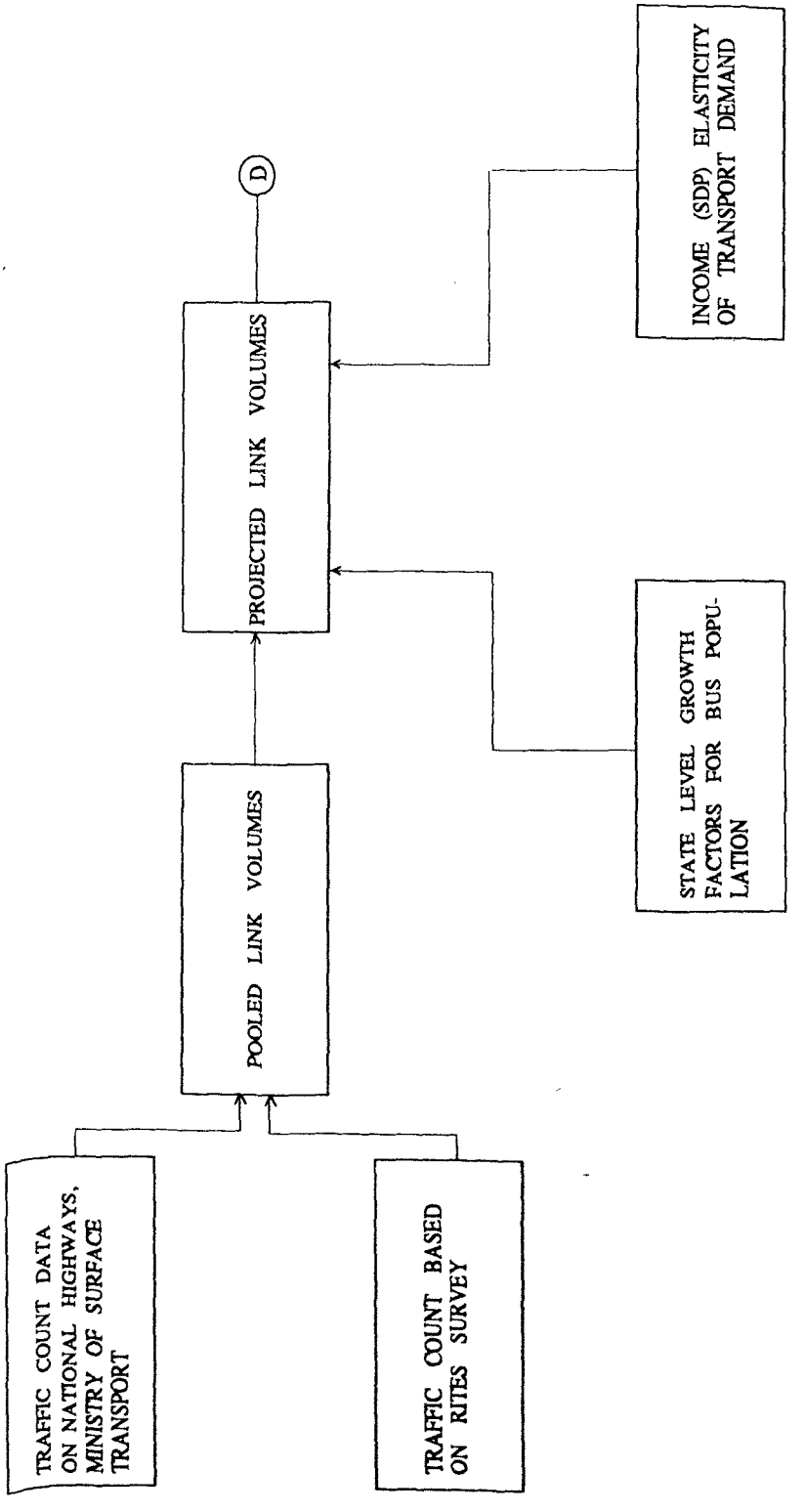

TOTAL TRANSPORT SYSTEM STUDY
TRANSPORT MODEL
FLOW DIAGRAM 4.1
FLOW DIAGRAM
REGIONAL SUPPLY/DEMAND FORECAST SUB MODEL FOR BULK COMMODITIES CONSISTENT WITH INPUT-OUTPUT MODEL (PLANNING COMMISSION)
NON-BULK COMMODITIES
REGIONAL ORIGINATING/ TERMINATING TRAFFIC FOR BASE YEAR
PROJECTED ORIGINATING/ TERMINATING TRAFFIC FOR HORIZON YEARS
STATE LEVEL MODERATED GROWTH FACTORS AFTER ALLOWING FOR INCOME (SDP) ELASTICITY OF TRANSPORT DEMAND
BASE YEAR O-D FLOWS MATRIX
PROGRAMME FOR GENERATING FUTURE O-D FLOWS (RAS)
PROJECT INTER-REGIONAL TRAFFIC FLOWS
LP MODEL
MIN.C = $\sum_i \sum_j C_{ij} X_{ij}$ SUB. TO CONST. $\sum_{j=1}^{n} X_{ij} = S_i$,
$\sum_{j=1}^{n} X_{ij} = D_j X_{ij} \geq 0$
WHERE X_{ij} FLOW (TONNES) FROM ith REGION TO jth REGION.
S_i - SUPPLY FROM ith REGION.
D_j - DEMAND AT jth REGION
AND C_{ij} - MINIMUM ECONOMIC TRANSPORT COST FROM i TO j
A
RAIL O-D FLOWS FOR EACH OF THE 9 BULK COMMODITIES & OTHER (NON BULK) COMMODITIES
B
ROAD O-D FLOWS BULK AND OTHER (NON-BULK) COMMODITIES
MODAL SPLIT SUB-MODEL SCENARIO-1 (BEHAVIOUR BASED) SCENARIO-2 (LEAST ECONOMIC COST BASIS)
PROGRAMME FOR TRAFFIC DISTRIBUTION (L.P. MODEL)
MINIMUM COST MATRIX
PROGRAMME FOR GENERATION OF MODE WISE LEAST-COST O-D MATRICES
COMMODITY-WISE NATIONAL DEMAND FORECASTS
REGIONAL ALLOCATION OF PRODUCTION, DEMAND AND IMPORT/EXPORT
COMMODITY-WISE NATIONAL PRODUCTION FORECAST
COMMODITY-WISE IMPORTS/ EXPORTS
MODE WISE NETWORK CONSTRUCTION AT REGIONAL LEVEL
MODAL ECONOMIC COSTS INCLUDING INTERFACE TRANSFER COSTS


RAIL PASSENGER TRAVEL DEMAN
(ENTROPY MAXIMISATION-INFORMATION MINIMISATION APPROACH)
FLOW DIAGRAM 4.2
REGIONAL URBAN/RURAL POPULATION OR EMPLOYMENT PROJECTIONS FOR THE HORIZON YEARS
BASE YEAR LINK VOLUMES (NO. OF TRAINS EACH WAY PER DAY)
ESTIMATION OF INTER-REGIONAL TRIP PROBABILITY FACTORS *
DISTANCE-BASED SHORTEST PATH O-D MATRIX
PROGRAMME ENTAILING REGRESSION OF OBSERVAED LINK VOLUMES ON TRIP PROBABILITY LOADINGS TAKEN INDIVIDUALLY AND/OR COMBINEDLY FOR CHOOSING THE BEST FITTING SET OF TRIP PROBABILITY LOADINGS LEADING TO THE MODEL ** FOR ESTIMATION OF FUTURE LINK VOLUMES
SEED O-D MATRIX
FUTURE LINK VOLUMES/ SECTION LOADINGS
C
PROGRAMME FOR ESTIMATION OF MOST LIKELY O-D MATRIX THROUGH ITERATIVE APPROACH
IS THE DIFFERENCE BETWEEN THE ESTIMATED AND OBSERVED LINK VOLUMES LESS THAN OR EQUAL TO 1 PERCENT
NO
YES
MOST LIKELY O-D MATRIX
* THE PROBABILITY FACTOR LIKE THE ONES ILLUSTRATIVELY SET OUT BELOW HAVE BEEN WORKED OUT FOR SPECIFIC VALUES OF 'B' VIZ. 1.0, 1.5 AND 2.0
(PiPj/Dij)/(ΣPiPj/Dij)
(PiEj/Dij)/(ΣEiEj/Dij)
WHERE
P: POPULATION IN REGION i OR j
E: EMPLOYMENT IN REGION i OR j
Dij: DISTANCE BETWEEN i AND j
**V = 333 + 1.2[(PiPj/Dij)/(ΣPiPj/Dij)]
R = 0.523, F = 1786
t = 42.27
WHERE V STANDS FOR LINK VOLUMES

FLOW CHART 4.3 ROAD PASSENGER

ROAD PASSENGER SECTION LOADINGS

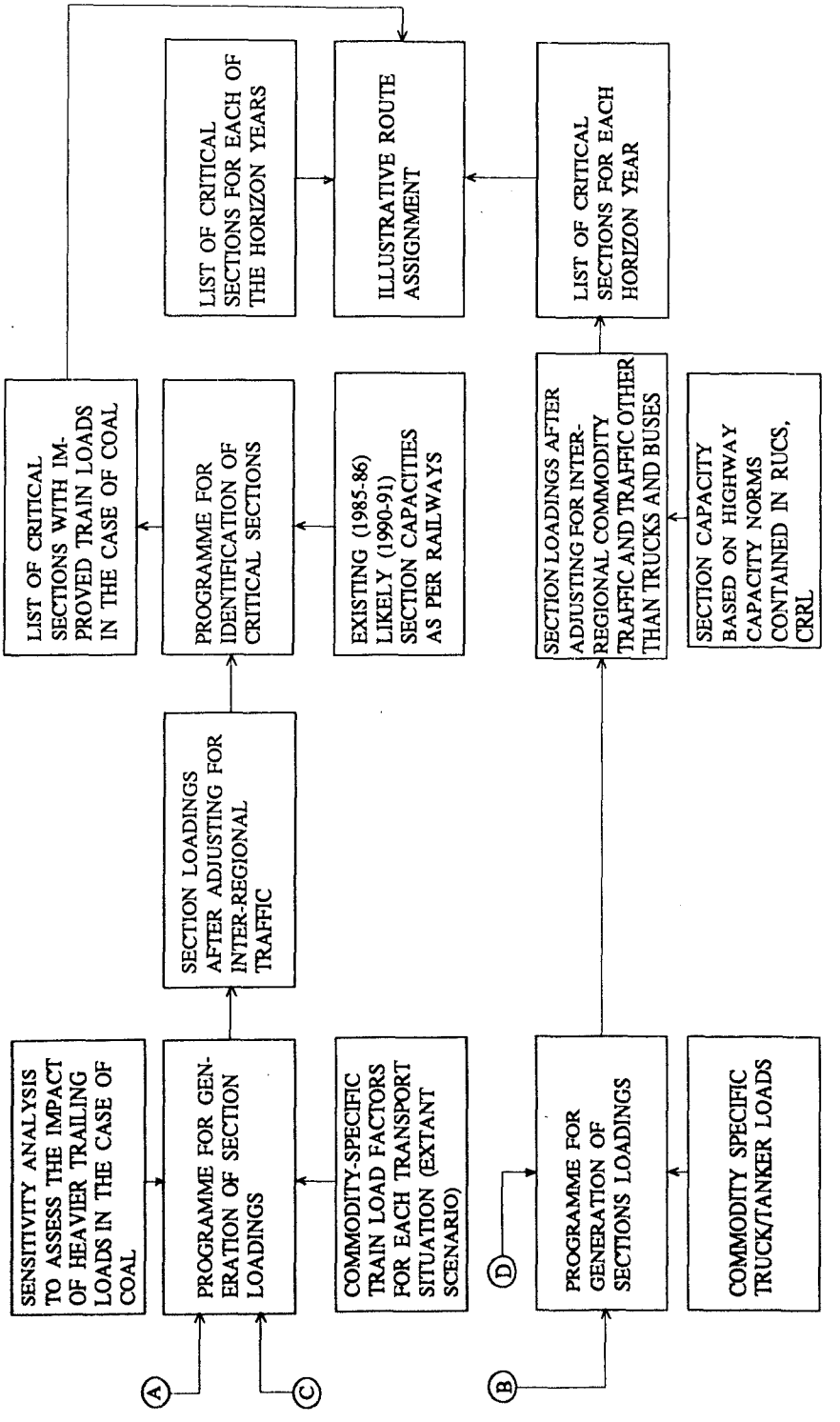
FLOW DIAGRAM



FLOW CHART 4.4 SECTION LOADINGS

SECTION LOADINGS

(BASE YEAR BEHAVIOURAL SCENARIO FOR 1989-90 AND 1994-95 AND LEAST ECONOMIC COST SCENARIO FOR 1999-2000)



Modal Shares

5.4 On the basis of rail-road modal shares the following three broad commodity categories emerge: Category 1: predominantly rail borne-rail share exceeding 60 per cent, Category 2: Predominantly road borne road share exceeding 60 per cent, Category 3: Non-selective i.e. rail/road share within 40 per cent to 60 per cent. In terms of tonnes carried and tkms earned, ten commodities viz. coal, iron ore, manganese ore, limestone & dolomite, gypsum, other ores, mineral oils, cement, coal tar bitumen and salt fall in Category 1. On the same criteria, 20 commodities viz. cotton raw, jute raw, sugarcane, tobacco, fruits & vegetables, milk & milk products, other stones, non-ferrous metals, building material, chemicals & drugs, paints & dyes, tea, coffee, etc., provisions & household goods, tyres & tubes, leather manufactured, cotton manufactured, footwear, automobile & parts, cycle & cycle parts and electrical equipment fall in Category 2.

Spatial Distribution

5.5 Spatial distribution of traffic is characterised by marked concentration in a few States. On the basis of total tonnage handled, top 12 States & Union Territories viz. Uttar Pradesh, Maharashtra, Madhya Pradesh, Bihar, Andhra Pradesh, Gujarat, West Bengal, Tamil Nadu, Karnataka, Rajasthan, Orissa and Delhi contribute 87.5 per cent of traffic. Similar pattern exists for originating as well as terminating traffic. As regards modal shares, originating traffic is predominantly by rail (exceeding 60 per cent) in respect of the States of West Bengal, Bihar, Madhya Pradesh, Orissa and Punjab, predominantly by road in Uttar Pradesh, Maharashtra and Tamil Nadu and the modal choice is indifferent in the remaining States. Terminating traffic is predominantly by rail in West Bengal, Bihar, Punjab and Madhya Pradesh, predominantly by road in Karnataka and either mode is equally preferred in the remaining States/UTs.

5.6 Out of the total 421 regions, top 142, 124 and 141 regions account for 80 per cent of traffic in terms of total, originating and terminating traffic respectively. State capitals/metropolitan cities account for about 15,26 and 20 per cent of originating, terminating and total tonnage.

5.7 Bulk commodities indicate very little cross-hauls i.e. two-way movements. However, the following heterogeneous groups indicate maximum levels of cross-hauls in terms of percentage share in total tonne kilometres: other commodities (20.2), cotton manufactured (14.9), provisions & household goods (13.1), electrical equipment (10.1), paper (9.8), chemicals & drugs (9.4), machinery & equipment (9.8), tyres and tubes (8.5), liquefied petroleum gas - LPG (7.3), building material (7.0), fruits & vegetables (6.9) and paints & dyes (6.8)

Passenger Flows

5.8 Due to certain inherent flaws in the data tapes on passenger flows, as obtained from the Railway Board, RITES could not provide information on O-D flows for passenger traffic by rail. However, in the case of Highways, bus O-D flows were prepared for both private and public sectors. In the estimated total 71.84 million bus trips (1986-87) with an average lead of 104 kms, accounting for movement of 2,961 million passengers in the country, seven States viz. Tamil Nadu, Uttar Pradesh, Maharashtra, West Bengal, Andhra Pradesh, Punjab and Haryana contributed about 75 per cent in total bus trips and above 76 per cent in terms of passengers carried. The State of West Bengal displayed the highest level of occupancy, its share of 11.2 per cent. About 13.5 per cent of the total bus trips and about 13.2 per cent of passengers with an average lead of 157 kms related to inter-State operations.

5.9 The public sector share in total bus population is 40 per cent (1985-86). It contributes about 55 per cent bus trips, 51 per cent passengers carried and 69 per cent passenger kms performed and has an average bus trip lead of 140 kms at inter-regional level. On the inter-State operations, public sector share is still higher. It contributes about 79 per cent of bus trips, 76 per cent of passengers carried and 88 per cent of passenger kms and has average bus trip lead of 183 kms. Although, the share of private sector is comparatively lower, it has a substantial share in some States/UTs e.g. in Bihar (87 per cent), Manipur

(85 per cent), Pondicherry (84 per cent), Rajasthan (83 per cent), Uttar Pradesh (82 per cent), Tripura (82 per cent), West Bengal (82 per cent), Arunachal Pradesh (80 per cent), Assam (70 per cent), Madhya Pradesh (58 per cent) and Tamil Nadu (56 per cent).

5.10 Of the total estimated bus passenger traffic, about 82 per cent bus trips and 83 per cent passengers carried are contributed by the top 150 regions amongst the 421 regions. The maximum concentration of bus trips is found in Calcutta region (5.6 per cent). Combined with contiguous regions (viz. Howrah and Budge Budge) the share of Calcutta region rises to 6.9 per cent of the total for the top 150 regions.

Comparison with 1978-79 Survey

5.11 A comparative picture of inter-regional freight traffic between the RITES Survey of 1978-79 and its present Study (1986-87) is presented. During the period under reference, the volume of originating inter-regional tonnage increased by more than 71 per cent, the corresponding increase being 38 per cent for Railways, 133 per cent for Highways and 76 per cent for Coastal Shipping. As a corollary, while rail share in transport declined from 65.2 per cent to 52.7 per cent, that of the Highways increased from 33.7 per cent to 46.2 per cent and of Coastal Shipping remained constant at 1.1 per cent. The overall increase in terms of tonne kms was 58 per cent, the corresponding percentage increase in the Railways being 33, Highways 170 and Coastal Shipping 62. While the percentage share of Railways declined from 79.2 to 66.5, that of Highways increased from 17.8 to 30.5 and Coastal Shipping remained constant at 3.0.

5.12 Share of rail declined in all the bulk commodities and the decrease was more marked in the case of foodgrains, cement, fertilisers, iron and steel, limestone and dolomite. Over the period, average leads of various commodities by both rail and road showed significant variations. On rail, while average leads of coal, limestone and dolomite, iron and steel and other stones increased over the period, those of foodgrains, iron ore, mineral oils, cement and fertilisers decreased significantly.

5.13 The share of traffic - total/originating terminating - contributed by the top 8 States viz. Madhya Pradesh, Bihar, Uttar Pradesh, Maharashtra, Gujarat, West Bengal, Andhra Pradesh and Tamil Nadu is around 75 per cent according to both the studies. State-wise shares are also in close agreement except in the case of West Bengal where there is a marked decline in the shares during the period between the two studies.

Modal Costs: Railways

5.14 Rail transport costs are estimated on the basis of data obtained from a sample of 21 busy rail sections (14 on the BG and 7 on the MG). The unit total economic cost profiles by rail for different commodities reveal the following uniform and consistent cost behaviour:-

i) Because of the higher traffic density and/or fuel efficiency, unit cost of movement on
   - Broad gauge is less than that on metre gauge.
   - Diesel double line is less than that on diesel single line.
   - Electric traction is less than that on diesel traction.

ii) On account of extra tractive efforts required, transport cost on ghat sections is more than that on plain sections.

iii) Owing to the associated economies (i.e. lower transit time and less terminal detentions) movement in block load is cheaper than in wagon load.

5.15 Unit economic operator cost profiles for passengers for different transport situations display the following cost behaviour:-

i) Cost is less for electric traction than for diesel, irrespective of the service;

ii) Within a traction, mail/express service is costlier than ordinary passenger service; and

iii) Transport operator cost on metre gauge is higher than that on broad gauge.

5.16 A comparison of railway freight rate/fare with operator cost at the average lead indicates that generally passenger travel is subsidised by goods traffic. Similarly, metre gauge traffic is subsidised by broad gauge and wagon load by block load. Railways being essentially a monopoly, their tariffs are in the nature of

administered prices. Cost of service and value of service determine the lower and upper limits of the fare/freight rates. However, there is inter-commodity and inter-service subsidisation depending on the nature of goods and services and relevant transport situations. Similarly, for practical reasons, freight or fares cannot vary between gauge, track, traction and density of traffic, although costs can vary.

5.17 During the two survey periods, within the distance range under consideration (50-1250 kms), with the solitary exception of POL, the average annual percentage increase in operator cost ranges between 4.13 and 7.78, and is lower than general price rise (8.47 per cent). However, average annual increase in unit economic user cost during the inter-study period exceeds that of the general price rise and is due to a substantial increase in packing cost element of user cost. For the passenger traffic, average annual increase in unit operator costs is marginally lower than the increase in wholesale price index.

Cost Estimates - Highways

5.18 The transport cost estimates for goods and passengers for highways are based on data collected from a representative sample of 14 highway sections. Unit economic cost profiles for highways for different commodities display the following uniform and consistent cost behaviour:-

i) Owing primarily to impact of gradient, differentials in payload, traffic volume and number of annual working hours, unit operating cost in the plains is comparatively lower than that in the hilly terrain.
ii) Within plains, unit cost is marginally less for double lane than for single lane.
iii) In the case of operations in hilly terrain, unit cost is marginally less for single lane than for double lane because of comparatively higher capacity utilisation in the case of single lane.

