

# Productivity & Structural Adjustment

A. Vaidyanathan

*A series of structural reforms has been initiated by the Government last year with a view to creating incentives as well as opportunities for improvement in productivity. The author analyses the strong productivity aspect inherent in the macro-economic policy reform currently under way and concludes that liberalisation, reform of the public sector undertakings, democratic decentralization and other basic institutional changes will create an environment conducive for productivity enhancement.*

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The past year has witnessed the beginnings of a major change in the economic policies of the Government of India. For nearly a decade, the country's fiscal situation and balance of payments had shown a progressive and marked deterioration. That corrective action was needed to check this trend and bring the economy back to a more healthy dynamism has been obvious for some time. But it took the external payments crisis precipitated in the wake of the Gulf war for the government to confront the task of bringing the fiscal and BOP deficits under control. On the fiscal side, we have seen the centre trying to cut expenditures on subsidies (food, fertilisers and exports), keeping a tight rein on the quantum of budgetary support for plan programmes and slowing down the increase in overall plan expenditures. On the foreign exchange side, there has been rupee devaluation, and a severe squeeze on imports (essentially through tightening credit) and a dual exchange rate regime with the value of the rupee in the free market being allowed to find its level depending on supply and demand. The expectation is that cutting the fiscal deficit would contain and eventually reduce domestic inflationary pressures, stimulate faster growth of exports and contain import growth within manageable limits.

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There is ofcourse much more to the reform than this: It also seeks to 'liberalise' the economy by dismantling government controls on private sector investment, production, imports of inputs, capital equipment and know-how; limiting the extent of budget support which public enterprises can expect and progressively trimming the scope of public enterprises activity itself. Restrictions and licensing requirements on import of inputs, capital and know-how have been substantially eliminated. And government has made known its intention to reduce, over a

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period of time, tariff levels and rationalise their structure. The government is also trying to evolve ways in which employers can have greater freedom to hire, fire and redeploy their labour force. All these steps are expected to substantially inject efficiency into the economy.

As a result of these measures, enterprises are expected to be under greater pressure to use their resources more productively, cut costs and improve product quality in order to survive internal and external competition. At the same time, liberalisation provides them larger space and freedom to exploit opportunities to raise efficiency: entrepreneurs can upgrade technology, undertake such fresh investment as may be needed to raise productivity and adjust product mix in the light of market conditions without any clearance from government. By redressing the imbalance in the relative rates of return to exports and import substitution, it is also expected that enterprises will have an incentive to produce and export commodities and services in which India has a comparative advantage. Specialisation based on comparative advantage is expected to improve the overall efficiency of resource use. Altogether, these are expected to result in a substantial improvement in the efficiency with which available resources are used and therefore in the rate of growth of income and employment. There is thus a strong productivity aspect to the macro-economic policy reform currently under way.

### Grounds for Skepticism

How fast these expected gains will be realised; and whether the magnitude of impact on the economy's performance in terms of growth in incomes and employment will be as large as is assumed by the proponents of the reform are contentious issues. There are several grounds for skepticism :

1. Whether the projected acceleration in the export growth following devaluation will come about as quickly as assumed especially in the context of the continued recession in the developed countries.
2. If the projected export growth does not materialise as rapidly and in as large a measure as assumed,

the availability and costs of imports and, therefore, the gains from liberalisation will be adversely affected.

3. Foreign private investment may not materialise on the scale expected. Moreover, foreign investors seem much more interested in the mass consumer market which India offers and in shifting "polluting" processes/industries rather than in intermediate and capital goods, or infrastructure which are far more important for upgrading the technological level and capability of the Indian economy.
4. In the long run, free import of know-how and accepting restrictions being proposed by the developed world relating to intellectual property rights are not in the interests of the country: more so because there is no evidence of a clear strategy to promote indigenous innovation.
5. Private enterprise, accustomed for so long to strategic manipulation of state policy, will take time to readjust its reflexes to functioning in a free market environment. To this extent, the gains from liberalisation will be slower than assumed.
6. While liberalisation may induce greater efficiency in organised private industry and services, its effects on the unorganised sector are not being anticipated and prepared for.

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7. Reducing fiscal deficit by squeezing public sector plan expenditures without a credible programme for raising the efficiency of public sector operation will sooner or later constrain overall growth via shortage of power, transport and other infrastructure.
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While these points are being debated, the inadequacies of the present package of reforms to raise the productivity of public sector generally and public enterprises in

particular as well as accelerating agricultural growth—both of which have a crucial bearing on the performance of the economy in practically every dimension—merit more discussion than they have attracted.

### Scope for Improvement

That there is much scope for improvement of efficiency in all facets of the public sector operation is obvious enough. Many government departments are over-staffed; there is much avoidable waste in several programmes, projects take too long to commission; and operational efficiency (in terms of capacity use and unit costs) is often below reasonable levels. But liberalisation and market pressures by themselves will not really make much of a difference to the efficiency of government per se (whose operations are by their nature outside the framework of markets) or of public enterprises (because they are not primarily oriented to or judged by the profits they make).

Public enterprises are expected to make reasonable profits and can, in principle, be subject to market discipline. But in reality they have little autonomy to devise production mix, pricing, investment or personnel policy. They are also expected to fulfill a number of "social obligations", the cost of which is seldom explicitly recognised, not to speak of being reimbursed. Nor do they get penalised if they do not earn sufficient profits. In fact, enterprises get loans to cover current losses and accumulated losses are eventually written off in the general budget. Investments are largely financed by loans guaranteed by the state and public enterprises do not have to face a strict budget constraint; fresh investments by enterprises are not impeded even if they do not generate any surpluses of their own.

In an attempt to correct this situation, the central government has sought to harden the "budget constraint" on PSUs by progressively reducing the level of budget support for their plans, and requiring them to mobilise the resources needed for fresh investment from their own surpluses or by borrowing directly from the market. The assumption is that the ability of a PSU to borrow in the market being dependant on its performance and financial health, this change will put pressure on them to manage their affairs better.

But this cannot go far unless the enterprises have a reasonable degree of freedom in decisions relating to current operations (production, pricing, procurement and marketing), hiring and firing of personnel and investments. There has been very little change in these respects; nor even a serious effort to address the issues. Fear of

retrenchment of workers is part of the reason. Golden handshakes financed from the national renewal fund will help. But given the magnitude of the problem and the (understandable) resistance from unions, this approach will not be sufficient. In any case, improvements in productivity cannot be achieved without active cooperation of labour which calls for a far more positive approach in convincing unions about the compulsions for rationalisation (even closure in some cases), exploring with them various options (including incentives such as linking remuneration to attainment of specific performance goals regarding capacity utilisation, material/energy use norms per unit of output, collection of dues); and working out arrangements which meet both parties' interests to the maximum extent possible.

Far more important is the reluctance of the executive arm of government to give up its detailed control on the PSUs (and the attendant opportunities for political patronage, and more) in favour of genuine autonomy with enterprise managements being free to run their affairs and being judged by overall results in relation to goals mutually agreed upon.

In order to increase the pressure on PSUs, besides hardening the level and terms of budget support to their finance and giving them greater autonomy, any proposal for increasing prices should be subject to review by an independent, expert body like BICP. This review, in which the concerned user groups should be given an opportunity to be heard, must examine the operational efficiency of the enterprise/industry in relation to standards which can reasonably be expected of them and relate approval of prices (or changes in them) to specified level of operational efficiency (or improvements therein).

### Social Obligations

On the government's side, the social obligations which PSUs or public sector industry are expected to fulfill must be made explicit; the costs of fulfilling these obligations

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should be computed and shown separately in the account of the enterprise; and these costs treated as a charge on general revenues. Progressively, the government should reimburse enterprises such costs from the general budget.

Agriculture (including irrigation), and rural development and social services absorb a substantial part of the government's resources. Most of the activities currently being done by the state cannot be passed on to the private sector; nor is it desirable to do so. At the same time, there is much room for improvement in the effectiveness of public expenditure in these areas.

In some cases (eg. major and medium irrigation projects) it calls for enforcing a tighter discipline on project evaluation and implementation. In some others (eg. rural development, minor irrigation works, soil conservation), it is a matter of eliminating duplication: in yet others (eg. watershed development, health, nutrition and family welfare), it is a matter of integrating related programmes/activities functionally and in space. Better targeting of antipoverty programmes, and reducing leakages would greatly improve the efficacy of IRDP and the various employment programmes.

At the more general level, stricter scrutiny and monitoring of large government projects, curbing the tendency to spread resources thinly in too many projects, and greater transparency regarding the criteria for taking up large projects, procedures for independent evaluation of the viability of projects and insistence of complete audit of all major projects will help. And the devolution of resources and responsibilities for local development works (which presently constitute perhaps one fifth to one fourth of total public sector plan outlays) to democratically constituted Panchayat Raj institutions would facilitate better integration of programme, bring about a closer correspondence between programme content and local needs/possibilities and achieve a higher level of accountability. In sum, reform of PSUs, decentralisation and the reform within the government are as important to raising productivity of the economy as liberalisation. But these involve a drastic change in the way the government and its enterprises are organised and function as well as in the relations between

government and PSUs. That such reforms are not on the active agenda is one of the reasons for skepticism of the magnitude of (sustainable) impact of liberalisation per se.

### **Specialised Consultancy Organisations**

Liberalisation, reform of the public sector undertakings, democratic decentralisation and other basic institutional changes will create an environment more favourable to productivity improvement. But this does not obviate the necessity to work out detailed programmes, strategies and supporting policies to realise potentials for such improvement in specific sectors and enterprises. Many of these reforms—eg. changes in lay-out, processes and equipment, production design and mix, better use of materials, labour deployment, inventory management, subcontracting and several other elements which contribute to greater "efficiency" will of course be done by individual enterprises with the help of professional consultants. The promotion of specialised consultancy organisations capable of providing expert advice on these matters—and there is by all account a great dearth of such expertise in relation to the magnitude of the problem facing Indian industry—is one of the ways in which the government and more importantly, organisations like NPC can help the process.

Besides the conventional concerns for increasing the productivity of labour and capital, there is need, and considerable scope, for economizing on the use of materials especially those which are likely to be in short supply and which are intensive in the use of scarce resources like foreign exchange and capital. Energy is an outstanding example: Generation and distribution of electricity are highly capital intensive: but apart from long gestation lags, the utilisation of capacity (PLF) is unreasonably low even as the losses in transmission and distribution are high. A substantial and growing part of the country's energy needs are met by petroleum. About 40 per cent of the oil and product requirements are met from imports; petroleum demand is growing by 9 per cent every year; domestic

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endowment of oil deposits is limited, with output expected to peak at around 50-60 million tonnes a year in another 15 years or so. At this level of extraction, reserves would last only another 15-20 years.

## Energy Saving

Under these circumstances, improving the efficiency of SEBs, and reducing the growth in demand for petroleum-based energy could make for substantial saving in both fresh investments and import demand. This calls for measures in several directions:

- (1) Better management of generating plants to get more energy output per unit of installed capacity and saving on additional governing capacity by flattening load curves.
- (2) Encouraging the substitution of import-intensive petroleum, or products based on oil (like fertilisers or road transport) which are intensive in the use of petroleum with those based on more abundant indigenous energy sources (manures, coal, railways).
- (3) Promoting more effective use of conventional energy sources and encouraging new technologies for renewable energy.
- (4) Adopting energy-saving technology to reduce the energy input (especially commercial energy input) per unit of output in end uses.

Enough is known to assert that the potential for saving energy generally, and more particularly scarce, strategically vulnerable sources like petroleum, is very considerable; Amulya Reddy has shown that with conservationist strategy, the requirements of additional electricity generating capacity during the decade of the 1990s could be half or less of what would be needed if it is "business as usual". 25-30 per cent saving in electricity is possible in pumping water if better-designed foot valves and more efficient pumps were introduced along with plastic intake pipes to reduce friction losses; a substantial saving of electricity in industrial use is possible by introducing better, more

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efficient motors; and generating capacity required per unit of electricity consumption can be substantially reduced by better load management. Long distance freight by trucks takes nine to ten times energy per tonne km used by railways; in urban areas, mass transport systems are far more energy-efficient than private automobiles and two or three wheelers; the consumption of petroleum feed stock per unit of fertilisers in Indian plants is much higher than elsewhere; and fertiliser use efficiency in agriculture leaves much scope for improvement.

But these potentials will not be realised unless there is concerted action on a wide front: It is of course necessary to raise the level of public awareness about the need for changing the pattern of energy use, and to disseminate information relevant to better energy management in specific activities. But it is also important to create an economic environment (through policies stating the rela-

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tive costs of various energy sources and energy-technologies) which induce users (producers as well as final consumers) to switch to a more desirable pattern of energy use and to promote conservation. Measures are needed to facilitate access to energy-saving technologies already available in the world and promote long term investments for generating specific technologies which the use of the relatively abundant indigenous sources economically more attractive.

## Sectoral Interdependence

The speed with which these policies work in one sector is often determined by what happens in other sectors: For instance, unless the efficiency of railways in handling freight (in terms of reducing time taken to load, transport and deliver consignments, and reducing the losses in transit) is improved along with pricing policies which better reflect the relative costs of different transport modes, the switch from road transport to railways may not take place at the pace desired. It is no use expecting much by way of saving in fertilisers, if the research and extension services do not generate and propagate better techniques of fertiliser application and/or more economical ways of collecting and processing animal and human wastes for providing energy and plant nutrients.

In the latter case, the solution is not merely technological but institutional. Technological improvements may cut the costs of biogas conversion; so perhaps would an increase in the scale of the unit. But in the Indian context, large units cannot be operated by the individual farmer on any extensive scale. Some way will have to be found to pool the wastes produced by a number of households, and perhaps the community as a whole, and then distribute the output of gas and manure if the economies of scale are to be realised. One can think of getting numerous, individually small producers/users of a resource (like cowdung) to work in a framework of cooperative utilisation with rules for allocation of costs and benefits which are fair and enforced in a fair manner. Or alternatively, one can conceive of a private enterprise motivated by profit doing the operation in a market type arrangement. This aspect of the problem is clearly a question of organisation: we need to understand the reasons why apparently sensible arrangements

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do not get established and function on a sustained basis with a view to working out what might be done to promote them.

In sum, improvements in efficiency of resource use generally, and of capital and input intensive products in particular, are crucial to the success of the reforms which have been initiated in the last year or so. While the reforms themselves are expected to create incentives as well as opportunities for productivity improvement, concrete steps needed to realise them in particular enterprises and sectors call for a great deal of specialised know-how and skills in applying them to specific situations. The fostering of expert organisations to perform this function on the required scale is a task for government and organisations like the National Productivity Council. But there are situations in which technology-based approaches alone will not suffice and a coordinated, forward-looking strategy covering all major sources of supply and uses will be essential to achieve significant results. This is particularly true of energy transport and also water. In these cases, desirable technological changes will not go far without significant reform in the institutions for managing production and use of resources. The productivity movement must therefore be concerned with and be in a position to contribute to the solution of these larger problems, even as it strengthens capability for dealing with specific situations in enterprises.

## IBM PIONEERS THE DESKLESS OFFICE

IBM Employees are being asked to work without a desk which they can call their own.

Under the company's 'office of the future' concept, desks are pooled among sales staff and other employees who spend much of their time away from the workplace.

By using mobile telephones and laptop computer, staff can work anywhere in the country, including at home, and save on the amount of furniture required at the office. The company's new north-east regional headquarters, opened in Newcastle last month, is the first UK building to fully implement the concept, known as 'Smart', standing for space, morale and remote technology.

The office has about 50 desks which are shared between 100 staff who work in sales, client support, servicing and engineering.

The concept, which encourages staff to reduce or eliminate 'personal territory', was developed at IBM's London and Glasgow offices.

"Rather than have a desk dedicated to one employee, there are a number of desks available for whoever needs to be in the building at the time," an IBM spokeswoman said.

The company hopes to extend its 'office of the future' to posts in other locations.

Source: Personnel PLUS June 1992

# Structural Adjustment & Productivity Growth in India

Isher Judge Ahluwalia

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*Ensuring productive use of the invested resources never really formed part of the explicit policy agenda in India until the eighties. Productivity considerations were typically subsumed under the assumptions of specific capital output ratios. The economic structure that evolved paid little heed to cost and quality considerations and became increasingly uncompetitive in the international markets. This paper explains the rationale for structural adjustment and its relationship with productivity performance.*

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Indian planning and policy has been dominated by the concern for raising the levels of saving and investment in the economy. By contrast, ensuring productive use of the invested resources never really formed part of the explicit policy agenda until the eighties. Productivity considerations were typically subsumed under the assumptions of specific capital - output ratios. No mechanisms of planning and policy were spelt out to ensure that these targets were met. It is no surprise then that the gains of capital accumulation in Indian planning were eaten away by the losses on productivity front.

As efforts were made to create capacities in "socially desirable" directions in both the public sector and the private sector, the evolution of the industrial and trade policy regime was characterised by policy instruments which relied heavily on physical controls and ignored the need for foreign as well as domestic competition. The economic structure that evolved paid little heed to cost and quality considerations and became increasingly uncompetitive in the international markets. This paper spells out the rationale for structural adjustment and its relationship to productivity performance. Our analysis shows that even the slow process of structural adjustment that was attempted in the eighties has had a significant impact on productivity growth in the industrial sector. The issue has acquired added importance because of the fact that structural adjustment forms one of the two main pillars of policy reforms that government of India has embarked upon in the last one year, the other one being fiscal adjustment or stabilisation.

## Major Elements of the Policy Regime

The development strategy for India was motivated by a vision in which the role of the state was not merely to "correct" market imperfections but more broadly to steer the course and pattern of development. The industrial strategy laid central emphasis on the development of heavy industries under the stewardship of the public

sector. The expectation was that the public sector would expand through augmenting the internally generated surpluses and provide resources for further development in new areas. Investment licensing (under Industries Development and Regulation Act of 1951) was the principal instrument for channelling investments in the industrial sector. Other major instruments were price and distribution controls, reservations in production for the small scale sector, Monopolies and Restrictive Trade Practices Act of 1970 and Foreign Exchange Regulation Act of 1973. If there were multiple barriers to entry and expansion, the exit routes were also blocked by labour legislation which was ostensibly designed to protect the interests of those employed in the organised sector.

There is no doubt that substantial investments were made both in the public sector and the private sector to create a diversified industrial base. But besides being highly discretionary, complex and unpredictable, the regulatory industrial policy regime suffered from a built-in bias in placing little premium on efficiency and cost reduction and much more on how "to manoeuvre" the system so as to make short-term gains. Very often the physical instruments of control drove investments underground so that the growth of "parallel" economy was a direct consequence of the overregulated and unadministerable policy regime.

As for the public sector, its coverage overextended from the original concept of "core", "strategic", "basic" and "capital goods" industries to miscellaneous sick non-viable private units which were nationalised owing to political compulsions, while the infrastructure sectors were neglected.<sup>1</sup> To make matters worse, the politico-economic and bureaucratic framework provided little autonomy in the functioning of the public sector. The result was that far from helping "socialise profits", the public sector, with its mounting losses and low returns on investments, became a liability for the budget.

As regards the import-substitution-orientation of the trade regime, this was derived from the objective of self-reliance under the assumption of export pessimism. The latter dominated the thinking and strategies of many developing economies in the post-Second-World-War period. In the event, world trade grew by 6 per cent per annum during the decade 1953-1963 and by almost 9 per cent per annum in the subsequent decade. While many developing economies shifted their strategies to diversify and share in the expansion of world trade, India persisted

with export pessimism and hence in import-substitution.

Even while planning with an inward orientation, Indian policy makers went beyond the call of the infant industry argument for protection. The refusal to face up to the question of how much protection and for how long has meant that Indian industry has functioned within a policy regime of quantitative controls on imports which put no limits on the extent of economic inefficiency to be tolerated in the process of import substitution.<sup>2</sup> The tariff regime which supplemented the import licensing regime was characterised by high and differentiated tariff rates across industries. Analyses suggest that not only was the effective protection high and varied, but in some cases it was negative as well.

Since inefficiency in the import-substituting activities could be passed on in the form of higher domestic prices without the fear of competition from imports, this raised the general cost structure of industry, and exports suffered from negative effective protection. The Indian policy response to the anti-export bias generated by the import-substituting regime was to provide numerous incentive schemes for exports (e.g., duty-free imports, duty-drawbacks and cash compensation) to offset the bias at least partially. Export subsidies as per cent of the value of exports increased from a little less than 13 per cent in 1970-71 to 22 per cent in 1979-80. However, these incentives, while imposing a growing burden on the budget, did not fully offset the disadvantages of the high cost industrial structure. At most they removed the "negative protection" faced by exports. As long as import substitutes benefited from positive effective protection, exports still remained less attractive for investors than import substitutes.

The interaction of the regulatory industrial policy regime with the highly restrictive trade policy regime yielded an industrial structure which provided little flexibility to economic units to respond to changing domestic demand conditions, varying external market scenarios and other competitive pressures. It was not until the mid-seventies that serious rethinking began and it was only in the late seventies that a slow process of reorientation of the policy regime was initiated.

There was significant deregulation of domestic industrial policy beginning with the late seventies. Some important aspects of the deregulation included removing the investment licensing requirement for some industries, re-endorsing the existing unauthorised capacities of others, providing more flexibility in the use of installed capacity, decontrolling the prices of cement and later

\* For a detailed account of how the infrastructure sectors were neglected for a good fifteen years after the resource crunch of the mid-sixties, see Ahluwalia (1985).

\* For an analysis of the foreign trade regime as it evolved upto the late seventies, see Bhagwati and Srinivasan (1978).



aluminium, and announcing industry-specific policy packages allowing for a larger play of market forces for certain industries, e.g., cement. More generally, there was recognition of the need to move away from physical controls to a system of financial incentives and disincentives in channelling investments. Also, to counter a secular trend of excessive fragmentation of capacities because of the incentives for regional dispersal, minimum economic capacities were specified in certain industries. Larger industrial houses were also allowed a greater scope for participating in the growth process. Deregulation of industrial policy was also associated with more emphasis on the development of infrastructure sectors, e.g., energy and transport.

In view of the widespread sickness in the industrial sector, the Board for Industrial and Financial Reconstruction (BIFR) was set up in 1987 following the enactment of the Sick Industrial Companies Act (SICA) in 1986 to help distinguish the non-viable sick enterprises from the revivable ones and provide some effective solutions for the exit of the non-viable units. The BIFR assesses the potential viability of sick units, coordinates the formulation of rehabilitation schemes and recommends a course of action for sick companies. The fact that the BIFR comes into the picture at a fairly advanced stage of sickness and that its powers are not mandatory have meant that it has not been effective in facilitating the exit of the nonviable sick units within the existing institutional constraints.

An area which was conspicuous by the absence of reforms even in the eighties was the financial sector. As the fiscal deficit of the government mounted, so did the statutory liquidity requirement for the banks. This was only one factor constraining the economic viability of banks. The requirement for extensive lending to the priority sector at subsidised interest rates and ceilings on interest rates were additional factors. As if this was not enough, prudential norms on bank loans were grossly violated. The propensity of banks to throw good money after bad" further perpetuated industrial sickness.

In trade policy, liberalisation during the eighties was hesitant and marginal. In the first instance, the focus was on simplification of the procedures. But with growing demand for a wide variety of intermediate inputs and components from domestic industry, access to intermediate materials imports was made easier through weakening the regime of quantitative restrictions, although this was associated with imposition of higher tariff rates on imports both for protective reasons and for reasons of raising revenues. With a view to facilitating

technological upgradation particularly for certain export-oriented industries there was also some easing of administrative constraints on the imports of capital goods within the discretionary framework in the second half of the eighties. Notwithstanding all the changes in the eighties, however, the import licensing regime remained highly complex. The average nominal tariff on the import of manufactured goods into India was also still as high as 117 per cent in 1989-90; among the highest in the world. In particular, the very high incidence of tariff on capital goods was truly exceptional and pushed the cost structure of Indian industry way out of line with that of its competitors in the world.

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At a time when attention of the policy makers was focussed on the deregulation of the industrial policy regime in the eighties, the fiscal policies were assuming an increasingly expansionary stance based largely on increased borrowings from the domestic as well as the foreign capital markets. Gross fiscal deficit of the central government increased from 6.4 per cent of GDP in 1980-81 to 8.2 per cent in 1990-91. If fiscal expansionism had been used to increase investments in the public sector which generated returns to service the debt and at the same time generated more economic and social development in the economy, it would not be a cause for so much worry. The disturbing development was that the government was borrowing in order to consume, and more and more so. From an average surplus of 1.8 per cent of GDP in the second half of the seventies, the revenue account of the central government turned into a deficit in 1980-81 and showed a consistent deterioration from 1981-82 onwards. By 1990-91, the deficit of the central government on the revenue account was of the order of -3.3 per cent of GDP. The escalation of current expenditures was mainly on account of interest payments, defence and subsidies. The overall impact of the fiscal developments during the eighties was to generate a macro-economic environment which contained the potential of undoing the gains from the slow process of structural adjustment that was under way in the eighties and was beginning to show its effect through improved productivity performance.

## Highlights of Economic Performance

A dominant aspect of economic performance as it evolved from the inception of planning in 1950 to the end of the seventies was that while saving and investment rates increased from 10 per cent in 1950-51 to over 20 per cent in 1980-81, these were not translated into higher growth rates as losses on productivity front offset the gains of resource mobilisation. As table 1 shows, the increase in the saving and investment rates in the sixties and the seventies was associated with a slowdown in the growth of GDP from 4.1 per cent per annum in the fifties to 3.8 and 3.3 per cent per annum in the subsequent two decades, respectively. The slowdown in growth was associated with an acceleration in inflation. A prolonged phase of stagnation in industrial productivity in the Indian manufacturing sector is extensively documented at a detailed level of disaggregation in

Table 1: Macro-Economic Indicators

Selected Growth Rates (per cent per annum)							
	1950-51 to 1960-61	1960-61 to 1970-71	1970-71 to 1980-81	1980-81 to 1989-90	1989-90 to 1990-91		
<b>GDP at constant prices</b>							
Total	4.1	3.8	3.3	5.6	5.5		
Industry	6.3	5.0	4.8	7.1	7.4		
Agriculture	3.0	1.8	2.1	3.2	4.2		
<b>Prices</b>							
GDP Deflator	1.4	7.0	8.4	7.8	11.4		
Wholesale Prices	1.7	7.1	9.1	6.6	10.2		
Consumer Prices	4.5*	7.2	7.8	8.5	11.6		
Selected Ratios (per cent of GDP)							
Year	Saving	Investment	Trade in goods and services		Current Account BOP	Fiscal Deficit**	
			Exports	Imports		Current	Overall
1950-51	10.4	10.2	—	—	--	—	—
1960-61	12.7	15.7	4.8	7.6	-2.4	0.5	n.a.
1970-71	15.7	16.6	4.1	4.2	-1.0	0.3	n.a.
1980-81	21.2	22.7	6.5	10.0	-1.2	0.1	-9.4
1981-82	20.9	22.6	6.4	9.4	-1.5	0.6	-8.1
1982-83	19.1	20.6	6.7	9.2	-1.3	-0.2	-8.8
1983-84	18.8	20.0	6.5	8.6	-1.1	-1.1	-9.4
1984-85	18.2	19.6	6.9	9.1	-1.2	-1.9	-11.1
1985-86	19.7	22.1	6.0	8.9	-2.3	-1.9	-11.3
1986-87	18.4	20.6	6.0	8.5	-2.0	-2.6	-12.2
1987-88	20.3	22.4	6.3	8.6	-1.9	-3.0	-11.4
1988-89	21.1	23.9	6.6	9.6	-2.6	-3.1	-10.8
1989-90	21.7	24.1	7.8	10.6	-2.3	-3.4	-11.3

Source: Economic Survey, White Paper (National Accounts) and Indian Economic Statistics.