5.19 A review of the operator cost level and structure for passenger traffic under different transport situations shows that while the cost levels vary over situations, the structure remains broadly invariant. The variation in the former is mainly due to the varying terminal costs, bus occupancy ratios and speeds. However, both the level and structure vary with distance as brought out in table 5.2

5.20 During the inter-study period, the average annual increase in unit operator cost at overall level (8.77 per cent) is higher than the corresponding increase in wholesale price index (8.47 per cent), and the average annual increase in unit user cost during the inter-study period is almost double that of the unit operator cost which is mainly attributable to relatively high incidence of packaging costs during the period.

TABLE 5.2 UNIT ECONOMIC OPERATOR COST STRUCTURE: HIGHWAYS
(TRANSPORT BETWEEN TWO METROPOLITAN CITIES)
(Percentage)

Sl. No.	Cost Component	Distance (kms)		
		100	250	500
1.	Total capital charges (including maintenance)	28	26	23
2.	Wages & salaries	29	26	25
3.	Fuel	30	34	36
4.	Other operating expenses	13	14	16
	Total	100.00	100.00	100.00
	Operating cost (Rs/passenger)	4.79	10.04	15.97

5.21 Average annual increase in operator cost for the passenger traffic under relevant situations ranged between 2.49 per cent (movement between metropolitan city and mofussil town) and 4.46 per cent (movement between two mofussil towns). This comparatively low increase vis-a-vis wholesale price index may be ascribed to decline in trip times and increase in vehicle working hours. In respect of unit total cost, the average annual increase during the inter-study period is less than that of unit operator cost due to decline in unit user cost during the same period.

TABLE 5.3 COMMODITY-WISE BREAK-EVEN DISTANCES (kms)

Sl. NO.	Commodity Group	Average Break-even Distance (Kms)	
		At 1977-78 Costs	At 1984-85 Costs
1.	Wheat	247	280
2.	Cotton raw	706	530
3.	Potatoes	467	380
4.	Coal	201	232
5.	Fertilisers	200	184
6.	Sugar	241	324
7.	Cement	222	193
8.	Livestock	233	328
9.	Steel tubes and pipes	311	220
10.	Small machinery, etc.	435	397
11.	Tea	*	*
12.	Cotton textiles	*	*
13.	Petroleum products	NC	67

* Break-even points lie beyond 1250 kms; NC: Not calculated.

Modal Choice and Break-Even Points

5.22 It is observed that generally, road transport is cheaper for short hauls; but for longer leads road loses its comparative advantages. The distance after which rail transport becomes economical than the road transport is called the break even point. The table 5.3 indicates the shifts of average break-even points between railways and highways as between 1977-78 and 1984-85.

5.23 A sensitivity analysis has also been carried out to reflect the impact of HSD cost i.e. 100 per cent, 200 per cent and 300 per cent, other things being equal. It would be observed that under assumption I (100 per cent price increase), the inter-commodity downward shift in break-even points ranges between 32 per cent (fertiliser) and 65 per cent (POL). Corresponding drop under assumption II (200 per cent price increase) ranges between 49 per cent (wheat) and 85 per cent (POL). Under assumption III, downward shift ranges between 60 per cent (wheat) and 94 per cent (POL).

Cost Estimates: Coastal Shipping

5.24 The transport cost estimates for coastal shipping are based on data obtained from a sample of 97 voyages (56 for POL between Haldia/Madras, 38 for coal between Haldia/Tuticorin and 3 for salt originating from Calcutta). The following table summarises results for operator and user costs:

TABLE 5.4: ECONOMIC COST ESTIMATES (AT 1984-85 PRICES) (FINANCIAL COSTS ARE GIVEN IN BRACKETS)

Sl. No.	Cost Elements	POL (Haldia-Madras) - 1,111 kms	Coal (Haldia-Tuticorin) - 2,241 kms	Salt (Kandla-Calcutta) - 4,634 kms
1.	Operator			
1.1	Port	52.98 (52.79)	69.14 (60.62)	57.66 (58.99)
1.2	Vessel	79.85 (63.18)	106.25 (127.98)	434.65 (352.03)
2.	User	13.27 (18.88)	25.02 (28.81)	115.78 (153.66)
	Total	146.10 (134.85)	200.41 (217.41)	608.09 (565.68)

5.25 Break-even points for Coastal Shipping vis-a-vis Railways and Highways (presented below) imply that Highways and Railways should be preferred for distances below the break-even points and Coastal Shipping would be less expensive for long distances above the break-even points. The observed break-even levels in respect of POL and coal reflect the effective role of Coastal Shipping. In the case of salt, however, the break-even levels at 6,449 kms in relation to Railways and 1,732 kms in relation to Highways are exceptionally high owing mainly to heavy port-stay days (42.7) and comparatively lower capacity utilisation (46.60 per cent).

TABLE 5.5: BREAK-EVEN POINTS FOR COASTAL SHIPPING VIS-A-VIS RAILWAYS AND HIGHWAYS

Coastal Shipping Versus	Break-even points at 1984-85 prices (In kms)		
	POL	Coal	Salt
Railways	640	1,198	6,449
Highways	191	676	1,732

5.26 During the inter-study period, in the case of coal, the annual increase in the unit operator cost (between 3.95 and 4.22 per cent) over the distance range under consideration is lower than that of the wholesale price index, while that for salt, (around 15.5 per cent) was substantially higher than the rise in wholesale price index. The comparative user cost levels for both coal and salt indicate that annual increase was higher than that

of either operator cost or wholesale price index.

5.27 In interpreting these results, however, it is important to exercise a great deal of caution. The cost calculations for railways, roads or coastal shipping relate to a sample to traffic situations and are not necessarily representative of the entire system. Again, the traffic flows on the various modes along specific routes or corridors, in actual practice, are influenced by freight rates which do not reflect costs of haulage. Moreover, as already discussed in Chapter III, subjective considerations particularly the users' perceptions of quality of service are important factors influencing the distribution of traffic between different transport modes.

VI. PROJECTION OF TRANSPORT DEMAND

RITES Study

RITES' study attempts projections of originating tonnage and average leads for 9 bulk commodities separately and others combined for the target years 1994-95 and 1999-2000. Projections of total inter-regional traffic by three important modes are summarised in the following table:

TABLE 6.1: PROJECTED INTER-REGIONAL TRAFFIC FOR THE YEARS 1994-95 & 1999-2000

(ORIGINATING TONNAGE IN MILLION TONNES, TONNE-KILOMETRES IN BILLION AND AVERAGE LEAD IN KILOMETRES)

Modes	Base 1986-87			1994-1995			1999-2000		
	MT	BTKM	LEAD	MT	BTKM	LEAD	MT	BTKM	LEAD
Rail	255	198	778	427	357	837	542	462	852
Road	224	91	406	315	124	395	396	157	397
Coastal Shipping	5	9	1,894	12	21	1,694	14	24	1,690
Total	484	298	616	754	502	667	952	643	675

6.2 It may be mentioned here that more recently (April 1988) RITES, at the instance of the Central Electricity Authority, has completed a comprehensive study on least cost solution for transportation of about 48.5 MT of coal from mines at Talcher to the thermal power stations proposed to be located at/near the Western and Eastern Coasts. The solutions indicate that the Rail/Inland Water-cum-Coastal Shipping route via Paradeep would be the least-cost solution, main features of which are summarised below:

a) Movement by Rail route till 1994-95;
b) Shifting to the Rail-cum-Coastal Shipping alternative for 1995-96 onwards till 25 MT is moved by the system;
c) Balance quantities to be moved by Inland Water-cum-coastal Shipping till full capacity is reached;
d) Continued use of IWT alternative even beyond 2000 AD in case IWT operations are satisfactory;
e) Expansions of Rail system up to Paradeep if IWT operations are found to be unsatisfactory.

These solutions indicate that by the year 1999-2000, the total volume of coal moved by coastal shipping via Paradeep port alone may be even 10 times of the total movement mentioned in the above table, and the rail/IWT-cum-coastal shipping route will be more economical than the all rail route in certain specific situations. However, in the present analysis, these options are not considered.

Composition of Traffic

6.3 An analysis of trends of composition of rail traffic indicates that shares of coal and POL products in both originating tonnage and tonne-kilometres are likely to increase, while those of foodgrains are likely to decline over the projection period (table 6.2).

6.4 Trends of composition of road traffic indicate that the shares of coal and non-bulk commodities are likely to increase and those of foodgrains and iron and steel are likely to decrease over the projection period (table 6.3).

Modal Shares

6.5 An analysis of trends of modal shares (presented in table below) indicates that the share of rail for POL and iron & steel, in terms of both originating tonnage and tonne kilometres, shows an increasing trend; while that in originating tonnage for iron ore, limestone and dolomite, and salt declines; and that for other bulk commodities show no significant change over the planning horizon (table 6.4).

TABLE 6.2: COMPOSITION OF RAIL TRAFFIC (IN PERCENTAGE) AND LEAD (KMS)

Modes	Base 1986-87			1994-1995			1999-2000		
	TON	TKM	LEAD	TON	TKM	LEAD	TON	TKM	LEAD
Coal	41	38	717	41	41	830	43	42	847
Foodgrains	8	13	1,146	6	11	1,436	6	9	1,427
Cement	8	7	678	8	7	756	9	8	752
Fertilisers	5	7	989	4	5	968	4	5	1,051
Iron & Steel	4	6	1,191	4	6	1,124	4	5	1,068
POL Products	9	6	526	12	6	477	12	8	534
Iron Ore	8	3	325	8	4	366	7	3	368
Limestone/ Dolomite	3	2	544	2	2	791	2	2	788
Salt	2	3	1,388	1	2	1,683	1	2	1,663
Others	12	15	1,013	10	16	1,136	12	16	1,136
Total	100	100	778	100	100	837	100	100	852

TABLE 6.3: COMPOSITION OF ROAD TRAFFIC (IN PERCENTAGE) AND LEAD (KMS)

Modes	Base 1986-87			1994-1995			1999-2000		
	TON	TKM	LEAD	TON	TKM	LEAD	TON	TKM	LEAD
Coal	7	8	460	8	11	309	9	11	295
Foodgrains	11	10	386	9	9	252	8	8	231
Cement	5	4	276	6	4	226	6	4	226
Fertilisers	4	3	292	4	3	215	4	3	217
Iron & Steel	5	6	487	2	1	124	2	1	104
POL Products	5	3	274	6	2	79	6	2	80
Iron Ore	-	-	373	1	1	358	1	1	358
Limestone/ Dolomite	1	1	303	1	2	288	1	1	304
Salt	1	1	354	1	1	251	1	1	255
Others	60	64	429	62	67	430	62	68	430
Total	100	100	406	100	100	395	100	100	397

TABLE 6.4: MODAL SHARES OF RAILWAYS (IN PERCENTAGE)

Commodity	Base 1986-87		1994-95		1999-2000	
	TON	TKM	TON	TKM	TON	TKM
Coal	86	91	87	91	87	92
Foodgrains	48	73	49	77	49	77
Cement	62	80	66	84	67	83
Fertilisers	59	83	57	83	60	85
Iron & Steel	46	67	78	92	76	92
POL Products	69	81	74	90	75	91
Iron Ore	96	95	91	94	91	94
Limestone/Dolomite	73	83	68	79	69	80
Salt	64	87	54	88	53	87
Others	20	36	21	41	21	41
Total	53	69	58	74	58	75

Comparison with Macro Estimates

6.6 Traffic forecasts made by RITES are inter-regional and need to be modified to take into account inter-regional flows, freight and passenger traffic on road on the basis of trends of number of vehicles and specific assumptions regarding capacities of vehicles, capacity utilisation, average speed etc. An estimate of base-period intra-regional traffic, by deducting inter-regional traffic (obtained from the RITES study) from total traffic indicates that about 11 per cent of total flows on rail and 57 per cent of total flows on road are intra-regional. Presuming that these ratios will remain unchanged over the projection period, total rail freight traffic by the year 2000 is estimated to be around 536 btkm and total road traffic around 316 btkm

6.7 The Committee's Secretariat has attempted traffic projections at the aggregate level on the basis of conventional methods as indicated below:

i) Trend Growth Rate Approach,
ii) Elasticity Approach,
iii) Transport Coefficient Method.

Under the trend method and elasticity approach, growth rates and elasticities of transport demand, as observed during the period from 1950-51 to 1986-87 have been presumed to hold good for the projection period 1990-2000.

6.8 Trend growth rates (as obtained from semi-logarithmic time trends) and transport elasticities (as obtained from log-linear equations) on the basis of time-series data for the period 1950-51 to 1986-87 are indicated in the following table:

TABLE 6.5: TRAFFIC ELASTICITIES WITH RESPECT TO: GNP, INDUSTRIAL PRODUCTION, TOTAL AND URBAN POPULATION DURING THE PERIOD 1950-51 TO 1986-87

	Variable	Trend Growth Rate (%)	Elasticity with respect to			
			GNP	Industrial Production	Population	
					Total	Urban
1.	Rail Freight	4.05	1.11	0.75	1.86	1.22
2.	Rail Pax	4.34	1.20	1.00	2.00	1.35
3.	Road Freight	9.53	1.60	1.00	4.39	2.00
4.	Road Pax	9.53	1.60	1.00	4.40	2.00
5.	Total Freight	5.45	1.49	1.00	2.51	1.65
6.	Total Pax	7.31	2.00	1.31	3.38	2.08

It would be observed that elasticities of transport demand with respect to GNP, urban and total population exceed unity. Elasticities of road traffic with respect to industrial production also exceed unity. This implies that transport demand grows at a faster rate as compared to either GNP or industrial production.

6.9 For the projected growth rates of the independent variables (viz. GNP, industrial production, urban population and total population) different scenario have been considered as indicated below:

PROJECTED GROWTH RATES FOR 1985-2000

1.	GNP	5,5.5,6 and 6.5 per cent
2.	Industrial Production	9, 10 and 12 per cent
3.	Urban Population	5 per cent
4.	Population	1.8, 1.9, 2 and 2.1 per cent

Transport Coefficient Method

6.10 The fitted time trends for transport coefficients and average leads indicate downward trend for transport coefficients and upward trends for average leads of traffic. Assuming that the

most recent trends of transport coefficients and average leads will continue for future, railway freight traffic for 2000 is projected by the transport coefficient method as indicated below:

TABLE 6.6: PROJECTED DEMAND FOR RAIL FREIGHT TRAFFIC FOR 2000 AD BY THE TRANSPORT COEFFICIENT METHOD

Commodity (1)	Transport Coefficient (%) (2)	Average Lead (km) (3)	Production (mn tonne) (4)	Originating tonnage (5)	Traffic (Bn. TKM) (6)
1. Coal	0.75	725	420	315	228
2. Raw Materials for steel plants	1.00	265	60	60	16
3. Iron & Steel	1.25	1,300	20	25	33
4. Iron Ore	0.45	650	90	41	26
5. Cement	0.65	800	90	59	47
6. Foodgrains	0.18	1,400	240	43	60
7. Fertilisers	0.65	1,150	40	26	30
8. Mineral Oils	0.45	780	90	41	32
9. Other goods	0.50	1,350	65	33	44
10. Total	0.58	804	1,115	641	516

Note: Projections of total production for the year 2000 are taken from the *Perspective Plan 1990-2000* as anticipated by the Planning Commission and are somewhat different from the forecasts of sectoral supplies as given in RITES study.

6.11 Traffic forecasts on the basis of different methods and different scenario on the profiles of GNP, industrial growth and demographic change are summarised in the table below. It is observed that the traffic forecasts have wide ranges - generally time trends provide lower limits and 12 per cent industrial growth rates provide upper bounds of traffic demands. Based on these forecasts, it may not be unrealistic to assume that both freight and passenger traffic on the railways by the year 2000 might double while in the case of road transport, the increase may be much higher-perhaps three to fourfold.

TABLE 6.7: PROJECTED TRANSPORT DEMAND BY RAIL & ROAD FOR 1999-2000

Methodology	Freight traffic (BTKM)			PassengeTraffic (BPKM)		
	Rail	Road	Total	Rail	Road	Total
1. Base Period (1986-87)	223	210	433	256	893	1,149
2. Projections						
a) Trend Growth	374	686	1,060	446	2,916	3,362
b) Elasticity w.r.t.i						
i GNP 5.0%	450	571	1,021	548	2,428	2,976
5.5%	482	628	1,110	590	2,673	3,263
6.0%	516	691	1,207	634	2,940	3,574
6.5%	552	760	1,312	682	3,231	3,913
ii Industrial Production						
9.0%	521	644	1,165	788	738	3,526
10.0%	571	724	1,295	887	3,082	3,969
12.0%	684	916	1,600	1121	3,898	5,019
iii Population						
1.8%	525	553	1,078	407	2,354	2,761
1.9%	549	583	1,132	417	2,478	2,895
2.0%	575	614	1,189	428	2,610	3,038
2.1%	602	646	1,248	439	2,748	3,187
iv Urban Population	482	725	1,207	601	3,101	3,702
c) Transport Coefficient	516	-	-	-	-	-
d) Modified RITES Study	536	316	852	-	-	-

Critical Sections on Important Corridors

6.12 An attempt has also been made to identify critical sections/links on important rail and road corridors. For this purpose, expected traffic for both goods and passengers has been converted into number of trains required for railways. On taking 25 additional trains per day as the critical level for railways, the most critical sections are indicated below.

1. Delhi - Karnal - Ambala Cant. - Ludhiana
2. Delhi - Kanpur Central - Mughalsarai
3. Mughalsarai - Gaya - Gomoh - Dhanbad
4. Asansol - Burdwan - Bandel - Belur
5. Howrah - Panskura - Kharagpur
6. Calcutta - Malda - Coochbehar - Jalpaiguri
7. Rupsa - Balasore - Cuttack
8. Delhi - New Delhi - Nizamuddin - Mathura - Sawai Madhopur - Kota-Dohod - Godhra - Anand - Ahmedabad
9. Vadodara - Bombay
10. Bhopal - Itarsi - Bhusaval - Jalgaon - Nasik Road - Dadar
11. Itarsi - Nagpur - Vijayawada - Gudur
12. Madras - Salem

As will be observed from table above there are likely to be many critical sections on rail corridors, particularly on the Golden Quadrilateral, its diagonals and the associated spurs, which need to be augmented by the end of the century. It will now be necessary in respect of each high density section to consider the various options for augmentation of capacity. In fact, an expert committee has already been set up in the Planning Commission to identify alternative routes which among other considerations could serve new and emerging growth centres.

6.13 As regards roads, RITES' projections do not adequately take into account the future growth of intra-regional traffic and therefore do not present a realistic picture of the emerging traffic densities on important highway sections. The Ministry of Surface Transport based on observed vehicle densities on some of the corridors through the surveys conducted by the Ministry have prepared their projections of the critical sections where density of traffic by the end of the century is expected to increase to 25,000 PCUs and above. These are the following: (i) Delhi - Ambala Jalandhar - Pathankot - Jammu; (ii) Delhi - Gaziabad - Meerut; (iii) Delhi - Jaipur - Ahmedabad - Bombay; (iv) Delhi - Kanpur - Varanasi - Durgapur - Calcutta; (v) Bombay - Pune - Bangalore - Madras; (vi) Madras - Dindigul - Madurai; (vii) Madras - Coimbatore - Cochin - Trivandrum; (viii) Madras - Visakhapatnam - Bhubaneswar - Calcutta; and (ix) Agra - Indore - Nasik - Bombay; (x) Delhi - Hissar; (xi) Lucknow - Kanpur; (xii) Bangalore - Mysore; (xiii) Dhulia - Nagpur - Raipur; and (xiv) Hyderabad - Vijayawada. Detailed techno-economic studies should be undertaken in order to prepare a phased programme for the development of the system.

VII. TECHNOLOGY AND TRANSPORT DEVELOPMENT

Early history of transport technology is virtually the history of civilisation itself. It made its debut with such inventions as the wheel and the sail and has now grown into highly sophisticated diverse modes of transport such as aviation, shipping, railways, roadways, pipelines and the like. It took these new modes of transport very long to mature and it is only after the advent of the Industrial Revolution about two centuries ago that the process of technical change has accelerated. As will be observed from the chart of historical progression of transport technology, while the animal drawn wheeled land transport and sail power at sea dominated transport for millennia, the last two centuries have witness the advent initially of railways and, in the current century, the motor car, the lorry and civil aviation.

7.2 Although progress of transport technology now looks ultra rapid when viewed in its long-term historical perspective, it still takes several decades for a new idea to mature into a viable technological innovation instead of millennia and centuries before the Industrial Revolution. For, as with many other things, every new mode of transport has to go through an initial period of less volume and high-cost adoption as development and assessment proceeds apace before there is general acceptance and widespread use. Since any new breakthrough in transport technology takes several decades to mature, it is not difficult to foresee how transport technology is likely to change in the next decade or so.

7.3 It seems that within such a brief span of time,

the configuration of the existing transport modes is unlikely to change much in the future with sole exception of Magnetic Leviation (Maglev) for suburban traffic in metropolitan cities. Subject to this caveat, one could affirm that engines will still be pulling wheeled containers over more or less fixed tracks (railway lines or highways), or floating vessels and barges over inland waterways or sea lanes. The areas of probable technological change are, therefore, in the engines and containers used and the right of way. All such improvements will enhance capacity within present configurations and improve equipment usage.

7.4 A complimentary aspect of transport development is the impact of a new tool on its operation like that of magnetic compass on navigation and telegraph on railway operation. The progress of this operational or "systems" aspect of transport technology was much slower in the past till the advent of computers in the 1950s. It is now picking up pretty fast. As a result the next decade or two will witness a transition or switch away from the conventional technical side towards that of systems or operational side This transition or switchover from technical to systems or operational side is the outcome of a much broader concern of many developed societies to optimise the yield of transport systems rather than devote great effort to invent new modes or techniques of transport. This is not to say that what on might call the "hardware" type advances will not occur. They will, but the greater emphasis is now and will continue to be the "software" type improvements to optimise the working of any given transport system.

7.5 There will also be a qualitative change due to the impact of two basic research fields most scientists and technocrats of the world agree are crucial to future economic development. They are (a) advanced information and communication technologies and (b) tailoring new materials to meet prescribed requirements or specifications. We give below a bird's eye view of likely developments for each mode of transport.

Rail Transport

7.6 The computers of the next decade will enable solution of design problems that could not be solved for lack of sufficient understanding of the complex phenomena like wheel-track interaction and thermodynamics of internal combustion of locos. It should thus be possible to design more efficient vehicles and locos. Similarly considerable improvements in both efficiency and reliability of rolling stock are likely to arise in future from use of non-metallic materials like ceramics and fibre reinforced plastics as well as by on-board computerised diagnostics. In particular, rail cars may not be designed as independent units of a train. Instead , it may be possible to design a single set of cars linked together to form a unit train thereby reducing some of the trappings like brakes required when the car is an independent unit.

7.7 As far as rail track is concerned, improvements in the offing are: new rail-to-tie fastening systems, longer rails, more widespread use of concrete sleepers, hardened rails using superior alloys, high speed turnouts and the like. Indeed, some of these innovations are already underway or will soon be.

7.8 There is considerable scope for speeding up both passenger and freight trains. But this will not be achieved by following the model of TGV (trains de grande vitesse) now 'a la mode, in some developed countries like France and Japan.

Road Transport and Roadways

7.9 As far as truck transport is concerned, the emphasis will be on fuel efficiency and design parameters taking into account the environmental concerns. Larger capacity truck bodies of lighter weight and truck-trailer components will become more prevalent.

7.10 The highways will show much technological change over the next decade by way of a new generation of expressways, modernisation of construction practices, better traffic management, etc. The need is also to catch up on years of under-maintenance especially in view of heavier loads anticipated.

Ports and Shipping

7.11 The advent of containerisation and change

in cargo handling techniques will bring about a sea change in port and shipping technologies.

7.12 In the next decade or so, the average ship size is likely to increase significantly with the exception of bulk carriers which seem to have reached the limiting size around 500,000 dwt already. There will also be major changes in the construction and design of ships to accommodate more up-to-date command and control systems by use of greater degree of automation. While on a global scale, no major change in cargo handling technology is in the offing, containerisation of Indian Liner cargoes will continue to increase at an accelerated pace stabilising itself by the advent of the next century. This will, however, require significant upgradation of cargo handling facilities in the major ports. In particular, they will have to be equipped to handle container carrying cellular vessels.

Civil Aviation

7.13 The standard jet engine is a turbojet. Over the past forty years, engine designers have tinkered with the turbojet to improve its efficiency. One way of doing is to put a fan on the front of an ordinary jet engine, thus making a turbo fan. Advances in aerodynamic design and the use of new, lighter and stronger materials - such as titanium alloys and carbon fibre - are making turbofans work better. Such efforts will continue in future. There is, however, some chance that jet engines of the next century may break entirely new ground. That is, they may sport strange little propellers known as *proofan* to attain a level of efficiency not possible with turbofan. But they will not be seen on the tarmac for sometime lest the new technology should obsolete the old prematurely. Consequently in the next ten to fifteen years all we may reasonably expect is marginally more fuel efficient propulsion systems and lighter body made of light weight composite materials yielding valuable savings in weight combined with greater structural strength and freedom from corrosion.

7.14 New advances in computer software and increasing use of digital technology will lead to greatly improved cockpit instrumentation, and automated flight management. They will also improve communication and navigation systems.

7.15 Finally, major changes in the area of navigation will result from the implementation of microwave and satellite based navigation systems. Two such systems which are likely to be introduced by 2000 A.D. are the Global Positioning Systems (GPS) and the Microwaves Landing Systems (MLS). Combined use of both these systems may eliminate the present Positioning Determination Systems (PDS).

VIII. ENERGY CONSERVATION IN TRANSPORT SECTOR

Transport Sector is the second largest consumer of energy next only to industry. In 1984-85, transport consumed about 31 per cent of its energy consumption is scarce petroleum oil which explains the vital importance of energy conservation in this sector. As will be observed from Table 8.1 below, the major consumer of energy is the road sector. Besides, the rate of increase of energy consumption by road transport is rising much faster than other modes of transport.

TABLE 8.1. ENERGY CONSUMPTION BY DIFFERENT TRANSPORT MODES

Sl No.	Mode	Total in million tonnes of coal replacement (MTCR)	POL consumption in million tonnes	Percent per annum increase (1980-81 to 1985-86)
1.	Railways	22.04 (16.82%)	1.258 (9.11%)	1.51
2.	Roads	94.72 (72.30%)	10.70 (77.46%)	5.85
3.	Civil Aviation	11.95 (9.12%)	1.44 (10.42%)	4.95
4.	Water Transport	2.30 (1.76%)	0.416 (3.01%)	2.00
	Total:	131.01 (100.00%)	13.814 (100.00%)	4.75

8.2 The maximum consumption of POL is by the road sector (77.46%) followed by civil aviation (10.42%), railways (9.11%), and water transport (3.01%). In view of the fact that POL resource will be much scarcer by 2000 AD than now, it is essential to explore ways of improving energy conservation in the two basic modes of surface transport, namely, roadways, and railways. We will deal with this problem separately for each mode. We may, however, sound a note of caution before discussing specific measures for energy conservation in various transport modes. Although no doubt, energy conservation is an important consideration, it is necessary to evaluate the various options and to consider their impact on the overall efficiency of the transport system. Efficiency criterion requires that total cost of transport for any given transport volume be minimised and not just simply energy cost. Any single minded effort to minimise use of petroleum in transport, for example, may lead to traffic diversion as between different modes ignoring the quality or cost of the service provided. In costing different services, of course, it is important to take into account scarcity value of POL.

Road Transport

8.3 Several factors lead to excessive fuel consumption in road transport at present. They are low-grade fuel, low engine performance due to poor maintenance and a much larger proportion of overaged vehicles, lack of traffic planning leading to frequent traffic jams on highways and cities, extensive overloading, shoddy upkeep of urban roads and highways, crowded highways due to ribbon development on the outskirts of growing towns through which they pass, etc. To the extent these adverse features are rectified, it will be possible to improve fuel efficiency as well as reduce the pollutant content of vehicle emissions.

8.4 The greatest adverse factor in the fuel consumption of road vehicles being excessively high is the outdated designs of engines of the road vehicles. The vehicles now plying on Indian roads belong to three distinct design vintages dating from the late 1940's. Bulk of the vehicles on road now still belong to the first two categories. Their engines were designed in an era of cheap oil when there was no awareness of the imperative need for energy conservation. Although the new brands of vehicles manufactured under collaborative arrangements with foreign manufacturers are relatively more energy efficient, their fuel consumption continues to be excessive as compared with some of the modern energy efficient vehicles produced in industrially advanced countries. What is needed is a comprehensive review by the Ministry of Industry of the advanced technological options now available for the design of auto vehicle engines. On the basis of this review, the Industry Ministry should prescribe standards or norms for fuel consumption of various types of vehicles.

8.5 Other measures for energy conservation are adoption of traffic controls (TCFs) like enforced car pooling, greater use of mass transportation and curbing of personal transport. These include (a) development of viable public transport system including where feasible rail based systems to wean people away from commuting by cars and scooters; (b) providing really efficient bus services in cities like Delhi; (c) creating more private or para-transit services in the form of car-pools or vanpools to increase vehicle occupancy in urban travel; (d) outright prohibition of personal car access to central urban areas; (e) land use policies to decongest crowded cities like Bombay, Calcutta, Delhi, etc. For historic reasons, most of the cities have their markets close to the railway terminals. The cities could be decongested by shifting the markets located in the vicinity of rail terminals.

Railways

8.6 The bulk of energy consumed by the railways is for traction with only a small residue for other purposes like workshops, lighting, etc. as shown in Table 8.2 below:-

TABLE 8.2: PATTERN OF ENERGY CONSUMPTION (1985-86)

Source	Traction (Percentage)	Others (Percentage)	Total
Coal	94	6	100
HSD	97	3	100
Electricity	72	28	100

Source: These estimates are based on the Railways Board's study on Energy Conservation

At present, the railways have three modes of traction, namely, steam, diesel and electric. In the case of steam traction only 6.5 per cent of the thermal energy generated at the source, the furnace, is transmitted to the wheel for traction. The remaining 93.5 per cent gets wasted in transit in various ways. The corresponding values of the yield in respect of diesel and electric traction are 23.3 and 24.2 per cent respectively. Steam traction is being phased out by the turn of the century. Of the remaining two modes of traction, electric is marginally superior to diesel, but capital investments on overhead structures for electrification are very high. Hence only on heavy density double (or multiple) line sections, electric traction is more fuel efficient than diesel. In view of our continued dependence on import of POL, it is important that conversion from diesel to electric traction be planned on all high density double-line sections. This will also help control air pollution.

8.7 The energy consumed in hauling a train depends on three factors, namely its mass, velocity and frictional forces of the tract such as wind resistance, etc. Let us first consider the mass aspect. The energy consumed in hauling a train is directly proportional to its mass. The energy consumed thus can be saved by reducing the tare weight of the vehicles with use of lighter materials. The present tare weight of a BOX wagon is 25 tonnes. By recourse to the following materials the tare weight of a wagon can be reduced to the extent indicated against each:

	Tare weight reduction (in tonnes)
i) Use of aluminium in place of mild steel in wagon body	2.0
ii) Use of high-strength low-alloy steel and cold rolled sections in the under-frame.	1.0
iii) Use of small wheel diameter i.e. 920 mm instead of 100mm.	0.6
Total	3.6

In the case of passenger coaches tare weight can be reduced by 5 to 6 tonnes by making coach shell either of aluminium, high-tensile steel or stainless steel and substituting fibre glass reinforced plastic (FRP) for wooden furnishings of the coaches.

8.8 Energy conservation through limiting speed is even more rewarding because the kinetic energy of a train in motion is not proportional to velocity but its square. Hence the need to limit the speeds of trains both passenger and freight to their existing levels. The energy consumed is minimal if a train after starting attains its booked speed and continues at that speed till it reaches its destination. But in actual practice, trains can maintain booked speeds only for a fraction of the total running time from origin to destination and have to slow down every time while approaching signals, stations or even mid-sections. The most frequent cause of slow downs is the passage of a non-stopping train through a station via a loop line instead of main line. By providing high-speed turnouts at these loops now technically feasible, it is possible to pass the train via the loop line without such slowing down. It is, therefore, necessary to provide such high-speed turnouts at all roadside stations on crowded "core" routes.

8.9 In the case of freight trains, the average speeds of diesel/electric trains (BG) have been stagnant at 23/24 kmph for long despite massive investments in upgrading both traction and wagon technology and there is a wide gap between actual average speeds and booked speeds. It should be possible to increase the average speeds of freight trains to a range of 30 to 37 kmph on BG by adopting such measures as running of through block rakes, eliminating/reducing unnecessary shunting operations, and introduction of improved designs of failure-free reliable equipment, etc.

Energy Conservation on MG Network.

8.10 Although bulk of energy consumption on the Indian Railways is on the BG, the scope for energy conservation on MG is much greater because MG network has been neglected for the last decade or two in the expectation of its

eventual conversion to BG. Since due to resource constraint it is now considered necessary to retain the MG network, MG technology could be upgraded. The most important upgradations having energy conservation implications are:

a) track renewal with welded rails to improve vehicle rail relationship;
b) roller-bearing rolling stock in lieu of plain-bearing;
c) faster liquidation of steam traction and its replacement by diesel traction; and
d) application of the operational measures to increase the average speed of freight trains, in this context, review of present regulations to control speeds after each stoppage.

Energy Conservation by Diesel Shunters in Yards.

8.11 During the past decade or so there has been a great shift in the pattern of traffic movement from wagon load to train load. With the shift to block load movement the marshalling activity in big marshalling yards has been reduced significantly. However, it may still be necessary in certain cases to examine the existing "sanctions" of diesel shunters in major marshalling yards to wipe out the excess sanctions not yet rescinded. Another way in which diesel shunters waste fuel, in many cases quite extravagantly, is continued idling even when there is no shunting work to do over extended periods. This can be minimised with proper maintenance of the loco batteries. Additionally, some thought needs to be given to providing financial incentives to shunting loco drivers for effecting fuel savings.

8.12 Similar examination of diesel shunters in coaching yards may also be required if and when the railways decide to get rid of that bane of railway operation called "slip coaches" - coaches attached/detached from through Mail and Express trains at intermediate points. We should conform to the European pattern of train formations which run intact across the continent without any attachment or detachment of coaches en route. This would also help in conserving capacity at major passenger terminals for accommodating future increases in traffic volumes.

Other Energy Conservation Measures

8.13 As already mentioned, a significant proportion (28 per cent) of the total electricity consumed by the Indian Railways is for non-traction purposes such as in the workshops, for lighting, etc. A good deal of energy consumed by these non-traction uses can be saved through proper energy auditing. This helps to eliminate the waste in existing technologies. In certain situations, replacement of existing devices with modern, more energy efficient devices may be justified. For example, more efficient electric motors could be substituted for old motors.

Other Transport Modes

8.14 Among other transport modes, aviation is most energy intensive. In the case of Indian Airlines, for example, the cost of fuel and oil accounted for 44 per cent of its total operating expenses. Energy consumption in aviation can be saved considerably by selection of fuel efficient aircraft and engine combinations, utilisation of aircraft on long-haul rather than on short sectors, better maintenance and flight management procedures, etc.. Likewise, in ports and shipping sector, there is considerable scope for energy conservation through use of energy efficient equipment and better maintenance.

IX. ENVIRONMENTAL ISSUES OF TRANSPORT SYSTEMS

There are three main resources - Road, Air and Water - which are liable to degradation in varying measure by the impact of the diverse modes of transport. If we add to these three basic resources a nuisance called 'noise', we have four types of pollution fallouts for each of the four modes of transport. We find that while shipping leads to marine pollution in coastal waters and road vehicles to air pollution, railways and roadways both contribute to degradation of land. Aviation accounts for noise nuisance. Development plans must reckon with costs of environmental degradation and must, as far as, possible ensure the

sustainability of natural resources and provide for appropriate remedial measures for their restoration.

Land Abuse

9.2 Land pollution is due mostly to the railways and roadways largely because each of these modes requires a dedicated guideway or corridor of its own. Moreover, the increasing sophistication of both rail and road transport is likely to lead to the proliferation of such guideways - road transport is likely to lead to the proliferation of such guideways - roads diversifying into highways, expressways and the like and railways into dedicated lines for the movement of high capacity freight trains and high speed passenger trains. Both these prime modes of surface transport already occupy 3.1 per cent of India's total area and 4.6 per cent of usable land. Since land is our most scarce resource, we cannot afford to use up this valuable resource indiscriminately. This makes it necessary that every new road or railway line project is evaluated carefully taking into account the depletion cost of land as a scarce resource and viable alternatives considered where feasible. For example, new road for rail facilities could be avoided either by use of raw materials at their source, e.g. pithead generation of coal based power or by providing the use of an available waterway instead of surface transport, etc.

9.3 *Railways*

(i) Railway line constructions in the past have not merely disfigured the lie of the land, but worse, they have unduly disturbed the drainage of land by interfering with the free flow of water across the embankment. This damage can be mitigated by providing additional flood openings and extension of existing ones by constructing balancing culverts in existing railway alignments which are flood prone.

(ii) In construction of new railway lines, greater understanding is needed of land drainage problem created by new embankments. It is necessary to develop adequate construction guidelines to ensure provision of adequate waterways matching with streams/nallahs to avoid flooding/water logging in the vicinity of railway tracks. These aspects must be systematically studied by experts in institutions like the Track Research Institute, Pune, RDSO etc.

(iii) Railways should also provide for compensatory vegetative cover by tree plantation in lieu of those uprooted by construction of new lines.

(iv) New techniques have to be devised to avoid borrow-pits while constructing new railway lines. The borrow - pits along existing lines must be gradually used either for pisciculture or for tree plantation.

(v) Railways also contribute to deforestation in two ways (a) by still having to use wooden sleepers on many existing lines and (b) by construction of new lines. One can be avoided by use of cement concrete sleepers to the exclusion of wooden sleepers and the second by planting trees along the new lines, in lieu of those felled during its construction phase.

Roads

9.4 Roads occupy about nine times the area occupied by railway lines simply because road network (1.8 m kms) is 18 times longer than rail (only 0.1 m kms). Consequently what has been said earlier about railways applies, *mutatis mutandis*, even more forcefully to roadways. In particular, it is necessary to assess the following impacts of all major constructions of new highways or large scale extensions of older ones;

(i) Dislocation of natural drainage of the land and flows of river and streams in its vicinity,

(ii) Soil or sediment erosion likely to lead to chemical and biological pollution such as turbidity of stream, temperature rise, etc.

(iii) Adverse effects on physical or natural features of the area like ecological formations, scenic beauty spots (if any), archaeological historical landmarks, sanctuaries, etc.

(iv) Effect of unplanned dumping of waste material of construction activity and so on.

9.5 However, the environmental impacts of road construction are not equally severe everywhere. They are far worse in ecologically frail hilly areas like the Himalayan region where the problem is compounded by increased aggravation of landslides every year. Consequently, it is necessary to assess the environmental impacts of not merely new projects but also those of the maintenance of existing roads in hilly regions. Road maintenance in hilly regions must receive priority over roads and highways in the plains.

Roads in the Hilly Areas

9.6 The ecological problems to which hilly roads give rise are shown. As will be observed, they are closely inter-related with one another. Thus, rock cutting and excavation in road making gives rise to geological disturbance which in turn triggers other effects like emergence of imbalanced geophysical forces. The stability of roads is undermined resulting in landslides. Other problems that arise are (a) loss of forests and vegetation cover, (b) soil erosion, (c) interruption of drainage pattern, (d) flash floods, (e) leaching of soil nutrients, and (f) aesthetic degradation.

9.7 In view of the serious ecological problems of hilly roads, it is necessary to carefully evaluate every new project and consider the true costs involved taking into account the effort of environmental degradation. Where other viable alternatives exist; they must be considered so that decisions on new projects are taken on a proper evaluation of all available options.

9.8 Many existing hill roads are perennially prone to landslides particularly during the monsoons largely because of defective technology for building then in the first instance and then using an equally defective one for rectifying the land slides. The existing technology for repair of landslides is defective on two counts. First, it involves back cutting of hillside or construction of breast-walls, check-walls etc. which are mostly carried out manually resulting in a patchwork breaking down at the least provocation or even none. Secondly, there is no way to transport away from the site the excavated material which is dumped down hill resulting in added ecological damage to the downhill slope. These defects have to be rectified by appropriate revisions of existing technologies of landslide repairs.

Air Pollution - Road Transport

9.9 Air pollution in India is mainly due to emissions of vehicles moving on roads. In India unlike developed countries like USA, no nation-wise estimates exist of pollutant emissions from man-made source. However, estimates of emissions from road vehicles currently in five large Indian cities - Delhi, Bombay, Calcutta, Madras and Bangalore were made by the Indian Institute of Petroleum, Dehradun in January 1985. Based on these estimates, the extent of nationwide pollution caused by road vehicles can be approximately inferred. If we compare these inferred estimates with those of USA, the *absolute* magnitudes of vehicle emissions of diverse pollutants in India seems to be very low. But this is explained by the low vehicle population and their very low consumption of POL. Our annual consumption by road vehicles (2 m tonnes) is only one tenth of USA. (300 m tonnes). But the rate of pollutant emission like carbon monoxide (CO) per vehicle in India is 33 per cent *higher* than its counterparts in USA. for various reasons such as poor maintenance, large proportion of overaged vehicles, more frequent traffic jams due to lack of traffic planning, extensive overloading, poor upkeep of roads, crowded highways, ribbon development, etc. However, the fact that the absolute magnitudes of our exhaust emissions in the big cities are as yet only a small fraction of the nationwide emissions in the USA need cause no complacency. On the contrary, the situation is worrisome because the projected vehicle emissions in the five cities mentioned above are estimated to increase three-fold in the next decade.

9.10 Briefly the vehicle emission situation in India is as shown in Table 9.1 below which sets out the main gaseous pollutants emitted by road

vehicles without pollution control. In addition, about 90 per cent of lead in the 'anti-knock' agent added to petrol is emitted in the form of inorganic compounds reaching concentrations of up to one microgram per cubic metre in urban air.

TABLE 9.1. TYPICAL COMPOSITION OF EXHAUST GASES (HEAVY VEHICLES) IN PARTS PER MILLION (PPM) BY VOLUME.