\* For 1954-55 to 1960-61

\*\* For Centre, States and Union Territories taken together

Ahluwalia (1991). Table 2 presents an overview of the productivity trends. Of particular significance is the concept of total factor productivity growth which identifies the contribution to an increase in output of influences other than increases in the factor inputs. It includes the effect not only of technical progress but also better

Table 2: Trends in Productivity and Growth: Manufacturing

	(per cent per annum)			
	1959-60 to 1979-80	1959-60 to 1965-66	1965-66 to 1979-80	1980-81 to 1988-89
Value added	5.5	9.1	5.0	7.0
Capital stock	8.6	13.4	7.0	7.5
Employment	3.3	4.0	3.5	-0.5
Capital-labour ratio	5.1	9.0	3.3	8.0
Total Factor Productivity	-0.5	0.2	-0.3	2.8
Labour Productivity	2.1	4.9	1.4	7.5
Capital Productivity	-2.8	-3.8	-1.9	-0.5

source: Basic data from Annual Survey of Industries.

utilisation of capacities, learning by doing, improved skills of labour, etc. During the two decades of the sixties and the seventies total factor productivity in the manufacturing sector declined at the rate of 0.5 per cent per annum.

It is worth noting that while the slowdown in industrial growth occurred after the mid-sixties, total factor productivity growth had been negligible even in the first half of the sixties. The rapid growth then was largely derived from increases in factor inputs (column 2 of table 2). The very rapid growth in capital-labour ratio during this period was accompanied by a much slower increase in labour productivity. The period from the mid-sixties to the end of the seventies experienced an even slower increase in labour productivity, while total factor productivity declined. This was clearly a period of industrial drift. There is now definitive evidence to indicate that the decade of the eighties was characterised by distinctly better productivity and growth performance in the industrial sector. Indeed, the long-term decline in total factor productivity (TFP) was reversed significantly and the growth in TFP during the eighties was at the rate of 2.8 per cent per annum (table 2). It appears that the reorientation of the industrial policy framework which allowed for better utilisation of existing capacities and which emphasised the importance of infrastructure was having significant effect on productivity. Employment during this period declined as industry adjusted to the overmaning of the previous decade and a half and increasing use was made

of contract labour to bypass the labour laws.<sup>3</sup> Even for the economy as a whole significant acceleration in GDP growth in the eighties to 5.6 per cent per annum was achieved with stagnant savings rates and only small increases in the investment rate (table 1). The growth revival of the eighties was also associated with some slowing down of inflation.

Reference was made earlier to the underlying premise of export pessimism which pervaded Indian policy and planning. The persistence with import-substitution policies meant that for India export pessimism became a self-fulfilling prophecy. India's share in world exports declined steadily from over 2 per cent in 1950-51 to 0.5 per cent in 1989-90. The high cost industrial structure made exports increasingly uncompetitive in the world markets. Even when there was a turnaround in productivity and growth in the eighties, this was not associated with better export performance in the first instance. The appreciation of the real effective exchange rate of the Indian rupee from 1979 to 1983 seems to have had an adverse effect on the competitiveness of Indian exports.<sup>4</sup> The slowdown in the growth of world markets was also a factor. Exports other than petroleum in US dollars grew at only 1.1 per cent per annum in the first half of the eighties, but their growth accelerated to almost 17 per cent per annum in the second half of the eighties (table 3). By 1990-91, though, export growth seemed to be losing the momentum.

A significant development during the eighties was a sharp increase in the share of manufactured goods exports in the total from 55 per cent in 1980-81 to 75 per cent in 1989-90. Exports which recorded relatively fast growth in the first half of the eighties were the newer non-traditional items such as gems and jewellery, ready-made garments and leather, with simpler technologies and less focus from the policy makers. By contrast, engineering goods which had continually received government

attention as a thrust sector for exports did poorly. The engineering goods with their forward and backward linkages which were structurally rooted in the regulatory policy regime became a victim of the cost push effects of the regime. As the appreciation of the real effective exchange rate was reversed in the second half of the eighties and as the import regime was made easier for exports, the effect could be seen in the acceleration in the export growth of engineering goods and chemicals in the second half of the eighties.

There have been assertions that trade policy liberalisation in the eighties has opened the floodgates to imports in the economy. Empirical evidence shows this to be far from true. Even excluding petroleum, imports in US dollars slowed down from 15.4 per cent per annum in the seventies to 10.4 per cent per annum in the eighties (table 3). The thrust on modernisation and consequent

Table 3: Growth of Exports and Imports

	Export's (per cent per annum)					
	60-61 to 69-70	70-71 to 79-80	80-81 to 89-90	89-90 to 90-91	80-81 to 85-86	85-86 to 89-90
Agriculture & allied products	5.5	15.5	8.7	29.5	8.6	10.9
Iron Ore	23.9	12.6	11.3	13.0	12.4	12.2
Petroleum products	13.9	7.3	26.2	28.1	127.0	4.0
Manufactured goods	10.3	17.1	19.7	14.9	11.5	34.9
Gems & jewellery	62.5	38.5	25.1	-0.9	18.2	39.0
Readymade garments	42.8	40.0	20.7	24.4	14.0	30.6
Engineering goods	36.3	24.1	7.9	17.9	2.7	22.5
Chemicals & allied products	17.5	24.1	25.6	18.7	18.0	45.2
Leather & leather manufacture	16.1	19.7	23.2	31.6	18.3	26.6
Jute manufactures	6.3	0.9	0.1	0.6	-1.3	2.2
Other manufactures	7.2	13.3	22.6	16.4	10.5	45.6
Other exports	12.9	14.5	-0.6	5.9	-17.5	21.2
Total exports (Rs)	10.2	19.3	14.9	17.6	11.3	26.5
(US \$)	3.2	18.1	7.2	9.1	3.3	15.9
(Volume index)	3.6	7.3	3.6	-	1.1	11.5
Non-Petroleum exports(US \$)	3.2	18.1	7.7	8.8	1.1	16.9
<b>Imports</b>						
	60-61 to 69-70	70-71 to 79-80	80-81 to 89-90	89-90 to 90-91	80-81 to 85-86	85-86 to 89-90
Petroleum Oil & Lubricants	3.8	41.0	-1.8	72.4	-0.8	9.3
Fertilizers	33.7	17.8	12.9	-0.6	23.8	0.5
Cereal & Cereal preparation	13.4	-2.8	5.0	51.8	-3.4	56.0
Edible Oils	18.9	51.5	-3.4	54.5	6.9	-21.3
Capital goods	4.5	16.5	19.7	18.5	17.5	16.4
Other imports	4.8	17.4	16.9	9.4	13.2	23.9
Total imports (Rs)	7.2	21.6	11.2	21.9	9.1	16.4
(US \$)	0.5	19.3	5.4	9.0	1.4	10.5
(Volume index)	1.9	4.5	5.9	—	4.8	6.2
Non-Petroleum imports (US \$)	0.7	15.4	10.4	-0.7	6.4	12.5

Source: DGCI, Ministry of Commerce

- Whether we take the growth in value added or in capital stock, there is clear evidence of a major and significant slowdown from the first half of the sixties to the period covering the subsequent decade and a half. The slowdown in employment growth, on the other hand, was marginal. It is possible to argue that the overhang of employment that was created during the latter period made it possible to achieve acceleration in the growth of value added with little if any increase in employment.
- See Virmani (1991) and Rangarajan (1992) for the role of the exchange rate in export performance for India in the eighties.

loosening of the import of capital goods in the decade of the eighties was reflected in an increase in capital goods imports as per cent of total investment from 6.2 in 1980-81 to 7.4 in 1988-89. By contrast, import of intermediate goods as per cent of the value of output in manufacturing declined from 8.1 in 1980-81 to 7.5 in 1988-89. While the import intensity in the economy did not increase significantly in the eighties, the fact remains that imports into India are either crucial for the functioning of the economy be it petroleum, fertilisers and intermediate imports for production and capital goods for technological upgradation or critical for meeting India's basic consumption needs, e.g., foodgrains, edible oils, sugar, pulses, etc. There is no further scope for pruning imports. On the contrary, there is an unambiguous need for faster growth of exports if India is to become self-reliant in meeting its import needs. This in turn requires a dismantling of the import substitution regime. Exporting within the shackles of this regime is not only an expensive proposition for the budget, but it will not work. There is need for structural adjustment which will make Indian exports more competitive and Indian economy truly self-reliant.

**There is an unambiguous need for faster growth of exports if India is to become self-reliant in meeting its import needs.**

The new decade should have seen the beginning of corrective action on the fiscal front with a view to consolidating the visible gains on the production front. This was not to be, at least for some time. A grand confusion on the major aspects of economic policy in 1990-91 was combined with populist rhetoric and action on the part of the government which pushed the economy towards fiscal chaos. A measure of the severe fiscal deterioration is provided by the sharp increase in the revenue deficit of the central government in a single year from Rs. 11,900 crores in 1989-90 to Rs. 18,562 crores in 1990-91. The Gulf War of 1990 only made a bad enough situation phenomenally worse. More than the direct effect of the Gulf War on the current account was the effect on the balance of payments of an increasing erosion of confidence in the government's ability to manage the economy. The drying up of the market for external commercial loans in 1990-91, a series of step reductions during the period from August 1990 to May 1991 in the international credit rating of India which had an impec-

cable record of credit-worthiness until then, a flight of Non-Resident Indian (NRI) deposits which began in October 1990 and continued much till the end of 1991, were all symptoms of a growing erosion of confidence. Notwithstanding the import compression measures by the Reserve Bank of India and the large drawings from the International Monetary Fund amounting to US\$2.4 billion in July 1990 and January 1991, the year 1990-91 saw a sharp reduction in the foreign exchange reserves. As of July 1991, the level of reserves at Rs 2,600 crores was barely sufficient to finance imports for a mere fortnight. As inflation accelerated to 14 per cent and foreign exchange reserves dwindled, the nation was on the brink of international default.

### **Structural Adjustment Policies**

Fiscal adjustment was begun with a view to bringing about macro-economic stabilisation. At the same time, steps were taken in the direction of structural reform of the industrial and trade policy framework to shake Indian industry out of its lethargy and prepare it for international competitiveness. It is important to recognise at the outset that the gains from structural adjustment may dissipate if macro-economic stabilisation is not adhered to. In this context the government of India's decision to bring down the ratio of fiscal deficit to GDP from 8.5 per cent in two steps to 5 per cent is a welcome effort towards macro-economic stabilisation. The medium-term perspective on the strategy of current economic reforms, however, can only be provided by the policies for structural adjustment which focus on reforms in the industrial and trade policy regime. These are designed to improve the efficiency, productivity and international competitiveness of Indian industry. While the costs of adjustment are experienced immediately, the benefits accrue in course of time. The performance record of the eighties on productivity front provides more confidence in the need for reorienting these policies.

In industrial policy, a major aspect of reform has centred on loosening the barriers to entry for firms so as to encourage competition in the industrial sector. Licensing requirement for industrial investment has been abolished for all but 18 industries, while the area of industrial activity "reserved" for the public sector has also been considerably reduced. In particular, power generation and distribution and air transport are now opened up for private investment. The MRTP Act has also been amended to eliminate the need for prior approval for capacity expansion or diversification on the part of large industrial houses.

An important initiative of the new industrial policy is a new approach towards foreign investment. Steps have been taken to facilitate the inflow of direct foreign investment both with a view to attract new technology, marketing expertise and modern managerial practices and reduce reliance on fixed-interest debt. The permissible limit of foreign equity holdings has been raised from 40 per cent earlier to 51 per cent on an automatic basis in a wide range of priority industries and higher limits are possible on a case by case basis. Procedures for foreign investment in non-priority industries have also been streamlined. Moreover, the Foreign Investment Promotion Board has been set up for purposive negotiation with the world's largest international manufacturing and marketing firms to attract foreign investment in critical areas and expedite the clearances required. The Board also considers individual cases involving applications for foreign equity participation above the 51 per cent limit.

**Recognising that the process of industrial restructuring in response to the industrial policy changes will be neither short nor smooth, the government has established a National Renewal Fund to ensure that the cost of technological change and modernisation does not fall too heavily on the workers.**

On exit policy, it was noted earlier that the BFIR has not been able to function effectively within the present institutional constraints. Recognising that the process of industrial restructuring in response to the industrial policy changes will be neither short nor smooth, the government has established a National Renewal Fund to ensure that the cost of technological change and modernisation does not fall too heavily on the workers. This Fund will provide assistance to cover the cost of retraining and redeployment of labour and also provide compensation to labour affected by industrial restructuring. It goes without saying that the process of restructuring would be relatively less difficult to manage if the overall environment is one of growth rather than stagnation.

Much more remains to be done, however, in the area of facilitating exit for non-viable sick units. The inflexibility in the mechanism for hiring and firing workers under the existing labour laws is already taking its toll on employment which has been declining in the eighties. Firms have increasingly made use of contract labour rather than payroll labour to meet their requirements. In the name

of "protecting labour" the present institutional framework is coming in the way of growing opportunities for productive employment. A constructive dialogue with the trade unions on modernising the labour laws on hiring and firing while safeguarding the interests of labour is urgently needed. Only when effective steps are taken in the direction of providing some flexibility in the hiring and firing of labour can the declining trend in employment be arrested.

**A constructive dialogue with the trade unions on modernising the labour laws on hiring and firing while safeguarding the interests of labour is urgently needed.**

To a large extent the resistance to exit has been facilitated by "twisting" the financial system to keep these enterprises afloat. The maladies of the financial system have been amply documented in the recent official report by the Narasimham Committee. A beginning has been made by lowering the statutory liquidity ratios of banks as the fiscal adjustment process is under way. The interest rates have also been partially freed both on lending and on deposits. But much more needs to be done. The more recent developments in the financial sector have highlighted the gravity of the situation. Reforms in the financial sector will go a long way in cleaning up the system for financial institutions as well as arresting the trend of throwing good money after bad. Only then will it be possible to bring about effective exit of the non-viable sick units and long overdue restructuring of the industrial sector.

A second major area of policy reform is trade policy which has been designed to prepare Indian industry to accept the challenges of global integration. A beginning was made with a downward adjustment of the exchange rate of the rupee to ensure competitiveness of Indian exports without the need for large export subsidies. The budgetary subsidy on exports was replaced by a regime in which importers would subsidise exporters. This was accompanied by major changes in trade policy which strengthened incentives for exports. Encouraged by the experimentation with market forces through the Exim scrip route, the government subsequently introduced a system of partial convertibility of the rupee. Under the new system, for all foreign exchange remittances, 40 per cent is to be converted into Indian rupees at the official exchange rate and the remaining 60

per cent at a market-determined rate. The foreign exchange surrendered at the official exchange rates will be used to finance imports such as petroleum and oil products, fertilizers, defence and life saving drugs.

The new initiative has eliminated import licensing and associated bureaucratic delays and inefficiencies over a wide range of items. A large part of total imports is now automatically regulated by the available volume of foreign exchange. Scarcity of foreign exchange is reflected in a premium on it in the market which accrues to those who earn or remit foreign exchange. Undue volatility of the premium can be kept in check by interventions in the foreign exchange market by the Reserve Bank of India. The fact that the import of gold within limits has been legalised should also help divert foreign exchange away from illegal channels.

Another significant area of trade policy reform has been that of custom duty reductions. The peak level tariff inclusive of specific duties has been lowered to 110 per cent. For capital goods, the duty has been lowered from 80 to 55 per cent on project imports and general machinery. Even for other capital goods, there has been a reduction of 10 percentage points. For capital goods needed by the energy sector, the rates have been rationalised and lowered to 30 per cent. These reductions were long overdue and form part of a phased programme.

**It is only when the degree of protection is brought down to some reasonable level that exports will emerge as a genuine option to import substitution in the economy.**

An econometric analysis using cross-section data for 62 industries' long-term productivity growth (1960-1986) shows a significant negative relationship between productivity growth and the degree of import substitution (Ahluwalia, 1991). The reduction in custom duties should therefore be expected to have a favourable effect on productivity growth in the medium run. Also, as was discussed earlier, it is only when the degree of protection is brought down to some reasonable level that exports will emerge as a genuine option to import substitution in the economy.

## Conclusion

Structural adjustment policies are crucial for improving the productivity performance in the economy. In particular, the dismantling of the import-substitution

regime will impose an external audit on the domestic cost structure. But success of the structural adjustment program which by its very nature is a medium-term programme depends on three important factors :

(i) The need to ensure macro-economic stability. Inflation must not be allowed to eat into the gains that will accrue from structural reforms. The success of the fiscal adjustment programme is therefore crucial for the effectiveness of structural adjustment policies.

(ii) The provision of growing infrastructure needs. Because of the tight fiscal squeeze on government resources and compelling demands on the budget from social sectors, poverty alleviation schemes, and National Renewal Fund, effective alternative means must be found for delivering on the infrastructure front. Government of India's effort in this direction to encourage private investment in the power sector is a step in the right direction. But it needs to be supplemented by policies which would allow limited distribution in private hands, at least in the metropolitan areas, and a mutually agreed pricing policy. Similar efforts must be made in the areas of transport and telecommunication.

(iii) As the process of restructuring goes on, it is extremely important to ensure that the costs of adjustment are not borne disproportionately by the poor. Poverty alleviation schemes should be revitalised to provide special protection to the poor from the effects of adjustment. Similarly, National Renewal Fund should be strengthened to minimise the socio-economic costs of adjustment for those who are at present employed in industries which are dying but need to be trained and deployed in new and dynamic industries.

If the stability of the macro-economic environment is assured and the structural adjustment process is humane, Indian policy makers would discover in the nineties a new source of growth, i.e., productive use of invested resources.

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# Crisis & The Cure : A Critical Review of India's Macro-Economic Reforms

M.A. Oommen

*The economic crisis prevailing in India has led to the introduction of structural reforms by the Government. The author opines that India is facing only a resource-gap crisis due to the fiscal deficit, foreign exchange imbalance and saving-investment gap. The paper critically evaluates the macro-economic reforms initiated by the Government and concludes that it is a strategy of attacking the symptoms rather than curing the malaise.*

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On 24th July 1991, Finance Minister, Dr. Manmohan Singh declared that India is facing 'an acute and deep economic crisis'. (Budget Speech 1991-92). He almost repeated this in the Budget Speech of 1992-93 when he said that "we inherited an economy on the verge of a collapse". So concerned was a former economic adviser to the Government of India, that he wrote a book titled *India's Economic Crisis : The Way Ahead* (Jalan, 1991). Judged in terms of the growth performance during the 1980s at an all-time high-trend rate of growth of 5.5 percent, it is difficult to accept the contention that India has been passing through an acute economic crisis. True, there was a situation in which the Government of India found it difficult to honour her foreign debt obligations. The purpose of this paper is to examine the nature of the economic problems and to see how far the structural reforms currently being vigorously pursued are an answer to them.

The hypothesis is that the so-called economic crisis is a resource-gap crisis. Analytically the latter has three dimensions viz, fiscal imbalance, foreign exchange imbalance and saving-investment gap. All the three are inter-related. We may examine them one by one.

## Fiscal Deficit

The fiscal deficit may be defined as the sum of the amount the Central Government borrows and the overall budget deficit to meet excess expenditure over receipts during a financial year. The real villain of the piece is the deficit in the revenue account which over the years has come to be financed from funds borrowed ostensibly for productive purposes. What began as a small revenue gap in 1981-82 (0.9 percent of GDP) progressively widened and reached an all-time record in 1990-91 (3.4 percent of GDP) which in turn resulted in a fiscal deficit of nearly 8.9 percent of GDP in that year. It is this fiscal deficit which the Finance Minister seeks to reduce to 5 percent by the end of 1992-93. Whether this was prompted by IMF/World Bank (WB) conditionalities or not, the need to reduce the fiscal balance stands on unassailable grounds.

However, a question that remains to be answered is, are we attacking the symptom or the malady? The problem of growing fiscal imbalances has been the result of a distorted pattern of resource mobilisation and growing imprudent expenditure. The tax and non-tax revenues of the GOI have been inadequate to meet the maintenance needs of public administration and other non-plan requirements since 1979-80. While the tax to GDP ratio has increased from about 6.7 percent in 1950-51 to 17.7 percent in 1989-90, the share of direct taxes to GDP virtually stagnated around 2.4 percent of GDP. Clearly the main source of tax revenue has been indirect taxes which are normally regressive. There has been no honest attempt to mobilise the rich reservoir of black income and wealth which has been variously estimated to range from 21 percent to 50 percent of GDP. In a country of 850 million people and 46 million LIC policy holders, only 7 million pay income tax. A large number of traders, professionals and business people escape the tax net or attract only light incidence. To crown everything, the black-wealth holders are placated with schemes and rewards<sup>1</sup> to the chagrin and dismay of those who are honest. The frequent announcement of such schemes even without much success in the past renders the elaborate enforcement provisions in the tax laws redundant. There is no dearth of "safety nets" graciously given to the super rich comprising law breakers, smugglers and tax evaders.

Turning to the expenditure side, interest payments, subsidies and defence constitute the three major expanding items of expenditure especially during the last decade. Interest charges account for Rs. 32,000 crores in the 1992-93 budget estimate and represent an increase of Rs. 4750 crores over the revised estimates for 1991-92. The interest income accrues largely to the richer households from whom the Government has chosen to borrow rather than resorting to the 'unpleasant' alternative of taxing them. The expenditures on the so-called antipoverty programmes (this includes rural development, education, health etc.) which are now being deliberately slashed down as part of the effort at containing the fiscal imbalances have been incurred in the past by borrowing at high rates of interest and offering attractive tax shelters to the rich.

Subsidies constitute an important item that have widened the fiscal imbalances. While subsidies like those for food, fertilizers and export directly affect the size of the budgetary imbalances, there are hidden subsidies (the

1. There were five disclosure schemes in 40 years to help the black-money holders. Dr. Manmohan Singh's two budgets have four schemes: the Voluntary Disclosure Scheme, 1991, the Foreign Exchange Remittance Scheme, 1991, the India Development Bond and the Gold Bond Scheme.

**Any approach at reducing fiscal imbalances to a magic figure (e.g. 5 percent of GDP) is a purely arithmetic or technical exercise. It is attacking the symptom without examining the root causes leading to it.**

magnitude of which are nearly four times that of direct subsidies) in the pricing of public utility services like electricity, railways, road transport etc., and social services like health, education and the like which too have added to the fiscal imbalances.

The straight solution to the problem of subsidies as a threat to fiscal imbalances is to remove them. It can be legitimately argued that subsidies are irrelevant under a perfectly-competitive situation. But perfect competition exists only in economic text books. To insulate the weaker sections of society (by giving exchange entitlements to participate in the market in an unequal society) against the evils of market distortions and unequal distribution of income, subsidies may have to be provided to them. The rationale of providing essential commodities at lower prices through public distribution system rests on this consideration. Providing cheap food is 'instant socialism' as Dantwala once remarked. As an incentive mechanism, subsidies are justifiable if it helps to promote sustainable development. Therefore proper targeting is very important. A blanket cut or progressive general reduction of all subsidies do not seem to be a step in the right direction.

Defence expenditure is generally treated as a sacred cow. It is also seen as a milching cow for a few like contractors, commission agents and others. No one can gainsay the fact that an independent and expert scrutiny of defence expenditure could reduce significantly the fiscal as well as foreign exchange gap. There are also several items such as those on para-military forces, that can be pruned down through proper rationalization. The salaries and dearness allowance tied to the cost of living index form a significant item of expenditure that contributes to the widening of the fiscal imbalance. Any approach at reducing fiscal imbalances to a magic figure (e.g. 5 percent of GDP) is a purely arithmetic or technical exercise. It is attacking the symptom without examining the root causes leading to it.

### Foreign Exchange Imbalances

For many years since the inception of planning, foreign exchange imbalance has been with us. By the turn of



1991, it reached a crisis dimension of an unprecedented magnitude. On January 18, 1991, foreign exchange reserves stood at only Rs. 1,666 crores, hardly sufficient to meet the import requirements for even ten days. It is important to have a fresh look at this sudden turn of events particularly because of the phenomenal growth of FCNR deposits for some years continuously since 1985 and the high credit rating of the country before 1990 by the American credit rating agencies like Moodys and Standard and Poor. First the growing budget deficit has had its bearing on the trade deficit, though no one-to-one correspondence could be established. Second, the liberalisation policy followed during the 1980s (which cannot be seen independent of the IMF loan of 1981 for SDR 5 billion imposing conditionalities) paved the way for the import of capital and technology with a built-in bias for larger and larger raw materials and components from abroad. This is true of most of the sunrise industries like electronics. Third, the multi-lateral lending agencies like World Bank in recent times have been encouraging India to borrow more from the commercial market, with high interest rate and short maturity. The debt profile gradually got oriented towards short-term loans. As reported by Moodys, private sources accounted for 39 percent of India's total debt at the end of 1991 compared with 18 percent in 1982. Thus as the proportion of soft loans from multi-lateral sources declined, commercial loans expanded dramatically resulting in a regular outflow of foreign exchange by way of debt servicing. Fourth, the Gulf war which raised oil prices accentuated the problem as petrol and petroleum products constitute over 30 percent of the import bill of the country. It was almost at this time that internal production of petroleum levelled off. The dramatic upturn in India's oil production in the recent past and the subsequent decline in the ratio of availability to demand (while the level of self-sufficiency increased from 5 percent in 1960-61 to 70 percent in 1984-85, it declined to less than 67 percent today) may be traced to the diminishing returns from Bombay High and Assam oil fields and the almost-indifferent effort to tap the potential in the innumerable offshore and onshore blocks. Fifth, the confidence of the NRIs got eroded due to the worsening BOP situation, political insta-

**Was there not the option to reschedule the payment commitment in foreign exchange by taking the country fully into confidence?**

bility (particularly the hung parliament situation) and the upturn in the credit rating by Moodys and Standard and Poor in 1990 all of which coincided. They started withdrawing their money or failed to renew deposits. The publication of the executive summary of World Bank's Report "Strategy for Trade Reform" which inter alia recommended a 20 percent devaluation acted as a wrong signal to the NRIs. This hastened the process of capital flight.