Pollutant	Idling	Accelerating	Cruising	Deceleration
(a) **Petrol Engines**				
Carbon Monoxide (CO)	69,000	29,000	27,000	39,000
Hydrocarbons	5,300	1,600	1,000	10,000
Nitrogen Oxides (NO)	30	1,020	650	20
(b) **Diesel Engines**				
Carbon Monoxide (CO)	Trace	1,000	Trace	Trace
Hydrocarbons	400	200	100	300
Nitrogen Oxides (NO)	60	350	240	30

Source: *Road Transport and the Environment* by B. Cottee

9.11 Total emission of many of these pollutants in India has increased greatly during the past decade because of the rise in the vehicle population and absence of pollution control. Estimates of pollutant emissions by road vehicles in the five large Indian cities referred to above show that:

(a) air pollution by road vehicles, if not controlled now, will increase three-fold in the next decade;

(b) The rate of pollutant emissions per *vehicle* is about 33 per cent higher than in the developed countries like the USA. for the reasons already mentioned in para 12.

(c) Apart from the adverse effects of each pollutant emission individually on man, plants and materials, their joint effect is even more serious. It results in acidification of atmosphere. Although this effect has not been evident in India so far, its manifestation is inevitable in course of time if anti-pollution measures are not taken immediately.

(d) Steps must therefore be taken instantly to enforce Air Prevention and Control of Pollution Act passed in 1981 at least in so far as pollutant emissions of automobiles are concerned.

(e) As the level of lead in vehicle emissions in major towns like Delhi, Bombay, Madras, Calcutta, etc., is already very high, steps must be taken to provide improved quality lead free petrol to road vehicles specially as poor quality petrol supplied at present in India leads to speedy choking of the slow jet of the carburettor of the vehicle resulting in increased fuel consumption and therefore increased air pollution per kilometre travelled by the vehicle.

(f) So far only Maharashtra State has taken steps to lay down standards of emissions of carbon monoxide (CO) and hydrocarbons (HC) by road vehicles in Bombay and to require compliance with the prescribed standards as a pre-condition for registration of vehicles.

(g) It has to be emphasised that formulation of measures required to effectively control pollutant emissions of road vehicles is a highly complex, technical and scientific undertaking. To start with, it will be necessary to provide equipment at petrol stations in major cities to measure emission of all vehicle pollutants and at least of CO. It will also be necessary for air pollution control authorities to discriminate between the various types of designs of engines fitted on vehicles now plying on Indian roads. Some of these engine designs are of vintage as old as the late 1940s, others of the 1960s and some as recent as the 1980s. The approach to be followed has to be broad based and multi- disciplinary. It will have to involve several Ministries and State Authorities. In particular, Industry Ministry will have to decide that vehicles to be produced in future are equipped with newly designed engines venting clean emissions. As for the old vehicles already on road, the Ministry should require fixation of the now available exhaust control devices within a prescribed period long enough to permit indigenous production of the specified emission control equipment in sufficient quantity to go round. Meanwhile it may be more effective to adopt the two-pronged approach briefly mentioned below rather than mere legal prohibition of certain types of emissions by fiat now under contemplation.

9.12 The problem is two-fold: (a) how to provide an adequate and environmentally clean public transport in the big cities that will check significantly the proliferation of personal transport by scooters and cars and, (b) how to control emissions of such residual vehicles as will continue to ply on the city roads. We will not dwell on (a) as it is a problem, specific to each big city and has to be tackled in a special way suited to its own layout and requirements. Problem (b) may be solved by resort to Transport Control Plans (TCPs) adopted in the USA in the early 1970s under circumstances somewhat similar to ours now. These TCPs met air standards by reducing or relocating travel by resort to draconian measures like enforced car pooling and prohibition on personal cars driving down town to central business district. Other steps required are a suitably graded penal rate of road taxation for renewal of registration of overaged vehicles and legislative measures to curb ribbon development on outskirts of towns on highways, etc. However, the most important single reason for our abnormally high rate of pollutant emissions per vehicle not mentioned above is the exceedingly large proportion of two stroke engines of scooters, motor cycles and mopeds. According to estimates of the Indian Institute of Petroleum, Dehradun, their number in 1980-81 was 1.8 m out of a total fleet of 3.8 m vehicles, nearly 50 per cent and this percentage is expected to rise to 66 per cent in 1991-92 and 76 per cent in 2000-2001. It is, therefore, time that steps are taken to curb the proliferation of two-stroke engine scooter/moped population not merely to reduce air pollution by vehicle emissions but also to control the increasing noise and chaos on city roads that is an inevitable nemesis of such proliferation. Furthermore, these vehicles should change over to four-stroke engine instead of two-stroke to reduce their pollutant emissions. The cost differential between the two is not too high if the social cost of air pollution is taken into account.

Air Pollution - Railways

9.13 Air pollution by rail engines is negligible because the total diesel fleet of railways is only 3,047 diesel locos, an insignificant proportion of vehicle population. The most pollutant of railway locos is the steam engine, which should be extinct by 2000, if not earlier. It is being replaced by electric and diesel locos. The former emits no pollutant while the latter emits pollutant fumes which can be greatly mitigated by better maintenance. Railway Board should prescribe Hartridge smoke units for their diesel locos like Maharashtra State has done for diesel road vehicles and then take steps to ensure their compliance.

Air Pollution - Aviation

9.14 Aircraft like railway locomotives emit a far smaller volume of air pollutants than road vehicles. The best available evidence suggests that none of air-craft emissions into the atmosphere is significant.

Water Pollution

9.15 Transport pollutes our water resource only by marine pollution in coastal waters caused by ships and shipping related activities. Recent monitoring of coastal waters has shown that the most seriously polluted areas of our coastal littoral are the coastal waters adjoining six major ports - Bombay, Calcutta, Vishakapatnam, Madras and Cochin. The situation in three other ports, namely, Haldia, Kandla and Tuticorin though not serious as yet, will become so in the near future with growth of traffic. The main sources of marine pollution in these ports are two: (a) oil spillage from ships and coastal refineries, and (b) discharge of domestic sewage and industrial effluents into the sea. As far as pollution due to oil spillage is concerned there is so far no report of high level of oil pollution in any part of the seas adjoining our country except a moderate one at Bombay harbour. But there is always hanging the Damocles' sword of a collision or grounding of oil tankers and big ships leaving serious pollution in their wake. There is, need for provision of contingency arrangements to meet such an emergency.

9.16 In general, the main sources of pollution in the coastal waters of the aforementioned nine

ports are of two kinds: one associated with shipping activities, the other industrial and domestic sewage discharges into the seas. The problem of marine pollution by domestic sewage is alarmingly serious at Bombay and Madras. Bombay must, therefore, expedite implementation of its ambitious programme for domestic water treatment with World Bank aid before its discharge into the sea. Madras, which is perennially short of water, might consider formulating a scheme for recycling its waste waters (both domestic and industrial) based upon a proper analysis compared with alternative sources of water supply.

9.17 Other steps required to curb marine pollution are briefly enumerated below:

(i) Rectification of maladroit operation of industries like oil refineries, the prime polluters of harbour waters, mainly because of their neglect to repair their leaky and corroded pipelines dripping oil into the sea.

(ii) Setting up an independent agency to monitor and assess the environmental impacts of all shipping and harbour activities in the ports. Although the need for such an agency has been recognised by the Department of Environment and Port Authorities, the precise structure of the intended set-up is not yet clear. It is suggested that an urgent action be taken to install the monitoring agency specifically tailored to meet the requirements of each of the six ports mentioned earlier.

9.18 In this context, there are three other related issues namely, legislative, equipment, and personnel that also need to be looked into. Legislative measures have to be taken to stiffen the penalties prescribed in the existing three Acts for violating anti-pollution regulations. In addition, specialised equipment has to be procured to clean up marine pollution like oil spillage. Besides, it will be necessary to recruit trained personnel to operate the new equipment. The estimated cost of the cleaning equipment required for the aforementioned nine ports is Rs. 22 crore. In view of the resource constraint it may be worthwhile to enlist private investment for such equipment on suitable terms.

9.19 Traffic noise at high level can pose a risk to health or hearing or give rise to others. Traffic noise in large cities with a few exception pockets is at present generally below the maximum acceptable level of 65d B.A. There is, therefore, at present a greater case for legislative ban on other noises such as those from loud speakers, portable radios, air conditioners, lawn movers and other contributory sources than on *traffic*, noise. If and when such legislative measures against traffic noise become necessary, statutory measures could be taken to enforce uniform standards for controlling noise emissions of noisy vehicles like heavy trucks and motor cycles, the noisiest of the lot. It is necessary to lay down noise standards for futures insist on some more sophisticated engineering to damp vehicular noise by installing silencers built to more rigorous standards than at present. We may also consider traffic curfew measures on certain busy roads in metropolitan cities.

9.20 Noise pollution on the Railway will be mitigated by increasing the use of (a) long welded rails, (b) heavier track structures and coaches of improved vehicles design, and (c) concrete bridges with ballasted deck up to 50m spans.

9.21 Noise pollution by civil aircraft is so far a serious problem only in the vicinity of Bombay and to a lesser extent at Delhi airports. The introduction of Microwave Landing System (MIS) instead of the present Instrument Landing System (ILS) by 1995 as envisaged by the Planning Group on Civil Aviation will greatly abate the noise nuisance near airports.

X. INVESTMENT NEEDS, DEVELOPMENT PRIORITIES AND FINANCING

Investment Needs

As explained above (paragraphs 4.22 to 4.29) - the available data and projections are far from adequate to provide any meaningful basis for investment planning. Considering additional data gathering and analysis is necessary to be able to develop magnitudes of investments required for the transport sector in the Eight and Ninth Plans. In-as-much as planning of transport capacity must depend upon the demands to be generated by major users, a systematic effort is needed to have indicative long term plans prepared for some of the basic industries in the country before transport demands can be assessed realistically. As the Planning Commission proceeds to develop a strategy for the Eighth Plan, this should provide a perspective for detailed planning for the various

sectors of national economy. Perspective planning for transport sector should proceed side by side with the planning of agriculture, mining, industry and energy sectors and be integrated at every crucial stage of planning.

10.2 At this stage, the best we can do is to put together such tentative estimates of investments as have been worked out by some of the planning groups for various transport modes and comment on the financing implications of these estimates. For railways, the Corporate Plan prepared by the Railway Board attempted an estimate of investment based on a 5.0 per cent rate of growth of GDP in the period 1985-2000. For roads, an estimate has been worked out by the Roads Wing on the basis of the list of essential works on national highway development and development of other roads in the country. For shipping, ports and airports, the respective planning groups have prepared estimates based on their own assumptions of incremental demands. These estimates have been adjusted on the basis of projected 1989-90 prices after excluding provisions already made in the Seventh Plan.

TABLE 10.1. PUBLIC INVESTMENTS ON TRANSPORT (Rs Crore)

Transport Mode	VII Plan (As anticipated)	VIII & IX Plans
Railway	16,290	52,523
Roads	6,535	81,271
Road Transport	2,265	9,098
Ports	1,868	5,459
Shipping	1,197	8,248
Inland Water Transport (IWT)	242	2,911
Air	1,979	21,470
Total for Transport	30,376	180,980

10.3 The estimates given above appear to be on the high side for roads, shipping and civil aviation sectors. For railways, the estimates may be somewhat low because they are based on a traffic projection corresponding to a rate of growth of GDP of not more than 5.0 per cent per annum. Assuming a 5.5 per cent per annum growth of GDP and capital output ratio of 4.5, the total investment in the economy for the 10 year period 1990-2000 would work out to Rs. 1,400,157 crore at 1989-90 prices. The proposed public investment for transport of Rs. 180,980 crore comes to about 12.9 per cent of the total investment in the economy which is lower than in the Seventh Plan (14 per cent). In view of the past backlog of overaged assets and the need for technology upgradation, modernisation and expansion of services commensurate with the growing requirements of the national economy, there appears to be a strong case at least to maintain the share of public expenditure on transport at about 14 per cent which is the level provided in the Seventh Plan. It is to be noted in this context that the share of investment in transport in the Fourth and Fifth Plans was 16 and 14 per cent respectively although, for the Sixth Plan, it was reduced to about 12.7 per cent. The total outlay for transport sector in the Eighth and Ninth Plans would thus work out to about Rs. 200,000 crore (at 1989-90 prices). Within the transport sector, a sizeable step up for road development is warranted, particularly if the overall strategy is aimed at a balanced, regional growth of the country with priority assigned to development of agriculture and diversification of economic activities.

Broad Sectoral Priorities

10.4 Broad priorities for various transport modes are discussed in the related chapters. Briefly, these are the following:

(i) For the railways, besides track renewal and replacement of overaged assets, adequate capacity needs to be developed for movement of bulk commodities and containerised traffic along high density corridors/routes, particularly the four sides and two diagonals of the Golden Quadrilateral. Railways must also step up capacity for long-distance inter-city passenger traffic. Priority must be given to upgradation of technology of locomotives and rolling stock and improvement of terminals and yards. Electrification should be extended along the heavy density corridors. Track renewal on the core routes must receive high priority and should provide for higher axle loads. Above all, the railways should have a systematic plan for modernisation of railway

services to increase their productivity and deal effectively with the emerging problem of labour redundancy.

(ii) Large investments will need to be directed towards road construction and maintenance in the Eighth and Ninth Plans. Within the available resources, priority must be given to improvement of existing road network along National and State highways and other trunk roads including city roads. At the same time, a phased plan should be prepared for construction of limited access highways along high density corridors. Considerable institutional strengthening will be needed at the Centre and in the States to improve road development planning and implementation. Moreover, for any meaningful intensification of road building programmes to provide access to villages, it is imperative to mobilise people's support on a massive scale. This will require major organisational effort.

(iii) The road transport industry, currently in a somewhat depressed state, must have an increasingly important role in the future. Essential pre-requisites for development of efficient road transport services in the country are to create conditions conducive to making road transport operations financially viable, and to technically upgrade vehicle manufacturing industry to be able to produce more economical and energy-efficient vehicles. It is particularly important to produce buses with improved design for city and inter-city operations and to promote public transport with a view to discouraging the use of private motoring, especially two and three wheel vehicles. Adequate provision must also be made for better maintenance of vehicle fleets in public as well as private sectors.

(iv) Port facilities need to be modernised including selective deepening of ports and upgrading of cargo handling systems to increase productivity and improve turn-round particularly of large size ships. Significant capacity augmentation is needed for handling coal, POL, and iron ore and for container handling. It is important to adopt a systems approach, taking an integrated view, region-wise, of major and intermediate ports so that facilities for container handling can be centralised at one port in each region with parallel development of inland transport services for containers. As for shipping, high priority must be given to replacement of overaged and obsolete shipping tonnage with modern and more economical ships. Very substantial investments are needed to organise integrated rail-cum-coastal shipping services, using inland water transport where feasible, for movement of coal from Talcher Coalfields to power plants along the Southern and Western coasts. It is important, at the same time, to improve the economics of coastal shipping operations to make them commercially viable. In view of the technological changes in the offing, it is necessary also to restructure training facilities to meet the needs of modern ships.

(v) Projected investment needs of civil aviation sector are beyond the industry's capacity to finance and it is therefore, important to sift priorities based on careful evaluation of projects. Within the available resources, priority must be given to the improvement of infrastructure including upgrading of airports, passenger and cargo handling facilities and installation of modern navigation and communication equipment, etc. Domestic airlines will need to give priority to long distance business traffic and curtail short haul services while Air-India will need to concentrate mainly on commercially viable routes particularly, to the Middle East and South-East Asia. High priority must also be given to improved facilities for international cargo.

(vi) As regards plans for pipelines, these will need to be considered on the basis of a detailed assessment of volumes of potential traffic and financial and economic evaluation of investments involved. It is important to conduct pre-feasibility studies of potential projects to prepare a perspective plan for pipelines in the country.

Financing

10.5 How the investments proposed are to be financed and, particularly, what is the extent of internal resource mobilisation for each transport mode are important questions requiring thorough examination and intensive research. Railways' Corporate Plan envisages about Rs. 25,000 crore (at 1984-85 prices) to be provided from internal resources of the railways over a 15 years period 1985-2000 including about Rs. 22,000 crore from the Railway Depreciation Reserve Fund. The Railways expect about Rs. 20,000 crore to be contributed as fresh capital from General Revenues. The Railways with suitable adjustment of fares and freights, improvement of productivity through effective measures for remedying labour redundancy and other wastages could possibly mobilise more resources than presently estimated. On the other hand, without concerted actions in all these areas, there might be a genuine misgiving about the Railways' capacity even to contribute their share of investment as projected in the Corporate Plan.

10.6 For the roads sector, several innovative measures are under consideration including mobilisation of private capital for construction and maintenance of roads. A significant recent development is approval by the Government of contribution of a small part tax on diesel to the Central Road Fund. It may be desirable to restructure the Fund on the basis of the Highway Transport Fund in the USA. There may be a case for levy of an additional cess on petrol and diesel to raise resources specifically for road improvement and construction. For development of toll roads along some of the high density corridors, it would be necessary to prepare a well thought out programme on a self-financing basis and mobilise private sector resources to the extent possible. The proposed establishment of Indian Highways Financing Corporation may also help raise additional resources for the highway sector. Despite all these measures, however, the road sector will continue to depend heavily on direct contributions of the General Revenues and this may be an important limiting factor for any major expansion of allocations for the sector.

10.7 In so far as other transport modes are concerned, except for IWT and coastal shipping which merit special assistance, a major part of their expansion should be financed from their own resources including funds to be raised from capital markets/suppliers' credits within the country and abroad. This is particularly true of international shipping and aviation and pipelines. Detailed financing plans will need to be prepared as part of planning for the development of these sub-sectors.

XI. INSTITUTIONAL DEVELOPMENT FOR TRANSPORT POLICY COORDINATION PLANNING

In our discussion of transport policy and planning issues for transport sector as a whole and for various transport modes, we have referred to existing institutional arrangements and pointed out their weaknesses to be rectified. In this chapter, we make some suggestions and recommendations on institutional development needed for transport policy coordination and planning for the future.

Data Base

11.2 For efficient investment planning and policy coordination, it is necessary to develop an adequate data base which must be systematically collected and kept up-to-date. We have to differentiate between two types of data: (i) data needed on a continuing basis for monitoring operations of transport services and policies; and (ii) data required for formulation and appraisal of specific policy issues and development projects or plans from time to time. The basic data needed for the transport sector relate to traffic flows and resource costs of various transport services. The data on traffic flows should be collected along all important links in the transport network of the country and should be organised on a continuing basis. On the other hand, for formulation of development plans or projects, it is important to have *ad hoc* surveys to assess transport market situations and transport demands for the regions to be served. An important aspect of planning and project formulation, of course, is the choice to be exercised from among the various alternatives which must be made on the basis of a systems approach to the development of the relevant

transport modes as part of a balanced development of the sector as a whole.

11.3 As is brought out in the preceding chapters, the existing status of data availability is far from satisfactory. Data in regard to traffic flows and resource costs were first collected for the Committee on Transport Policy and Coordination in 1959. Since no data existed for road transport, the Committee's secretariat organised *ad hoc* traffic surveys on six trunk routes in the country. A few years later, the Ministry of Transport undertook surveys of traffic flows to cover 16 long-distance trunk routes. The Planning Commission, in the meanwhile, established Joint Technical Group on Transport Planning which was given the task of conducting transport surveys of selected regions in the country and organising studies of movement of 15 bulk commodities by various transport modes. This group was later wound up and the studies discontinued. The next effort for collection of traffic flows and resource costs data was made by the Planning Commission in 1977-78 for the UNDP Transport Policy Planning Project. RITES' services were engaged to conduct a countrywide survey of inter-regional flows for three major modes, namely, railway, roads and coastal shipping and covering as many as 37 commodities. In 1980, NTPC in its report recommended that information on traffic flows and resource costs should be periodically collected, preferably once in every five years. The Government of India accepted this recommendation and in compliance thereof, the Planning Commission engaged the services of RITES to conduct a comprehensive survey of traffic flows and resources costs in 1986 which the Steering Committee was asked to monitor. The basic data collected through this survey have been presented in Chapters V and VI. As discussed earlier, these data have serious gaps and limitations from the point of view of their use for policy formulation and development planning.

11.4 The Steering Committee was interested not merely in the collection of the data on existing traffic flows and resource costs but also in an assessment of the projected traffic demands in the time horizon of 2000 AD. Recognising the limitations of general surveys, the Committee asked the consultants to focus on high density rail, road and coastal shipping corridors and nine bulk commodities, namely, coal, steel, iron ore, POL, fertilizer, cement, limestone, foodgrains and salt which accounted for a major part of traffic on the railways, coastal shipping and, to some extent, on trunk roads. The consultants were also asked to prepare projections of inter-city passenger traffic along these high density corridors and trunk roads. Projections of bulk commodities were to be based on a careful assessment of the development potential of the relating industries and their future location patterns. This required a close collaboration with the Ministries/departments and organisations responsible for the planning of the nine bulk industries referred to above.

11.5 In actual implementation, the survey attempted to cover all inter-regional routes in the country which turned out to be a highly time-consuming exercise. As a result, sufficient attention could not be focussed on high-density routes of critical importance, nor on study of future development pattern of the nine basic industries on a realistic basis. The Ministries responsible for these industries were, in fact, not prepared for any meaningful exercise on long-term planning and hence the resultant projections particularly of locational patterns, except in a few cases, could not possibly be realistic. Moreover, the survey having been confined to inter-regional flows does not take into account future growth of regional traffic with the result that it does not give a realistic picture of the future growth of traffic demands particularly on the highways.

11.6 The Steering Committee is of the view that such *ad hoc* studies and surveys to be conducted once in every five years will not meet the requirements of efficient transport investment planning or policy formulation. The results of such general surveys may not be commensurate with the effort and expense involved in the surveys. The Committee, would, therefore, recommend that rather than conduct countrywide surveys periodically, the Ministries of Railways and Surface Transport and the State Governments should organise data collection on traffic flows along important routes on a continuing basis. The railway data are invoice-based and the Railway Board has only to tabulate these data and publish them. The road data on commodity flows could

be compiled through close cooperation with the road transport operators. The Ministry of Surface Transport, some time ago, introduced a so-called "Pocket Book Scheme" for maintenance of such data by the transport operators but, unfortunately, this has not produced any dependable results mainly because of lack of effective monitoring either at the Centre or in the States. If properly monitored, the data to be maintained by the transport operators will be much more reliable than those collected on the basis of a few days' survey of trucks on the roads through drivers, often not well informed of the contents of their consignments. Where necessary, the data could be supplemented by field surveys of specific routes on a sample basis.

11.7 As regard data for formulation of specific projects and plans, again, these are not presently collected on a systematic basis except in the case of large projects funded by international agencies like the World Bank and the Asian Development Bank. The Ministry of Surface Transport is required to obtain approval of the Public Investment Board (P.I.B.) of major projects particularly for ports and shipping. On the other hand, the railway projects do not go through PIB and are cleared within the Railway Board and referred to the Planning Commission for inclusion in five-year and annual plans. These references are not always backed up by proper feasibility studies. The Committee is of the view that in future all major transport projects including railway projects should be subjected to detailed financial and economic evaluation whether they necessitate a reference to PIB or are cleared directly by the Ministries and the Planning Commission. This will ensure that the financial and economic feasibility of projects is established before any investment decisions are taken.

Existing Institutional Arrangements

11.8 The primary responsibility for data gathering and analysis for various transport modes is divided between three Ministries, namely, Railways, Surface Transport and Civil Aviation. The institutional arrangements in the three Ministries for coordination and planning are described below:

Ministry of Railways

11.9 In the Ministry of Railways (Railway Board), Executive Director, Railway Planning is responsible for sectoral as well as project planning. A Perspective Planning Cell was created in the Planning Division in 1973 to prepare a long term corporate plan for the railway system and to keep it under continuous review. The Planning Division has no systematised approach to prepare traffic forecasts in major commodities or along specific routes of the railway network. Neither the Planning Division nor any other unit in the Railway Board has the responsibility to collect information on projected industrial development - industrywise and regionwise - and study their traffic implications. Even the Zonal Railways do not undertake systematic studies of economic activities in the regions served by them. Industrial projects are generally referred to the Railway Board on an *ad hoc* basis and the railways in most cases do not have any effective role in decision making on location patterns of industrial projects. Railway development projects are thus not always based on systematic studies of projected demands they are designed to serve. The quality of project preparation and appraisal leaves much to be desired and, in particular, economic evaluation of projects is not done except for some new railway lines or gauge conversions. Even the studies of new railway lines although satisfactory in technical aspects are often weak in assessment of traffic potential and of financial and economic rates of returns. In the absence of any systematic approach to taking up new lines based on economic studies and surveys, the Ministry of Railways often find it difficult to resist political pressures with the result that a large number of new railway line projects have been taken up in the past which for lack of funds are carried forward from one plan period to the next.

11.10 With the massive investment involved in railway development programmes, it is important that the existing institutional and procedural

deficiencies in planing are examined and appropriate strategies adopted, first to be able to choose projects based on a systems approach to development of railway capacity and second to analyse projected financial and economic returns on investments on a realistic basis. This, in turn, requires close integration of railway planning of major user industries both in the public and private sectors. This is an aspect which has not received adequate attention in the past. The Railway Board need to institutionalise its working arrangements with the major user Ministries/Departments and other organisations to be able to have an effective role in planning of important industries and to plan the needed railway capacities on a realistic basis.

Ministry of Surface Transport

(a) Roads and Road Transport

11.11 The Ministry of Surface Transport do not have any central unit for coordinating planning work in relation to various transport modes. The Roads Wing coordinates planning of national highway development through its Planning Division which is mainly engaged in day to day planning activities relating to 5-year and annual plans. The Division is not adequately equipped to do any systematic work for long term perspective planning for national highways, not to speak of the road sector as a whole. In particular, the existing set-up in the Ministry is not conductive to integrated planning of road and road transport development. The Ministry, in fact, has no effective role at present in such vital aspects of development, as vehicle manufacturing programme and the levy of taxes directly or indirectly affecting road transport operations in the country. Having regard to the great importance of development of road transport as an integral part of the country's transport system and its current weak state of health, it is imperative that the Ministry create an appropriate cell which could keep under review all aspects of road transport development and make an effective contribution to the planning of road transport. The Ministry should make necessary institutional changes to be able to develop an integrated approach to planning of roads and road transport working closely with the State Governments.

(b) Shipping and Port Development

11.12 The existing arrangements in the Ministry for planning of shipping and port development are also not adequate to ensure integrated planning. While the various port administrations must continue to have the primary responsibility for planning of respective ports, it is necessary for the Ministry to effectively contribute to this work. The Development Adviser in the Ministry is responsible for techno-economic appraisal of port projects but is not organised to be able to undertake any systematic studies of emerging needs in the light of perspective developments in the country's overseas trade. There is no inbuilt arrangement at present to ensure proper integration between development plans of the various ports or to adequately integrate port planning with planning of shipping industry in the country. A decision has been taken recently to set up a National Ports Authority at the Centre which, among other functions, will assist in integration of development plans of the various ports. The Authority will need to be adequately staffed to undertake systematic studies and play an effective role in port planning.

Ministry of Civil Aviation

11.13 The Ministry of Civil Aviation too do not have any central unit for coordinated planning of aviation sector. Each organisation under the Ministry normally undertakes its planning exercises independent of detailed inputs from other organisations. The various projects after screening by the respective Departments and Boards come up to the Ministry often at a stage when it is difficult to make any significant changes. The Ministry needs to develop a pooled data base and introduce joint planning mechanisms ensuring adequate inter-actions between the various organisations responsible for development of infrastructure and services. The Ministry is currently giving thought to reorganising planning work in the various organisations

and making arrangements within the Ministry to ensure integrated planning in the perspective of a long term development plan for the aviation sector.

Institutional Developments for Sector Policy

Coordination and Planning

11.14 There is, at present, no single agency at the Centre for coordination of policy formulation for the transport sector as a whole. NTPC recommended constitution of a National Transport Commission preferably as a non-statutory body to be set up by the Planning Commission with three main functions of coordination - pricing, investment and regulation - entrusted to it. According to NTPC, the proposed commission would be a body of experts and its services would be available to the Planning Commission in formulation of transport investment programmes and to the concerned Ministries, State Governments and other agencies for determination of fares and freights on rational considerations. National Transport Commission was to assume the responsibility of undertaking systematic studies of traffic flows and demands for inter-modal coordination. The NTPC also recommended constitution of transport planning boards in the States for coordination of transport planning programmes at the State level. The Government after consideration of the NTPC's recommendations, however, took the view "that the existing arrangements for coordination in respect of transport planning.....may continue".

11.15 As already explained elsewhere in this report (para 3.22) with the emerging pattern of traffic in the country, the respective roles of railways and road transport are getting better defined and the traditional problem of coordination between them has lost much of its seriousness. Accordingly, it is no longer necessary to regulate road transport operations to protect the railways' interest in carrying long distance traffic in high value goods. Government has recently liberalised licensing policies with the result that Inter-State and national permits are freely available on payment of the taxes due to all the States covered along the routes operated. Regulatory policies thus need to be reoriented and directed mainly to such aspects as safety, environmental protection and energy conservation rather than the regulation of introduction or of volume of services provided.

11.16 Policies in regard to fares and freights need to be oriented to promote rate setting based on costs of services provided. To the extent that various transport modes are enabled to adjust their rates based on costs, the need for administrative actions to harmonise rates and fares as between various transport modes is minimised. Introduction of cost based rates should go a long way to meet the requirements of coordination particularly, in the case of railways, coastal shipping and domestic air services. Regulation of rates for road freight services in the private sector presents practical difficulties in enforcement as long as services are not organised through viable undertakings or association of truckers operating from common terminals. The Ministry of Surface Transport could assist best through institution of systematic studies of costs and prices to provide guidelines for review of rates and fares from time to time.

11.17 There is, therefore, no strong case now to set up a national transport commission of the type recommended by the NTPC which will take care of coordination of the operations and freights and fares of the various transport modes in the country. On the other hand, a coordinated approach to investments in various transport modes is necessary in the interest of a balanced development of the transport system. In the absence of any effective arrangements for coordination of operations, it becomes all the more important that investment programmes of various transport modes are appropriately conceived, coordinated and integrated. The responsibility for coordination of investment rests with the Planning Commission. The Planning Commission's task in coordinating investments will be considerably eased if, as suggested above, the Ministries are adequately organised to prepare development programmes and projects based on systematic studies to ensure their technical, financial and economic viability. The Planning Commission, of course, must be adequately equipped for appraisal of all development plans

and projects.

11.18 While we do not quite endorse the NTPC's recommendation for constitution of a National Transport Commission, we do consider it necessary that the Planning Commission gets appropriately organised for policy and project appraisal. Preparation of projects should remain the responsibility of the respective Ministries and the Planning Commission should be able to advise them on data collection and project and policy formulation on a sound basis. The Transport Division in the Planning Commission is responsible for coordination of transport investment plans and the Division should be able to keep policies and plans for development of transport under continuous review and direct detailed supporting studies to be conducted in the Ministries for such review.

11.19 The Transport Division obviously needs a strong supporting research organisation of selected expertise to assist it in appraisal of policies and projects. We recommend that a small centre be organised for transport policy research to work closely with the Transport Division. The Centre would need a small inter-disciplinary team of high level experts. The Centre's function will be to establish guidelines, set standards, direct studies of key policy issues and assist the Ministries and the Planning Commission in appraisal of transport policies and projects. The Centre should provide continuity in the basic studies relating to transport sector which cannot be accomplished under the current practice of *ad hoc* studies being done through consultants.

11.20 It need hardly be emphasised that the proposed Centre for Transport Policy Research will need to work hand in hand with the Transport Division of the Planning Commission and maintain close liaison with the planning units in the Ministries. It should be structured as an integral part of the Planning Commission. However, this should not become an inhibiting factor for the Centre to attract researchers of high calibre. The Centre will need to be given special dispensation in recruiting its experts from a wide field and offering attractive terms to them. An alternative approach will be to set up a separate autonomous institute for transport research. We do not favour such an institute. As has happened in some other countries e.g. GEIPOT* in Brazil, an institute functioning independently might run into difficulties in integrating its studies with planning and policy formulation in the Planning Commission or the Ministries. In order to enable the Centre to influence Government's policy decisions, it is vital that its studies are integrated fully into a continuous planning and coordination process. This can be best ensured if the Centre is an integral part of the Planning Commission.

XII. CONCLUDING OBSERVATIONS ON PERSPECTIVE PLANNING

The preparation of a perspective plan for the country's vast transport system comprising diverse transport modes is an ambitious undertaking which requires collective effort of numerous organisations - both providers of transport services and their major users. While the need for advance planning of transport infrastructure is recognised, transport planners cannot proceed far without parallel exercise being undertaken for major user sectors of transport.

12.2 Perspective planning of transport by its nature has to be a continuing exercise. Its parameters keep changing and must, therefore, be reviewed from time to time. The Committee's efforts constitute the first modest step towards initiating a systematic process for perspective planning for the transport sector. Although at this stage, it is not possible to put together a development plan for the transport sector, the Committee's efforts have resulted in some useful gains the importance of which need hardly be underestimated. The Committee thus is able to present a general development perspective and policy directions for transport sector and broad priorities for principal transport modes. More

* A transport planning and coordination agency (GEIPOT) was established under the Ministry of Transport in Brazil in the seventies to formulate sector policies and to assist the agencies in preparing sub-sectoral plans. GEIPOT grew rapidly as an independent public enterprise and its role progressively became that of an outside consultant. Neither the Ministry of Transport nor the modal agencies could integrate GEIPOT's plans and recommendations into a continuous planning and coordination process.

importantly, the Committee has made specific recommendations on technology upgradation in order to modernise transport services and promote their productivity and efficiency. In this respect, some of the planning groups have done pioneering work. The future technological perspective for the sector presented in the Committee's Report should help systematise technology forecasting and integrate technology improvements in planning processes for the transport sector. The Committee has also been able to relate transport development to environment preservation and conservation of the use of scarce energy resources in the services provided by various transport modes.

12.3 Above all, the Committee has demonstrated the application of appropriate approaches to planning of transport on a coordinated basis, integrating transport development with development of other important sectors of the national economy, and suggested specific directions of studies and data build up for integrated planning and institutional development needed to carry on further work on a systematic basis. The main outcome of these efforts is to be seen not only in the development perspective presented in the Report but also the awareness created in the numerous organisations of the need for advance planning and for appropriate institution building to systematise planning processes.

12.4 Now that the overall strategy for the Eighth Plan is under consideration, and detailed planning of various sectors is to be undertaken, the stage is set for integrated planning of transport sector. The broad policy and planning approaches recommended by us should help organise systematic work on policy review and planning of the sector. Much useful work has been initiated on the emerging technologies in the transport sector and an all-round concerted effort must be made to incorporate this in the planning process.

12.5 The success of these efforts will, however, depend, in no small measure, on strength of the institutions involved in planning. It is, therefore, our earnest hope that the recommendations of the Committee on institution building will receive early consideration on the part of the Government.

REVIEW ARTICLE*

A FRESH LOOK AT INDIAN HISTORY: POLITICS SINCE INDEPENDENCE

S.V. Kogekar

All history is said to be contemporary history. Looking at the past through the eyes of the present provides a view that is highly coloured by the problems and concerns which appear compellingly relevant to the surrounding reality. Perspectives change. New facts come to light. New interpretations gain acceptance. And history has to be rewritten to encompass all such changes. It is therefore quite natural that the Cambridge University Press should launch upon a project of bringing out *The New Cambridge History of India* more than fifty years after the original *Cambridge History of India* which was published between 1922 and 1937. Planned chronologically from the earliest times to the end of the Great War in 1918, that work had it own distinction. It not only presented a comprehensive survey of India's past but, intentionally or otherwise, emphasised the work of British empire builders fired with the mission of taming and civilising an ancient, tradition-bound agrarian society riven by all kinds of internal dissensions and contradictions, and ungratefully lending itself, towards the end of that period, to an 'irresponsible ' agitation by 'extremist' leaders and their 'half-educated' followers demanding Home Rule for India! That work as originally planned was divided into six volumes but was concluded with only five, the second volume dealing with the period from the 1st century A.D. to the 11th never having appeared. Each volume was the work of a number of scholars from the universities and also from among military and civilian officers with long experience of administering India - most of them with impressive titles conferred on them by their sovereign. Each writer was assigned a certain period or theme within the chronological scheme of each volume. During the five decades since the publication of the sixth and last volume of that History, the world experienced another global war leading to tremendous changes in the old imperial order. Alongside of the new developments in the world order a good deal of scholarly work has been done on different facets of the history of these times which render the older histories out of date. No wonder then that Cambridge University Press decided to bring out a new history of India. The General Editor of the new history is Gordon Johnson, Director of the Centre of South Asian Studies at the University of Cambridge with C.A. Bayly of the Department of Modern Indian History in that University and John F. Richardson, Professor of History at Duke University, as Associate Editors.

The format of the new History is quite different from that of the old, reflecting a change in approach and perspectives. As the General Editor says in his preface to an earlier book viz. Vol. II-1, in the series, it was decided 'that the best scheme would be to have a History divided into four overlapping chronological volumes each containing about eight short books on individual themes or subjects. Although in extent the work will therefore be equivalent to a dozen massive tomes of the traditional sort, in form the *New Cambridge History of India* will appear as a shelf full of separate but complementary parts'. It may be further noted that unlike the old History the new one does not start with the ancient period but only with the Mughals and their contemporaries which constitutes the first main division of the work. The second division comprises the Indian States and the transition to colonialism. The Indian Empire and the beginnings of modern society constitutes the third division followed by the Evolution of Contemporary South Asia as the concluding part. The first three parts roughly correspond to the last three volumes of the old History brought upto date till the attainment of independence, chronologically speaking. But their contents are bound to be quite different. The fourth part seems to be intended to deal with the post-independence period though one does not

---

S.V. Kogekar is a retired Professor of Political Science, Ex-Principal, Fergusson College, Pune and Ex-Vice-Chancellor, Tilak Maharashtra Vidyapeeth, Pune.

*"The New Cambridge History of India: The Politics of India Since Independence" by Paul R. Brass, Cambridge University Press, Cambridge, 1990, Pp. xvi+357, Price Rs 250.00, (Published in association with Orient Longman).

quite see the point in extending its coverage to South Asia. Looking at the seven titles planned under it only one expressly relates to South Asia while three others refer specifically to India. The titles of the remaining three give no precise indication of their spatial scope. While the publication of all the 31 books of the new History will take some time, seven of them have already been published. Looking at the list of authors who have been chosen to collaborate in this work, one is impressed by the predominantly academic character of their background and also by the inclusion of a number of Indian scholars among them - a departure in both the respects from the older work and a sign of the changed times. It would be obviously premature to venture a judgement on the adequacy of the new history in coherently bringing together and interpreting the vast data covering nearly five centuries of Indian history. But the scheme of making each of the projected 31 volumes into independent, though complementary, and self-contained books permits a review of each of them as it appears in print. It is proposed to deal here with one such book published as volume I in part IV of the New History entitled *The Politics of India Since Independence* by Paul R. Brass.

Brass is no stranger to the field of political analysis of the various strands which go to shape Indian politics today. For nearly three decades he has been working on various aspects of India's political developments and has, as a result, come to possess a definite point of view which he has been expressing cogently and insightfully in his writings. He has taken the opportunity of writing this volume to present a synthetic view of his findings which merit careful study by all those interested in unravelling the labyrinthian course of Indian politics. As he puts it in his preface to the volume, its 'central theme concerns the consequences of increasing efforts by the country's national leaders to centralise power, decision making, and control of economic resources in one of the most culturally diverse and socially fragmented agrarian societies in the world..... These consequences suggest the existence of a systemic crisis in the Indian polity which will not be easily resolved". He, however, believes that "alternative paths towards such a resolution exist within Indian political and economic thought and political practices and that an alternative leadership may yet arise to seek such a resolution, basing itself on India's own traditions'.

This central theme has been elaborated in the ten chapters under three parts following an introduction, into which the book has been divided. The introduction deals with continuities and discontinuities between pre- and post-Independence India. It indicates how the colonial legacy of a parliamentary system of government and the aspirations nurtured during the nationalist movement for freedom such as fundamental rights and adult franchise, found expression in the Constitution framed for the sovereign republic. But even more than that it lays bare the inherent contradiction between a western type democratic system of government and the all but democratic nature of the society which was expected to work that system. You therefore start with a hiatus between the State and Society. The problem whether the State should mould Society in its own image or the Society should bend the State to suit its traditional modes of behaviour becomes the basis of sharp divergence between the political rhetoric and political practices. The absence of a national consensus on the rules of the game to be faithfully observed while working the parliamentary system as laid down in the Constitution did indeed create this divergence. By hindsight one can say that the way it could have been remedied was the steadfast adherence to the constitutional system and its vigorous propagation by the leadership of the Congress which at the time of attaining national Independence had both the popular support and an effective grass-roots organisation to activate the people. Unfortunately this did not happen under pressure of an immediate encashment of Independence in terms of various short-term gains for those in power and a desire to continue in power by making all kinds of concessions to aspiring sections of the people whose votes had to be secured by any means. A Westerner like Paul Brass rightly observes that 'Indian politics have lacked the ideological underpinnings of European political traditions..... nor has it been possible for most political parties in India to adhere to a consistent ideology in the manner of many European parties which formulate manifestoes, whose programmes they

actually implement when they achieve power. Rather, Indian politics have been characterised by an all pervasive instrumentalism which washes away party manifestoes, rhetoric, and effective implementation of policies in an unending competition for power, status and profit.... The contradictions between the foreign models adopted, the Indian traditions which have permeated the actual practices within the Western-derived institutions and what can actually be achieved in an agrarian society, a caste-dominated social order, and a heterogeneous civilization have been of the essence of Indian politics since Independence' (Pp. 19-20). He sees "a strong moral streak in Indian commentary on politics which is displayed in constant condemnation of the corruption of the politician and the bureaucrats and of the relentless pursuit of power.... Such moralism usually drawing inspiration from Gandhian ideals, gives force from time to time to mass mobilization to bring down the ruling party" (p. 19), but is rarely effective in transforming institutions and political practices.

While one may agree with Brass in the above characterisation of Indian politics as a historical reality, one should be wary of inferring by implication that an alternative to the parliamentary system was readily available to the Constitution makers at the time of Independence. For nearly a century before the dawn of Independence the British parliamentary model held the field in the thoughts of Indian political leaders and thinkers as the ultimate institutional goal under *swaraj* or self-rule. The Gandhian alternative of a network of village republics based largely on village self-sufficiency was never seriously supported even by his closest associates like Nehru who was a fervent believer in the modernization of Indian society through rapid economic development on socialistic lines. Such a development was seen as the most effective means of social transformation necessary for harmonizing the social system with modern political institutions. It must be admitted as a failure on the part of the post-independence leadership that it succumbed to the temptation of somehow remaining in power and made compromises which continuously widened the gap between its professions and performance at every level of political activity.