All these factors created a foreign-exchange crisis and Government of India found it difficult to honour her foreign debt obligations. Was there not the option to reschedule the payment commitment in foreign exchange by taking the country fully into confidence? This of course would entail serious abridgement of the comforts enjoyed by the upper class. Logistically viewed, under such a situation the immediate reaction was to rush for more loans from the IMF/World Bank and take to the series of economic reforms directed by the lenders.

### **The Saving-Investment Gap**

Foreign-exchange gap is basically the result of the saving-investment gap, which as already noted is also related to the budgetary deficit. The saving-investment gap was around 2.4 percent of GDP during the 7th Plan. At the close of the seventies, India's saving rate reached an all time high record of about 25 percent of GDP. This gradually declined and reached an average of 20.3 percent during the Seventh Plan and stayed around 21.6 percent during 1988-89 through 1990-91. The main reason for this is the dissavings of the government and the poor performance of the public sector undertakings. The saving of Government sector which was 1.2 percent of GDP during the Sixth Plan, became a negative 1.58 percent during the Seventh Plan and declined further to -2.2 percent in 1990-91. The savings of public sector enterprises which was only 2.46 percent of GDP during the Sixth Plan rose to 3.9 percent during the Seventh plan and remained stagnant at that rate even in 1990-91.

At the same time, the contribution of the savings of the household sector increased from 14.28 percent during the Sixth plan to 16.08 percent during the Seventh Plan and to 17.82 percent in 1989-90. The performance of the household sector probably would have been much higher had it not been for the high consumerism that characterised the 1980s. The pattern of resource mobilisation has a built-in bias in favour of the middle and upper class who have sustained a consumerist boom.

**In practice, stabilisation and Structural adjustment programmes are treated as what we call macro-economic reform package.**

### **Macro-economic Reforms : the salient features**

For countries facing macro-economic imbalances particularly BOP and foreign-debt crisis, IMF/World Bank combine offers certain standard reform packages which have come to be termed as Stabilisation and Structural Adjustment Programmes (SAPS). These have now become part of the conditionalities of the IMF loans given under the Structural and Enhanced Structural Adjustment Facilities.<sup>2</sup> The World Bank also has structural adjustment loans besides project loans. It is possible to discern three plans underlying the macro-economic reforms: globalisation, privatisation and liberalisation. Devaluation of the currency, curtailment of government expenditure, elimination of subsidies and price controls etc., are generally mentioned as stabilisation programmes rather than as structural adjustment programmes. In practice, stabilisation and structural adjustment programmes are treated as what we call macro-economic reform package. The underlying philosophy of all these reforms may be summed up in the expression 'market friendly approach' in which the Government's role is reduced to the minimum.

Globalisation implies gradual abolition of import quotas, important controls, import licensing and reduction of import tariffs (a uniform rate of anything between 20 and 40 percent, percentage above 20 being a concession on revenue consideration), besides free currency convertibility, tax homogeneity and the like. What is envisaged basically is an export-led growth strategy in a relatively 'free' world (no conditionalities apply to countries like USA or Japan which do not borrow from IMF/WB.) On the assumption that competitive market conditions would ensure efficiency, it is required that public sector enterprises be privatised and basic investment and production decision be left to market forces. Decontrol, delicensing and all process of liberalisation follow almost as a natural corollary to this approach.

2. Besides the Reserve and credit trenches related to the quotas of member countries IMF has created five facilities under which loans are given under strict conditionalities. Standard Adjustment Facility and Enhanced Structural Adjustment Facility (ESAF) form part of these facilities.

Since July 1991, Government of India has been announcing and vigorously pursuing a series of reforms in trade, industry, fiscal and monetary policies to bring about stabilisation and structural adjustments. Certain macro-economic targets have been specifically announced for the years 1991-92 and 1992-93.<sup>3</sup>

It is very difficult to sum up the salient features of the innumerable reforms that Government of India has initiated and implemented one after the other since July 1991. Only a few are mentioned here. First, devaluation of the rupee by over 20 percent in two stages. Second, industry and trade-policy reforms including an exit policy covering the period of the 8th Plan. Third, fiscal and monetary reforms. The following are the main features of the trade and industrial reforms.

- Substantial dismantling of import controls, import licensing and import tariffs particularly of capital goods.
- Partial convertibility.
- Foreign investment up to 51 percent in equity has been approved in several priority industries (and in some cases up to 100 per cent )
- FERA has been amended to provide 'level playing field' for both foreign and local firms.
- The power of MRTP Act has been toned down and the asset limit for MRTP companies eliminated.
- Automatic approval for technology agreements related to high priority industries.
- Cancellation of the convertibility clause for new projects.
- Relaxation in location policy.
- Allowing private investment in core areas reserved for public sector.
- Public sector enterprises have been brought within the purview of the Board of Industrial and Financial Reconstruction (BIFR) for their revival.
- A specially-empowered board—the Foreign Investment Promotion Board—has been constituted to scrutinise and approve applications and to take initiative to negotiate with foreign firms.
- Disinvestment of equities for select public sector enterprises in a phased manner.

3. For 1991-92, some important macro-targets were: Union Government's fiscal deficit at 6.5 per cent of GDP and Budgetary deficit at 2.7 percent; inflation at 9 per cent; and broad money (M3) growth at 13 per cent. Except inflation target, most others were realised. The 1992-93 target aims at maintaining fiscal deficit to 5 per cent of GDP, inflation to 6 per cent and growth in M3 to 11-12 per cent.

India has signed the MIGA (Multilateral Investment Guarantee Agency) Convention which offers security cover against non-commercial risks involved in investing in India such as curbs on repatriation of dividends and repayment of principal, nationalisation, etc. The macro-economic fiscal targets (which are part of the IMF/World Bank conditionalities) obviously are meant to cut down expenditures and increase revenues. (It is as part of this exercise that cutting down subsidies on food, fertiliser, and export has been contemplated and acted upon.) Tax reforms (direct taxes in particular) should not be out of tune with international realities.

Monetary reforms which are based on the Narsimham Committee Panel (1991) recommendations (which in turn are based on the guidelines issued by the World Bank on monetary reforms) are considered as an essential part of the liberalisation process. According to the Committee, banks and financial institutions are to be given full operational flexibility with freedom of starting new institutions being given to domestic and foreign operators with no threat of nationalisation. The Committee "strongly favours substantial and speedy liberalisation of the capital market. Prior approval of agency—either government or SEBI—for any issue in the market should be dispensed with". (Report, 1991, p.xxvii). The Committee proposes that the directed credit programme (which has a redistributive objective) be phased out and must be limited to 10 per cent of the aggregate credit. The Statutory Liquidity Ratio (SLR) is to be reduced from 38.5 per cent to 25 per cent (already reduced to 30 per cent in the 1992-93 budget.) Ultimately the present administered interest rate regime will be replaced by a market regime.

### A Critical Evaluation

There is a tendency to idealise market and competition and even to equate market with an economy. No one can gainsay the role and significance of the institution of market in a civilised society. But an economy is much more than a system of markets and is concerned with the structure of relationships of a group of people engaged in the organisation of production (or better resource use) and settlement of claims of what is produced. A market is an institution that has the right to exclude built into it, as participation in the market is limited to those who have the required exchange entitlements—assets, employment, social security and the like. The landless, the assetless and the jobless have no normal place in the market though they are part of the economy and polity. Such a regime is not a socialist pattern, however elastically the concept is defined.

Again, privatisation of the public sector enterprises or disinvestment of shares is also part of the economic philosophy followed. True, performance of some of the public-sector undertakings (PSUs) leave many things to be desired and needs rectification. But to treat privatisation as a panacea to the failure of public sector is simply untenable. That privatisation is efficient and public sector-undertakings are invariably inefficient is a myth and has no empirical validity. There are over two lakh sick units in the private sector. Of course, there are several cases where enterprises go deliberately sick to avail of 'aids' or steal prime lands for real-estate business or for other benefits. While privatisation may provide an answer to overstaffing, or use of obsolete technology or several other problems, it is wrong to attribute all these to public ownership per se. The management, the workers, bureaucracy and politicians have contributed to the failure of PSUs. The success stories are not to be forgotten.

Disinvestment is used as a means to fill the fiscal gap. Economically illogical, this measure is undesirable on many counts. Disinvestment is made in profit-making units which are not a burden on the exchequer. It is the yielding assets that are liquidated. Financial experts say that 10 rupee shares of Bharat Petroleum may be quoted at Rs. 1000 and that of Hindustan Petroleum at Rs. 700 when they will be unloaded in the stock exchanges by the mutual funds and financial institutions. The decision to sell 49 per cent of the equities of PSUs to foreigners may throw up a big bonanza into the lap of foreigners.

Second, it appears GOI has been turning a 'crisis' into an opportunity to introduce the macro-economic reforms. While the crisis was there, it was more a liquidity crisis than an economic or solvency crisis. Several public-sector companies of India (e.g. ONGC, Indian Oil, Hindustan Petroleum, Bharat Refineries, SAIL) appeared among the list of big five hundred industrial corporations in the world published by *Fortune*. It is estimated that the value of the assets of the 244 central government undertakings works out to 2.6 lakh crores which far exceed the total central governments internal debt even at current exchange rate. (Sahni, 1992).

Third, globalisation as a development strategy has serious limitations for India as well as for the Third World countries. In a world marked by extreme unequal distribution of income (the OECD countries with 14.7 per cent of world's population account for 76.6 per cent of world's income) and unequal exchanges.<sup>4</sup> The strategy of export-

4. It is estimated that a net capital outflow of atleast \$40 billion (about Rs. 10,000 crores) per annum is transferred from indebted countries to the advanced countries and this does not include the implicit transfer of income resulting from the deterioration in terms of trade. (See Levit, 1989).

led growth with severe competition to sell their products to the rich can only lead to further cheapening of their products and widening the already-yawning gap between the rich and poor countries. Ultimately, such globalisation of poverty will affect the rich, as a great deal of their property depends on deepening and widening the import-demand base of the poor countries. While it is important to improve India's competitive strength, it is equally important to realise the serious limitations to our capabilities. India's share in world export trade which was over 2.5 per cent in 1951-52 has fallen to 0.45 per cent in 1989-90. Even a doubling of our export trade (which is a remote possibility) would not mean much in terms of world trade. The industrialisation that is being promoted under the new dispensation is highly import-intensive and energy-intensive which can have only an adverse impact on net export earnings. The import substitution strategy of the Nehru-Mahalanobis era and the goal of self-reliance have now been thrown overboard.

The problem will be much worse if TRIPS (Trade-related intellectual property) TRIMS, (Trade-related investment measures) and GATS (Government Agreement on Trade in Services) get accepted as part of the GATT negotiation which are well under way. Can we ignore the hidden agenda involved in opening up India's market for imports from the capitalist world of USA, Japan and Europe within the framework of devaluation, liberalisation, privatisation and Dunkel proposals? India cannot afford to close her eyes to the lessons of the so-called 'success stories' that are frequently mentioned in support of the new economic policies (e.g.) South Korea, Taiwan, Hongkong and Singapore) as well as, the dismal experience of several Latin American countries and Sub-Saharan Africa. Most, if not all, of the 'success' countries including Chile among the Latin American countries have been controlled economies, with lesser commitment towards solving social issues like inequality, mass poverty, unemployment and the like. (Some of them like South Korea and Taiwan were recipients of liberal US aid as well). Indeed, the problems of inequality, ill health, illiteracy, poverty and unemployment faced by India have no parallel in other parts of the world. The stagflation (co-existence of growing infla-

**Indeed, the problems of inequality, ill health, illiteracy, poverty and unemployment faced by India have no parallel in other parts of the world.**

tion and unemployment), growing inequality in income and wealth, decline in per capita consumption, increase in incidence of diseases, environmental hazards and negative net transfers to the creditor countries experienced by the majority of the 70 odd countries that have come under IMF/World Bank macro-economic reforms are too strong and convincing to be ignored by India. (see Jalan 1991 Epilogue; Levitt, 1989; Saha, 1991; Levitt, 1992; Chos-sudovsky, 1992).

**Is globalisation a better alternative to strengthening the home market and reinforcing the inter-sectoral linkages?**

Fourth, probably what is more important is to realise the large potential of India's home market which is being ignored in the rush towards globalisation. The size of our home market depends on the size of the purchasing power of the rural masses, especially those in the agricultural sector. Though this paper is not concerned with policy alternatives, it may be noted that at least three basic instruments of policy are important in this context: (a) a relevant agricultural-price stabilisation programme which will ensure a stable agricultural income to farmers, irrespective of good and bad years (a blanket disapproval of subsidies can have dangerous implications for India). (b) equitable land reforms and (c) an employment-guarantee scheme for the rural unemployed. Is globalisation a better alternative to strengthening the home market and reinforcing the inter-sectoral linkages?

Fifth, the burden of structural adjustment is not equitably distributed between the rich and the poor, capital and labour as well as the Centre and the States. The tax reforms that followed as part of the structural reform (1991-92 and 1992-93 budgets) abound in concessions for the rich, probably unheard of in the history of Indian public finance. By raising the exemption limit of income-tax payers from Rs. 22,000 to Rs. 28,000, the number of income-tax payers (mostly confined to the inescapable group of salary-income earners) has fallen from 7 million to 6 million which itself is too small (0.7 per cent of total population). The wealth-tax payers whose number today is below 6 lakh is likely to be reduced to a negligible number with the raising of the exemption limit from 5 lakhs to 15 lakhs and omission of financial assets from wealth-tax purview. As we have already noted, the direct tax base has been deliberately narrowed (the growth of the black-

income sector is a clear evidence of this) and a regressive excise-tax burden with a built-in inflationary bias has been imposed to compensate for this. Inflation coupled with the reduction in ration subsidies (and all the subtle efforts to undermine the public distribution system) and the inevitable axing of the 'unproductive' expenditures on various social consumption are likely to put a heavy burden on the poor.

According to an ILO study, due to the structural adjustment, nearly 8 million people will be rendered unemployed in India. In the public sector, it is estimated that nearly 4 lakh employees will be retrenched in 58 PSUs now declared sick. On the basis of an average rate of Rs. 1.5 lakh compensation per employee, about Rs. 6,000 crores are required to compensate the employees of these enterprises alone. It is held that an exit policy for the private sector is being envisaged. Given the estimated number of people who will be retrenched in the private sector, the cost of the exit policy is simply staggering. The National Renewal Fund with a budgetary provision of Rs. 1,000 crores (which itself has a World Bank loan content) will definitely prove too inadequate to meet the challenges of the likely displacement of labour in the next three years.

The policy documents are indeed silent as to how the Government is going to bridge the trend rate of labour force at 2.1 percent per annum and the employment growth rate of 1.55 percent. Is not an 'entry policy' more important than an exit policy?

The structural-adjustment measures initiated by the Central are going to impose a greater burden on the States in the long run. The burden of providing basic amenities such as education, health, drinking water and above all reducing the growth in unemployment and poverty will fall squarely on them.

Sixth, another extremely-bad effect of SAPS will be the adverse impact on environment destruction due to the excessive exports of forest-based product, agriculture, mining and the like. Given the freedom and level playing-

Is not an 'entry policy' more important than an exit policy?

ground rules, the foreigners may choose to invest in industries involving hazardous and toxic substances. (The classic case of Union Carbide in Bhopal that killed 2,500 people and debilitated two lakh people is still fresh in our memory.) The experiences of Ghana, Costa Rica and Taiwan are too well known to need further documentation.

## Conclusion

To conclude, GOI is going strong with structural adjustment programmes. The problem of Indian economy and polity basically consists in solving illiteracy, illhealth, malnutrition, drinking-water scarcity, poverty, unemployment and gross social and economic inequalities. SAP is seeking to reduce macro-economic imbalances as if they are the ultimate goal. We are attacking symptoms rather than the disease. Our analysis of macro-economic imbalances shows the need for progressive taxation and netting in black income, cutting of expenditure on defence and internal security through diplomatic and political initiatives, proper targeting of subsidies, raising user charges sparing the poor (people below the poverty line and pollution line,) rescheduling the debt payment and actively promoting the internal market and above all implementing a decentralised administration and planning. While any money-lender has a right to supervise the loan utilisation, IMF/World Bank do not merely supervise—they approve national budget; approve monetary, trade, industry and fiscal policies; review public expenditure and indulge in several exercises which no sovereign country normally would like to surrender. No reform should be at the expense of India's sovereignty and dignity.

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# Industrial Restructuring : Subcontracting in Japan

Yoshikuni Ohnishi

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*The subcontracting system has assumed considerable importance in the industrial development of Japan. The cost performance of Japanese industries is better than their European or American counterparts which rely on an integrated manufacturing system. The author presents the dynamic aspects of the Japanese subcontracting system in this paper.*

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Industrial development cannot be achieved without taking into account two critical factors. First, the manufacturing industry should be the basis of development. The competitive advantage of nations can be only measured by the strength of the manufacturing sector. Increasingly many developed countries including Japan have tilted in favour of the third sector emphasizing the 'softening' of economy. But the 'service economy' cannot play a major role in national development unless it is supported by the manufacturing industry. After all productivity of service industries, inter alia, which are highly labour intensive, is lower resulting in a decline of income level and the standard of living (Karatsu, 1992; Dertonzos et. al, Cohm & Bysman, translated versions). The industrial performance and international competitiveness of both the USA and the UK have been declining over the past couple of decades partly because of a resource allocation in favour of the service sector. Second, industrial development cannot be achieved without the involvement of small industry. Sony, Toyota, NEC, Hitachi, etc. have earned their reputation as leading firms in the international market, but their competitiveness is largely derived from the highly developed subcontracting system in which small firms provide materials, parts and components, or semi-finished products to parent firms. Thus the overall product coordination and integration starting from design conceptualization to R and D, and to assembling and marketing become the main role and function of the parent firm. They produce only the critical components such as engines or transmissions of the automobile industry and assemble

**Industrial development cannot be achieved without the involvement of small industry.**

the other parts collected from multi-layered subcontractors. For example, Toyota Motors purchases parts and components from more than 280 subcontracting firms, each of which in turn relies on their subcontracting firms. Altogether Toyota receives services from more than 25,000 firms (Baranson, translated version, 252). Due to this subcontracting system, the cost performance of Japanese industries has been much higher than their European or American counterparts which rely on an integrated manufacturing system or market internalization. Although many of them use subcontracting just as the Japanese firms do, their higher propensity to rely on the free market wherein firms are free to enter or withdraw depending on the circumstances, no one expects to develop inter-firm human relationships. The market concept in the Japanese subcontracting system refers to interactions between buyers and sellers which are not determined excessively by short-term economic gains but are based on long-term, stable relationships. Hence transactions aim not for maximizing individual profit but the profits of both the partners (Itami, 1987,42-46)

The Japanese subcontracting has been criticised as being a closed economic system which does not allow foreign participation resulting in market monopoly by Japanese industries. But this ignores the fact that many foreign firms have assimilated and adapted themselves in their own environmental settings. For instance, the success of IBM personal computers owed largely to high Quality of parts and components, low Cost of production and quick Delivery (QCD) which have been achieved through the joint effort of the parent company and its subcontractors. Thus the IBM's corporate strategy with emphasis on market externalization seemed a replica of the Japanese subcontracting system. (Ohmae, 1990, 27-28) Japanese car manufacturers in the USA also emulated this system, with considerable success. This has embarrassed Japanese subcontracting firms that went abroad at the request of parent firms for parts manufacturing in the USA because job orders which were expected to be given to them were now given to local subcontractors (AERA, 1992, 10). It has been argued that the parent firms have abused the weak position of small subcontracting firms

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and that the subcontracting system developed in Japan was originally intended to save fixed capital investment or to act as a buffer from business fluctuations or a combination of both. Protection of these firms could result in higher social costs. This explains why Japan has so many laws and regulations to protect and promote small industries.

Some argue that the emphasis on the weak nature of subcontracting firms could be misleading (Yamasaki, 1991, 153-60) The fact that a large number of subcontracting firms became independent and technology-oriented was attributed to a kind of entrepreneurship in response to the strong and sometimes unreasonable pressures from parent firms. Hence these pressures were blessings in disguise to them. They were able to assimilate, adapt, modify, improve and develop technologies to the extent that they became fully competitive in the domestic and international markets. It cannot also be ignored that, in some cases, it is the subcontracting firms that retain the final decision-making authority over the supply of parts and components to their parent firms.

#### **Definition of Small Industry & Area of Activities**

In Japan, the small industry is defined in terms of capital and number of workers. The pertinent government policies and programmes are applied only to firms which fit the definition. In manufacturing, firms with fewer than 300 workers and capital of less than 100 million yen are defined as small industries. In wholesale, it is fewer than 100 workers and capital of less than 30 million yen. In retail and service, it is fewer than 50 workers and capital of less than 10 million yen. Some key statistics of small industry in the manufacturing sector in 1988 were: a) the total number of work force was 8 million accounting for 73 percent of total work force in the manufacturing sector; b) the number of enterprises were 434,000 accounting for 99 percent of the total number of enterprises; c) the shipping volume was 143.800 billion yen accounting for 52 percent of total shipping volume. These statistics show the significant position occupied by small industries in the Japanese economy.

The areas of activities can be classified into three : those dominated by large industries, those dominated by small industries and those in which both types coexist in the market. The areas dominated by small industry are : a) those that require relatively less capital investment, b) those which do not require large-scale technology, c) those that involve relatively small markets free from the economies of scale. Broadly two types of coexistence are observed . The first occurs in a large market based on

mass production, but the manufacturing activities can be broken down into a number of processes so that small subcontracting firms can handle some of the processes using their own technology and other resources. Parts and components thus made are sent to the parent firm for final assembly. This is the typical subcontracting activity. The second occurs where there is a clear demarcation between large and small firms in terms of the nature of products, quality, price, and market. They include, bread, fish cakes, industrial machinery, paper, shoes, shipbuilding, etc. only to mention a few,

Due to the diverse nature and characteristics of small industries, it is almost impossible to bundle them under a single category. In order to grasp the actual image of Japanese small industries, they can be classified into the following categories:

(a) **Classification by *raison de'tre***

(i) *Independent type*

The entrepreneur not only possesses capital but also holds final decision-making authority. Hence his firm produces brand products for which prices can be set on his own decision.

(ii) *Dependent type*

It produces no brand products and simply undertakes part of the production processes at the request of a parent firm. More often it relies upon the parent firm for financial arrangements, marketing, raw material supply, and technical guidance.

b) **Classification by location**

(i) *Local-market oriented*

Small industries which offer goods and services to the local market where they operate. They include wholesale and retail businesses, service industries or manufacturing-cum-retail industries.

(ii) *Community-based*

A number of small firms all belonging to the same industrial category which are concentrated in a specific area. By forming a regional cluster of firms they can realize scale economies in terms of raw materials, labour and technology. Their markets are not limited to their locality, but are extended to the whole country or beyond national borders. In Japan there are as many as 350 production regions where such community-based industries are in operation.

(iii) *Large-industry linked*

A large number of satellite small industries which

surround a large industry to form the parent-subcontracting relationship. However, some of them have grown out of the conventional type of subcontracting firms and become independent taking advantage of their ownership-specific technologies and other managerial resources.

(c) **Classification by the nature of business**

(i) *Conventional Corporate Ownership*

Small firms which undertake business activities for profit maximization using workers recruited from the external market.

(ii) *Family-based Corporate Ownership*

Small firms which undertake business activities using mainly family labour, but there is a clear separation of profits and wages so that the former is reinvested for business expansion.

(iii) *Family-based Individual Ownership*

Small firms which are owned by individuals. No book-keeping is made so that profits could be plowed back to family members to sustain their living. The owner has little motive for business expansion. Sometimes the owner could be the wife who runs the business with family members while her husband earns a stable income from office or factory work.

**Subcontracting System in Japan: State of the Art**

The subcontracting system is defined as a production system using the social division of labour between small firms which supply parts and components and large firms which assemble them into finished products based on a long-term, stable relationship. Logically industries with longer backward linkages have a higher propensity to opt for such a system. We, however, immediately come across the problem of quantification of such contracting according to this definition. We often use the subcontracting rate in terms of sales turnover. In general, if the firm's subcontracting rate exceeds 50 per cent it is qualified as a subcontracting firm. (Ogawa, 1991, 31). In fact, when a large-scale survey was conducted on subcontracting in the Chubu region which is one of the largest industrial

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zones in Japan, the ratio exceeded 80 per cent for more than 60 per cent of firms. But a firm the author interviewed recently, a supplier of automobile parts and components to large automobile makers, claimed itself a subcontracting firm even though their ratio was as small as 20 per cent.

Even if the ratio is high, very few firms are captive. The same survey revealed that it was relying only 12 per cent on the parent firms for supplying parts and components (Ogawa, 1990, 33). It appears therefore that there is no hard and fast rules to define subcontracting. The definition is also not easy from the view point of the subcontracting layer. The same survey showed that 48 per cent of subcontracting firms undertook the production of final goods (in which case they should not have been treated as subcontracting firms), whereas the primary subcontracting firms accounted for 37 per cent and the secondary 15 per cent. Overall, the quantitative definition did not appear to have any useful meaning for government policies and programmes to protect their interests. One of the most practical yardsticks to define subcontracting is the extent of control executed by the parent firm and negotiation power enjoyed by the subcontracting firm. Following is the ratio of subcontracting out of the total small and medium manufacturing firms in Japan:

Table 1: The Ratio of Subcontracting Firms in Japan (%)

1966	53.3
1971	58.7
1976	60.7
1981	65.5
1987	55.9

Source : Government of Japan (1988).

The subcontracting rate has been increasing gradually till it reached an all-time high in 1981. It then followed a downward trend and indeed a significant reduction of the ratio was observed between 1981 and 1987. It was during this period that the Japanese industries experienced drastic changes in the industrial structure. During this period, the subcontracting system has changed from captive to independent type (table 3). Further the subcontracting ratio has declined among the major manufacturing industries from 1981 to 1987 (table 4). During this period, both the large and small firms were taking stock of their business strategies in order to cope with the changing industrial structures. Subcontracting relationships were also being reviewed.

The Small and Medium Industries Agency, Ministry of International Trade and Industry, (Government of Japan), classifies subcontracting firms into four types, viz., (A) captive-type, (B) quasi captive-type, (C) quasi multi-trans-

action type, and (D) multi-transaction type. Details of the definition are given in table 2.

Table 2: Categories of Subcontracting Firms

	No. of Parent Firms	Transaction Rate
A	1	more than 90%
B	2-5	more than 90%
	1	less than 90%
C	2-5	less than 90%
	more than 6	more than 70%
D	more than 6	less than 60%

Source : Government of Japan (1991)

It is interesting to note that subcontracting firms have gradually strengthened their independence from captive-type (Type A) to multi-transaction type subcontracting (Type D) increasing the number of parent firms they deal with. (table 3).

Table 3: The Share of Subcontracting Small Firms by Type (%)

	Type A	Type B	Type C	Type D
1988	34.5	38.6	24.5	2.4
1990	15.8	36.8	38.0	9.4

Source: Govt. of Japan (1990).

**It is interesting to note that subcontracting firms have gradually strengthened their independence from captive-type (Type A) to multi-transaction type subcontracting (Type D).**

There are seven industries where the subcontracting ratio exceeds 70 per cent. They include, in order of the ratio the transport machinery, electrical machinery, textiles, apparel, general machinery, precision machinery and metal products (table 4).

The changing pattern of the subcontracting system Japan can also be observed from the extent of control. It is convenient to divide prevailing subcontracting arrangements into two types. The first is the most conventional arrangement wherein subcontracting firms fall under the direct control of the parent firm (*keiretsu* subcontracting).

Table 4: Changes of Subcontracting Ratio in Major Industries (%)

	1966	1971	1976	1981	1987
Textiles	70.8	75.9	84.5	84.9	80.1
Apparel	73.6	71.4	83.9	86.5	79.3
Metal	66.3	71.7	74.8	78.6	71.1
General machinery	70.7	75.8	82.7	84.2	75.0
Electric machinery	81.4	78.9	82.3	85.3	80.5
Transport machinery	67.1	77.9	86.2	87.7	81.2
Precision machinery	72.4	70.7	72.4	80.9	71.1

Source : Government of Japan. (1989) p. 60.

The second is just the opposite of the first wherein subcontracting firms are independent of the parent firm (non-*keiretsu* subcontracting). Till 1986, the first type had accounted for as high as 85 per cent but has decreased to 66 per cent in 1989. It is expected to decrease further to 41 per cent in future (Govt. of Japan, 1990, 152). There is a third type of subcontracting arrangement which goes beyond the national boundary. It is the international subcontracting under which the parent firm mobilizes resources possessed by the foreign firms for manufacturing parts and components. Though it was only 0.3 per cent before 1985, about 2 per cent in 1989, the phenomenon has gathered momentum and it is expected to increase to about 15 per cent in future.

At the outset of this paper, we have mentioned that the *keiretsu* subcontracting has brought about a serious politico-economic conflict between Japan and the USA. *Keiretsu* is a group of firms which are closely associated with each other under a large leading firm. The parent firm, making foreign direct investment, brings *keiretsu* firms to the host country so as to ensure the same QCD practised in Japan, or uses these firms at home to supply parts and components to a new subsidiary firm in the host foreign country. The issue here is that the parent firm does not place confidence on indigenous firms of the host country and the *keiretsu* arrangements intend to exclude them from participating in the market. In this context, Japanese firms internalize the external market just as US firms do. The Newsweek (1991, 38-40) described Japan's *keiretsu* system as an unfair trade barrier. It argued that Toyota's vertical *keiretsu*, led to Toyota owning a substantial stake of vendors from which many of the parts were supplied. More recently, however, the three US auto makers underwent radical changes in purchasing policies and started organising similar type of subcontractors' association (as Toyota's Kyoho group or Nissan's Sakae group) with a view to establishing a stable business relationship with parts vendors or suppliers. For example, GM has already established its subcontractors' association in Japan which is composed of approximately 90 firms (Research Division,

As large industries started to concentrate their resources on the production of high value-added or high-processed goods, or on R and D activities due to needs emerging from economic globalization, shortage of manpower, or unstable currency position, small firms attempted to grow out of conventional subcontracting relationships.

1989). In Europe also, Fiat in Italy and Peugeot in France followed suit by making similar arrangements with small firms across national borders. The organization of the pyramid-type stratification of small firms through *keiretsu* or long-term business relationships seems to point to the global trends in assembly-oriented industries (Shimokawa, 1992, 223).

### Characteristics of the Subcontracting System

The Small Industry Policy Formulation Council of the Japanese Government put forward a New Vision of Small Industries in the 1980s and called them a 'dynamic majority' and a 'seedbed' in generating changes in the economic structure, technological progress, and human resources. And hence they could be a source of social progress and economic development. Not surprisingly, the New Vision which appeared in 1980 provoked a lively debate since small industries were hitherto governed by low productivity, low wage, low profitability, weak financial capability, excessive competition, etc. The weak image of small industries has been ingrained in the minds of the people. With the passage of more than ten years since the New Vision the image given to the small industries as a 'dynamic majority' was not necessarily wide of the mark. In spite of the difficult business environment in the 1980s illustrated by the 'oversupply of goods in the market', the small industries have gradually accumulated techno-managerial strengths and some of them have been successful in dominating the market hitherto enjoyed by large industries or entering the niche market. The new image of small industries seemed to upgrade their status in subcontracting.

As large industries started to concentrate their resources on the production of high value-added or high-processed goods, or on R and D activities due to needs emerging from economic globalization, shortage of manpower, or unstable currency position, small firms attempted to grow out of conventional subcontracting relationships. Many subcontracting firms have started to pro-

duce finished products either using their own brand names or under original equipment manufacturing (OEM) arrangements. This interesting phenomenon can be interpreted as the new corporate strategy of small industries of taking, at least partly, over the roles and functions of the parent firms. Subcontracting firms which excelled in technology and production management were able to strengthen negotiating capabilities vis-a-vis parent firms, thereby taking initiatives in setting price or production volume (Govt. of Japan, 1990, 149-53). Keeping the above new image and strategy in mind, several characteristics associated with the Japanese subcontracting system are emerging:

First, the continuous business dealings with the parent firm is one of the important attributes of the subcontracting system. Generally, the relationships between the two parties are stable and long-lasting. These relationships may have something in common with the stable employment system which is considered one of the important characteristics of the Japanese management system. In both subcontracting and employment, long-term human relationships prevail over short-term financial gains at the free market. According to our survey, nearly 60 per cent of subcontracting firms stated that they have maintained business relationships with the same parent firms since establishment (Govt. of Japan, 1986, 68; 1988, 61) and this ratio increased as the size of the firms became larger. Further, 35 per cent of subcontracting firms have dealings with the same parent firms for more than 20 years. Thus more than half the subcontracting firms have maintained long business relationships. A top management of one of the big three automobile makers in the USA studied the impact of long-term relationships upon cost-down efforts. A parent firm in the USA had difficulties in persuading vendors and barely achieved the cost-down by 0.25 per cent, while a Japanese counterpart was able to reduce cost by six per cent (Dertouzos, et.al, 1990, 151). The difference of productivity increase was 1 to 24. Internalization in manufacturing and short-term transactions is costlier compared with the Japanese system. Mention must be made that the US Anti-Trust Law declares the formation of inter-firm cooperation prevailing in the Japanese subcontracting system illegal.

Second, functional linkages seem to be developed among the vertical division of labour, the size of parent firms, and the ratio of intermediate products made by subcontracting firms. The 1986 Japanese White Paper on Small and Medium industries undertook a comparative study on the ratio of intermediate products between Japanese and US firms. From the analysis of the three major

Japanese industries heavily relying on subcontracting arrangements, i.e., textiles and apparel, electric machinery and transport machinery, it was found that the larger the size of parent firms, the more they rely on the vertical subcontracting structure. And this in turn results in a higher ratio of intermediate inputs. In other words, the production process is so segmented as to call for the participation of many subcontracting firms. On the contrary, this phenomenon has not been observed so clearly among the US firms.

Third, decisions by large firms whether to subcontract or not depend on the nature of technology. If the technology is the function of scale, the parent firm tends to internalize the production without relying on subcontracting firms. But if it is specific and good for small lot production, it would be less economical for the parent firm to undertake production. They seek the participation of subcontracting firms which have good technological capability. They are generally termed 'specialized processing firms' that possess full capabilities to design, develop, and manufacture new products only upon the provision of its concept and function by the parent firm. The parent firm won't provide specifications but product concept only. In such cases, the question whether to subcontract or not is no more relevant simply because the parent firm cannot generate such sophisticated technologies in-house. Thus the subcontracting relationships are established only when the interests of both parties are met. Often it is argued that historical linkages between them could go beyond economic rationality. But this doesn't hold true. Their decision-making is based on rational business behaviour. This is substantiated by the motives of establishing subcontracting relationships (Govt. of Japan, 1986, 69-70). Small firms claim: (1) the continuous flow of orders, (2) difficulties of in-house product design, (3) difficulties to obtain orders through external markets, and (4) mobilization of available resources for limited manufacturing activities. While large firms enter into subcontracting arrangements due to; (a) unique technologies possessed by small firms, (2) the concentration of resources in areas which are advantageous over competitors, and (3) the merit of small lot production by small firms.

Fourth, the subcontracting system can contribute in saving information cost. More often than not, no formal agreement is prepared for the transaction but it is based on an oral promise. Both the parties rely on 'confidence and trust' which can be developed only on long-term and stable relationships between them (Minato, 1990, 8-10). Reduction of information cost deserves substantial merits on various fronts: (1) The parent firms can save the cost of

choosing qualified subcontracting firms. When they look for new relationships, they have to collect the information about candidate firm's technical, financial and managerial capabilities. (2) Both the parties can save cost in research, development and design by sharing these activities. (3) They can save the cost of negotiating unit price. In fact, mutual understanding is formed that the production cost of parts and components should be reduced on a long-term basis. Hence it is an established practice for subcontracting firms to accommodate the reduction of unit price which the parent firm would request once in several years. This is different from the vendor firms in the USA which would request assembly firms to increase the unit price in return for their additional work to upgrade quality or change designs (Asahi, 1992). (4) Mutual confidence developed can save the cost of inspection of intermediate goods since one party can perform this function for the other. This inspection-less delivery system has been introduced by two thirds of parent firms according to a survey in Japan (Osaka Industrial Development Research Institute; 1990, 44). (5) Technology transfer is one of the most noticeable features in subcontracting since intensive technical training, guidance, and consultancy rendered by the parent firm contribute to the upgradation of technological level of subcontracting firms. Quite often, machinery and equipment are also provided to ensure the quality of products. They are encouraged to introduce factory automation using CNC, FMS, and robotics.

Technology transfer plays an important role in accomplishing QCD in the shortest time possible. Even when small firms already possess firm-specific technologies for which guidance is not required, joint consultation and operation would be beneficial to both the parties for further improving the quality of technology. In general, the majority of small firms have not reached this level, so parent firms spend considerable time assessing the technological capabilities or potentials of candidate firms before subcontracting. Once favourable assessment is made, they ask candidate firms to manufacture parts and components on a trial basis in accordance with given specification. If the sample model satisfies them they place orders on difficult terms and the subcontracting firms respond

**Technology transfer plays an important role in accomplishing QCD in the shortest time possible.**

with challenging spirit. They know they would lose out in the competition if goods are not delivered as desired. This is a conflict game wherein both the parties need to adjust different interests. In any case, they won't escalate the conflict to the level where no compromise is reached. Strong pressures from the parent firm and undaunted challenge by subcontracting firms leave no place for spoon feeding. Only when the parent firms are thoroughly convinced of the capabilities and commitments of subcontracting firms, they release resources for improving the technological capabilities of the latter. Quality control, production methods of new products, and process design and improvement are three major services offered (Govt. of Japan, 1986, 72-74). Technical guidance is not limited to the mere supply of design drawings, working drawings, or specifications. The parent firms depute engineers to subcontracting firms for a certain period. And the latter sends engineers or technicians to the former for on-the-job training. For example, a relatively large subcontracting firm which manufactures communication parts has been very active in exchanging engineers with parent firms, participating in academic societies, joining study groups to share experiences among the small firms, or sending staff to local public research and development institutes (Ito, 1988, 48-51). They claimed the deputation of the technical staff to the parent firms has proved most effective in developing new products. The firm has already deputed six staff to an electric firm for one year to study mechanical designing and another five to a computer manufacturer for three years to assimilate system design. They have absorbed not only new technologies so far unavailable to the firm, but also learned the system of product development. The experience gained was particularly valuable when the parent firm undertook joint research and commercialization projects. Since the staff understood the system of product development at the parent firm, and further the human network and good communication had already been established between them, the technology transfer was achieved quickly and satisfactorily. Another survey also confirmed that subcontracting firms themselves highly appreciated services rendered by the parent firms, and claimed that their technological level was more upgraded than that of competitive firms (Govt. of Japan, 1986, 72-74). The subcontractors' association—in the area of Osaka, 60 per cent of parent firms organize such associations (Osaka Industrial Development Research Institute, 1990, p. 45)—plays a catalytic role in accelerating technology transfer. In general, primary subcontracting firms and their group members organize joint studies to share information about new production technologies and processes. As a result, the new technology developed by a member firm is

disseminated quickly among all members increasing the effectiveness of technological guidance by parent firms.

### New Directions

In the above, we have elaborated several characteristics associated with the subcontracting system in Japan. They seem to point in a new direction which is a departure from the conventional understanding of the Japanese subcontracting system (Watanabe, 1991a, 6-19; 1991b 1-2; Ogawa, 1990, 32). It may be due to the economic globalization, market competition based on highly advanced technologies, the impact of information and computer technology, or serious labour shortage. The conventional dichotomy was to classify small firms into subcontracting and non-subcontracting firms. However, this classification has begun to lose validity in view of the emergence of small firms which are ready to provide services based on sophisticated production and process technologies as well as RDD (research, development and design) capabilities. They provide not only parts and components to client firms in accordance with the latter's specifications but also undertake design and develop new products with their own brand names. Consequently the transaction relationships become more complicated; some are vertical, others horizontal. And there are many subcontracting firms which deploy a mixture of such linkages to suit their purpose.

We may have emphasized the brighter side of subcontracting. But there is always the other side of the picture. First, we have already mentioned the emergence of 'specialized processing firms' among the subcontracting firms that possess strong RDD capabilities. But there still are a large number of firms which cannot produce parts or components unless the parent firm provides detailed specifications. The sifting of subcontracting firms based on RDD capabilities has already started, and even member firms of the subcontractors' association could be eased out if they fail to upgrade the technological level (Nakamura, 1992, 174). Second, a number of parent firms

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abuse their superior position vis-a-vis small subcontracting firms. This is particularly true in high-technology areas represented by semiconductor industries. Many subcontracting firms have invested in sophisticated machinery and equipment to upgrade quality in order to meet changing specifications. But parent firms have not evaluated the increase in value added and refuse to increase the unit price though they are very pleased to reduce it. (p. 178). The recent TV documentary film about subcontracting firms in Osaka presented a gloomy picture: A firm produces a steel ring at the price of ten yen per piece (US seven cents). Several elderly workers can produce at most 10,000 pieces a day. Once the parent firm found one defective piece among 10,000 through random checking and refused to accept all. The parent firm reduced the unit price to six yen per piece (US four cents) due to the prevailing economic recession. Today the factory is closed in the absence of orders from the parent firm. Now in Osaka, firms dealing in second-hand machinery and equipment disposed of by the defunct subcontracting firms are doing good business. These cases illustrate the shadowy side of the subcontracting system. Whether these practices are unfair or not is subject to argument. But they are also under the influence of changing paradigms of the Japanese subcontracting system.

### Changing Paradigm of the Japanese Subcontracting System

We have already introduced the US type of production system wherein large firms undertake the vertical integration of production via market internalization and the Japanese type which depends upon a pyramid of suppliers which are eventually integrated by the parent firm. In the actual world, it is not as simple as it appears, and a combination of market internalization and organized market is likely to be a practical *modus operandi* in the Japanese subcontracting system. Japanese large firms mobilize a huge number of subcontracting firms and establish intimate human as well as business network. The parent firm controls the primary subcontracting firms which in turn control secondary subcontracting firms. Thus the parent firm's decision-making authority trickles down to the last layer of the pyramid. More often, the parent firm controls subcontracting firms through stock holding. Even if they do not own stocks, a strong interdependence is developed between the parent and subcontracting firms through, for example, family relationship, historical working relationship, or structural relationship.

If the vertical integration refers to the production system under which the production of all key parts and

components is internalized by large firms themselves, it is different from the Japanese system because in Japan most parts and components are made by subcontracting firms. Still it may be argued that Japanese parent firms in substance internalize the external market because most subcontracting firms are fully integrated in the parent firm's production system as if they were one and the same. From the viewpoint of decision-making, therefore, the distinction between the US and Japanese type of production system becomes thin since both the US and Japanese large firms hold the final decision-making authority. In this context, it may be more appropriate to call the Japanese subcontracting system quasi-internalization or-integration.

Further, the conventional pyramid-type, multi-layered structure is not always relevant to the subcontracting system prevailing in Japan. Surely, giant automobile or electronic firms such as Toyota or NEC still maintain a solid pyramid structure. Sometimes the pyramid is constituted of four to five layers. But this structure has become less relevant to small firms which supply their products to a number of client firms. We may imagine something like a chain of mountains rather than a single pyramid in explaining the new type of subcontracting structure (Watanabe, 1985, 13-18). Many large assembly firms and machinery-making firms form the top of mountains and share a fleet of small firms specializing in sophisticated processing of parts and components at the foot of the mountains. There are also not so high mountains in-between which are medium and small firms manufacturing finished products for the niche market. Small firms at the foot are classified not in terms of products but different production processes and undertake transactions with many firms. The chain of mountains thus depicted suggests that the subcontracting firms are not always captive serving only one parent firm. Conversely, this means the parent firms have freedom in choosing the subcontracting firm.

This implies that the subcontracting relationship has become increasingly closer to free market rather than organized market in the light of long-accumulated mutual confidence and joint work as well as profit sharing between the parent and subcontracting firm. However, some argue that it may be too premature to judge that the subcontracting structure has already shifted its emphasis to market mechanism (Ogawa, 1991, 33). In the following, we will discuss several factors which have affected the changing paradigm of the subcontracting system.

First, mutual trust, effort, and benefit are said to constitute implicit prerequisites for maintaining subcontracting relationships. If this hypothesis is accepted as

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broadly valid, both the parties should be prepared to share resources—technology, market, finance or management—in proportion to the capabilities of each party. In actuality, however, resources which the parent offers are either limited or not equivalent to the value of those possessed by subcontracting firms. Subcontracting firms are getting less dependent on the parent firm because they have recognized that resource sharing has been made to the advantage of the parent firm. The accumulated techno-managerial capabilities have gradually instilled confidence among them that it is more profitable to manufacture their own products and sell them directly in the market rather than placing themselves in the shadow of large firms (Seki, 1989, 6-12). Furthermore, the parent firms used to wield power and dictate their own terms due to an unlimited supply of subcontracting firms. But this is now a myth in Japan in the light of a serious shortage of manpower. Consequently, the limited supply of subcontracting firms and their increasing capabilities have driven parent firms to rely on small firms (Minato, 1990, 14-16): Though this type of small firms may not necessarily be a majority, sometimes their relationships could be reversed putting subcontracting firms in a stronger position in negotiating terms and conditions with parent firms.

Second, the parent firms used to abuse the controlling power over subcontracting firms which were hitherto treated as a buffer in preparation for business recession. For example, a sharp upward movement of yen value after September 1985 drove, inter alia, export-oriented large firms to reduce the extent of subcontracting relationships in a scale unheard of. They took it for granted that the volume of orders and the unit price should be reduced and that the relationships per se should be discontinued for their own survival. Indeed, 18 per cent of parent firms under survey decided to discontinue subcontracting relationships (Govt. of Japan, 1990, 155). This is what the buffer was all about. But they failed to honour the creed of mutual trust, effort and benefit (a couple of cases have been illustrated before). It was quite natural that the subcontracting firms sought their survival by diversifying business transaction or strengthening self-reliant efforts. When parent firms recognized that the supply of subcon-

tracting firms was no more unlimited, however, it was too late to regret the unwise actions taken. They lost not only business partners but also the confidence on them. Thus, they received a costly social penalty. According to a government survey business strategies of subcontracting firms in response to these actions taken by the parent firm included: (a) less dependence on a limited number of parent firms, (b) identification of new parent firms, and (c) development of new products through in-house R and D. Another survey in Osaka region indicates that 37 per cent of subcontracting firms under survey expanded transaction opportunities in order to overcome a sharp drop of orders from existing parent firms (Osaka Industrial Development Research Institute, 1990, 100) Another survey shows that 12 per cent of subcontracting firms refused to receive orders from parent firms, (Govt. of Japan, 1988, 156). From the above surveys, it was found that the appreciation of yen value in 1985 was not an exclusive motive in changing subcontracting relationships. Changing times and business environment must have dictated parent firms to take stock of both the merits and demerits of such relationships. And this also held true of subcontracting firms. Indeed, nearly half the subcontracting firms under survey also felt an increasing selectivity by parent firms. And this motivated them to adopt new strategies including 'say no' to the unfair practices imposed by the parent firm.

Third, a number of small firms that have assimilated, adapted and developed highly sophisticated technologies are now considered specialized processing firms. Many of them obtained the capacity to upgrade technological levels while they were working as subcontracting firms. There are some others which have acquired high technologies in collaboration with local public research institutes, universities, or other small firms via the technology fusion. In what way did subcontracting firms cope with product or process development undertaken by the parent firm? A study on metal and machinery industries in the Nagoya region reveals that 46 per cent of subcontracting firms (subcontracting ratio more than 80 per cent) took part in product design and development in collaboration with the parent firm, showing a close partnership between them. The country average in product design and development was 18 per cent of all subcontracting firms ( Govt. of Japan, 1990, 159). As to the process development, 43 per cent of subcontracting firms have achieved considerable improvement in production process and equipment and 35 per cent introduced sophisticated machinery. Indeed, subcontracting firms have introduced factory automating to the extent comparable with large firms: 71 per cent of subcontracting firms have already introduced CNC-based

machinery compared with 78 per cent of large firms. 40 and 32 per cent of them introduced the machining centre and industrial robots respectively, compared with 50 and 37 per cent on the part of parent firms. Many subcontracting firms have also been successful in strengthening design and R and D capabilities. According to the 1990 white paper 38 per cent possessed design departments while 26 per cent undertook R and D activities. Their capabilities in these fields suggested the direction towards the manufacturing of their branded products, 24 per cent were already manufacturing them, and further 40 per cent planned to manufacture their own products in the near future. Approximately, more than 60 per cent of subcontracting firms were ready to participate in the market based upon their own products.

Fourth, the use of computer and information has exercised considerable influence upon subcontracting relationships. Nowadays, even small subcontracting firms are fully using ME-based technology such as robotics and CNCs (due partly to labour shortage, though). However, a wide range of information technology has generated more impact on small firms than the mere introduction of factory automation. The information network thus created has given powerful support to them in technology development and market exploitation. Hence computer-integrated management which links development, manufacturing, and marketing is called for to realize total manufacturing efficiency. Further, the progress of information technology has encouraged subcontracting firms to widen the scope of business relationship. They have established arms' length business relationships with other large and small firms. The survey results are shown in table 5 in regard to the application of information technology among subcontracting firms in the Nagoya region (Ogawa, 1991, 124-152). Except the information network between branch offices (which is understandable due to small scale of operation) and ISDN (which is also understandable due to its sophisticated level of technology), not much difference has been observed between small subcontracting firms and large firms. Moreover, the information network between firms is more advanced than the industrial average, showing an active exchange of information among the small firms in different lines of business.

Fifth, the technology fusion and the sharing of experiences among small firms in different lines of business (*igyoshu kohryu*) acted as two major mechanisms in strengthening the extent of dependence of small subcontracting firms. The former mechanism aims at promoting technological commercialization through technology fusion among small entrepreneurs. With the enactment of

**Table 5 : Application of Information technology by subcontracting firms (%)**

	Subcontracting	Average
CAD	31.7	43.8
LAN	20.8	20.8
Network between production and marketing	20.7	30.5
Network between branch offices	11.9	21.3
Network between firms	15.8	13.3
VAN	7.9	9.9
ISDN	5.0	8.6

Source : Field Study on the New Image of the Manufacturing Industry in the Chuubu Region, 1990.

the Law of Technology Fusion in 1988 leading to the establishment of Small Business Fusion Promotion Fund, small firms can now undertake risky commercialization projects jointly with other small firms. The latter mechanism has gained momentum since the beginning of 1990s in Japan through which small entrepreneurs have access to the resources they lack. The essence of these mechanisms lies in the sharing of knowledge and information, techno-managerial resources, and creativity. There are three main stages in the mechanism: exchange, development, and commercialization. Sharing or exchange of information among small entrepreneurs is the first stage. In the second stage, resources possessed by them are used jointly so that they can achieve economies of scope. At this resource-sharing stage, technological development is actually undertaken. Through the first two stages participating members are increasingly motivated to undertake jointly technological development or the receipt of orders at the third stage. Two factors seem to hold the key to make joint operations successful. First, small entrepreneurs should honour the spirit of reciprocity, and second, they should not be satisfied with the status quo but seek new innovations constantly. These two mechanisms, although far from complete, have prompted small subcontracting firms to adopt more flexible corporate strategies taking into account controlling power, negotiating power, techno-managerial resources, or the extent of information network. But if the traditional subcontracting relationship would be changed to something like the US model which emphasizes short-term business strategies and arms' length relationship, small firms have to negotiate everything with many potential business counterparts. This is time consuming and inefficient, and moreover lacks scope for mutual trust and growth.

### The Basics

And lastly, we come back to the basics. The Japanese subcontracting system has been understood as a produc-

tion system in which the division of labour is practised in a highly sophisticated and integrated manner. This is represented by the Toyota production system which integrates both JIT (just-in-time) production and delivery systems as a typical model of subcontracting structure. The core of such production system lies in the continuous, incremental effort to upgrade technology through active worker participation at the workshop level. The basic principle of the Toyota production system was not designed by Toyota itself since the original concept was from the Ford Motor's production system. But one clear departure from the Ford's system is that Toyota emphasizes workers' initiative, participation, and ingenuity in implementing the JIT system. This approach has equally been emphasized among the subcontracting firms when they carry out the JIT delivery system. It has been taken for granted that the small subcontracting firms ingrain in workers the practice of 5 Ss (clearing - *Seiri* in Japanese, orderliness, *Seiton*, cleanliness - *Seiketsu*, Sweeping/washing-*Seiso*, and discipline- *Shitsuke*). Further, workers are requested to pay good attention to remove *Da-Ra-Ri*. This is a coinage of Toyota Motors and means the elimination of wastes (*MuDa* in Japanese), unevenness (*MuRa*), and excessive deviation from standards (*MuRi*) from the production system. They are also encouraged to improve work productivity through 5W and 1H (asking Why five times and think How once). Through the implementation of these practices, subcontracting firms have been able to upgrade

**The Japanese subcontracting system has been understood as a production system in which the division of labour is practised in a highly sophisticated and integrated manner.**

technological capabilities to the level of Design and R and D (Sei, 1991, 6-8). Needless to say, parent firms have played an important role in accelerating the process of technological upgradation of subcontracting firms. Through this process, their relationships have become increasingly horizontal and it is no more relevant to use the term subcontracting. In fact it has been replaced by 'cooperative firms, or 'business partners, (Govt. of Japan, 1991, 98). Particularly when the nature of technology becomes extremely specific and deep, it is difficult even for the omnipotent parent firm to cover the entire gamut of technology. These new terms reflect the changed relationship between the two parties.