The result of this process has been correctly expressed by Brass when he says that 'at every level of the system, factionalism, personalism, and opportunism rather than ideology, party ties, nationalism, or communalism have structured routine conflict and alliance patterns' (p. 25) Other features of the political system include the interference of higher levels in the lower ones, intra-communal political divisions, the principle of "divide and rule" in operation, hierarchical loyalties enabling leaders to build bases of support, and occasionally, the use of charismatic leadership to threaten the support bases of local leaders or to maintain direct popular links with the masses to improve its bargaining position with provincial leaders.

Thus the introduction to the book, in a way, brings out in summary fashion the main features of Indian politics which are gone into in greater detail in the three parts to follow.

Part I deals with political change in three chapters devoted to the structure and functioning of government, parties and politics, and state and local politics, respectively. On the changes in the structure and functioning of government, the author traces the modifications effected in the parliamentary, federal and bureaucratic system in its actual working in relation to what was originally envisaged by the makers of the Constitution. In doing this he draws a dividing line between the period upto 1964 when Nehru was the Prime Minister and the post-Nehru era. Under Nehru's Prime Ministership, the role of the central government was less obtrusive in its relations with the state and local governing institutions. This was, as all observers of the Indian political scene have noted, due partly to circumstances and partly to a deliberate effort on the part of Nehru to adhere to the normal conventions of parliamentary democracy. The circumstances were also favourable for such a course: the live and vibrant organisational base of the Congress all over the country, the presence of stalwarts of the nationalist movement at the helm of many governments and the fairly unified approach to dealing with the problems before the newly independent state. This situation however changed radically under Nehru's successors faced with growing factionalism within the Congress party, the intense

competition for power and the emerging manipulative character of political activity. The desire for centralisation of decision making as a means of controlling the party units, the erosion of loyalty to the party amongst its constituent parts, the lip-sympathy paid to national goals and the crass opportunism displayed in defections from and to all parties led to an adaptation of the Constitution to suit actual political practices. It violated the federal spirit and undermined the parliamentary system by making the office of the Prime Minister all important. The situation reached its culmination during the Emergency period from 1975 to 1977. The cabinet's role, the authority of parliament and the judiciary, the neutrality of the civil service, Centre-State relations - all suffered a set-back and an era of institutional instability was ushered in. A consequence of over-centralisation was the emergence of regionalism challenging the hegemony of the Centre resulting in the establishment of opposition governments in several states. The Central Government, however, did not relent and rather than revise its ways, preferred to abuse its Constitutional powers by using the office of the Governor to topple the state governments. Not possessing a single charismatic leader and dogged by questionable manoeuvres by ambitious dissenters from its inception, the Janata government could hardly pose as a stable, viable alternative to the Congress in the post-Emergency period. With the re-entry of Mrs. Gandhi as the Prime Minister in 1980 and the induction of Rajiv Gandhi in that position after her assassination in 1984, the old Congress game was revived without hope for an institutional improvement. These events and tendencies have been very well narrated by Brass with an objectivity that should evoke admiration.

In the next chapter dealing with parties and politics, Brass has presented a picture of the party system and its working in India in a superbly readable and concise way. He not only brings out the salient features of the parties and their support bases but emphasises the lack of their institutionalisation except for a few long standing ones like the Congress and the Communists or the more recent Jan Sangh (BJP). While many parties may actively participate in the electoral process, few of them exhibit a continuity of existence or any firm ideological commitments. In several states there have emerged regional parties which, however, are specific to particular states like DMK or AIDMK in Tamil Nadu, the Telugu Desam in Andhra Pradesh, the Akali Dal in Punjab, the National Conference in Jammu and Kashmir and the AGP in Assam. These parties have even won majorities singly or in coalition with others in the respective legislative assembly elections and formed governments. Opposed to the dominance of the Congress, they have raised the banner of State autonomy against the centralisation of power in the hands of the Union Government. They strive for a regional identity and for the promotion of their regional culture. Curiously, 'the State units of the CPM too have become, in effect, regional parties in so far as their popular support is concerned' in West Bengal, Tripura and Kerala. At the national level the Congress still appears in a dominating position which has led Indian political scientists to characterise the system as a 'one-party dominant system'. Brass does not agree with the validity of this label and considers it to be something of a 'misnomer'. According to him, 'it was always obvious that, since the Congress itself rarely polled a majority of votes in most states and only once since Independence, in 1984, nearly did so at the Centre, Congress dominance was only partly a result of its own support base. Equally important was the disunity of the opposition which, if it could be overcome, as it was in 1977, could lead to the displacement of the Congress from power at the Centre' (p. 69). However, it should be obvious that the label was quite appropriate to the end result, whatever might have been its causes. And the causes mentioned by Brass were not unknown at any time when election result were analysed or commented upon by Indian scholars. It is possible that the corresponding Western idiom might have conveyed to him a wrong connotation of the particular label. A factor which was not sufficiently emphasised by Indian scholars in connection with the electoral process and which Brass has brought out very well is that relating to the importance of various interest groups and intermediaries, formally organised or not, or even influential individuals who 'act as links between the formal institutions of the Indian political order, parties

and bureaucratic agencies, and the social institutions of Indian society, caste, family, and village' (p. 96). He further points out that factions which provide an indispensable set of such linkages also act as 'a dissolvent which renders impractical most of the proclaimed goals of the national leaders of the country. In short, factions and personal leader-follower ties have been the principal structural components of the "parties" in the Indian party or, better, the Indian factional system' (p. 97). He also points out to the emergence of a whole class of intermediaries who act as "brokers" between the people and the administration. 'While the work of the brokers... often facilitates communication and programme implementation, it also leads to the distortion of information, the diversion of development funds to persons and groups other than those for whom they are intended, and to the spread of corruption throughout the administrative system. The flourishing of the brokerage system, therefore, must be seen as a reflection on the general failure of the administrative system of post-Independence India to function effectively, popularly and honestly' (p. 98). Few will disagree with this judgement.

In regard to state and local politics Brass sees a continuation of the scenario at the national level. There too the Nehru and post-Nehru eras are contrasted, the latter displaying an unrestrained use of Constitutional provisions for furthering the party interests of the Congress. For one thing the Nehru era was marked by the existence of Congress governments both at the Centre and in most of the States - a situation which did not last particularly after 1967 when non-Congress governments emerged in many states. Secondly, the delinking of parliamentary and state assembly elections after 1971 gave a greater opportunity to regional parties to attract a favourable response from the voters in state elections. The Congress government at the Centre unabashedly went on using the office of the Governor for toppling non-Congress governments or itself directly destabilising such governments (and sometimes even non-complying Congress chief ministers) by encouraging defections within the ranks of their supporters. The long term effect of this strategy was seen in further strengthening regional party formations as pointedly indicated in the success of the AGP in Assam in the elections in 1985. However, as recent events have shown this kind of strategy is not confined only to the Congress. The Janata Government (1977-79) forced fresh assembly elections in many States before they had run out their normal tenure under the specious plea that, with the change at the Centre, they no longer represented the will of the people! What is most surprising is the even more recent plea for the dismissal of the duly elected Congress Government in Andhra Pradesh, in view of its alleged complicity in the violence let loose in that State after the assassination of Rajiv Gandhi, made by the spokesmen of the TDP - itself a champion of the doctrine of State autonomy as against Central intervention. The TDP Government in Andhra Pradesh had, it may be recalled, suggested to the Sarkaria Commission on Centre-State relations that the office of the Governor should be abolished altogether as a remedy against Central intervention in State Governments!

Coming down from the State to the district level Brass observes that 'the characteristic form of politics in the districts of India is factional politics, especially where the Congress has been traditionally dominant or the strongest force in a district. It involves pervasive struggle to gain and retain control of the multiple political resources in a district.... the panchayats, cooperatives, banks, sugar factories and party organisations' (p. 123). With the weakening of the Congress organisation at the State and district levels and the direct intervention of the national leaders in settling local political rivalries, such factionalism has actually been encouraged.

Part II of the book relating to pluralism and national integration consists of three chapters dealing with language problems, non-Hindu and tribal minorities and varieties of ethnic conflict, respectively. The general tenor of the argument on various types of conflict is that 'India's cultural diversities do not themselves provide inherent obstacles to national unity or inevitable sources of conflict. Conflicts between language, religions, and ethnic groups tend to centre around issues of jobs, educational opportunities, and local political power. The roots of these conflicts

have often been quite similar in the pre-and post-Nehru periods. However, a combination of increasingly assertive centralizing drives by the Indian State and its national leadership with an intensified struggle for power in Centre, State, and locality have contributed to the intensification of conflicts based on such categories in the post-Nehru era' (p. 134).

The chapter dealing with language problems leading to political movements for or against recognition of particular languages for official language status or for reorganisation of States or even for provision of primary education facilities through the mother tongue, provides a competent survey of the linguistic situation in the respective contexts. The tussle between Hindi and Urdu, Bengali and Assamese, Hindi and Punjabi, Hindi and various allied languages like Maithili, Bhojpuri, etc., has been explained with commendable objectivity. The North-South divide on the Hindi-English controversy has been adequately covered. On the whole, India appears to have dealt with the language problems on the basis of accepting the principle of pluralism without sacrificing that of secularism. The only exceptions to this general statement is the continued existence of the Punjab and Assam problems though they are not due solely to linguistic issues.

The minorities problem which is another source of conflict in India has been divided into two parts. One relates to the non-Hindu minorities and the other to the tribal peoples. In Punjab and in Assam the reorganisation of the States in question is still an unsettled issue. The main hurdles in the way according to Brass are the secessionist demand of the affected people to start with, which the Government of India would never concede, and later, the use of the resulting frustration of the minority communities by the Central Government for its own purposes. It tried to establish direct links with the dissidents to strengthen its own position *vis-a-vis* the state political leadership. In Punjab under the Prime Ministership of Rajiv Gandhi, an accord was reached with the Akali Dal under the leadership of Sant Longowal. But the conditions agreed to were not observed according to the agreed time table, leaving the problem unresolved. The effect of the accord on the neighbouring State of Haryana and the power-equations at the Centre were too important to be brushed aside from the standpoint of the Congress. In the reorganisation of Assam and the ultimate creation of Nagaland and Mizoram also the same kind of strategy was used, the Centre trying to strengthen itself at the cost of the State leadership.

As for the tribal peoples in various areas like Madhya Pradesh, Bihar and Andhra Pradesh where the protest of the tribals tended to take the form of violent, insurrectionary action, the strategies used by the Central Government of (a) economic development, (b) 'absorption' by drawing to itself the whole or part of the tribal leadership and (c) repression, have had mixed results depending on the strength of the leadership of the protest movements.

The Hindu-Muslim question is another unsolved problem in Indian politics. It has many facets. The demand for recognition of Urdu as an official language in Uttar Pradesh, Bihar and Andhra Pradesh is only one of them. The application of Muslim personal law (Shariat) brought up into prominence after the Shah Bano case, the status of the Aligarh University, the Mandir-Masjid dispute in relation to the shrines at Ayodhya, the Kashmir issue and the organisation of Muslim political parties have all led from time to time to a sharp cleavage between the two communities. The Congress has generally been regarded as the protector of the Muslim minority and laid claim to the Muslim vote at the time of the elections. But it has never secured more than half of the Muslim vote in its favour and when even that was doubtful, the Congress has not desisted from tilting in favour of Hindu communal forces, as is said to have happened in 1984. Nor has the opposition been far behind in enlisting the support of the Muslims, especially in 1989. The political use to which Hindu-Muslim tensions have been put has only made the problem more intractable.

Other sources of conflict between different groups of people have been studied by Brass with reference to caste and migrant-non-migrant relations. His general conclusion after an extensive study of such conflicts in several States in the North and South of the country is that 'conflict and violence between castes or between migrants and non-migrants have occurred rather

when combined with particular economic conditions and when political elites seek short-term advantage from potential conflicts' (p. 205). The response of the politicians to the economic basis of caste conflicts has been to resort to reservation of jobs in public employment. What was done in the case of persons belonging to the scheduled castes and tribes in this respect has been extended to other 'backward' castes in the States where such conflicts crystalized in the shape of political parties or movements. Promise of reservation in jobs played an important part in competitive politics at the State level. For the extension of the same principle for employment under the Central Government, Backward Classes Commissions have been appointed in 1953 and 1978, the latter when the Janata Government was in power. But the Congress which had displaced the Janata Government when the report was submitted did not pursue it further. It is a matter of very recent history as to the tremendous public uproar which followed the announcement of V. P. Singh accepting the second report and reserving 27 per cent of all Central jobs for the other backward classes, 'class' having been identified in terms of 'caste' as suggested in that report.

The 'migrant vs. local' issue is the direct result of large-scale unemployment among the educated middle classes, especially in the urban areas. This issue has also been politically exploited by 'champions' of the 'sons of the soil'. Brass has surveyed it with reference to Assam, Andhra Pradesh and Maharashtra.

The finding of Brass as regards all the above conflicts is worth pondering over. According to him the 'problem arises from the tensions created by the centralising drives of the Indian State in a society where the predominant long-term social, economic, and political tendencies are towards pluralism, regionalism, and decentralisation. Although the same tensions existed in the Nehru years, Central Government policies then favoured pluralist solutions, non-intervention in State politics except in a conciliatory role or as a last resort, and preservation of a separation between Central and State politics, allowing considerable autonomy for the latter. From the early 1970s, however, during Mrs. Gandhi's political dominance, the Central leaders have intervened incessantly in State politics to preserve their dominance at the Centre, the boundaries between Central and State politics have disappeared in the critical north Indian States especially and have been challenged elsewhere as well, and pluralist policies, though not discarded, were often subordinated to short-range calculations of mutual benefit' (p. 241). This calls for a fundamental rethinking of Centre-State relations not so much in their formal, Constitutional form as in the actual conduct of the political process.

The third part of the book deals with political economy in two chapters (8 and 9), while the concluding chapter sums up the problems and prospects as seen by the author. The attempts at economic development are surveyed mainly with reference to the goals, strategies and results of Planning followed by a discussion of the political aspects of agricultural change. Brass quite rightly points to the Mahalanobis-Nehru strategy adopted from the Second Five-year Plan (1956-61) as providing the basic approach to planning in India. It was designed to introduce a centralised formulation of the plan for a capital-intensive, fast-paced heavy industrialisation, led by the public sector which would control the commanding heights of the economy, leaving the private sector to play a complementary role in a mixed economy. In the long term this was expected 'to establish India as a modern, self-sufficient industrial military power' (p. 256). In stating the goal in these words, one feels rather unhappy that Brass has, perhaps unwittingly, given a wrong tilt to the aim of Indian planning, 'self-reliant, modern, industrial' economy, certainly. But not as a 'military power'. Even if the model before the planners at the time is assumed to be that of Soviet Russia which was also a military power, there does not seem to be any valid basis for suggesting that Indian planning was intended to lead to the emergence of India as a 'military power'. It was still planning for achieving social welfare - greater employment, removal of poverty, disease, illiteracy, squalor, and generally an improvement in the standard and quality of life of the people. It is well known that till the disastrous encounter with China in 1962, the military aspect was not given much thought by the Indian Government. It was only after 1962

that India became aware of its defence deficiencies and a larger budgetary provision started to be made for defence, out of the sheer compulsions of the situation endangering its territorial integrity. To say that Indian planning was directed to build the country as a military power is to present a distorted picture of history. Nor does it appear to be a casual remark if one looks at the description of the contents of the book as given in its blurb.

Apart from this *faux pas*, Brass has set out the problems of the distribution of resources between industry and agriculture, regional imbalances in development, pervasiveness of poverty, and the efficacy of various anti-poverty programmes fairly and succinctly. The 'urban bias' in the policies and economic development complained of by Charan Singh and his allies, requires a major shift in policy to counter it which is difficult to expect. That is because, according to Brass, the main beneficiaries of the present policies 'continue to be the politicians themselves and their corrupt allies and dependents in the bureaucracy, business entrepreneurs who manipulate the system effectively or thrive in the black economy, and the urban classes who obtain growing access to indigenously produced or smuggled foreign luxury products and the amenities of urban life' (p. 278). Such changes in the agricultural sphere as have taken place in spite of the industry-oriented strategies of planning have been further examined in the following chapter.

Agrarian reform did not make much headway even when in 1965-66 high yielding varieties (HYVs) were introduced to increase the yield of rice and wheat in the irrigated areas in the northern States. The rain-fed paddy growing areas in northern and eastern India remained largely untouched by the new technology. Programmes for the abolition of zamindari and other types of intermediary rights, the passage of land ceiling laws and distribution of surplus lands among the poorer peasants were indeed undertaken, but except for the first of these reforms the rest were not seriously implemented by the State authorities. That only perpetuated the local political and economic influence of the major proprietary castes in different states. Price, procurement and distribution policies were so devised as not to disturb the existing equations of power in the rural and urban areas, helped by large imports of U.S. foodgrains under P.L. 480. The Green Revolution was confined to the wheat growing areas of Punjab, Haryana and Western U.P. to start with. In the case of rice also it was confined to these states and to Andhra Pradesh, Tamil Nadu and Kerala, though the increases in the production of rice were not as spectacular as those in the case of wheat. But this very factor has increased disparities in production and prosperity between these and other States. The response of the less privileged peasantry, however, did not take the form of any large scale organised resistance to the powers that be. Such movements as did give an impression of organised revolt were confined to isolated areas with a large tribal population and were sustained by the leadership provided by Communists of various shades. This is illustrated with reference to the Tebhaga movement in north Bengal, the Telangana movement in the old Hyderabad State, the Naxalbari movement in post-partition West Bengal, the Naxalite movement in Andhra Pradesh, and the Andhra movement led by a Maoist formation in three predominantly tribal districts of that State. All the major movements, it is pointed out, preceded the Green Revolution, the first two having taken place in pre-Independence days. The only exception to this general situation is the Bhojpur district of Bihar which has been a recurrent scene of agrarian violence mainly on account of the landowners trying to increase their share of the gains from the Green Revolution through a reduction of the traditional share due to the agricultural labourers. Naxalite elements from outside and local scheduled castes leaders joined hands in a violent resistance to exploitation of this kind - a case similar to the situation in the Thanjavur district of Tamil Nadu. But unlike in Thanjavur, where despite violent retaliation by landlords and the local police, the peasants drew some benefits from ameliorative measures taken by the Tamil Nadu government, it is the landlords who have become more powerful in Bhojpur. After taking a review of all such movements, Brass comes to emphasise 'the extraordinary stability of agrarian society' in India 'in the face of caste divisions, considerable inequalities and pervasive poverty' (p. 305). He joins issue with the Marxist theoreticians on their perception of

the agrarian situation leading to an eventual revolutionary class war between the poor and the landless peasants and the land-controlling castes led by the so-called *Kulak*, which according to him is far from the realities of the countryside. Rather than resulting in class polarisation as expected by the Marxists, the organisation of political conflicts has been taking place 'along the lines of competition *among* land-controlling castes more than between them and the poor and landless' (p. 310). So far at least history seems to be on the side of Brass.

In the concluding chapter of the book the author deals with the problems and prospects before the Indian polity. One problem which has recently attracted much attention is the possibility of securing greater political stability and a firmer direction to the economic development of the country by changing over to the presidential as against the present parliamentary system of government. The need of a strong Centre in spite of the federal character of the Constitution has been emphasised right from the time of Independence as an antidote against the fissiparous tendencies inherent in the aspirations and policies of different States. The demand for an Executive not constrained by the constant requirement of retaining the confidence of the Legislature appears quite attractive whenever the hegemony of the Centre is likely to be threatened by growing opposition to it in the country. But the implications of the Presidential system in all its details as applied to Indian conditions have never really been worked out and the debate is usually and casually talked out. The truth of the matter is that the Centre, especially in the post-Nehru period, has never honestly tried to treat the federating units as being coordinate with it and not subordinate to it. Taking advantage of what were intended to be exceptional provisions to deal with exceptional situations as the normal weapons in the hands of the Centre to enforce its will over the States by introducing President's Rule, the federal character of the Constitutional arrangement is already subverted. Rather than remedy this distortion by allowing the States their autonomy, the attempt has been to deny them their autonomous status by further strengthening the Centre. This only underlines the sense of insecurity felt by the Central leadership of the Congress. It is no mere accident that the demand for a Presidential system comes mainly from the henchmen of that leadership. Much as it may suit the desire of that leadership to somehow continue in power, the problem of holding the country together through strong Central control appears to be doomed to failure given the multiple diversities, regional aspirations and support bases of the State and local leadership. Brass has rightly pointed out how with the primacy of power over performance during the last two decades the institutions responsible for maintaining law and order in the country viz. the bureaucracy and the police have been politicised and corrupted in a manner which spells disaster to the performance of their normal functions.

Another problem which appears to defy solution in the foreseeable future is the daily increasing pressure of a growing population which clamours for meeting its elementary needs. Technological modernisation of the economy and "liberalisation" of the regime of licences and controls are being thought of for encouraging greater enterprise in the private sector with large-scale aid of foreign private capital. Even then the scale on which employment opportunities are needed to be created is likely to outstrip these efforts unless a massive development of the rural economy is vigorously pursued, the implementation of which would need the willing cooperation of local and state organisations of the people rather than a centralised system of authority.

Speculating on the prospects before India, while acknowledging the remarkable strength of the Indian democratic polity in comparison with other developing countries, Brass opines that 'the more immediate danger for India is the further spread of violence, lawlessness, and disorder at the local level. If such a spread continues, the Centre may feel the necessity of a further assertion of its power and authority, possibly including another venture into authoritarian practices, which will have its own costs. Those costs, if the evidence from neighbouring countries is any guide, would include a long-term threat of major violence from discontented segments of society, more insistent demands from the States for

regional autonomy, and even the spread of terrorist movements to other groups in society' (p. 335).