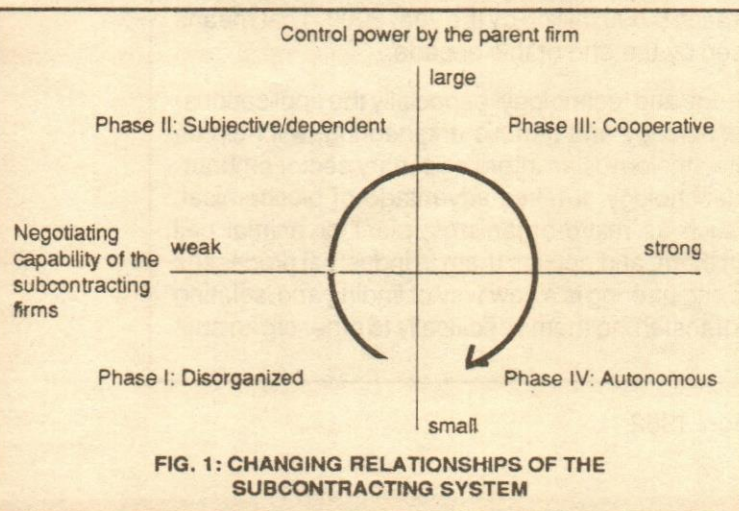
The new partnership can be analyzed from the view-



point of the balance between the controlling power possessed by the parent firm and the negotiating power possessed by subcontracting firms. It is argued that the Japanese subcontracting system has shifted its paradigm from the floating and disorganized transaction to dependent and subjective, to cooperative, and eventually to an independent and autonomous type (fig. 1). At present the relationship appears to move, though slowly, from the cooperative to independent transaction. If it points in the future direction, would the Japanese subcontracting system lose its original role both in style and substance? It would be difficult to draw definite conclusions at this stage. But one emerging view is that the Japanese subcontracting system would sooner or later change its conventional characteristics. A dramatic transformation is in the offing.

We have discussed another group of subcontracting firms which are subject to the vagary of parent firms, but avoided jumping to the conclusion that the business practices of the parent firms were unfair. Weaker position of subcontracting firms vis-a-vis parent firms is due partly to the excessive competition among them which is one of the characteristics of Japanese small industries. Hence it is unavoidable, to some extent, that small firms lacking strong techno-managerial capabilities are destined to disappear. In particular, many of them went bankrupt at

The new partnership can be analyzed from the viewpoint of the balance between the controlling power possessed by the parent firm and the negotiating power possessed by subcontracting firms.



Source: T. Minato, (1990)

the time of various crises. Implications derived from the Japanese experience is that, on the one hand, many small subcontracting firms have become a dynamic majority by overriding one crisis after another, and on the other, these crises have created a number of losers. Through the mechanism of rise and fall of subcontracting firms, they have acquired competitive strengths in domestic and overseas markets and this mechanism per se is the main source of dynamism possessed by small firms.

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## GENETIC ENGINEERING FOR PROTECTING PLANTS

Genetic engineering is a technology of pivotal importance to progress in modern industrial society. It has an important contribution to make in the health and agricultural sectors. Only genetic engineering has the potential to help us determine the causes of many life-threatening diseases and to develop substances to overcome them. Without genetic engineering, we would be overwhelmed by such challenges as AIDS, cancer, Alzheimer's Disease - to name just a few. Genetic engineering also has a role to play in ensuring the world's food supplies. Its strength lies in being able to improve the properties of cultivated plants faster and more precisely than conventional methods of breeding and selection can.

There's much to be done in the plant protection sector. Experts say as much as a third of the world's potential harvests are lost to pests, plant diseases, and weeds. Only half of today's world population of 5,000 million people can be said to be adequately fed. The world's population is expected to reach 6,500 million by the year 2000. That means some 1,500 million more people to feed by the end of this decade.

Only the latest advances in knowledge and technology, especially the applications-oriented knowledge potential of biotechnology and genetic engineering, will help us solve these problems of mankind. Biotechnology is an interdisciplinary sector embracing chemistry, biology, and process technology. It takes advantage of biochemical, metabolic processes in living cells such as micro-organisms, plant or animal cell cultures, or of enzymes extracted from them, and applies them in industrial processes to produce valuable products. Genetic engineering is a new way of finding and isolating specific genes in organisms, and then transferring them specifically to other organisms to achieve distinct effects.

Source: German News Vol XXXIV. April 1982

# The Public Distribution System & Liberalisation

Kamal Nayan Kabra & E.K. Rao

*This paper examines the impact of the liberalised policy regime on the scheme of providing inflation-insulated supplies of essential cereals through the Public Distribution System (PDS). The paper explores the adverse consequences of the liberalised economic policies and the scope of setting them right by strengthening and re-designing the PDS. Some limitations of these steps have been brought out. The paper provides a retrospective view of the operation of the PDS which lends support to the hypothesis regarding the cosmetic character of the revamping of PDS. Some additional features of liberalisation limiting the effectiveness of the PDS have also been highlighted.*

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The programme of economic stabilisation and structural reforms initiated in order to obtain large credits from the IMF and the World Bank puts severe strains on the economy, particularly on the lower income groups or those who do not enjoy a rewarding and meaningful participation in the market processes. Recession in the industrial sphere, replacement of domestic industry by imports, technological tailism, inflation, loss of employment and intensification of inequities are the major unfavourable consequences likely to ensue from the implementation of this programme. Devaluation of the Indian currency as a result of partial convertibility in the face of adverse current and capital account position of the balance of payments would further accelerate the pace of inflation. Inflationary processes are known for their differential impact; they hit those harder who have relatively poor capacity to bear the erosion of the purchasing power of their money incomes. Even if "trickle down" really materialises, as the authors of these policy changes contend, it is very slow, requires a big spurt in the growth rate and becomes ineffective in the context of our demographic trends. The processes of "pull-up" remain inter alia weak as the fiscal constraint remains acute.

The assumption of adverse effects of the liberalisation policy is based on both an a priori analysis of the operation of the new policy mechanism as also on the experience of the Latin American and African countries which adopted stabilisation and adjustment policies. These effects are not an once-over phenomena. In so far as these adjustment programmes do not succeed in creating the capacity to repay the loans or make the balance of

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payment position viable, periodic resort to the IMF and the World Bank for structural adjustment loans becomes a built-in feature for any economy which succumbs to these policies. We went in for such a loan from the IMF during the early 1980s and are doing so in a bigger way now. (Bhattacharya, 1992). Thus further rounds of liberalisation, which improve the access of foreign capital and foreign goods to the markets of the borrowing countries, become recurrent phenomena. This leads to deindustrialisation and loss of growth momentum and may result in the sacrifice of the welfare of the common people. As for the transformational processes, the structural adjustment programme breeds negative or retrograde tendencies—an essential outcome of intensification of inequities, increased access to borrowed, inappropriate technology and foreign capital and market-based resource allocation leading to extended reproduction of existing distortions.

### Need for Revamping PDS

It is on account of such factors that the liberalisers speak of the need to put a 'human face' or mask on the structural adjustment programmes. Setting up of a Fund to give golden handshakes and retraining and re-employment facilities is probably one aspect of the 'human face'. Revamping the Public Distribution System (PDS) is another. In our country, the present regime has been emphasising quite stridently its commitment to strengthen the PDS. This is undoubtedly a very useful strategy and may lighten the burden of adjustment for the weaker sections. This is also in keeping with the basic thrust of the PDS which is a complementary element of the food economy which attempts to supply essential goods to the poorer sections at stable and affordable prices, particularly in view of the persistent inflationary pressures.

During the later part of the 1980s, the need for strengthening the PDS increased on account of some additional factors. The food prices have become major contributors to the rising wholesale and consumer price indices (table 1). The adverse impact of rising food prices should be softened by making basic food items available to the identified needy in some fixed quantities, at subsidised, fixed prices at regular, periodic intervals from authorised retail outlets, known as Fair Price Shops.

### PDS: Administrative Design

Following the official recognition of the above logic, various steps have been taken to strengthen the PDS. The purpose of opening additional public distribution system outlets in relatively backward poverty-concentration areas

**Table 1 : Indices of Wholesale price, economic cost and issue price**

(1981-82 = 100)

Year	Wholesale price Index	Economic cost Index	Issue price Index
Rice			
1982—83	125	107	107
1983—84	121	116	119
1984—85	121	124	124
1985—86	128	127	124
1986—87	134	132	132
1987—88	153	135	137
1988—89	162	149	139
Wheat			
1982—83	126	128	110
1983—84	111	110	119
1984—85	115	116	119
1985—86	130	122	119
1986—87	129	130	131
1987—88	147	133	134
1988—89	165	144	141
Average Sales Realisation		Economic Cost	Consumer Subsidy
Rupees per quintal			
Rice	432.07	519.04	127.71
Wheat	276.71	404.42	86.97

Source : Wholesale Price Index: Economic Survey, Ministry of Finance, GOI.

Economic Cost Index : Calculated from data on issue prices, procurement and distribution costs.

**The food prices have become major contributors to the rising wholesale and consumer price indices.**

(in some 1700 blocks) seems to be to introduce a certain amount of preferential treatment by increasing the availability of the PDS supplies through changes in the administrative design and issue of additional ration cards to the intended beneficiaries. Given the limitations of the administrative arrangements, an attempt has also been made to involve the people themselves in monitoring and exercising vigilance over the activities of the supply agencies, particularly the FPS.

The formal universal entitlement given to the public distribution system, with only about 10-15 per cent of the total supplies moving through it creates informal preferential access to the relatively better-off sections both on account of economic and non-economic factors. (Kabra, &

Ittyerah, 1987) From this point of view, it has been argued and has also been accepted in some of the official documents (Report of the Working Group on Civil Supplies, 1989) that a new mechanism is required to bring about closer targeting for the poor, particularly the rural poor. The scheme of opening new FPS in some 1700 blocks, including the distribution of additional ration cards in these areas, may amount to introduction of some preferential treatment for the economically backward. However, in the absence of additional supplies being ear-marked for these areas and making these supplies commensurate with the quantum of entitlements granted to the intended beneficiaries, it is unlikely that the preferential access becomes a meaningful reality.

In addition to these basic limitations, absence of any attempt to identify and reach the relatively poorer sections particularly in the rural areas, and slums is likely to nullify the effectiveness of the revamped public distribution system. It may also be hypothesised that the better-off, more organised and those living in the urban areas in the backward blocks are likely to corner much of the benefits likely to become available under the present scheme. In addition to the above factors, the policy for the PDS is based on questionable foundations. It has been sought to be energised, it appears, more in order to mask the reality than to reduce the consequences of structural adjustments programmes by really increasing the effectiveness of the PDS. The food subsidies have come for adverse notice by the Fund-Bank authorities and the economic design of the structural adjustment programme enjoins upon the government to bring down the fiscal deficit substantially inter alia, by reducing food subsidies, though various hidden subsidies (e.g., concessions and exemptions in corporate taxation) are not even talked about. In order to reduce the food subsidy, the authorities are tempted to increase the issue price of the cereals sold under the PDS. This is what has precisely been done recently and by a huge amount. (table 2) The recent (late 1991) price increases are expected to yield to the state exchequer a total amount of Rs. 1,000 crores every year (Krishnan, 1992). Irrespective of the claimed anti-inflation effect of reduced fiscal deficit, the increase in the PDS

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**Table 2 : Increases in Procurement and Issue Prices for Rice and Wheat**

(Rs./Qtl.)

Year	Rice (Common)		Wheat (FAO)	
	Procurement price	Issue price	Procurement price	Issue price
1980-81	15.75	12.00	2.00	n.c
1981-82	19.30	13.00	13.00	15.00
1982-83	11.05	7.00	12.00	11.00
1983-84	15.80	15.00	9.00	16.00
1984-85	10.10	5.00	1.00	n.c
1985-86	7.95	19.00	5.00	3.00
1986-87	6.30	12.00	5.00	15.00
1987-88	6.30	n.c	4.00	5.00
1988-89	18.20	5.00	7.00	9.00
1989-90	n.a	45.00	10.00	30.00
1990-91	n.a	88.00	n.a	46.00

- Note: 1. Increases in issue prices are adjusted for the period for which they are effective except for the last three years.  
2. Procurement prices are for the marketing year. n.c. = no change, n.a. = not available

issue price may pitch the prices out of the reach of a large number of the poor and the unemployed. How far is such a step consistent with the declaration of the intent to ensure that the poor are not to be made to bear the burden of the structural adjustment programme? One can see that out of the budget provision of Rs. 2500 crores for the year 1992-93, only about R. 2083 crores are meant for consumer subsidy. Based on the rate of a Rs. 127.71 per quintal for wheat and Rs. 86.97 for p.q. of rice, and the estimated off-take of 95 lakh tonne and 100 lakh tonnes of wheat and rice respectively, the consumer subsidy would amount to Rs. 2083 crores, leaving over Rs. 400 crores for covering the carrying cost of bloated food stocks. (Expenditure Budget, 1992-93, 11-12).

### Operation of PDS—a Retrospect

The hypotheses concerning the less-than-adequate effectiveness or even the counter-productive impact of the revamped PDS (in order to nullify the adverse consequences flowing from the IMF/World Bank scheme of structural adjustments) can be better appreciated if we view the operation of the PDS in its retrospect. Significant increases in food production, particularly after 1966, have kept marginally ahead of the rate of growth of population. However, the growth rate has not been adequate to result in a marked and even increase in the per capita availability of cereals in all the regions of the country. The food economy remains poised on knife-edge and even a small disturbance makes it go off the course. More importantly, the endemic problem of malnutrition persists for a large number of people—40 per cent of the Indians are below

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the poverty line. As against the normative requirement of 2400 calories per person per day, the actual intake is about 2000 calories. Between 1972-73 and 1988-89, the average consumption of cereals declined from 15.260 kg. per month to 14.56 kg. The average consumption of the bottom 30 per cent of the population stagnated at about 13.5 kg. per month between 1983-88 (38th and 43rd Round of NSS Consumption Expenditure Survey data). Even the per capita net availability of cereals was stagnating around 155 kg. per year during the 1980s.

It would be useful to analyse the operation of the procurement of PDS supplies and administrative price policy with respect to cereals in the background of the trends in the production of cereals during the preceding decades. The trend rate of growth in the production of rice, wheat, coarse grains and pulses during the period 1967-68—1989-90 were 2.7 per cent, 5.52 per cent, 0.58 per cent and 0.60 per cent respectively. (The period 1968-90 saw a lower trend growth rate in the production of cereals at 2.82 per cent compared to that during 1950-55 at 3.18 per cent. The period also shows an increase in the variations in the annual production. (Hanumantha Rao et al, 1988).

The increased production levels were accompanied by increased procurement. This was a logical outcome of the policy of support price which was the fulcrum of the green-revolution strategy. Procurement of cereals increased from 8.7 million tonnes during 1970-71 to 22.6 million tonnes during 1989-90. However, the procurement level experienced considerable variations from year to year. The co-efficient of variations in the procurement of rice during 1970s was 28 and for wheat (excluding the year 1973-74) it was 35; the comparable figures during 1980s were 22 and 18 respectively. However, the share of procurement in wheat production increased from 9.9 per cent during 1970s to 13.1 per cent during 1980s. As a result of the concentration of increased production in certain states, 82 per cent of the procurement of rice was accounted for by Andhra Pradesh, Haryana, Punjab and U.P. alone, while Haryana, Punjab and U.P. contributed 98 per cent of total wheat procurement. The procurement operations were carried out by the centre through the Food

Corporation of India, while the states had rather a minimal role. Though the states are asked to undertake procurement on their own, the centre grants subsidies only on the quantities allotted (for PDS) from the central pool. This reduces the incentive or may be even the capacity of the states to go in for procurement on their own.

The total size of PDS supplies has been hovering around 10-15 per cent of the total production (table 3). Imports have become rather marginal and the centre has to maintain buffer stocks in order to ensure macro-level food security against the monsoon and market-led fluctuations in food output. The levels of procurement and buffer stocks put limitations on the total quantities likely to become available for distribution under the PDS. The quantity offered under the PDS is not adequate even to supply 50 per cent of the requirement of the bottom 40 per cent of the population. It has been estimated that in order to accomplish this level, procurement has to be nearly one-fifth of total production, amounting to 31 million tonnes at 1990-91 level of production. The imbalance in the commodity composition of the procured quantity of cereals also creates difficulties in raising the level of PDS. The share of wheat in procurement has gone up to 51 per cent, while the share of coarse grains (which account for about 1/5th of total cereal production) was as low as 0.5 per cent during the 1980s. This represents the practical elimination of the small and marginal farmers, particularly in dry, drought-prone and deficit regions, from the purview of the price support operations and at the same time excludes large proportions of the poor consumers from going in for coarse grains from the protective umbrella of the PDS. Given the substitutability between coarse cereals and wheat and rice, despite strong regional food preferences for wheat and rice in different parts of the country, the practical exclusion of coarse grains from the purview of the PDS compels the poor consumers to incur additional expenditure on the purchase of high-priced cereals

Moreover, the PDS is a highly-uneven phenomenon between different states of the country as nearly one-half of the PDS supplies goes to the states having about 30 per cent of the country's population. In this pattern of regional variations, the concentration of poor inhabitants is not

**The total size of PDS supplies has been hovering between 10-15 per cent of the total production.**

taken into account. This is reflected in the fact that the states accounting for about 52 per cent of poor population secured only 20 per cent of the central supplies (during 1981-1988). This pattern of regional inequities in the availability of PDS goods is not confined to cereals; about one-half of the total supplies of imported edible oils supplied through the PDS channels went to Maharashtra and Gujarat while the share of U.P., Bihar and Orissa was less than 10 per cent. In fact, even in the design of the PDS one can see such inequities—for example, the ration entitlement in many states is about 5 kg. per person, per month which is about one-third of the normative level of requirement. The ineffectiveness of the existing PDS is revealed by the low utilisation of PDS supplies.

### Limitations

The PDS, despite its laudable objectives and immaculate rationale, has remained a weak instrument to subserve its avowed objectives. We have gone into neither the political economy of the PDS, nor the administrative design, which, as seen elsewhere (Kabra, 1990) expose the serious constraints on the capacity of the PDS to provide effective succor to the masses suffering the consequences of inflation.

In addition to the overall limitations there are other factors reducing the effectiveness of the PDS. These are:

1. The government has been managing the food economy in such a way that the overall market availability of cereals is declining with its expected adverse impact on open market prices. The closing stocks of rice and wheat are higher than the buffer requirements in a number of years with consequent higher food subsidy and lower consumer subsidy.
2. Lately, the objective of ensuring PDS supplies at affordable price has been compromised. The procurement prices have been increased considerably pushing up the economic cost of supplies available for releases under PDS. The fear of increased procurement prices causing a large ballooning of the subsidies bill has had more weightage than the commitment to stable and affordable prices. This is

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**Table 3 : Change in availability due to Government operations in cereals**

(in million tonnes)

Year	Rice		Wheat	
	Change in availability	Current releases minus current procurement	Change in availability	Current releases minus current procurement
1980-81	-5.5	0.4	-1.2	4.7
1981-82	-3.5	0.0	-1.5	3.7
1982-83	-1.8	0.9	-3.0	3.5
1983-84	-3.1	-0.8	-7.2	2.1
1984-85	-6.5	-3.0	-7.9	2.4
1985-86	-7.6	-2.0	-10.4	1.8
1986-87	-6.2	0.3	-10.7	-0.7
1987-88	-2.4	3.0	-7.7	1.3
1988-89	-1.7	1.0	-4.4	0.9
1989-90	-4.9	-2.9	-4.6	-1.9

Notes : Year corresponds to marketing year  
 Rice : October to September  
 Wheat : April to March

2. Change in availability = (Opening stocks + Procurement + Net imports)-(releases to PDS + open market sales)
3. Opening Stocks : as on 1st October for rice; as on 1st April for wheat.
4. Procurement : October to September for rice; April to March for wheat.
5. Imports : April to March.

Sources : Economic Survey, Ministry of Finance, GOI.  
 Bulletin on Food Statistics, Directorate of Economics and statistics, Ministry of Agriculture, GOI  
 Annual Report : Food Corporation of India.

reflected in the large increase in the PDS issue prices than was essential to neutralise the increase in procurement prices. This has been happening more or less regularly during the 1980s (table 2). This has compromised the promise of the PDS to ensure stable price, inflation-insulated supplies of essential cereals to the poor. In fact, the 1980s have seen an ironical phenomenon of the PDS issue prices rising at a faster pace than the procurement price of wheat and rice. The recent hike in the PDS issue prices is in line with this policy.

3. The loopholes in the administrative design of the PDS operations result in leakages of the meagre supplies to unintended channels, non-availability of entitlements with FPS dealers on account of diversion by the FPS dealers in collusion with civil supply authorities, irregular supplies, inferior quality of grains supplied and restrictions on drawals according to the consumers' capacity and convenience, etc. The present revamping has failed to address itself to these basic defects.

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4. The overall imbalance in the total entitlement given under PDS and the quantities actually made available is continuing. This is worsened by giving formal universal access, without excluding anyone, from the purview of the PDS and the failure to give preferential access to certain deserving sections of the population. This is true even with respect to the supply of cereals at special low prices in tribal areas. The PDS policy which is supposed to correct the imbalances and inequities created by the relentless march of the inflationary process does not exclude from its purview even those sections who are the powerful 'players' in the economy and who are the net beneficiaries of the inflationary process (like the trading community or the producers with sufficient oligopolistic/monopolistic power to be able to determine or influence the market prices or those who generally benefit from rising prices in so far as they do not have contractual, fixed income or those whose incomes are fully indexed to rising prices).

## Conclusion

High-voltage publicity campaign to play up ineffective and counter-productive steps like opening more FPS or issuing additional ration cards or creating a facade of people's vigilance committees is made surrogate for effective policy, and administrative steps. It may be concluded that notwithstanding the need to strengthen and redesign the PDS in order to counter or reduce the adverse effects of the liberalisation programme on the poorer sections, it is the very logic of the liberalised policy regime and its compulsions which prevent the PDS from discharging its intended role.

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## 'HR STRATEGIES CAN BOOST PRODUCTIVITY'

UK Productivity could be given a boost by paying greater attention to human resources strategies, according to Martin Wibberley, director of human resources at Robert Bosch.

Wibberley, in the second lecture of the annual series sponsored by the IPM and Manpower (UK), said: "We must do two things. First, give much more attention to the human and organisational aspects of major investments in technology because technology alone will not succeed."

"Secondly, improve productivity by putting in place and sustaining human resource strategies that really motivate performance in our people. Here the four most likely strategies to succeed are total quality, continuous improvement, involvement and continuous learning."

Where these had been introduced, work had become a source of enthusiasm, Wibberley said.



# From Import Substitution to Open-door Industrialization : An Evolution

Bhaskar Majumder

*This paper examines the switching of India's trade policy from the pre-1966 inward-looking import-substituting industrialization (ISI) to the post-1966 outward-looking export-oriented industrialization (EOI) and the ultimate convergence to the path of open-door industrialization (ODI) in the terminal decade of the twentieth century. The analysis justifies the contention that on the basis of our development experience during the last four decades of Indian planning, there is a need to reorient our strategy to ensure both economic growth and growth-led trade.*

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The international trade theory found in text books fails to portray 'what in fact is happening in the world at large' (Hindley, 1980, 188; Chakravarty, 1985, 53). To quote Hindley, "The standard theorems of international economics offer no route to an explanation of existing trade policies beyond making clear that to explain them as the actions of an intelligent government primarily concerned to maximize the aggregate economic welfare of its residents is very difficult indeed". Trade problems and policies are often seen in isolation from the wider spectrum of the problems and policies related to industrialization. Foreign trade is often conceived as a separate activity like transforming import inputs (bearing cost) into export output (earning revenue) where the problem ultimately boils down to one of allocation of resources.

It has sometimes been contended that the inefficiency of the Indian foreign trade regime and also the gradual erosion of the possibilities of import substitution in Indian economy since mid-sixties contributed to the retardation of Indian industrial growth. The course of the economy had been redirected towards an outward-oriented industrialization strategy following the crises in the economy and the halting of an uninterrupted process of five-year planning since mid-sixties. The scope of this paper is a limited one. It aims at examining the switching of India's trade policy from the pre-1966 'inward-looking' import-substituting industrialization (ISI) to the post-1966 'outward-looking' export-oriented industrialization (EOI) and the ultimate convergence to the path of open-door industrialization (ODI) in the terminal decade of the twentieth century. Our analysis justifies the contention that on the basis of our de-

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velopment experience during the last four decades, there is need to reorient our strategy to ensure both economic growth and growth-led trade.

### Rationale of ISI Strategy

In post-independent India, an explicit notion on ISI was formulated by Prof. Mahalanobis in 1953 (which was thereafter incorporated in the Second Five Year Plan model constructed by him) (Bose & Mukherjee, 1985, 116). A criticism is often made against the autarkic character of this strategy. (Bhagwati & Desai, 1970, 236). This criticism is unjustified since "the import-substituting industrialization in certain basic sectors of the economy was expected to pave the way for export promotion efforts over a sufficiently broad base" (Chakravarty, 1978, 128). The fact, however, is that during the pre-1966 Indian trade regime "the industrial targets were supported by the quantitative restrictions which shielded domestic production automatically from foreign competition..." (Bhagwati & Desai, 1970, 122). In this time-phasing of the gradual transformation of the economy that was called for from the beginning of planning, the State was supposed to play the decisive role (Planning Commission, 1952, 32; Singh, 1986, 6). The emergence of a new economic order associated with the Second Plan (1956-61) priorities brought into being the 1956 Industrial Policy Resolution. The 1956 Resolution reiterated the Mahalanobis strategy of inward-looking ISI (Planning Commission, 1956, 43-49).

We find a number of examples suggesting why inward-looking, home market-based development strategy was preferred in the early stages of development (Deane, 1984, 50, 69; Raj, 1979, 157; Bagchi, 1982, 118-119; Mabogunje, 1977, 437-440).

Pre-1966 ISI strategy was adopted because Indian economy was in the early stages of development and hence export promotion was impossible (export pessimism). The following were the expected outcome of the strategy:

- (1) Expansion of home market and the progressive minimization of dependence on foreign markets for final commodities.
- (2) Allowing infant industries to grow and be able ultimately to compete in the international market.
- (3) Allowing infant and indigenous technology to develop.
- (4) Restricting higher order commodities and technologies (in use in advanced capitalist countries) flooding the economy since these are intended to

serve only the affluent society.

- (5) Saving scarce foreign exchange reserves.
- (6) Creating an acceleration in employment (as associated with investment composition-cum-commodity order) and hence, expansion of home market.
- (7) Learning and adaptation of technology (product innovation and process innovation), whenever necessary, but not technology imitation.
- (8) A check on income-distribution from being skewed.

Additional considerations are :

- (1) A political feasibility of the policy (a policy under parliamentary democracy cannot be identical with a policy under military government, for example).
- (2) Both internal and external factors, e.g., size of the country (geographically and demographically), natural resources, mobility of labourers (inter-regional and international etc.).
- (3) An independent adoption of policy by the state.

### Rationale of EOI Strategy

The year 1966 is a turning point in the history of Indian industrialization when the Government relaxed quantitative restrictions on imports following devaluation of the rupee in June, 1966 (Planning Commission, 1970, 96). An EOI strategy, with or without professing import liberalization explicitly, was followed during the days following June 25, 1975, when the 'Emergency' was declared. The sanctioning of loans to India in 1981 by IMF confirms the adoption of the above strategy (Sau, 1981, 57). The Reserve Bank of India (R.B.I.) during the seventies stressed on import-led export promotion (R.B.I., 1973-74, 232; 1975-76, 204; 1978-79, 251, 254-55). During the same period, the Planning Commission announced import substitution and export promotion as complementary objectives (Planning Commission, 1974, vol. I, 17, 18). The Draft Five-Year plan (1978-83) advocated selective relaxation of trade controls on the basis of 'make or buy' decisions which may be interpreted as growth-led export promotion and import liberalization-led growth (Planning Commission, 1978, 66-68). On the contrary, the Sixth Plan

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(1980-85) took the twin objectives of import substitution and export promotion as did the Fifth plan (Planning Commission, 1981, 84). The Seventh plan (1985-90) stressed on 'export earnings' as a means of "sustaining sufficient and uninterrupted supplies of imported inputs for smooth functioning of the economy, of activating idle capacity, and of exposing industry increasingly to the more exacting world market" (Planning Commission, 1985, Vol. I, 66).

In 1981, a Memorandum seeking loans submitted by the Government of India to the IMF revealed the intention to promote exports and liberalize imports via adoption of appropriate measures (Govt. of W.B., 1981, 35-37). The assessment made by the IMF staff confirmed the Government's pledge for acceptance of export promotion and import liberalization. (Govt. of W.B., 1981, 46-49). The import and export policy announced by the Government for April 1985 to March 1988 sought (i) "to strengthen the base for export production and strive for a major thrust in exports" (ii) "to facilitate increased production through easier and quicker access to inputs that need to be imported" (iii) "to make all possible savings in imports, to support indigenous production, and to promote efficient import substitution", (iv) "to facilitate technological upgradation and modernisation in production", (v) to reduce licensing, to streamline procedures and to decentralise decision-making, which should reduce costs in terms of time and resources", and thus (vi) "to impart continuity and stability in Import-Export policy" (Foreign Trade Review, 1985, 595).

Though the decade of the 1980s can be said to be converging to import liberalization along with export promotion, we consider it more appropriate to talk about the emergence of ODI strategy with the announcement of the New Industrial-cum-Trade Policy, 1991.

The following aspects of EOI strategy (1966-90) may be noted:

1. A shift in trade policy from import-substituting to export-promotion was based on a shift from dependence on home market to dependence on the world market.
2. The post-1966 excess capacity in capital goods sector associated with pre-1966 capital goods-based heavy industrialization strategy created surplus. Export promoting path could be a 'vent-for surplus'.
3. Pre-1966 quantitative controls led to the protection of domestic industries irrespective of cost structure, in turn, leading to inefficient import substitu-

tion (Bhagwati, 1968, 55). This necessitated the EOI strategy.

4. The export promotion was expected to result in comparative (cost) advantage for the economy in factor endowments and hence in commodity production (Bhagwati, 1968, 7).
5. Domestic resources were expected to be allocated efficiently in sectors producing exportables, when the export-sector industries faced competition from abroad.
6. The expected favourable effects of EOI strategy may be attributed not only to the application of economies of scale or the 'stimulating effects of foreign competition', but also to limiting quantitative restrictions, thus eliminating distortions in the instruments of incentives-disincentives in economic activities. This favourable effect may be realized, it is often argued, from a stable government committed to exports (Krueger, 1978, xv, xvi).
7. Social benefit from export promotion was supposed to exceed social cost from protection to domestic industries (World Bank, 1987, 90).
8. 'Import inflexibility' of certain commodities, e.g., POL, fertilizers etc. meant for India a continuous depletion of foreign exchange reserves. This was expected to be compensated by promotion of exports. This argument is nothing but the 'export capacity to import'.
9. A direct relationship between export promotion and higher saving was expected "either because the propensity to save is higher in the export sector than elsewhere or because government savings rely heavily on taxes on foreign trade" (Maizes, 1968, 58). This relationship, however, will not materialise in the absence of a higher saving-yielding export sector and/or in the absence of higher taxes imposed by the Government on the export sector.

### Viability of EOI Strategy

The conditions for adoption of EOI strategy are (i) an adverse trade balance, and (ii) a gradually deteriorating foreign exchange reserves position during the 'Planning Era' (Government of India 1989-90, S-66-67, S-73). India's import of technology (in number of effective foreign collaboration agreements) steadily increased during the successive plans of the 'Planning Era' (NCAER, 1971, 124-125). In addition, an increasing pre-1966 debt servicing had far-reaching implications via perpetuation of aid

whereby an independent policy-induced growth path was blocked (Rao, 1983, 199; Maity, 1986, 106; Government of India 1983-84, 81). In this background, the policy-makers chose the EOI strategy.

Aimed at export promotion, the Government, in addition to devaluation in 1966, offered export assistance through (i) Duty Drawback (D.D) and (ii) Market Development Assistance (M.D.A.). (Table 1) The product distribution of C.C.S. (the major form of M.D.A.) is weighted in favour of non-trationals as presented in table 2. It was engineering goods that enjoyed the lion's share, though declining, of C.C.S. during 1974-84. While the share of chemicals gradually declined, that of leather and woollen products and handicrafts increased.

During seventies and eighties, the relative weights of non-trationals like machinery and transport equipment, gems and jewellery etc. increased in India's export basket. (Table 3). A declining share of two traditional items, jute

**Table 3 : India's Export Earnings from Principal Commodities as percentage of total exports**

	Jute Manufactures	Tea	Principal Commodities
1972-73	12.78	7.47	51.99
1973-74	9.01	5.78	46.95
1974-75	8.92	6.85	42.43
1975-76	6.23	5.88	39.62
1976-77	3.91	5.69	38.73
1977-78	4.53	10.53	47.37
1978-79	2.04	5.95	43.79
1979-80	5.70	5.73	45.49
1980-81	4.92	6.34	44.43
1981-82	3.30	5.06	42.79
1982-83	2.34	4.20	56.76
1983-84	1.75	5.27	54.17
1984-85	2.91	6.53	53.68
1985-86	2.40	5.75	60.60
1986-87	2.11	4.37	57.00

Note : Here, Principal Commodities = Jute Manufactures + Tea + Cotton Textiles + Leather & Leather Manufactures + Tobacco unmanufactured + Gems & Jewellery + Iron Ore + Machinery & Transport Equipment.

Source : Report of the Committee on Trade Policies, GOI, Ministry of Commerce, Dec., 1984, 102-103; ES, GOI, Ministry of Finance, 1987-88, S-74, S-75 & 1989-90, S-76, S-77.

and tea, together with increasing share of a large number of non-trationals in India's exports during seventies and eighties may imply a diversifying export basket and by no means an expanding export frontier. For example, we may consider the case of machinery and transport equipment (the major capital goods) in table 4. During seventies and eighties, imports of machinery and transport equipment as a percentage of total imports are greater than exports of the same as a percentage of total exports ( $M_{T/M} > X_{T/M}$ ) in a state of adverse trade balance ( $M - X > 0$ ). Obviously the trade balance of major capital goods was weighted in favour of imports. Increasing  $X_{T/M}$  in addition to reducing  $M_{T/M}$  is often interpreted as (net) export promotion of machinery and transport equipment. This, however,

**Table 1: Trends in Export Assistance, Rs. Crs.**

Year/ Assistance	Duty Drawback	Market Development Assistance	Cash Compensatory Support (C.C.S.)
1973-74	42.3	62.4	52.4
1974-75	60.0	76.4	59.9
1975-76	82.0	148.3	123.7
1976-77	120.0	239.6	226.4
1977-78	133.0	324.4	310.3
1978-79	150.0	375.2	359.0
1979-80	152.0	360.9	344.1
1980-81	164.0	399.1	376.4
1981-82	204.0	476.9	452.4
1982-83	127.0	476.3	448.8
1983-84	132.0	461.4	429.9

Note : M.D.A. = C.C.S. + E.C.D. + G.I.A + Others, where  
E.C.D. = Export Credit Development Scheme  
G.I.A. = Grant in Aid to Export Promotion Councils (EPCS) and other organisations.

Source : Report of the Committee on Trade Policies, GOI, Ministry of Commerce, Dec. 1984, 109.

**Table 2 : Percentage Distribution of C.C.S. Between Major Commodity Groups of Exports**

Commodity Goods	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Engineering Goods	65.5	65.3	50.9	46.3	45.0	42.6	41.9	47.0	45.0	42.8
Chemicals & Products	23.1	19.7	12.2	12.0	10.1	8.8	9.7	9.4	8.7	8.0
Finished Leather, Leather Manufactures etc.	2.0	3.4	9.8	10.4	11.5	15.2	11.8	11.3	11.9	11.7
Woollen Carpets, Rugs & Druggets	3.5	4.1	6.3	7.9	8.5	10.0	12.4	10.3	8.4	8.8
Jute Products	—	2.2	5.1	7.7	6.0	3.9	1.4	1.2	3.1	2.6
Handicrafts	Neg.	0.2	2.8	3.8	4.4	4.4	4.8	3.9	3.0	2.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Report of the Committee on Trade Policies, Op. Cit., Dec., 1984, pp. 110-111.

**Table 4 : Imports and Exports of Machinery and Transport Equipment as Percentage of their respective totals**

Year	M <sub>TM</sub>	M <sub>TX</sub>	X <sub>TX</sub>
1970-71	24.17	25.73	—
1972-73	28.49	27.00	4.29
1973-74	22.05	25.82	4.69
1974-75	15.39	20.90	6.47
1975-76	17.79	23.15	6.45
1976-77	20.65	20.37	5.88
1977-78	18.44	20.53	6.23
1978-79	18.49	22.00	6.94
1979-80	15.12	21.53	6.99
1980-81	14.51	27.13	7.84
1981-82	14.55	25.37	7.91
1982-83 (P)	15.55	25.26	6.62
1983-84	20.04	32.47	8.26
1984-85	17.98	26.23	8.14
1985-86	20.78	37.49	8.75
1986-87	31.25	50.43	9.09
1987-88 (P)	21.18	30.14	9.10
1988-89 (P)	18.86	26.19	11.44

Note : M = Total Imports : X = Total Exports.  
M<sub>T</sub> = Imports of Machinery and Transport Equipment.  
X<sub>T</sub> = Exports of Machinery and Transport Equipment.  
Data on X<sub>T</sub> for the years 1983-84 to 1988-89 cover Exports of Machinery and Transport Equipment, and Metal manufactures including Iron and Steel.

Source : Report of the Committee on Trade Policies, GOI, Ministry of Commerce, Dec., 1984., 1984, pp. 102-103, 115; Economic survey, GOI, Ministry of Finance, 1989-90, p. s-74 to s-77.

depends upon relative rates of increase in (X<sub>TX</sub> — M<sub>TM</sub>) and (M — X) (Government of India 1989-90, s-73). The non-traditional products that attained most success during seventies and early eighties had been engineering goods, as may be evident from table 5.

**Table 5 : Percentage Share of Engineering Exports in Indian Exports**

Year	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78
Percentage	7.1	7.6	10.5	10.1	10.7	11.5
Year	1978-89	1979-80	1980-81	1981-82	1982-83	1983-84
Percentage	12.5	11.5	13.4	13.4	14.1	12.4

Source : Singh, A.P. 'Indian Engineering Exports', in Foreign Trade Review, January-March 1985, 584.

However, the choice and success of EOI strategy depend more on the global order in which a developing country like India is set than on the internal economic incentives offered to the product-specific potential and actual exporters. Generally, the share of the developed market economies (product-technology leaders) in World exports leaves little room for the developing economies to promote their share. (table 6 & 7). In fact, the very LDC type export structure of India (derived from her product structure) leaves little room for sustaining an EOI strategy, in addition to allied problems and constraints (Kaplinsky,

**Table 6 : Exports of Developed Market Economies as Percentage of Total Exports**

Year	1951	1960	1971	1972	1973	1974	
Percentage	62.9	66.9	72.0	71.9	70.9	64.9	
Year	1975	1976	1977	1978	1979	1980	1981
Percentage	66.2	65.0	64.6	67.2	65.2	63.0	62.7

Source : Sau, R. Economic Crisis and Economic Theory, Economic & Political Weekly, Annual No. , April 1982, 577;

Varshney, R.L. 'World Trade Trends', in Foreign Trade Review, Vol. XX, April-June 1985, 13.

**Table 7 : Share of Selected Countries in World Exports of Manufactures**

	1965	1970	1975	1980	1983
1. LDC total of which	5.5	6.5	7.0	9.6	12.1
India	0.8	0.5	0.4	0.4	0.5
Korea	0.1	0.3	0.8	1.4	2.0
Taiwan	0.2	0.5	0.8	1.5	2.1
Hongkong	0.9	1.2	1.1	1.6	1.9
Singapore	0.3	0.2	0.5	0.9	1.2
2. EEC	46.5	45.3	45.8	45.1	39.8
3. USA	16.6	15.2	14.3	13.1	12.7
4. Japan	7.1	9.0	10.4	11.0	13.1
World Total	100.0	100.0	100.0	100.0	100.0

Source : Akira Hirata & Takashi Nohara, 'Changing patterns in International Division of Labour in Asia and the Pacific', in Moyohei Shinohara and Fu-Chen Lo (Eds.), Global Adjustment and the Future of Asian Pacific Economy, Institute of Developing Economies), 1989

1984, 77-78). In this setting, Indian exports as a percentage of world exports confirm a declining share over time (table 8). Contrary to the increasing weightage of engineering goods in India's export basket, the exports of Indian engineering goods as a percentage of World exports of the same was not only insignificant but declined during seventies as shown in table 9. This commodity-specific stagnant or falling share of Indian exports as percentage of World exports is true for the non-traditionals for which huge export-assistance was provided (table 10). In addition, we see a gradually declining share of India in exports from developing countries (table 11). In fact, while during 1973-83 World exports grew at a compound rate of 12.2 percent p.a., exports from developing countries grew at a rate of 15.2 percent and Indian exports at a rate of 9.8 per cent (Varshney, 1985, 4). The better export perform-

**However, the choice and success of EOI strategy depend more on the global order in which a developing country like India is set than on the internal economic incentives offered to the product-specific potential and actual exporters.**

**Table 8 : Indian Exports as Percentage of World Exports**

Year	1948	1949	1950	1951	1952	1953	1954	1955	1956
Percentage	2.6	2.4	2.1	2.2	1.8	1.5	1.5	1.5	1.4
Year	1957	1958	1959	1960	1961	1962	1963	1964	1965
Percentage	1.4	1.3	1.4	1.2	1.2	1.1	1.2	1.2	1.0
Year	1966	1967	1968	1969	1970	1971	1972	1973	1974
Percentage	0.89	0.84	0.82	0.75	0.72	0.58	0.58	0.51	0.47
Year	1975	1976	1977	1978	1979	1980	1981	1982	1983
Percentage	0.50	0.55	0.56	0.51	0.48	0.42	0.41	0.49	0.41
Year	1985	1986							
Percentage	0.5	0.4							

Note : There are minor discrepancies in data offered by these sources.

Source : Bhagwati J. & T.N. Srinivasan, *Foreign Trade Regimes and Economic Development : India*, NBER, OXFORD and IBH, 1975, 19 (for 1948-70);

Ahluwalia, I.J. *Industrial Growth in India, Stagnation Since the Mid-Sixties*, Oxford Univ. Press, 1985, 117 (for 1971-76); *Economic Survey*, GOI, 1983-84, 150-151 (for 1977-81);

Varshney, R.L. *'World Trade Trends' in Foreign Trade Review*, Vol. XX, April-June, 1985, 14 (for 1973-83); *Economic Survey*, GOI, 1989-90 (for 1985-86).

**Table 9 : Percentage Share of India in World Exports of Engineering Goods**

Year	1970	1977	1978	1979	1980	1981
percentage	0.3	0.3	0.2	0.2	0.2	0.2

Source : Singh, A.P. *'Indian Engineering Exports'*, *Foreign Trade Review*, January-March, 1985, 586.

**Table 11 : Percentage Share of India in Exports from Developing Countries**

Year	1973	1977	1978	1979	1980	1981	1982	1983
Percentage	2.63	2.21	2.19	1.86	1.62	1.62	1.51	1.64

Source : Varshney, R.L., *'World Trade Trends'*, *Foreign Trade Review*, Vol. XX, April-June 1985, 14.

**Table 12 : India's Expenditure on POL Imports**

Year	M <sub>POLM</sub>	M <sub>POLX</sub>	M <sub>TX</sub> + M <sub>POLX</sub>
1970-71	8.32	8.85	34.58
1975-76	23.29	30.33	53.48
1977-78	25.78	28.71	49.24
1978-79	24.76	29.46	51.46
1979-80	36.45	51.60	73.13
1980-81	41.95	78.43	105.56
1981-82	38.14	66.48	91.85
1982-83	39.33	63.86	89.12
1983-84	30.52	49.45	81.92
1984-85	31.57	46.06	72.29
1985-86	25.38	45.79	83.28
1986-87	13.99	22.57	73.00
1987-88	18.23	25.94	56.08
1988-89	15.51	21.55	47.74

Note : M<sub>POL</sub> = Imports of Petrol, Oil and Lubricants.

Source : *Economic Survey*, GOI, Ministry of Finance, 1983-84 142-145; 1987-88, S-72 to S-75; 1989-90, S-74 to S-77.

**Table 10 : India's Share % in World Exports, Selected Commodities (Selected Years)**

Commodity Division	1970	1973	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Chemical Materials and Products	—	—	0.2	0.2	0.21	0.19	0.18	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Leather, Leather Manufactures etc.	9.1	0.4	13.3	15.0	14.39	14.78	18.06	6.8	7.1	6.5	5.3	5.7	6.8	5.5	5.9
Iron and Steel	0.9	0.3	0.3	0.9	0.90	0.53	0.25	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of Metals etc.	0.6	0.6	0.6	0.7	0.76	0.80	0.75	0.6	0.6	0.8	0.7	0.8	0.6	0.5	0.5
Power Generating Machinery & Equipment	0.1	0.2	—	—	—	—	—	0.2	0.3	0.2	0.1	0.2	0.1	0.1	0.1
General Industrial Machinery & Equipment & Machine parts thereof	—	—	—	—	—	—	—	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Electrical Machinery apparatus & appliances	—	—	0.2	0.2	0.21	0.20	0.17	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1

Ref. : *Economic Survey*, GOI, Ministry of Finance, 1981-82, 136-137; 1987-88, S-78, S-79 & 1989-90, S-80 to S-83.

ance of developing countries as a group might have been an offshoot of their better growth rates attained during 1973-82 as well as oil price hike (Patel, 1985, 1652, Varma, 1985, 78; Varshney, 1985, 4, 6). However, the same global environment favouring export promotion for the oil exporting developing countries obstruct export promotion for the others. What is specifically adverse for the Indian economy is an increasing pressure on her expenditure on oil imports following both oil price hike and inflexible imports of oil (table 12).

Increasing import expenditure, particularly on oil, machinery and transport equipment as a percentage of total export earnings during the late seventies and the eighties implies increasing cost of a capital-cum-fuel intensive process of development for India. This growth process in fact had been imposed on the economy by the decision-makers right from the beginning of planning (Majumder, 1990, 138; Majumder, 1991, 231, 234). The implication is, if India cannot control oil price (which obviously she cannot,) and cannot shed her dependence on repetitive imports of technologies-cum-capital goods, she has to divert the path of development towards capital-cum-energy saving and/or capital-cum-energy generating resources.

### **Rationale of ODI Strategy**

In view of 'the fast changing global scenario' thrown up by 'today's increasingly interdependent industrial world, and the emerging challenges, the New Industrial Policy (NIP), 1991, announced by the Government of India declared to make the economy more 'outward oriented, and to provide much 'freer play of market forces' (GOI, 1991, 4-5). "India can grow faster as part of the world economy and not in isolation. Our trade policy must therefore create an environment that will provide strong impetus to exports and render export-activity more profitable", as claimed by the New Economic Policy (NEP) (Government of India 1991, 24).

The package of trade policy reforms the Government announced on 4th July, 1991, aimed at access to high technology and world markets. Thus the reforms aimed at "strengthening export incentives, eliminating a substantial volume of import licensing and optimal import compression in view of the balance of payments situation. Essential imports of sensitive items such as POL and fertilisers were fully protected, but other imports of raw materials and components were linked to export performance..." (Government of India, 1991, 24).

**The package of trade policy reforms the Government announced on 4th July, 1991, aimed at access to high technology and world markets.**

In addition to 'Abolition of Phased Manufacturing Programme' which ensures abolition of any attempt to force the pace of 'indigenisation' in manufacturing or which erases any need for enforcing 'local content requirements', the New Policy aims at minimizing the interference of Government, if not totally abolishing it, in matters related to import of technology by Indian firms, particularly in high technology and high investment priority industries (Government of India, 1991, 3-4).

A perusal of the New Industrial-cum-Trade policies thus reveals an import liberalizing-cum-export promoting or what we call ODI strategy.

The rationale of such a strategy may be interpreted to be based on the following :

1. A sound foreign exchange reserves position may help import liberalization. Whether or not there exist such reserves, a policy of import liberalization has to be supported by an effective EOI strategy at least to maintain the capacity to import.
2. If output produced at home fails to satisfy home demand, then the gap may be met by imports. This is nothing but the 'make or buy' hypothesis in favour of import liberalization.
3. Export promotion as thought to be a corollary to import liberalization can be phrased alternatively as 'import-led-growth-led-export'. Success of any strategy depends upon the nature of imports, the extent of product-specific capacity creation and utilization, the nature of home market vis-a-vis a possibility of 'vent-for-surplus'.
4. A policy of import liberalization (whether or not associated with export promotion) may aim at 'import-pushed growth'. Such a growth process is supposed to work via import and investment of inputs to be transformed into final output.
5. It is supposed that liberal import of technology increases economic efficiency. Also that "there is increasing evidence that adoption of new technology has been faster in outward-oriented developing economies" (World Bank, 1987, 91).

6. A liberal trade regime seeks a 'liberal environment' via reducing protectionist barriers, and hence, inviting foreign capital, technology and entrepreneurship into domestic market for competitive growth. (Patnaik, 1985, 6). The essential point, however, may be that the Indian economy facing long-term crises had to pledge accommodation of more metropolitan capital in the terminal decade of the twentieth century.

### The Problem in Perspective

A shift in trade policy from ISI to EOI led neither to narrowing down the import-export gap nor to reducing the magnitude of external debt and debt servicing during eighties (Government of India, 1989-90, S-73, 90). In fact the long-run viability of an industrialization strategy for a country like India during the last quarter of the 20th century cannot rely on an EOI strategy for the very status she enjoys vis-a-vis her trade partners. Her problems at this stage are wholly different from one of attaining the product-technology structure of global leaders. We cannot keep abreast with the best global technology by continuous imports of technology. On the contrary, repetitive imports of technology may invite a 'Dual Trap', viz., (i) a technology trap, (ii) a debt trap.

If a process of inefficient industrialization supported by skewed distribution and industrial oligopoly, is perpetuated with a product-cum-technology structure meant to satisfy the elite minority a trade regime cannot be efficient. In other words, the operational success and failure of a trade regime cannot be assessed in a context where the market-determined and planned output-structure are conflicting. If in a situation of exclusion of the bottom majority of population from the market for industrial goods, a pre-1966 strategy of inward-looking ISI fails, the solution cannot lie a switching trade strategy over to outward-looking EOI. Partial dimensions are not to be confused with the total reality.

In fact, the exhaustive symptom of the era of ISI was evident from the very inception of the strategy. "If the

**We cannot keep abreast with the best global technology by continuous imports of technology.**

industries being given protection are legitimate infant industries and have potentialities for becoming economically viable, they can retain a high rate of growth by eventually becoming export industries. The point is that weaknesses in the import substitution process are not necessarily inherent if the industries are carefully selected and if opportunities for enlarging the market are exploited." (Yoneda, 1983, 204). Supported by this policy of selecting the hierarchy of products and projects, the inward-looking ISI could be justified had the Government taken care of the process of income generation emanating from the nature of ownership over resources.

The organised private sector as well as the public sector used the import restriction regime in their favour to strengthen their prevailing oligopolistic pattern of business, thereby restricting the possibility of home market expansion. The weak (in the sense of being junior partners of western capitalists and in the sense of being reluctant to use home-made, not-yet-commercially-tested technology) indigenous capitalists depend on the use of imported technologies in a ready profit-guaranteed collusive oligopolistic market frame backed by the State allowing entry of higher-order technologies.

An exhaustion of the process of ISI is not an argument against import substitution, but an argument against the nature of commodity production—its inability to expand the home market and this inability is organically related to demand. While the objective of industrialization, particularly with reference to crises, is restructuring demand in association with rearranging product-cum-technology ordering, we often criticize a trade regime which is synonymous to bypassing the very essence of planning for industrialization.

The power of making political and economic decisions vested in the hands of a few leading to skewed distribution and property structure and it becomes possible for a foreign power, directly or indirectly, to exert pressure on the small group of (internally) powerful persons to oblige the foreign power. In this setting of internal and international distribution of power, the State can hardly be expected to gear the growth pattern to guarantee market for industrialization. However, debates centering around the secondary problems, e.g., the right trade strategy, will continue unless and until the internal dynamics of the economy (via conscious entry/exit of the majority of people in decision-making processes) ensures exercise of positive degree of 'State Power', in turn, revealing self-determined choice for product-technology-trade.