Referring to alternative solutions, he suggests the possibility of 'greater decentralisation of power to the States, districts and villages of India, a return to the pluralist policies of the Nehru period, and major reforms of the bureaucracy and the police.... The overall size of the civil bureaucracy might also be reduced for it is overstaffed, inefficient, and a great drain on the resources of the country' (p. 335). He thinks that decisive moves, one way or the other, must be initiated soon as 'it would be folly to be sanguine about the future of India, to consider that the country is only going through a "stage" in its development, and to fail to recognise that a grave systemic crisis is in progress' (p. 336).

There is no doubt that Brass has built a powerful argument drawing on a wealth of historical data in support of his thesis in this book. Though he has confined himself primarily to the internal politics of India, leaving out the entire field of external relations and its repercussions on internal politics, within the self-imposed limits on the subject he has done an excellent job and made a valuable contribution to the understanding of the subject.

Book Reviews

(1) S.R. Maheshwari, *The Mandal Commission and Mandalisation: A Critique,* Concept Publishing Company, New Delhi 1991, Price - Rs. 130/-; (2) Anirudh Prasad, *Reservation Policy And Practice In India: A Means To An End,* Deep & Deep Publications, New Delhi, Price - Rs 550/-; (3) S.P. Agrawal and J.C. Aggarwal, *Educational And Social Uplift Of Backward Classes: At What Cost And How?: Mandal Commission And After,* Concept Publishing Company, New Delhi, Price - Rs 275/-; (4) H.C. Upadhyay, *Reservations For Scheduled Castes And Scheduled Tribes,* Anmol Publications 1991, Price - Rs 550/-.

These four books deal with the nature and extent of the protective discrimination mandated by the Report of the Second Backward Classes Commission, popularly known as the Mandal Commission and undertake critical scrutiny of its premises and prescriptions. Ever since the then Prime Minister, V.P. Singh declared his government's intention to implement the recommendations of the Mandal Commission, there has been raging a fierce controversy on the wisdom and social desirability of the policy of reservations. Mandalisation has come to acquire a peculiar meaning in Indian politics. Mandalisation to its supporters means power sharing by socially and educationally neglected sections of society and to its opponents it means castification of Indian politics and denial of equal opportunities on ascriptive basis. What does it really mean? Although the matter was taken to the Supreme Court in order to defuse the political conflict and to provide escape routes to the warring groups who seemed to have adopted rigid normative positions, the Court did not provide the expected relief. It seems that all political parties are united on the view that protective discrimination in respect of access to education and jobs must be provided for a period of time so to enable those lagging behind due to historical reasons to catch up with the advanced sections of society. The questions that are debated are: (a) how are such beneficiaries of protective discrimination to be identified?; (b) what should be the extent of such protective discrimination? and (c) how long will it or should it continue? These four books, doubtless, contribute to the further understanding of these complex socio-legal issues.

However, Mandalisation has become so bitterly controversial that it has become difficult to examine the issues with fair amount of objectivity and aloofness. One is apt to become subjective and even emotional on these issues. In fact both subjectivity and emotionalism are enemies of genuine scholarly pursuit. But class war battle-lines are so clearly drawn that it may become difficult for people on either side of the fence to control their prejudices. The books under review are not totally free from such bias, but it must be said to their credit that they have to a great extent sustained objectivity and impartiality inspite of class predilections.

Maheswari's book is the one which reflects the bias rather too sharply and is an open advocacy of the anti-reservation viewpoint. His bias starts from the very dedication of the book. It is dedicated to "students who are presently making sacrifices for the integrated future of mother India". Obviously, this seems to refer to those students who self-immolated in the course of agitation against the Mandalisation. The Preface of the author also projects this bias rather strongly. In chapter I, the author refers to various provisions of the Constitution to analyse the concept of reservation. The second chapter contains criticism of the Mandal Commission's criteria for backwardness and other aspects of the report. In Chapter III, the author describes the whole political setting of the Mandal Commission controversy and in Chapter IV, he examines the morality of the Mandalisation of public services. He ultimately observes

'It, thus, flows from the foregoing that the Mandal Commission was not ethical in its motivations and strategy. Indeed, its Report is a model of how a commission on matters of social concern ought not to function' (p. 38).

The author's thesis is that in order to make public services broadbased, reservation is not the proper strategy; the better strategy would be to provide high quality education to the weaker sections and even to economically support them (p 42). The author believes that 'reservation for the scheduled castes and scheduled tribes was, wisely, a time-bound concession made for a period of 10 years only' (p 39). This assumption is not correct. The time limit to reservation is contained only in articles 330 and 331 of the Constitution which deal with reservation of seats

in legislatures. No time limit has been provided in Article 15(4) or 16(4) which contain the State power to discriminate in favour of the Scheduled Castes, the Scheduled Tribes and the 'socially and educationally backward classes of citizens' in respect of educational opportunities and government jobs. No such time limit was prescribed because no such time limit would have been feasible. The author's contention that reservation is not a good strategy and that other ameliorative strategies such as providing good education or economic help would have sufficed also is not free from doubt. The questions to be answered would be: how long would it take to achieve social equality through non-reservation ameliorative strategies?; would it have enabled us to contain social discontent for such a long period?; would it not have jeopardised the social harmony and national integration?. Reservation was adopted as a strategy for its symbolic and immediate effect of diffusing the social tension. It had to be time-bound, no doubt (not ten years but a much longer period), and also had to be carefully and imaginatively planned so that merit-linked principle and social justice requirements could be harmoniously accommodated. One great positive aspect of the book is its analysis of Kaka Kalelkar's views and the reproduction of the Kalelkar Committee's conclusions, suggestions and recommendations in the penultimate chapter of the book. This reviewer, however, feels that the author has not taken enough notice of the distinction between reservations for SCs and STs and for other backward classes (OBCs).

Anirudh Prasad's book deals with the subject much more comprehensively and convincingly. He makes distinction between reservations in favour of SCs and STs and those for OBCs. He justifies the former but argues that through constant dereservation and reclassification, the reservation benefits must be made to reach the real sufferers of social injustice. Those who had ascended the ladder through the use of reservations ought to be descheduled or dereserved either by applying the generation test or income test. He also argues in favour of operating the reservation policy within a time frame so that vested interests in reservations do not articulate. Prasad, however, feels that so far as the OBCs are concerned, since they constitute nearly 52 per cent even according to the Mandal report, they are a majority and any move to provide reservations for them amounts to their being judge in their own cause. Must reservation be confined to a minority which is not in a position to get for itself a political mileage? Since reservations are a strategy of social justice and not of political sharing, should they be used to benefit the majority?. In a democracy, majority has always an advantage in the political process. But do we contemplate people to organise themselves castewise for political purposes?. Normatively not, but Prasad raises a pertinent question whether a majority can ask for legal safeguards such as are designed only for the minorities?. Prasad takes us through decided cases of courts and tellingly illustrates how courts have mediated between claims of merit-based consideration of equality and protective discrimination in the interests of social justice. The decision of the Supreme Court in *Balaji* vs *Mysore* that the upper limit of reservations should be 50 per cent of the total number of jobs or seats in an educational institution must be scrupulously observed. Prasad urges the Court to consider whether such upper limit should apply only to reservations for SCs, STs and BCs or should it also apply to all reservations including those for physically handicapped, sports persons, freedom fighters, etc.? The author deals with reservations in favour of women, not so backward and other disadvantaged classes. In Part five, the author discusses the ameliorative measures other than reservations for empowering the weaker sections of society. The author concludes that caste consciousness has increased due to the policy of reservations and therefore, we should look for other methods of social justice. We feel that reservation is not an alternative to social, educational and economic inputs for the empowerment of the SCs, STs and BCs; it is rather to be used along with such other methods and has to be gradually withdrawn over a period of time.

S.P. Agrawal and J.C. Aggarwal raise significant questions about the methodology adopted by the Kalelker Commission as well as by the Mandal Commission regarding the identification of the backward classes. The Kalelkar Commission recommended different percentages of reservation of seats/vacancies in educational institutions (40 per cent in Class III and Class IV

categories, 25 per cent in class I category and 70 per cent of the seats in professional and technical institutions). In the absence of any explanation of the rationale for fixing different percentages, the different groups of posts etc., the approach, according to the authors 'appears somewhat arbitrary'. What robbed the report of its legitimacy was not mere methodological inaccuracy but the fact that three of its members were opposed to the use of caste as a criterion for social backwardness and the reservations of posts in government service on that basis (p. 25). The authors very elaborately discuss the terms of reference of the Mandal Commission appointed in 1978 and its modus operandi. They are, doubtless, of the view that reservations as a strategy is imperative in the Indian situation. They observe:

'In a highly unequal society like ours, it is only by giving special protection and privileges to the under-privileged sections of society that we can enable the weak to resist exploitation by the strong' (p. 40).

They observe that opportunities between a rich or urban upper middle class/caste boy and a poor, rural, lower caste boy are not equal. Our entire set of tests for determining merit are faulty and they heavily lean in favour of the well-to-do or better-off sections of society. The Constitution, therefore, provided for protective discrimination not as being an exception to the principle of equality as the Supreme Court has said in several decisions but as State power untrammelled by other merit-linked principle embodied in the Constitution. The Constitution of India, doubtless, envisaged reservations as a strategy for social justice, though for a temporary or transitional period. Power has been given to the State to discriminate in favour of socially and educationally backward classes of citizens and it must be exercised for that purpose. Reforms in educational system and programmes for poverty abolition would, doubtless, be used for that purpose. But reservations have to be used until these programmes take off the ground. Obviously, there has been a dismal failure on the part of the State to make success of those programmes. The educational system has become more disparity-ridden and socially irrelevant, and disparities of income and wealth have increased in geometrical proportions. Reservations are bound to become much more lethal under such circumstances.

H.C. Upadhyay's book deals with the problems of the Scheduled Castes and the Scheduled Tribes and comprehensively documents through various tables the positions occupied by those oppressed groups in government jobs and how and to what extent that position has improved over the years. This book does not deal with Mandalisation but deals only with reservations for SCs and STs and takes us through various judicial decisions in which such reservations were challenged on constitutional grounds. Upadhyay also gives us valuable information about various welfare schemes for SCs and STs and about their implementation. This is a valuable most up-to-date and well-documented study of the State effort to ameliorate the lot of the most oppressed social groups with a critical audit of its actual performance.

All the four books make good addition to the literature on this most hotly debated and explosive subject.

S.P. Sathe.
Principal, ILS Law College and Hon.
Director, Institute of Advanced Legal Studies,
Pune.

Economic Justice Under Indian Constitution, by Raj Bahadur Srivastava, Deep & Deep Publications, New Delhi, 1989; Pp. 266; Price Rs 225/-.

In this book the author traces the history of the concept of economic justice right through the days of *Ramrajya*. Its origin, the author observes, dates back to *Ramayana*, the great epic of Valmiki (Balmiki) *"Lokah Samasthah Sukhina Bhavanti"*. Economic justice is the cornerstone on which the edifice of the happiness for all can be erected. Satisfaction of the three basic needs of food, clothing and shelter can 'wipe every tear from every eye', Gandhiji had desired.

The dichotomy of the 'two Indias' - the affluent haves and the deprived have-nots or the exploiters and the exploited - is the theme recurring in the book again and again, in the preface, the first

chapter (Pp. 19 and 30) and the last chapter (p. 245). The famous statement of Dadabhai Naoroji, wrongly spelt as Naroji in the book under review, gives the genesis of this dichotomy as follows:

'In reality there are 'two Indias' - one the prosperous, the other poverty stricken. The prosperous India is the India of the British and other foreigners. They exploit India as officials, capitalists .... The second India is the India of the Indians, the poverty stricken India' (p. 19).

The author regrets that after more than forty years of Independence the white exploiters have been merely replaced by the brown. Despite several noble pronouncements in election manifestoes, constitutional mandates, five-year plans, formulation of economic policies and the plethora of economic welfare legislation, the glaring disparity between the 'two Indias' continues to thrive.

The book is divided into four parts. The first part is replete with quotes which help us to understand how our national leaders in the Freedom Struggle had always envisaged economic and social liberation as included in and being an integral part of political liberation. The framers of the Constitution too, have made ample provisions for the eradication of poverty such as those in the Preamble, where it is stated that "EQUALITY of status and of opportunity" is to be secured for all citizens of India, or as those in the articles 23 and 39. The author delineates on these provisions in the next parts. However, such provisions as in the articles 42 and 43, which enjoin on the State to secure for all workers a living wage and just and humane conditions of work that ensure a decent standard of life, full enjoyment of leisure and social and cultural opportunities, are not dealt with in the book. The whole exercise of five year planning has been undertaken since 1951, with a view to 'establishment of a socialistic pattern of society'. But to our great misfortune and dismay all these efforts are reduced to nothing but a farce.

The second chapter of this first part discusses the normative basis of equality, particularly the economic equality, in the Constitution; it also refers to the inclusion of the word 'socialist' in the Preamble by the Constitution (Forty-Second) Amendment Act, 1976. The author then points out the significance of the Preamble in the interpretation of the Constitution as pronounced in several judgements by the Supreme Court, such as the ones delivered in the cases of *Re Berubari Union* and of *Kesavanand Bharati*. In the former it was held that the Preamble, being the key to open the minds of the constitution makers, is not a part of the Constitution, whereas in the latter this view was rejected and the Preamble was accepted as a part of the Constitution, which can be invoked in the defence of the Fundamental Rights as well as of the Directive Principles of the State Policy.

The second part is devoted to Fundamental Rights in Part III of the Constitution. Again diving deep into the pages of history the author points out how the concept of rights was visualised by Kautilya. Although he mentioned no rights of citizens, he listed the duties of the State. Here the author suggests that whatever Kautilya regarded as the State's duties, can also be thought of as the citizens' rights.

As in other commentaries on the Constitution, the book hereafter deals with all the important constitutional controversies - what is 'State' as defined under article 12; 'law' in article 13; equality in article 14 - 'equality before the law' and 'equal protection of the laws' - equal treatment of unequals leading to injustice; classification and reasonableness of classification; and exceptions to the equality principle. One whole chapter is devoted to discussion on equality of opportunity in matters of employment under article 16 and most of the aspects of articles 15, 16, 301 and other provisions meant for bringing about social justice. And it is rightly so, since social justice and economic justice do overlap. The limits of reservation, appointment of a commission to investigate as to who belongs to the backward classes or to the socially and educationally disadvantaged and the criteria for backwardness are some of the aspects of these articles dealt with in detail with appropriate references to all the relevant judgements.

The entire next chapter is an essay on article 23 which prohibits *begar*, i.e., bonded labour, and other similar forms of forced labour and traffic in human beings (slavery). The well-known cases on bonded labour *(begar)* such as the *Asiad Project Case* are cited with quotations from the

judgments as well as from the writings of other authors on the subject. The land tenure systems including zamindari and the resulting agricultural indebtedness lead to bonded labour. The land reforms legislations could have given effect to the provisions of article 23(1). The author regrets that, as a matter of legal strategy, this aspect has hardly ever been examined in any of the cases challenging such legislations. Had article 23 been used for upholding the agrarian reform measures, it would have gone a long way to ensure economic justice. The legislations were, however, challenged always on the grounds of article 19(1)(f) or article 31. These articles had guaranteed to the Indian citizens the right to property as a fundamental right, though with certain reasonable restrictions. Hence, none was to be deprived of his/her property without compensation. The Constitution (Forty-forth) Amendment Act, 1978, repealed both these articles; however, article 31 was reintroduced as article 300A by the same Amendment. The right to property is, therefore, now merely a constitutional right and not a fundamental right.

Chapters VII and VIII deal with the right to property as defined and redefined by successive landmark judgments and consequent constitutional amendments. The meaning of the concept of property is laid threadbare. Chapter IX discusses the freedom of profession, trade and business as guaranteed by article 19(1)(g) and the reasonable restrictions that may curb this freedom.

The third part elucidates the role of the Directive Principles of State Policy in bringing about economic justice. According to the author, article 39 is a complete code of economic justice (p 182). It requires the State to formulate policies, (1) that would secure for all citizens adequate means of livelihood, equal pay for equal work and work suitable to their health, strength and age; (2) that would protect children and youth from exploitation and not neglect them; (3) that would avoid concentration of wealth and means of production; and (4) that would distribute the ownership and control of material resources of the community to achieve the common good and the welfare of all. Since the underlying objective of the Directive Principles is, in the words of Dr. Ambedkar, "to prescribe that every Government whatever is in power, shall strive to bring economic democracy", it is obvious that the author covers extensively all the aspects of the Directive Principles including their significance in judging the reasonableness of restrictions under article 19(5). However, he fails to analyse how far the legislative, industrial, financial and taxation policies formulated by successive Governments, both Union and the State, adhered to these principles or how much is their real commitment to them or whether there is only lip service rendered. For example, despite the growth of the economy, the proportion of the population below the poverty line rose from 38 per cent in 1960-61 to 48.4 per cent in 1980. The land reforms resulted in the rise in the concentration ratio of assets owned by households, mainly agricultural land, from 0.65 per cent in 1960 to 0.68 per cent in 1981. There is no survey in the book of the economic decisions taken by the Governments which ought to have been taken within the broad framework provided by the Constitution, how far these decisions followed the constitutional norms, how much deviation took place due to political exigencies and what drawbacks they contained, as a result of which they failed to eliminate economic disparity. The book under review discusses merely the judicial interpretation of the constitutional provisions for economic justice and not the legislative measures or the flaws therein, nor the failure of the executive in implementing such economic legislation and the reasons thereof. As a result, it turns out to be one of the many commentaries on the Constitution, but restricted to only those judgments that have some relevance, however remote to economic justice.

Chapter XI discusses the concept of free legal aid, access to justice, right of a person to free legal aid as guaranteed by article 39A and the cases on this article, with some very apt observations on the profession of law (Pp. 208-10), and as a sequel, there is a discussion about judicial activism with regard to access to justice in Chapter XII. Mentioning most of the public interest litigation (PIL) cases, in which the rule of *locus standi* was liberalised, the author lauds the judicial effort to bring justice to the common man. He believes that both, lawyers and judges, may have some role to

play in ushering in economic democracy in the country and in securing for 'the poor, starved and mindless million' 'the enjoyment of human rights'. It is relevant to mention, however, that the PIL cases that reached the courts form only a minuscule percentage of the actual instances of economic and social injustice. And this is a reflection not only on the stark reality but also on the failure of the Indian legal system, which serves the interests of the rich but remains inaccessible to the poor.

The relationship between the Fundamental Rights and the Directive Principles is discussed in Chapter XII. Stating in brief the views of the two schools of thought regarding this relationship, the author concludes that there has to be a balance or equality between the Fundamental Rights and the Directive Principles. The Fundamental Rights represent the civil and political rights; they can be meaningful, only when the Directive Principles embodying social and economic rights are realised.

The last chapter in this part examines the role and functions of the welfare state as envisaged in the Constitution. In order to free the people from economic wants and to secure for them all essential conditions of good living, governmental control of privately owned economic enterprises has been introduced and the author commends this measure; in fact he favours wider application of it and asks us to remove from our heart the fear that the expansion of government's regulatory and service functions would inevitably result in arbitrariness and would be fatal to the rule of law. He seems to be oblivious to the recent developments in the communist regimes, where such controls are being replaced with economic liberalisation.

The fourth and the last part - 'Conclusion and Suggestions' - contains mostly the summary of the earlier chapters. The only suggestions are for facilitating access to justice such as liberalisation of the rule of *locus standi*, abolition of court-fees, amendment of procedural codes, organisation of legal literacy campaigns by the law students on the lines of the National Service Schemes in universities and colleges, etc., (p. 258). One more commendable suggestion is to train the minds of the people so as to alter the existing bias in favour of the haves and to get a fair deal in life for the long suffering have-nots. Here too, he mentions 'revival of old religious human values' (p. 258). What he exactly means by these words is not clear. But taken in the right sense they could mean,

> '... universal education, by which right conduct, fear of God and love will be developed among the citizens from childhood. It is only if we succeed in this that Swaraj will mean happiness, otherwise it will mean the grinding injustice and tyranny of wealth' (p. 259).

The monograph thus concludes with the above words of C. Rajagopalachari. The dangers inherent in the long continued tyranny have been succinctly pointed out by Yash Pal, the former Chairman of the University Grants Commission.[1]

> "If the 20/80 law, 20 per cent of the people enjoying 80 per cent of the comforts and luxuries available is not changed, "anything will be enough for the suffering 80 per cent, to give vent to their anger against the discrimination in the society".

Although the author has not specifically expressed such fears, he seems to be aware of them and that is why he speaks of training the people's minds. For he admits that the mechanisms of law or the Constitution are not the means for ending the paradox of 'two Indias'; what is required is 'attitudinal change coupled with a spirit of patriotism', - does he mean, humanism? Whatever it is, the author does point out the significance of human resource development which needs priority over the development of physical resources.

The book is titled *Economic Justice Under Indian Constitution;* however, it fails to refer to some of the important economic rights, such as the right to work as a fundamental right, right to livelihood as a part of the right to life, under article 21 of the Constitution, the Equal Remuneration Act, 1976, social security legislation, free and compulsory education, etc. Similarly how far the laws enacted with the purpose of bringing about economic justice to the poor masses are being implemented effectively and whether the courts are impeding their implementation are some of the questions that remain unanswered in the book.