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# Macro-Economic Reforms & The Agricultural Sector

H.G. Hanumappa

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*The liberalization policy under way is a move towards globalization of economy. It has led to market-based pricing of goods and services. Three-fourths of our population being in the rural areas, the impact of the new macro-economic environment on agriculture merits a detailed study. This article sketches the short-term challenges as well as the long-term prospects in the agricultural sector arising from the macro-economic reforms.*

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The thrust of the macro-economic reforms of 1990-91 and 1991-92 can be briefly characterized as moves towards market-based pricing of goods, services and foreign exchange. The containment of discretionary controls such as industrial licensing, reduction in the scope of MRTP provisions and a more-open stance towards the inflow of foreign investments together have the impact of liberalizing the markets for industrial products. This would imply a move away from administered prices to market-based prices. In addition, import liberalization and the expected reduction in the levels of tariffs should lead to a compatibility between domestic and international prices. This is a move towards globalization of the economy, fostering not only competition within the country, but exposing the domestic industry to the stimuli of the world market. In the area of foreign exchange, the country has embarked on the Liberalized Exchange Rate Management System (LERMS) which brings the external value of the rupee into a sharp market focus. Thus all these measures may be called market-friendly approaches towards marketization and globalization of the economy.

**The containment of discretionary controls such as industrial licensing, reduction in the scope of MRTP provisions and a more-open stance towards the inflow of foreign investments together have the impact of liberalizing the markets for industrial products.**

Regardless of criticisms that may be levelled against specific measures and the timing of reforms, one should appreciate and be sympathetic to the philosophy behind the measures. In the broadest sense, they are governed by the principle that hard work, enterprise and productivity should receive rewards—not smuggling, corruption and inefficiency. While this philosophy should be welcomed by

all sectors including the agricultural sector, the fact that about three fourths of the population is in the rural areas and rural poverty continues to be a high 40 per cent would mean that the linkages between the macro-economic reforms and agriculture require careful scrutiny. This article briefly sketches the short-term transitory problems as well as the long-term prospects in agriculture arising from the macro-economic reforms.

**Short-Term Challenges:** Indian agriculture has a total cultivable area of some 160 million hectares of which 30 per cent or about 50 million hectares is irrigated and about 110 million hectares is rainfed dry land. It is estimated that on irrigated lands, a farmer can make a fairly decent living even on a one-hectare plot if he does not have to succumb to the vagaries of money lenders and lop-sided tenurial arrangements. Given this, the macro-economic reforms, by liberalizing credit markets and reducing fertilizer subsidies, may hit the small and marginal farmers adversely. While this is a valid view point, the adverse effects of liberalization can be countered if the product prices are also governed by free-market impulses and in addition, if the small farmer too can take advantage of LERMS. The farmers has demonstrated his capability to react to market signals as demonstrated in many micro-studies. In Karnataka, for instance, farmers have been very flexible in regard to cropping patterns, and have shifted from low-value to high-value crops in response to changing relative prices. (Vivekananda, 1992). Given this resilience of the farming community to market signals, the change in the macro-economic environment towards marketization augurs well. For instance, it will help conserve the use of

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fertilizer, optimize resource allocation and shift land use to optimum cropping patterns. These may very well lead to agriculture forming the basis for integrated development of the rural and national economy.

There is one problem, however, that marketization creates. In general, the large land-owner has greater flexibility in regard to reaction to market signals. It is therefore possible that the benefits of liberalization may accrue more to the large land-owner than to the small and marginal farmers. The short-term problems faced by the small and marginal farmers thus require special attention.

**Given this resilience of the farming community to market signals, the change in the macro-economic environment towards marketization augurs well. For instance, it will help conserve the use of fertilizer, optimize resource allocation and shift land use to optimum cropping patterns.**

A recent Conference on Land Reforms held at the National Institute of Rural Development, Hyderabad, considered the linkages between macro-economic liberalization and land reforms (Haque & Parthasarathy, 1992). A view was expressed that the higher fertilizer prices and other costs may induce the small farmers to lease out land in favour of large operators. This, however, can be effectively countered by moving towards focussed availability of fertilizer subsidies and credit to the small and marginal farmers. However, there is a need to take into account the implementation problems of dual price policy for fertilizers and the totally eroded rural credit market due to heavy overdues. As a compliment to the liberalization programme there is scope for reorienting small and marginal farmers towards greater monetization of their transactions.

Another view was that the large farmers may find their profits eroded as a result of higher input costs and hence lease out their lands. This may not be undesirable because it increases the availability of land for leasing out and may assist some of the landless to become tenant farmers. It would appear that on balance, the consequences of liberalization may neither be very adverse nor very favourable to the farming community, especially if the consequences to the small and marginal farmers are monitored and corrective strategies formulated and implemented.

The Planning Commission has taken steps to formulate agricultural development plans based on agro-climatic factors and states have been requested to integrate these programmes in the Eighth Plan. The basic objective of agro-climatic planning is to use land more meaningfully with due regard to the equity issue (Planning Commission, 1991)

One of the participants at the same Conference felt that land reform (implementation of lower ceilings and redistribution of land) may be an effective substitute for globalization of the economy. His view was that land reforms would optimise agricultural output and thus create a basis for an integrated development of the whole economy. While the case for land reform is thus well articulated, it does not come in conflict with globalization of

the economy. In fact there is absolutely no reason why the farmer, post-land reform, cannot reap the benefits of contact with the rest of the world. Finally, the Conference at NIRD heard the reservations regarding the impact of the entry of multinationals on the rural sector. Such a fear is totally unfounded if the concerned authorities play an effective role in the scrutiny and selection of foreign investment proposals.

The above account has alluded to the problems in regard to the impact of liberalization on agriculture essentially to illustrate the types of arguments advanced in recent months. The core argument is that a full-scale (as against piecemeal) liberalization of the economy would have no adverse consequences on the agricultural sector if suitable complementary measures are also implemented. For instance, when foodgrain prices are raised in line with the forces of demand and supply, the Food Corporation should be obliged to buy the grains in free market at a higher price than hitherto. Since a high price will hurt the poor, appropriate food subsidies will have to be put in place. Similarly, liberalization is likely to increase the prospect of rural inequalities and may lead to unity among the rural poor to press for land reforms. This may well be an indirect advantage of liberalization.

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In sum, the States' agility in monitoring and evaluating the effects of macro-economic reforms on the small and marginal farmers, and targeted fertilizer and food subsidies can play an effective role in addressing the short-term challenges that the agricultural sector is likely to face as a result of macro-economic reforms.

**Long-Term Prospects:** One must accept the inevitability of certain changes which are integral components of long-term development. They include the creation of agricultural surplus to feed the urban population and provide resources for industrial investments, and for rural population to shift to urban areas. Scale economies in higher education, modern medicine, modern transport etc., prevent their location in each and every village. It is therefore natural that the places where such services are located tend to attract people just as location of industrial and commercial activities attract such services in the first

**The States' agility in monitoring and evaluating the effects of macro-economic reforms on the small and marginal farmers, and targeted fertilizer and food subsidies can play an effective role in addressing the short-term challenges that the agricultural sector is likely to face as a result of macro-economic reforms.**

place. It is the locational economics, more than all other factors, that govern the growth of urbanisation.

As long as economic rationality (cost minimisation and efficiency in the provision of good quality services) dictates economic behaviour, it would seem natural to expect the growth of urban areas and the concomitant rural to urban shift of population. This natural process can be stopped by creating state-sponsored artificial price advantage, subsidies and incentives. Thus fertilizer subsidies, tax and other incentives to locate industries in rural areas, provision of house sites free of cost in rural areas etc., may be used to counter the rural urban drift. Such measures will be a continuous strain on the government finances and sooner or later, they have to be reduced if not eliminated. From a long-term point of view, therefore, it is better to go in for the right price signals and let nature take its course so long as the disadvantaged and ill-endowed are taken care of and income and wealth inequalities do not increase beyond socially-acceptable levels. Government continues to have the important role of alleviating the poverty problem of the disabled, disadvantaged and ill-endowed. This however, should not be misconstrued as permanent availability of subsidies to the people at large (Rao & Erappa 1987).

It is the view of this writer that liberalization measures when carried out fully, will set the right framework for the long-term development of agriculture and the economy. The problems of utilisation of the vast rural labour force, and redressal of rural inequality may however require complementary measures rather than accusing liberalization per se.

Consider, for instance, the enormous agricultural potential that can be unleashed in the country from investments in irrigation and appropriate water management. It is pertinent here to note that the Bhanu Pratap Singh Committee has called for stepping up private and public investments in irrigation and related infrastructure. This is especially urgent in view of the stagnation of investments in irrigation in recent years (Bhanu Pratap Singh, 1990).

**It is the locational economics, more than all other factors, that govern the growth of urbanisation.**

Yields per hectare differ substantially between irrigated and dry lands and between good and not-so-good water management regimes. What liberalization will accomplish is to make available resources to the Central and State Governments for investments in irrigation. This is likely as tax revenues improve as a result of rapid economic growth and as government expenditures are substantially reduced in unproductive areas (bureaucratic controls, for instance) as a part of fiscal reforms being carried out. (It is hoped that fiscal reforms will not be limited to Central Government arena only but will be carried out by the states as well). While the benefits of irrigation will take time to fructify, there is another area which deserves immediate attention. This refers to changes in dry land farming and improvement in dry land farming technologies. (Rao, 1991) Liberalization and consequent movement towards a regimen of market prices might induce farmers to accept new technologies in dry land farming relatively more easily.

**Overall Assessment:** There are short-term transitory challenges that liberalization of the economy is bound to create. They broadly refer to the impact on the poor. These have to be carefully addressed by the Central and State Governments through complementary measures. For the long-term, full-scale liberalization could pave the way for sustained agricultural growth, and on that foundation, balanced economic development. Just as the recent economic crisis has provided both a challenge and an

opportunity for macro-economic reforms, it is hoped that these reforms in turn will be the basis for structural reforms and sustained growth in agriculture.

**Liberalization and consequent movement towards a regime of market prices might induce farmers to accept new technologies in dry land farming relatively more easily.**

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Since rural people derive their livelihood primarily from agriculture, their living conditions depend, to a significant extent, upon the performance of this sector.

foodgrains, non-foodgrains and all crops) for three periods—Period-1 (1956-57 to 1969-70) Period-2 (1970-71 to 1988-89) and Period-3 (1956-57 to 1988-89). Period-1 may be considered as the pre-technological change period, and Period-2 as the post-technological change period. Although conventionally, 1965-66 has been considered as the cut-off point of technological change in India, we have considered 1969-70 as the cut-off point on the ground that new agrarian technology was not used, to a noteworthy extent, in many districts of West Bengal till the end of 1960s. Data used for estimating growth rates are taken from Government of West Bengal (1986) and various issues of Economic Review and Statistical Abstract of West Bengal.

Estimated growth rates for each period reported in table-1 reveal a not so encouraging picture about the performance of the agricultural sector, particularly in respect of foodgrains production. Estimated growth rate of foodgrains production in the post-technological change period is lower than that in the pre-technological change

**Table 1: Estimates of Annual Compound Growth Rate of Agricultural Production in West Bengal**

Crops/Crop Aggregates	Growth rate (per cent)		
	Period-1	Period-2	Period-3
Rice	2.29* (0.0057)	2.30* (0.0061)	2.12* (0.0022)
Wheat	17.53* (0.0404)	-1.82*** (0.0111)	13.52* (0.0155)
Pulses	2.76 (0.0078)	-3.34* (0.0055)	-1.62* (0.0034)
Foodgrains	2.50 (0.0057)	1.91 (0.0059)	2.21* (0.0022)*
Non-Foodgrains	2.09* (0.0075)	5.14* (0.0024)	3.84* (0.002)
All crops	2.02* (0.0058)	2.75* (0.0046)	2.62* (0.0018)

Note : Estimated equation :  $\ln Y = \ln a + bt$ .  
 Growth rate =  $b \cdot 100$ .  
 $t = 1, 2, \dots, 14$  for Period-1 (1956-57 to 1969-70)  
 $t = 1, 2, \dots, 19$  for Period-2 (1970-71 to 1988-89)  
 $t = 1, 2, \dots, 33$  for period-3 (1956-57 to 1988-89)  
 \* and \*\*\* denote significant at 1 percent and 10 percent levels respectively.  
 Figures in parentheses are standard errors.

period inspite of the fact that technological change has taken place mainly in major foodcrops (viz., rice and wheat). On the other hand, the rates of growth of production of non-foodgrains and all crops in Period-2 are higher than those in Period-1. What is also disappointing is that the growth rate of production of foodgrains is much lower than that of non-foodgrains in Periods 2 and 3. Moreover, production of pulses which are considered as the main sources of protein for the rural poor, experienced a negative growth rate in Periods 2 and 3. Thus, in view of the fact that expenditure on food items constitutes around 80 percent of the consumption expenditure on all items in rural area, growth rate of foodgrains production seems quite unsatisfactory from the point of view of the objective of poverty alleviation.

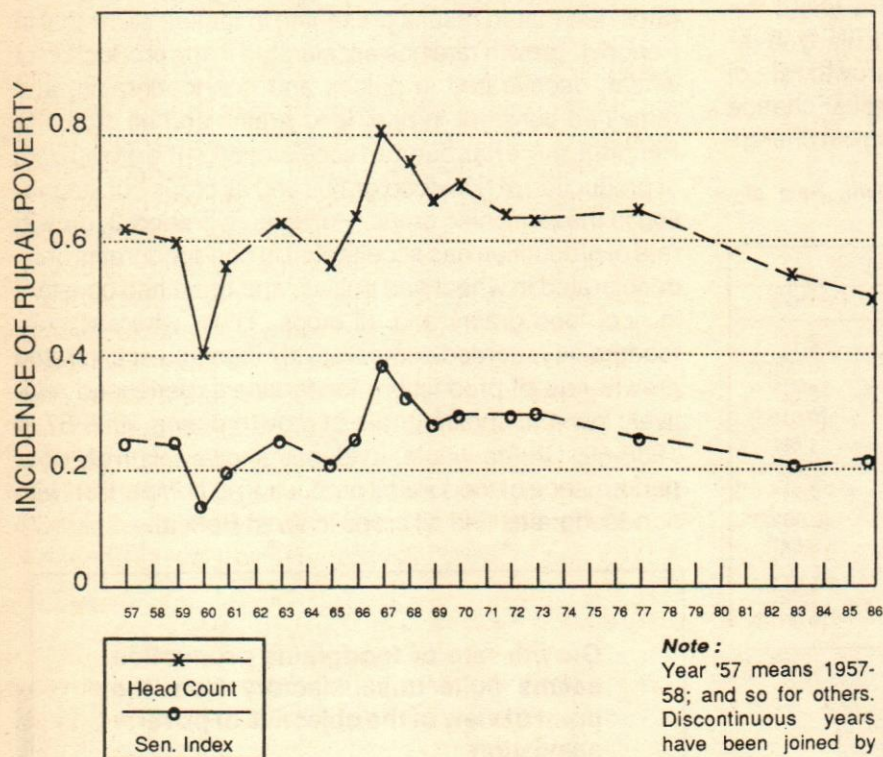
This is more so when we look at the direction of change in the growth rates of production of different crops over the three periods. We have estimated log quadratic trend (given by  $1n Y = 1n a + bt + ct$ ) in order to ascertain acceleration, deceleration or stagnation in the growth rates of production of the crops. Significantly positive and negative values of 'c' imply respectively acceleration and deceleration and insignificant value implies stagnation in growth rates. Estimated results presented in table-2 show that in Period-1, growth rate has accelerated in the production of wheat, decelerated in pulses and non-foodgrains, and remained constant in rice, food grains and all crops. In Period-2, there has been an acceleration in the growth rate of production of rice, food grains and all crops but stagnation in the remaining crops. However, in Period-3, growth rate of production has accelerated in non-foodgrains only, decelerated in wheat and pulses, and remained constant in rice, food grains and all crops. Thus, whereas non-foodgrains recorded comparatively high and accelerated growth rate of production, foodgrains experienced relatively low and constant rate of growth during 1956-57 to 1988-89. On the whole, evidence shows relatively poor performance of foodgrains production in comparison with non-foodgrains and all crops in West Bengal.

**Growth rate of foodgrains production seems quite unsatisfactory from the point of view of the objective of poverty alleviation.**

**Table 2 : Acceleration/Deceleration in Agricultural Production in West Bengal**

Crops/crop Aggregates	Period - 1		Period 2		Period - 3	
	b	c	b	c	b	c
Rice	0.0229* (0.0057)	0.00033 (0.00165)	0.023* (0.0061)	0.00275** (0.00109)	0.0212* (0.0022)	0.00022 (0.00026)
Wheat	0.1753 (0.0404)	0.03141* (0.00703)	0.0182p*** (0.0111)	-0.00014 (0.00235)	0.1352* (0.0155)	-0.00665* (0.0014)
Pulses	0.0276* (0.0078)	-0.00471** (0.00177)	-0.0334* (0.0055)	-0.00051 (0.0012)	-0.0162* (0.0034)	-0.0016** (0.0003)
Foodgrains	0.025* (0.0057)	0.00121 (0.00164)	0.0191* (0.0059)	0.0025** (0.0011)	0.0221* (0.0022)	-2.0E-07 (0.0003)
Non-Foodgrains	0.0209* (0.0075)	-0.00499* (0.00162)	0.0514* (0.0024)	0.0004 (0.0005)	0.0384* (0.002)	0.0008* (0.0002)
All crops	0.0202* (0.0058)	-0.0007 (0.0017)	0.0275* (0.0046)	0.00194** (0.00084)	0.0262* (0.0018)	0.0003 (0.0002)

Note: Estimated equation :  $1n Y = 1n a + bt + ct^2$   
 $t = -6.5, -5.5, \dots, 5.5, 6.5$  for Period 1 (n = 14)  
 $t = -9, -8, \dots, 8, 9$  for Period - 2 (n = 19)  
 $t = -16, -15, \dots, 15, 16$  for Period - 3 (n = 33).  
 \*, \*\*, and \*\*\* indicate significant at 1 percent, 5 percent and 10 percent respectively.  
 Figures in parentheses are standard errors of the coefficients.



**Fig. 1 TIME TREND IN RURAL POVERTY**

**Incidence of Rural Poverty**

*Time Trend in Rural Poverty* : The data presented in the Appendix reveal marked fluctuations over time in the incidence of rural poverty (measured by Head-count ratio and Sen's Index) during 1957-58 to 1986-87. A clearer picture of fluctuations in the incidence of rural poverty is obtained from Fig. 1. Both the measures of rural poverty display more or less identical pattern of fluctuations—incidence of rural poverty declined initially and reached its lowest level in 1960-61, then rose sharply and reached its peak in 1967-68, again started declining with fluctuations.

We have also fitted time trend (in linear, semi-log and double-log specifications) to each of the measures of rural poverty. Estimated results provide no evidence of any discernible time trend in the incidence of rural poverty in West Bengal during the period under consideration—all the coefficients of time (T) being found to be statistically insignificant.

$$POV(HC) = 63.413 - 0.078 T ; R^2 = 0.005$$

(0.298)

$$POV(SI) = 0.257 + 0.0006 T ; R^2 = 0.008$$

(0.0019)

$$\ln POV(HC) = 4.135 - 0.0009 T ; R^2 = 0.003$$

(0.0051)

$$\ln POV(SI) = -1.399 + 0.0036 T ; R^2 = 0.016$$

(0.0076)

$$\ln POV(HC) = 4.071 + 0.023 \ln T ; R^2 = 0.016$$

(0.048)

$$\ln POV(SI) = -1.509 + 0.069 \ln T ; R^2 = 0.065$$

(0.071)

(Figures in parentheses are standard errors; N = 16).

Our finding, thus, stands contrary to that of Ahluwalia (1978) who observed significantly rising trend in the incidence of rural poverty in West Bengal during 1957-58 to 1973-74.

Nevertheless, inter-temporal fluctuations in the incidence of rural poverty need plausible explanations.

*Determinants of Rural Poverty:* Several attempts have been made to explain inter-temporal movements in rural poverty in terms of a few selected variables. Most of the earlier studies used net domestic product in agriculture per head of rural population (NDPARP), consumer price index for agricultural labourers (CPIAL) and time (T) as independent variables for analysing temporal variations in rural poverty. Besides these three factors, we have, however, considered some other factors which are also associated with rural poverty. The basis of selection of those variables may now be explained.

Rural poverty, by the very procedure of its measurement, is a function of a poverty line at constant price, per capita consumption expenditure on all items at constant price (RPCE(G)), and Lorenz ratio of the distribution of per capita consumption expenditure (LRPCE). However, in view of the constancy of the poverty line at constant price for all the years, RPCE(G) and LRPCE may be considered as the relevant explanatory variables. Moreover, in view of the fact that at least 67.6 per cent of the consumption expenditure is spent on food by the general rural population, and at least 73.5 per cent by the bottom 50.0 per cent of the rural population (Bhattacharya et al, 1991), per capita consumption expenditure on food items at constant prices (RPCEF(G)) and Lorenz ratio of the distribution of per capita consumption expenditure on food items (LRPCEF) have also been considered as the explanatory variables. Further more, since, during the period 1957-58 to 1986-87, incidence of rural poverty fluctuated between 40.4 per cent in 1960-61 and 80.3 per cent in 1967-68, and if 1960-61 figure is ignored, between 50.8 per cent and 80.3 per cent (see the table in the Appendix), bottom 40-50 per cent of the rural population may be supposed to be the chronically poor. Naturally, for analysing inter-temporal changes in the incidence of rural poverty, one needs to pay special attention to the behaviour of average per capita consumption expenditure of the bottom 50.0 per cent of the rural population. That is why, we have considered per capita consumption expenditure (at constant prices) of the bottom 50.0 per cent of the rural population on all items (RPCE(BT)) and on food items (RPCEF(BT)) as the explanatory variables of special significance. While RPCE(G), RPCE(BT), RPCEF(G) and RPCEF(BT) are expected to be inversely related to rural poverty, LRPCE and LRPCEF are expected to vary directly with it. Moreover, the relationship between rural poverty and RPCE(BT) and RPCEF(BT) are expected to be stronger than those between rural poverty and RPCE(G) and RPEF(G).

Some of the important variables influencing per capita consumption expenditure of the rural population and thus rural poverty may now be identified. As per 32<sup>nd</sup> round (1977-78) of the NSS report, 81.13 per cent of the agricultural labour households and 45.96 per cent of the households self-employed in agriculture are living below the poverty line. Together, they constitute 75.11 per cent of the rural households living below the poverty line; (Mahendra Dev, 1988). Thus, agricultural labour households and primarily cultivator households consisting of marginal and small farmers are identified as the rural poor. Levels of per capita consumption expenditure depend upon the levels of income they derive from agriculture. 38<sup>th</sup> round (1983) of the NSS report shows that 50.4 per cent of the rural work force are wage labourers, 75.4 per cent of whom are casual. This suggests that at least 50.0 per cent of the rural work force depend exclusively upon wage-employment for their livelihood. Agricultural Census (1985-86) data show that 90.1 per cent of the total operational holdings are marginal and small whose average size is 0.645 hectare. This means that marginal and small farmers have to depend, at least partially, upon wage-employment to their livelihood. In the absence of any time series data on rural employment (unemployment), productivity of agricultural labourers (ALP) and real wage rate (RWR) of male labourers may be considered as the factors influencing directly the level of income (consumption) of the persons dependent upon wage-employment. Besides, state domestic product in agriculture per head of rural population at constant prices (SDPAR), growth rate of production of all agricultural crops (GRTHA), food production per head of rural population (FPHR) and growth rate of production of food grains (GRTHF) measuring the performance of agriculture are expected to influence, in the absence of any significant change in the distribution of income (consumption) the levels of income (consumption) of all sections of rural population including the poor. Again, consumer price index for agricultural labourers (CPIAL) has been considered as a factor influencing real income (consumption) of the rural poor. Whereas RWR, ALP, SDPAR, GRTHA, FPHR and GRTHF are expected to vary inversely with rural poverty, CPIAL is expected to vary positively with it.

### Regression Results

Effects of the selected variables upon rural poverty have been examined by estimating (by Ordinary Least Square method) simple and multiple regressions in their linear and log-linear specifications for both measures of rural poverty. Data used for this purpose have been taken from diverse sources which are reported in the Appendix.



Estimated results are presented in tables 3 and 4. Among the selected variables, RPCE(G), RPCE(BT), RPCEF(BT), RWR, ALP, SDPAR and GRTHA are found to have significantly inverse relation with rural poverty—their coefficients being found to be negative and statistically significant. Strength of the relationship (judged by the absolute values of the coefficients of linear regressions) between rural poverty and the significant variables is found to be the highest for RWR and the lowest for SDPAR. As expected, the fact which bears important policy implication is that the absolute values of the coefficients of RPCE (BT) and RPCEF (BT) are larger than those of RPCE (G) and RPCEF (G) respectively (table-3). This suggests that policy measures oriented towards increasing per capita income (consumption) of the bottom 50.0 per cent of the rural population would be very effective in alleviating rural poverty. Significantly negative coefficients of ALP and

RWR also suggest that rural poverty can be reduced substantially by increasing the productivity of agricultural labourers and ensuring higher real wage rate to them. Thus, policy prescription suggested by our results, by and large, confirms the World Bank's (1990) prescription of a two-part strategy of achieving rapid and sustainable improvement in the quality of life for the poor.

Significantly negative coefficients of SDPAR in both simple and multiple linear and log-linear regressions (table 3, 4 and 7) and of GRTHA in simple linear regressions (Table 3) assert the existence of trickle-down mechanism in rural West Bengal during 1957-58 to 1986-87. Thus, our results strongly contradict the findings of Bardhan (1984) and Gaiha (1989) who observed that agricultural growth in West Bengal is "immiserising". Results of Bardhan's logic exercise showed the possibility of growth induced pauperisation of agricultural labour households and primarily cultivator households in West Bengal. Gaiha obtained

**Table 3 : Effects of the Selected variables upon Rural poverty : Linear regression results**

Independent Variables	Dependent Variables			
	POV (HC) Percent		POV (ST)	
	Coefficient	R <sup>2</sup>	Coefficient	R <sup>2</sup>
RPCE (BT)	-3.195* (0.785)	0.542	-0.018* (0.0056)	0.430
RPCE (G)	-2.373* (0.480)	0.636	-0.013* (0.0037)	0.479
RPCEF (BT)	-4.387* (1.006)	0.576	-0.027* (0.0069)	0.516
RPCEF (G)	-3.908* (0.759)	0.655	-0.023* (0.0056)	0.542
RWR	-35.211* (12.037)	0.379	-0.267* (0.067)	0.531
SDPAR	-0.347* (0.128)	0.345	-0.0021* (0.0008)	0.321
GRTHA	-1.127** (0.589)	0.207	-0.0078** (0.0037)	0.240
ALP	-0.684* (0.206)	0.441	-0.0049* (0.0012)	0.563
LRPCE	-68.993 (114.417)	0.025	-0.281 (0.739)	0.010
LRPCEF	14.164 (109.935)	0.001	0.662 (0.683)	0.063
FPHR	-0.155 (0.136)	0.085	-0.0009 (0.0008)	0.071
GRTHF	-0.374 (0.641)	0.024	-0.0024 (0.0041)	0.024
CPIAL	-0.011 (0.017)	0.030	-4.2E-06 (0.0001)	9.87E-05

Note : \* and \*\* denote significant at 1 percent and 5 percent levels respectively for one tail test..