Finally one feels sorry to find several printing mistakes particularly in the quotations and the footnotes. The bibliography provided at the end fails to give even the minimum details of the publications listed, such as the year of publication.

NOTE

1. Yash Pal's 133rd Convocation Address delivered at the University of Madras in March 1991.

Suneeti Rao
Librarian, ILS Law College,
Pune.

Integrated Rural Development in Asia: Learning From Recent Experience, Edited by H. Ramchandran and J.P. De Campos Guimaraes, Concept Publishing Company, New Delhi, 1991, Pp. xvi+338, price Rs 300/-.

The problem of ameliorating the lot of the rural poor in India, and also in South-East Asia, has gained importance over the last two decades or more. Various programmes of integrated area/rural development have been experimented with to achieve the goal of raising the poor above a 'poverty' level. The publication under review, based on a Seminar held in the Institute of Social and Economic Change, Bangalore, is a collection of articles on the experiences of the programmes in the region. The book is divided into two parts. Part I deals with the experiences in Bangla Desh, Nepal, Sri Lanka, Indonesia, India and the Philippines. Part II discusses the experiences of the Indian programme in some of the districts in Karnataka State.

Two types of programmes appear to have been in vogue in these countries. One, the type sponsored and financed by foreign organisations and countries where, in some cases, even the implementation was coordinated by the organisation concerned. The other, where the programmes were drawn up by the country governments at the Central level and disseminated through the State/District or Block to the rural areas. In both cases, as the affected persons and their needs were taken as given at the planning level, the results were far different from what was anticipated. It is therefore fitting to quote in the beginning itself, the lessons learnt from the Philippines experience. These were (a) 'it was inappropriate to seek absolute solutions for rural development problems in the physico-economic models brought in by foreign technical consultants and massive external funding'; (b) 'it was not possible to cope with the complexities of rural development through even the most rational blue-prints but only through a rigorous learning process in which the beneficiaries should play the key roles'; and (c) 'inspite of the strong policy pronouncements supporting' the programmes, 'its radical innovations could not prevail against the highly centralised system of controls' (p. 136).

In his paper, J.P. de Campos Guimaraes makes an overall assessment of the working of the Integrated Rural Development (IRD) programmes. IRD shared several characteristics of the Community Development approach of the fifties, particularly the importance given to the removal of poverty through multi-sectoral activities, over restricted areas and with local participation and mobilisation. The strategy was to meet the basic needs of the poor through rural development programmes and projects. The strategy has, however, not been able to make a significant dent in the problem of rural poverty. Even where they had succeeded, the pilot projects were not replicable. Again the projects once implemented with special administrative arrangements and resources, faced difficulties of sustainability when integrated in the existing bureaucratic structure. The planning and management system itself needed to be dealt with for the problem to be solved.

Poverty was to a very large extent the result of on-going social *processes* and social *relations* that brought about a redistribution of resources away from the poor and in favour of some of the higher income groups. The delivery of resources to the poor, no matter how well coordinated and implemented was not enough. The dependence relations between the rich and poor in rural areas and of the way in which they influence the impact of programmes was of general relevance to IRD. Participation, especially in the way it was practised, was vulnerable to appropriation by the rich and the powerful in the rural areas. Also, exclusive rural focus of IRD projects was tantamount to disregarding the role and importance of urban systems for the development of rural areas.

Guimaraes suggested three different approaches to rural development for discussion at the Seminar these were (i) delinking the poor from their dependence relationship with the rich in the process of planning for their amelioration, either through relief programmes meant specifically for them, or by setting up socio-politico organisations of the poor or through both the processes; (ii) Organisational decentralisation, *i.e.* by increasing the decision-making capacity at the local level; and (iii) Spatial integration.

Two papers by M.Z. Rehman and K.B. Sajjadur Rasheed are on the rural development programmes in **Bangla Desh.** The programmes in the pre-Independence period (i.e. before 1971) commenced with what was called the 'Village Agricultural and Industrial Development' Programme (V-AID), largely an agricultural extension programme. This was followed by the 'Comilla Model' which envisaged the construction of physical infrastructure, development of irrigation facilities, building of institutions for mobilisation of savings, delivery of agricultural inputs, training in improved agricultural practices and a system for its dissemination. A two-tier cooperative structure was set up at the village and *Thana* levels. At the village level, farmers cooperative societies (KSS) consisting of about 50 farmers were to receive inputs and credit and a plan for cropping strategy applying improved technology. The KSS were federated at the *Thana* level as the Thana Central Cooperative Association (TCCA). The TCCA acted as the support and service apex organisation to provide credit and other inputs, overall coordination, supervision, training and support services to the KSS. Rural works programmes, including irrigation and flood control, drainage canals, roads, etc., were also the responsibility of the TCCA.

In the post-Independence (post - 1971) period, following the drawing up of five year plans, area development programmes more or less on the lines of the Comilla Model, but with extension of social services like health, family planning, and community education, were introduced. Unlike the Comilla Model where village level participation was encouraged, the area development programmes were largely government-oriented and-implemented. It was felt by one of the authors, that these programmes of rural development did not reach the rural poor. With the upgrading of the *Thanas* in 1982 and additional responsibility given to them to implement rural works programmes, it was hoped that more jobs would be created to absorb the landless rural labour. The Third Plan (1985-90) of Bangla Desh had also laid special stress for the alleviation of poverty by providing employment facilities, especially in the non-farm sector.

N.J. Kurian has reviewed the performance of the Integrated Rural Development Programme (IRDP) in **India.** This programme was introduced during the Fifth Plan period (1974-79), and continued through the Sixth and Seventh Plans, with the objective of providing poor families with income generating assets to enable them to produce the requisite incremental income to cross the poverty line. The review is based on the results of the IRDP Concurrent Evaluation Survey undertaken by the Department of Rural Development, Government of India, during 1985-86. The Survey had revealed that nearly 20 per cent of the beneficiary families who had been assisted in the IRDP were not eligible for such assistance as their incomes were much above the poverty level of Rs 3,500 laid down for the programme. About 55 per cent of the beneficiaries surveyed were provided with assets in the primary sector and 33 per cent in the tertiary sector. However, the two main 'assets' provided in order to achieve the requisite block level targets, were milch animals and sewing machines. Leakages at the stage of implementation of the programme were found to be quite rampant through malpractices, bribery and corruption. These varied according to the level and efficiency of the administration in the States. Often the beneficiary was a front-person while the man who acquired the asset was someone quite different. Even the assets given were valuated at a much higher price than that actually paid. In a number of cases assets were not given at all, but the cash amount was shared between the beneficiary and the implementing bank or authority. There were cases of defective assets being given to the beneficiaries too. The Survey, however, found that nearly 70 per cent of the beneficiaries had their assets intact after two years of acquiring the same and had benefitted from them with enhanced incomes. The rest of

the beneficiaries had either disposed of their assets because they were defective, did not generate enough income, or the assets had perished.

The IRDP project in India is financed partly by budgetary grants and partly through bank credit. The Survey revealed that loans granted by banks had been repaid by 45 per cent of the sample beneficiaries; another 8 per cent had overdues of up to Rs 250 only. Overdues from the rest of the defaulters was mainly due to inadequate income generation from the assets provided, or tight repayment schedules, etc. In the case of 24 per cent of the sample beneficiaries, the assets did not generate any income at all. This by itself was 'a damning commentary on the implementation of the programme' (p. 61).

The planning and development of the Karnali-Bheri Integrated Project (K-BIRD) in **Nepal** was studied by D.N. Dhungal and D.I. Field. The project is being implemented with Canadian collaboration in two districts of the Bheri Zone and one district of the Karnali Zone. It aims 'to increase the capacity for self-initiated and sustainable economic, environmental and social improvement in the project area' through '(a) increase of production at a higher rate, (b) increase of opportunities for productive employment, and (c) the fulfillment of minimum Basic Needs of the people' (Pp. 79-80). The first phase of the project (1980-85) was concerned with the establishment of institutional procedures and provision of infrastructure. In the second phase (1985-90), support was to be extended to agriculture, livestock, forestry, cottage industry, irrigation and manpower development. The project is being formulated, planned and implemented in a three-tier structure at the village, district and coordination centre. The village panchayats formulate their requirements and forward them to the district panchayat secretariat, which coordinates the plans of the different villages within the funds provided. This coordinated plan is forwarded to the Project Coordinator who liaises with the Government of Canada's representative for release of funds, approval of schemes.

The project has faced a number of constraints due to the remoteness of the area (districts), communication difficulties, subsistence economy, small size of farms, lack of marketing facilities, inadequacy of available data, etc. Lack of roads was the greatest hurdle; further the inhabitants of the villages/district did not take an active interest in the implementation and maintenance of works taken up under the project. Difficulties in coordinating the activities of the different government agencies hampered work under the project. An Appendix lists the achievements of K-BIRD between 1981 and 1987. These include agricultural extension activities covering over 30 thousand hectares; distribution of inputs like seeds, saplings and fertilizers; forestry and soil conservation; installation of power pumps, water turbines, drinking water schemes, rural electrification; setting up of small cottage industries, training programmes, etc. Little information is however available as to how far the project has improved the employment and living conditions of the poor in the districts.

The Integrated Rural Development Project (IRDP) in Ratnapura District in **Sri Lanka** has been studied by M. Jayamane. The IRDP commenced in Sri Lanka in the seventies as a supplement to other on-going programmes, so as to accelerate rural development. All the IRDPs rely on foreign funding, bilateral and multilateral. The two main types of planning approaches under IRDP have been (a) the 'blue print' or 'programme' approach adopted in the projects sponsored by multilateral agencies like IBRD, IDA or IFAD, or (b) the 'annual plan,' 'rolling plan' or 'process' approach adopted for projects financed by bilateral agencies like SIDA, NORAD, and the Netherland Programme of International Development (p. 102).

Ratnapura District was taken up for the IRDP in 1984 with financial support from the Government of Netherlands. Three key areas in three different climatic zones in the district were initially selected. For each area, a multi-sectoral package of projects was designed to address its development needs, which included road construction, rural water supply, reforestation, soil conservation, animal husbandry, health, education, etc. The Assistant Government Agent (AGA) was given the responsibility for the local planning process. As small key areas were selected, the planners were able to collect the requisite data of the area, have direct consultation

with the local people and formulate integrated investment packages for the area concerned. However, the implementation of these 'packages', having to be undertaken by different departments of the government, had often been difficult. This was because the IRDP funding was regarded as a supplementary source of finance for capital investment and was seen as 'outside' work. Also, coordination with other sources of finance like the Decentralised Capital Budget and District Development Council funds rarely took place. In view of the difficulties in getting the government agencies to implement the programmes within the stipulated time, the AGA often took recourse to non-governmental organisations (NGOs) to handle implementation. But such implementation created problems of maintenance of the assets built.

The impact of the IRDP programme in the key areas selected in the district were studied in 1988. It was found that rural areas, which were hitherto isolated, were linked with urban or semi-urban centres; access to public amenities such as education and health improved; infra-structural facilities such as roads, markets, service centres, etc., created opportunities for income generation. Employment opportunities increased with the construction of roads, reforestation of denuded hills and transport of goods and services to markets and urban centres.

M. Tjokrowinto discusses the two variants of integrated rural development (IRD) being implemented in **Indonesia.** These are through the UDKP (Development Working Area Unit) and the PDP (Provincial Development Programmes). The UDKP tended to rely on a sterotypical and uniform blue-print imposed from above, leaving little room for variations. The PDP, on the other hand, is adapted to local socio-cultural environment and gives room for changing activities in the process of implementation. The expected results of the IRD within the context of the PDP are increased standard of living for the rural poor and enhanced local rural development planning and management capacity.

The experiences of the integrated rural development programmes in the **Philippines** have been discussed in two papers by P.M. Nietes and M.P. Garcia. The history of rural development programmes since 1950 has been traced, commencing with community development programmes, followed in 1973 by regional development programmes, called later, the Integrated Area Development Projects (IAD). The IAD projects have been largely funded by foreign organisations like USAID, WB and ADB. These projects aimed at (a) increasing productivity of land and water resources, (b) manpower development, (c) generation of employment opportunities in both farm and non-farm sectors, (d) improvement of social services and (e) local participation in development. Functional linkages between resource regions and market and urban centres through construction of roads, ports and communications took up about 50 per cent of the cost of the projects. A number of problems were met in the initial period (1975-79), due to deficiencies in the planning process, in implementation and the financial constraints of a centralised sectoral authority.

The IAD projects planned after 1979, being mainly second generation pipeline and new projects, placed more emphasis on upland technology development, environmental protection, rural industries, local government capability build-up, nutrition and agricultural credit. Upland and rainfed communities which were left out of the first IAD projects, were given greater emphasis. The traditional hierarchical flow of decisions from top to bottom, gave way to bottom-up flows as more participatory approaches were adopted. An off-shoot of local participation was the emergence in the 1980s of small scale high impact projects with emphasis on local resource management.

In its performance analysis of major IAD projects, M.P. Garcia has quoted from the 1986 report of the Philippines National Council on Integrated Area Development as follows: 'Evaluation conducted after a major part of all of the physical components of IAD projects have been completed have showed that achievements in terms of socio-economic impact have been limited and have tended to benefit population groups that were better situated economically and *not the targeted rural poor* (italics added). Likewise, the observed performance of the productive sectors failed to show an automatic chain reaction in

terms of regional scale sectoral growth that can be positively attributed to such infrastructure' (p. 182). - That is the crux of the problem of the integrated rural development programmes in nearly all the countries discussed in this book. The targeted poor benefited the least, while the infrastructural developments proved most advantageous to the economically better off in the rural areas.

Part II studied the working of the IRDP in Karnataka by five authors. In his evaluation Abdul Aziz finds that the project intervention had helped only 18 per cent of the beneficiaries to cross the poverty line, although a member of underemployed agricultural labour households were able to find additional employment through the IRDP programmes. The quantum of assistance given to beneficiaries fell below the stipulated pattern provided in the guidelines. Similarly, the composition of the schemes to the beneficiaries did not conform to the guidelines of the programme. Primary sector schemes were given priority inspite of the business, industry and service sectors being more remunerative. In the primary sector too, often low quality animals were purchased due to the non-availability of the types specified. Some amount of inter-plan integration was attempted by the implementing authorities

E. Seetharamu studied a cluster of villages in the Channarayapatna block in Hassan District, while A.M. Kulkarni examined the rehabilitation schemes of bonded labour in Karnataka. H. Ramachandran assessed the impact of rural development programmes on scheduled castes households in the rural areas over the last forty years. At the other extreme, V.S. Parthasarathy discussed the role of the elite in the development process in a selected panchayat in Bangalore district.

What is it that one has learnt from these papers? J.P. de Campos Guimaraes has put it in a nut-shell in his paper that 'too much attention has been paid to the organisational and administrative problems of implementation, at the expense of better understanding of the nature, problems and dynamics of the rural societies for which the projects and problems are designed. More emphasis needs to be laid on the substantive problems of rural development projects and programmes, which are too often overshadowed or even completely hidden by the excessive concern with the administrative problems of implementation' (p. 13). A.K.N. Reddy in his valedictory address is more forceful when he asserts that 'rural people may be poor and illiterate, but they are not irrational, and we must understand this rationality' (p. 316).

A reading of the papers in this book would be useful to all personnel implementing rural development projects in the country.

F.K. Wadia
Indian School of
Political Economy

S.C. Jain, *Productivity and Discipline - Victims of Misdirected Social Justice*, Allied Publishers, 1988, Pp. xxvii+263, Price Rs 160/-.

This is a compendium of extracts from judicial judgements regarding labour disputes during the last forty years compiled with a view to finding out the shape that industrial jurisprudence and judge-made law in the field of industrial relations has taken. Social justice is said to be the objective of industrial jurisprudence and the explorations in this book reveal that the entire industrial jurisprudence evolved thus far in India seems to have, in the name of "directive principles" "social justice" and "activist-law-making", entirely vitiated the fabric of industrial relations by undermining discipline in the labour force. Inspired by vague notions of social justice, industrial peace and job security the judicial process has, in practice, promoted inequality in the guise of social justice. Industrial peace has failed to accelerate productive activities of the country for the benefit of the community and job security has encouraged indiscipline and inefficiency. The author fervently appeals to the judiciary to undertake a review of this entire industrial jurisprudence and evaluate if at all there is a nexus between the principles laid down and the demands of our planned development process. It is a useful book.

N.V. Sovani
Former Professor,
Gokhale Institute of Politics and Economics,
Pune.

ANNOTATED INDEX OF BOOKS AND ARTICLES IN INDIA

EDITOR'S NOTE

These abstracts are prepared by the author of each book/article sent to us voluntarily in response to our invitation through the Economic and Political Weekly. These cover publications after 1st January 1986. Only abstracts of books/articles so received are published. The index therefore is not exhaustive and complete.

The limit of 250 words and 100 words for abstracts of books and articles respectively is strictly enforced. Only a minimum amount of copy editing is done in order to bring the abstracts within the prescribed limits. The readers should approach the author of the abstract, not this Journal, for any clarifications.

BOOKS

1988

Barik, B.C. *Class Formation and Peasantry*, Rawat Publications, 3-NA-28 Jawahar Nagar, Jaipur 302 004, 1988.

Contrary to the conventional migration theories in India that the migration process continues and will continue unceasingly from backward zones to developed zones, the author questions its universal applicability. Based on village studies with extensive historical evidence drawn on 19th century and prevailing agrarian structure and migration from Ganjam District of Orissa State, the author emphasises that out-migration from rural areas is the product of agrarian capitalism and class formation.

According to him, out-migration from rural areas is historically and structurally conditioned. The findings of the study reveal that the incidence of migration is comparatively more in a capitalist agrarian structure than that of a feudal or semi-feudal one. The capitalist agriculture accompanied by several structural elements has expelled a large number of peasants and labourers to far off employment resourceful areas. The migration process gets accelerated by the inbuilt strong network of primordial loyalties both at the place of origin and destination. The author has avidly analysed, the consequences and impact of migration on local economy and social life.

1991

Raina, B.L. *A Quest For A Small Family*. Commonwealth Publishers, New Delhi 110 002, 1991.

Population problem continues to be alarming. "The total size of the World population in 2,025 is now expected to be 8.5 billion, some 300 million more than expected". Population of India is expected to be near one billion by 2,000. If the expected decline in fertility does not take place, the Indian population by 2,025 could be two billion or more. India has been a vast laboratory for varied experiments in family planning. This book explores the rich experience accumulated during the last 4-5 decades and offers suggestions which may help in accelerating the pace of the family planning programme.

In Part I of the book birth control technology past, present and future is discussed. In Part II, selected programmes and projects are discussed viz. Incentives and Disincentives; Training and Training Institutions; Communication System; Population Education; People's Participation; Intensive Health & Family Planning District Projects; Family Planning Through Hospital Care; Maternity Centred Family Planning Programme; Projects in Christian Medical Association, Indian Tea Association, United Planters Association of Southern India, Industries and Railways; Mothers and Child Health and Integrated Child Development Scheme; programmes integrated with development activities in Gandhigram, Malur and Jamkhed; and Kerala Story. Attempt is made to find leads to improve programme performance.

ARTICLES

1987

Shankar, Kripa 'Role of Rural Rich in Rural Transformation', *Man and Development*, Vol. IX, No. 1-2, September, 1987.

Rural rich do not utilise their land optimally. The cropping and irrigation intensities being lower on their farms, the yields and returns are lower. Labour intensity is also lower as they resort to mechanisation which impinges on scarce capital resources. Nor do they utilise their surplus in a productive manner as consumerism has also gripped this class. They have a vested interest in the status quo for it ensures better supply and control over labour. Any rapid diversification and transformation will disturb their power and privilege.

Better education of their children results in their urban orientation; only dullards in the family are left to carry on with agriculture.

The Journal will publish in each issue Annotated Bibliography of Books and Articles on Indian Economy, Polity and Society, published after January 1, 1986. Authors are requested to send their entries with full details of publication and annotation not exceeding 250 words for books and not exceeding 100 words for articles. Use separate sheet for each entry.

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS

Vol. XLVI | APRIL-JUNE 1991 | No. 2

CONTENTS

Annual Subscription Rates

Individual Membership Fee: Rs. 100.00; £ 25.00; $ 35.00.
Institutional Subscription: Rs. 200.00; £ 40.00; $50.00.

Please address correspondence to the Hon. Secretary & Treasurer, The Indian Society of Agricultural Economics, 46-48 Esplanade Mansions, M.G. Road, Bombay-400 001 (India).

FORM IV

(See rule 8)

Statement about ownership and other particulars about newspaper (Journal of Indian School of Political Economy) to be published in the first issue every year after the last day of February.

1. Place of Publication:	'Arthabodh' 968/21-22, Senapati Bapat Road, Pune 411 016
2. Periodicity of its publication:	Quarterly
3. Printer's Name Nationality: Address:	P.S. Palande Indian 'Arthabodh', 968/21-22, Senapati Bapat Road, Pune 411 016
4. Publisher's Name Nationality: Address:	P.S. Palande Indian 'Arthabodh', 968/21-22, Senapati Bapat Road, Pune 411 016
5. Editor's Name Nationality: Address:	V.M. Dandekar Indian 'Arthabodh', 968/21-22, Senapati Bapat Road, Pune 411 016
6. Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital:	Indian School of Political Economy, 'Arthabodh', 968/21-22, Senapati Bapat Road, Pune 411 016

I, P.S. Palande, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Date: October 1, 1991

P.S. Palande
Signature of publisher