Figures in parentheses are standard errors of the coefficients. Number of observations (n) = 16.

**Table 4 : Effects of the selected variables upon Rural poverty : Results of Log-linear Regression**

Independent Variables	Dependent Variables			
	POV (HC) Percent		POV (ST)	
	Coefficient	R <sup>2</sup>	Coefficient	R <sup>2</sup>
RPCE (BT)	-0.730* (0.164)	0.586	-1.007* (0.273)	0.494
RPCE (G)	-0.783* (0.154)	0.650	-1.044* (0.273)	0.511
RPCEF (BT)	-0.739* (0.164)	0.591	-1.080* (0.256)	0.560
RPCEF (G)	-0.906* (0.175)	0.656	-1.266* (0.295)	0.568
RWR	-1.176* (0.429)	0.349	-2.074* (0.575)	0.482
SDPAR	-1.102* (0.410)	0.340	-1.608** (0.625)	0.321
ALP	-0.622* (0.189)	0.436	-1.073* (0.246)	0.575
LRPCE	-0.233 (0.523)	0.014	-0.194 (0.788)	0.004
LRPCEF	0.142 (0.424)	0.008	0.759 (0.607)	0.100
FPHR	-0.588 (0.481)	0.096	-0.790 (0.731)	0.077
CPIAL	0.019 (0.084)	0.003	0.112 (0.123)	0.056

Note : \* and \*\* indicate significant at 1 per cent and 5 per cent levels respectively for one -tail test.

Figures in parentheses are standard errors of the coefficients. n = 16.

Log-linear regression with GRTHA and GRTHF as independent variables could not be estimated because of their negative values in some of the years.

**This suggests that policy measures oriented towards increasing per capita income (consumption) of the bottom 50.0 per cent of the rural population would be very effective in alleviating rural poverty.**

positive coefficients of IAPP and a rising residual time trend and concluded that his results are consistent with Bardhan's. However, what appears disquieting is that whereas improved agricultural performance measured as an increase in SDPAR and GRTHA has been associated with reduced incidence of rural poverty, agricultural performance measured in terms of either FPHR or GRTHF does not have any significant effect upon rural poverty (the coefficients of these variables although negative are not significant). This means that growth in the production of food grains has not trickled down to the rural poor the same extent as the growth of production of all crops taken together did.

Observed differences in the level of statistical significance of the coefficients of SDPAR and GRTHA from those of FPHR and GRTHF may be attributed to the differences in the trends of inequality in the distribution of per capita consumption expenditure on all items and food items. Estimated trends in the Lorenz ratio of the distribution of per capita consumption expenditure on all items (LRPCE) and food items (LRPCEF) are given below.

$$\text{LRPCE} = 0.256 + 0.0006 T; \quad R^2 = 0.052 \\ (0.0007)$$

$$\ln \text{LRPCE} = -1.365 + 0.0021 T; \quad R^2 = 0.045 \\ (0.0025)$$

$$\text{LRPCEF} = 0.196 + 0.0021 T; \quad R^2 = 0.609 \\ (0.0004)^*$$

$$\ln \text{LRPCEF} = -1.622 + 0.0094 T; \quad R^2 = 0.612 \\ (0.0019)^*$$

(Figures in parentheses are standard errors).

They indicate that whereas there has been no discernible time trend in LRPCE, LRPCEF has a highly significant positive time trend. As a result, growth in foodgrains production did not reach the consumption basket of the rural poor in the same proportion as growth in the production of all crops reached them. Estimated results of the relationship between RPCE (BT) and SDPAR or GRTHA, and between RPCEF (BT) and FPHR or GRTHF strengthen the basis of our assertion.

$$\text{RPCE}(\text{BT}) = -5.774 + 0.094 \text{SDPAR}; \quad R^2 = 0.473 \\ (0.026)^*$$

$$\text{RPCE}(\text{BT}) = 10.499 + 0.356 \text{GRTHA}; \quad R^2 = 0.388 \\ (0.119)^*$$

$$\text{RPCEF}(\text{BT}) = 2.175 + 0.033 \text{FPHR}; \quad R^2 = 0.129 \\ (0.023)$$

$$\text{RPCEF}(\text{BT}) = 8.636 + 0.154 \text{GRTHF}; \quad R^2 = 0.135 \\ (0.104)$$

(Figures in parentheses are standard errors).

Results show that whereas the positive coefficients of SDPAR and GRTHA are highly significant (at 1 per cent level for a two-tail test), the coefficients of FPHR and GRTHF are not significant for a two-tail test (but significant at 10 per cent level for one-tail test only). Moreover, the values of the coefficients of SDPAR and GRTHA are much larger than those of FPHR and GRTHF. More precisely, whereas 1 per cent increase in SDPAR and GRTHA tended to increase RPCE (BT) by 0.094 per cent and 0.356 per cent respectively, 1 per cent increase in FPHR and GRTHF tended to increase RPCEF(BT) respectively by 0.033 per cent and 0.154 per cent only. The above findings are sufficient to indicate that growth in food grains production influenced RPCEF (BT) to a much lower extent than growth in production of all crops. Significantly stronger influence of SDPAR and GRTHA on RPCE (BT) in the absence of any trend increase or decrease in LRPCE may be attributed to the fact that growth factor has outweighed the inequality factor. On the other hand, insignificant and much weaker influence of FPHR and GRTHF on RPCEF (BT) in the presence of significantly upward trend in LRPCEF appears to be due to the fact that inequality factor outweighed the growth factor. We may recall, at this point, the poor performance of foodgrains production relative to non-foodgrains and all crops.

Nevertheless, the coefficients of LRPCE and LRPCEF turned out to be insignificant in the linear and log-linear forms of the equation of rural poverty (tables 3 & 4) indicating that inequality in the distribution of PCE and PCEF did not have any significant impact upon rural poverty. Estimated results of multiple regressions displayed more or less a similar picture (tables 5 & 6). Although the coefficients of LRPCEF have been found to be significant in a very few cases, none of the coefficients of LRPCE is found to be significant. Moreover, inclusion of LRPCE and LRPCEF as independent variables along with RPCE (G) and RPCEF (G) respectively did not improve significantly the explanatory power of the equations (compare the values of  $R^2$  between simple and multiple regressions). It may, however, be noted that when LRPCE is considered along with RPCE (G), significantly positive residual time trend in rural poverty is observed. But no residual time trend in rural poverty is observed when LRPCEF is considered along with RPCEF (G).

**Table : 5 Determinant of Rural poverty: Results of Multiple Regressions**

Dependent Variable	Intercept	RPCE (G)	LRPCE	T	R <sup>2</sup>
<b>A. Linear Regressions :</b>					
POV (HC)	124.44	-2.695* (0.487)	-69.077 (67.322)	0.352** (0.187)	0.726
POV (HC)	115.52	-2.35* (0.493)	-41.851 (71.839)	—	0.645
POV (SI)	0.616	-0.016* (0.0035)	-0.377 (0.492)	0.0032* (0.0013)	0.644
POV (SI)	0.535	-0.013* (0.004)	-0.129 (0.557)	—	0.482
<b>B. Log-linear Regressions :</b>					
In POV (HC)	6.295	-0.791* (0.161)	-0.021 (0.329)	0.031 (0.03)	0.679
In POV (HC)	6.414	-0.785* (0.162)	0.027 (0.328)	—	0.650
In POV (SI)	1.584	-1.07* (0.271)	0.033 (0.554)	0.08*** (0.05)	0.598
In POV (SI)	1.889	-1.056* (0.286)	0.156 (0.579)	—	0.514

Note : \*, \*\*, and \*\*\* denote significant at 1 per cent, 5 per cent and 10 per cent levels respectively for one-tail test. Figures in parentheses are standard errors of the coefficients. n = 16.

**Table 6 : Determinants of Rural poverty : Results of Multiple Regressions.**

Dependent Variable	Intercept	RPCE (G)	LRPCE	T	R <sup>2</sup>
<b>A. Linear Regressions :</b>					
POV (HC)	119.033	-4.037* (0.845)	-28.813 (113.118)	0.161 (0.313)	0.664
POV (HC)	109.123	-3.909* (0.785)	17.283 (66.918)	—	0.656
POV (SI)	0.443	-0.023 (0.006)	0.525 (0.781)	0.0005 (0.0021)	0.611
POV (SI)	0.409	-0.023* (0.005)	0.681*** (0.458)	0.0008 —	0.609
<b>B. Log-linear Regressions :</b>					
IN POV (HC)	6.561	-0.903* (0.189)	0.091 (0.367)	0.0008 (0.0421)	0.660
IN POV (HC)	6.571	-0.904* (0.181)	0.096 (0.258)	—	0.660
IN POV (SI)	2.997	-1.253* (0.287)	0.752*** (0.557)	-0.009 (0.064)	0.653
IN POV (SI)	2.876	-1.249* (0.275)	0.694*** (0.392)	—	0.652

Note : Same as in table 5

It is generally held that higher CPIAL aggravates the incidence of rural poverty. Our results, however, show that CPIAL did not have any significant effect upon rural

poverty in West Bengal, none of the coefficients of CPIAL either in simple regressions (tables 3 & 4) or in multiple regressions (table 7) were found to be significant. Absence of any discernible time trend in the incidence of rural poverty inspite of significantly positive trend in CPIAL also suggests the absence of significant relationship between rural poverty and CPIAL.

Estimated linear and semi-logarithmic trends in CPIAL are

$$\text{CPIAL} = 33.402 + 16.097 T ; R^2 = 0.899$$

(1.439)\*

$$\ln \text{CPIAL} = 4.586 + 0.059 T ; R^2 = 0.947$$

(0.004)\*

(Figures in parentheses are standard errors ; \* indicates significant at 1 per cent level).

It follows that adverse effects of rising CPIAL on real level of living of the rural poor has been counterbalanced by the favourable effects of some other factors at work in rural West Bengal. Our results, thus, contradict the findings of Gaiha (1989) who observed significantly positive coefficient of some measure of fluctuations in CPIAL around its trend values in West Bengal during 1960-73.

Another important finding that emerges from table 7 is that after allowance is made for the changes in the incidence of rural poverty associated with agricultural performance measured by SDPAR, there has been a positive (and in most cases significant) residual time trend in the incidence of rural poverty during the period under consideration. This means that while improved agricultural performance measured in terms of an increase in SDPAR had significant influence in reducing rural poverty, there may be "other factors" at work in rural West Bengal which by themselves tended to increase the incidence of rural poverty. Similar results have also been reported by Ahluwalia (1978).

More importantly, when ALP is considered as an independent variable (instead of SDPAR), we observed significantly negative residual time trend in the incidence of rural poverty. This indicates that when allowance is made for changes in rural poverty associated with ALP, there has been a definite downward trend in the incidence of rural poverty during 1957-58 to 1986-87.

This result strongly advocates the need for considering ALP as an independent variable in explaining inter-temporal changes in the incidence of rural poverty. None of the earlier studies, however, considered this variable to explain inter-temporal fluctuations in rural poverty. Our results, thus, indicate that labour-productivity-augmenting



further support to their earlier results. It was observed that while growth effect reduced the number of poor population by 4.542 mn., population growth and distributional change increased poor population by 4.507 mn. and 0.619 mn. respectively, as a result of which the number of poor population has increased by 0.584 mn. in West Bengal during 1970-71 to 1983.

### Summary and Conclusion

A review of the performance of the agricultural sector in West Bengal indicated that performance of foodgrains production has been poor relative to non-foodgrains and all crops during 1956-57 to 1988-89. Against this background, we have examined inter-temporal changes in the incidence of rural poverty in West Bengal. Available data on rural poverty measured by head-count ratio and Sen's index showed marked fluctuations and thus no discernible time trend in its incidence during 1957-58 to 1986-87. An enquiry into the factors explaining inter-temporal fluctuations in the incidence of rural poverty with the help of regression and decomposition exercises revealed that growth factors were more important than the distributional factors. Estimated results also asserted the existence of 'trickle-down' mechanism in rural West Bengal. The special significance of labour productivity and real wage rate in reducing the incidence of rural poverty over time has also been established. The results of this study suggest the need not merely for growth in agriculture but for a particular type of growth process to be pursued for achieving sustained reduction in rural poverty. Labour-productivity augmenting growth process appears to be more effective in achieving a decline in the incidence of rural poverty. Other factors that do not have significant impact on rural poverty are:

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Focus

## Fiscal System & Rural-Urban Dichotomy

Jag Pal Singh

The fiscal system has been relied on to achieve the objective of an egalitarian society. However the progressive components of the total tax revenue have been characterised by a sharp decline during the past four decades. Indirect taxes cannot achieve this objective because of the shiftability of the burden forward or backward. By the declining share of social services in the total expenditure, even public expenditures could not ensure a fair share to the rural areas; argues this paper.

The broad objective of our economic policy has been to achieve a socialistic pattern of society in which the basic criterion for determining the lines of advance would be social gains and greater equality in incomes and wealth and not private profit (Ministry of Information and Broadcasting, 1981 : 193). For improving the distribution of incomes and wealth peacefully, legally and effectively, we relied basically on our fiscal system. It is argued that taxation and public expenditure policies are capable enough to transfer the wealth and income from one section of the society to another and from one area to another. Yet the share of agriculture in the net national income decreased from 50 per cent in 1951 to 37 per cent in 1985, the fall in the share of the rural workforce being from 67.5 to 63.5 in the same period. The net earnings of an agriculture worker was around 50 per cent of those of an industrial worker in 1951. This had dropped to less than 33 per cent in 1985 (Parthasarathi, 1990 : 1694).

### Taxation and Rural-Urban Dichotomy

The underlying principles of a welfare state require that the burden of taxation is borne by the richer section of the society. It is but natural that every tax-payer attempts to pass its burden on to others. The success in shifting the tax burden largely depends upon the nature of the category of wants largely depends upon the nature of the category of wants satisfied by the goods/services which the tax is imposed. In the case of indirect taxes, taxpayers have to bear the burden themselves. The burden of the indirect taxes may be shifted forward or backwards. A producer may shift it forwards to the consumers by raising the prices and backwards to the suppliers of the raw materials by

contrast to the indirect taxes, the direct taxes are of progressive nature. The direct taxes are considered more effective for redistribution of the national income and wealth. Thus the role of taxation in respect of rural-urban dichotomy can be examined from the angles of: (i) share of the direct taxes in the total tax revenue; (ii) elasticity of demand for and supply of the articles on which the taxes are imposed and (iii) returns to scale and 'market condition' under which most of the production units of rural and urban areas are operating.

Table 1 indicates that the share of the direct taxes in the total tax revenue has come down from 33.85 per cent in 1951-52 to 13.32 per cent in 1991-92 whereas the share of the indirect taxes has increased from 65.74 per cent to 84.44 per cent in the total tax revenue during the same period. Moreover, the share of taxes on property and capital transaction which are the preventive measures in respect of mal distribution of national income and wealth has come down from 1.71 per cent in 1951-52 to 0.34 per cent in 1991-92. This implies that the tax burden on the poorer sections of the society is increasing year by year. During the entire period of 1970-71 to 1989-90, major direct taxes registered a growth rate of 14.4 per cent per annum, while Non-Agricultural Gross Domestic Product (NAGDP) grew at the rate of 14.9 per cent and Gross Domestic Product (GDP) at the rate of 13.81 per cent during the same period, all at current market prices. The

difference in the rate of growth in NAGDP and direct taxes corresponds to a net withdrawal of incomes from the agricultural sector.

It is argued that by imposing heavy taxes on those articles of consumption which are generally consumed by the upper income groups and exempting those articles which are of common consumption, the indirect taxes have also been made progressive. In the absence of the required data, testing the validity of this claim is very difficult. However, the theoretical framework which has been explained here does not support this claim. The demand for the articles which are consumed by the upper income groups only is generally highly elastic. Therefore, forward shifting of the tax burden of the indirect taxes which are imposed on the luxury articles is very difficult. The recession consequent on the increase in the rate of excise duties on motor cars, light commercial vehicles and TV sets (ENS Economic Bureau, 1992:1) is a case in point. Seasonal nature of agriculture and survival needs of the labourers and the suppliers of the raw materials make their supply inelastic. It becomes easy for the producers of the luxury articles to shift the tax burden on to the labourers and the suppliers of the raw materials by paying them lower prices. Since in rural areas, there exists no scope for diversification of labour from the agricultural and allied occupations, unabated population growth creates the conditions for perfect competition and diminishing return to labour. On the other hand, introduction of a new production technique or/and products in the non-agricultural sector creates favourable conditions for monopoly and increasing returns to the entrepreneur. Therefore, in India indirect taxes can never be progressive as claimed. It can safely be concluded that both the kinds of taxes—direct and indirect have proved very effective channels for exploiting the rural sector in favour of urban population. Conceptually, every progres-

**The difference in the rate of growth in NAGDP and direct taxes corresponds to a net withdrawal of incomes from the agricultural sector.**

**Table 1: Contribution of Different Types of Taxes Towards The Revenue**

(in Rs. crores)

S.No.	Type of Tax	1951-52		1961-62		1971-72		1981-82		1991-92	
		Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1.	Taxes on Income and Expenditure	117.42	32.14	212.06	24.31	481.22	15.10	2310.87	16.98	7884.94	12.98
2.	Taxes on Property and Capital Transactions	6.25	1.71	21.31	2.44	39.82	1.25	85.19	0.63	206.30	0.34
3.	Taxes on Commodities and Services	240.13	65.74	636.24	72.95	2603.61	81.72	11215.18	82.40	51279.00	84.44
4.	Others	1.46	0.41	2.57	0.30	61.30	1.92	-	0.00	1361.43	2.24
	Total	365.27	100	872.20	100	3185.98	100	13611.25	100	60731.67	100

Source: Central Government Budgets for 1951-52, 1961-62, 1971-72, 1981-82 and 1991-92

sive tax, except progressive property tax accepts that inequality in income exists and it will continue in future also. All other taxes come under the category of 'cure-measures' if they are progressive in the true sense. In brief, improvement in the distribution of income peacefully, legally and effectively is beyond the capability and capacity of the present tax-structure. It is the progressive property tax which can prevent or minimise the accrual of income from property and, therefore, it can be effective in reducing inequality in income.

### Public Expenditure Rural-Urban Dichotomy

In India, public expenditure is divided into two categories: Revenue Expenditure and Capital Expenditure. Revenue expenditure is those incurred for the normal running of government departments and services and interest charges on debt incurred by the public authorities. Broadly expenditure which does not result in the creation of assets is treated as revenue expenditure. All grants given to the state governments and other parties are also treated as revenue expenditure. Capital expenditure consists of payments made for acquisition of assets like land, buildings, machinery equipment as also investments in shares etc. and loans and advances granted by the central government to states and union territories, government companies, corporations and other parties (Government of India, 1991 : 8 - 9). In terms of activities and programmes the public revenues are spent on creating and maintaining general services, social services, economic services and grants in aid and contribution to the state and other public authorities. The capital account takes care of the 'creation of asset' part of all the four types of services whereas revenue account provides monetary resources for maintaining and running these services. Capital expenditure can further be classified into two groups. (1) gross fixed capital formation and (ii) increase in stocks held by the producers, traders and the governments.

The organs of state, fiscal services, interest payments, and servicing of debt, administrative services, pension and miscellaneous (alongwith defence) services constitute the General Services. Education, sports and youth services, art and culture, public health, water supply and sanitation; housing, urban development, information and publicity, broadcasting, welfare of scheduled castes; schedule tribes and other backward classes, labour and employment, social security and welfare, nutrition, other-Social Services, come under the Social Service. Agricultural and allied activities, rural development, special area programmes, energy, industry and minerals, transport,

communications, science, technology and environment, general economic services come under the Economic Services. For providing these services to the people of a particular area certain infrastructural facilities and services have to be created in that area. The role of public expenditure in rural urban dichotomy is thus to be seen in terms of the distribution of public expenditure among different types of services; distribution of the infrastructural facilities and services in rural and urban areas and ultimately the share of rural population in the benefits of different developmental activities and programmes.

**Thus, the share of rural population in the benefits provided through General Services is negligible.**

Except in 1981-82, in all other years, General Services got the top priority (table 2). In almost all the years Economic Services have received second priority. The Social Services have received the lowest priority in all the reference years. The members of village Panchayat, Block Samiti and District Board do not receive any pay, allowance and/or honorarium as in case of the Members of Parliament and Legislative Assemblies. The number of persons involved in the administration of justice, elections and audit in rural India is very low. The salary of the village level workers is minimum in the country. Thus, the share of rural population in the benefits provided through General Services is negligible. To some extent, the rural population enjoys the benefits of Social and economic services. In other words, the rural population shared the benefits out of 24.93 per cent in 1951-52; 36.13 per cent in 1961-62; 31.45 per cent in 1971-72; 45.92 per cent in 1981-82 and 38.04 per cent in 1991-92 out of the total public expenditure made in these years. Since 1961-62, the percentage of capital expenditure on social and economic service to the total public expenditure is declining implying that the share of social and economic services in the total public expenditure is declining. This has gone against the interest of the rural population. The share of rural sector in the subsidy i.e. the difference between the actual cost of delivering publicity provided goods or services and the recoveries arising from such deliveries is in between 41 and 53 percent of the total volume of subsidies (Mundle & Rao, 1991; : 26 22). This also indicates that the rural sector could not get its share from the public expenditure (Sethi, 1987 : 6).

**Table 2: Public Expenditure on Different Heads in the Study Years**

Different heads of expenditure	Amount spent in crores of rupees in the study years					
	Revenue account		Capital account		Total	
	Amount	%	Amount	%	Amount	%
<b>1951-52</b>						
General services	326	60.14	26	4.84	352	64.98
Social services	14	2.83	0	0.12	14	2.95
Economic services	79	14.63	39	7.35	119	21.98
Grants in aid	15	3.07	-	-	15	3.07
<b>Total</b>	<b>435</b>	<b>86.71</b>	<b>66</b>	<b>13.29</b>	<b>501</b>	<b>100</b>
<b>1961-62</b>						
General services	704	42.12	41	2.51	746	44.63
Social services	98	5.86	3	0.23	101	6.09
Economic services	190	11.42	309	18.52	500	29.94
Grants in aid	235	14.08	87	5.26	323	719.34
<b>Total</b>	<b>1228</b>	<b>73.48</b>	<b>443</b>	<b>26.52</b>	<b>1672</b>	<b>100</b>
<b>1971-72</b>						
General services	3002	46.22	228	3.52	3231	49.74
Social services	207	3.19	7	0.11	214	3.30
Economic services	1544	23.78	283	4.37	1828	28.15
Grants in aid	1219	18.77	1	0.03	1221	18.80
<b>Total</b>	<b>5973</b>	<b>91.97</b>	<b>521</b>	<b>8.03</b>	<b>6495</b>	<b>100</b>
<b>1981-82</b>						
General services	7911	29.9	439	1.66	8351	31.56
Social services	778	2.94	140	0.53	919	3.47
Economic services	7752	29.3	3497	13.15	11232	42.45
Grants in aid	5953	22.5	-	-	5953	22.5
<b>Total</b>	<b>22396</b>	<b>84.65</b>	<b>4060</b>	<b>47715.35</b>	<b>26457</b>	<b>100</b>
<b>1991-92</b>						
General services	46321	35.6	5743	4.41	52065	40.01
Social services	3673	2.82	403	50.31	4077	3.13
Economic services	35532	27.31	9900	7.61	45433	34.91
Grants in aid	26734	20.54	380	0.29	27115	20.83
<b>Total</b>	<b>113699</b>	<b>87.37</b>	<b>16429</b>	<b>12.63</b>	<b>130128</b>	<b>100</b>

Sources : Central Government Budgets for 1951-52, 1961-62, 1971-72, 1981-82, and 1991-92.

The capital expenditure on Gross Fixed Capital Formation has direct impact on the distribution of the benefits of development between rural and urban areas. Construction and production of machines and equipments are the main elements of the Gross Fixed Capital Formation. The production of machines and equipments leads to the concentration of income and wealth in a few hands and at few places i.e. big cities. In other words, capital expenditure on the production of machines and equipments affects the distribution of income and wealth adversely. It accelerates the pace of earnings from property. This transfers the incomes from the wage funds to interest and profits. In India, as evident from table 3, the percentage of capital expenditure made on producing machines and equipments to the total capital expenditure on Gross Fixed Capital Formation has gone up from 27.57 in 1951-52 to 51.97 in 1988-89. The percentage of capital expenditure on construction to the total capital expenditure on the Gross Fixed Capital Formation has declined from 72.43 to 48.03 during the same period (Central Statistical Organisation, 1991, 19).

**Capital expenditure on the production of machines and equipments affects the distribution of income and wealth adversely. It accelerates the pace of earnings from property.**

**Table 3: Gross Fixed Capital Formation by Type of Assets**

(in Rs. crores)

Item	1950-51		1960-61		1970-71		1980-91		1988-89	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
I. Construction	633	72.43	1337	62.01	3960	62.81	13649	51.94	3894	48.03
1) Public Sector	169	19.34	676	31.35	1547	24.54	6900	26.26	21984	27.41
2) Private Corp. Sect.	15	1.72	101	4.68	105	1.67	508	1.93	2002	2.50
3) Household	449	51.37	560	25.97	2308	36.61	6241	23.75	14534	18.12
II. Mach & Equip	241	27.57	819	37.99	2345	37.19	12627	48.06	41678	51.97
1) Public Sector	55	6.29	379	17.58	847	13.43	4793	18.24	17964	22.40
2) Private Corp Sect	69	7.89	225	10.44	515	8.17	3033	11.54	11045	13.77
3) Household	117	13.39	215	9.97	983	15.59	4801	18.2	12669	15.83
<b>Total</b>	<b>874</b>	<b>100.00</b>	<b>2156</b>	<b>100.00</b>	<b>6305</b>	<b>100.00</b>	<b>26276</b>	<b>100.00</b>	<b>80198</b>	<b>100.00</b>

Source : Central Statistical Organisation Basis Statics Relating to the Indian Economy, 1990.



As stated earlier, the public expenditure is made for creating and maintaining the general, social and economic services along with grants to Union Territories. Service wise expenditure does not give any idea about the distribution of infrastructural facilities and services in rural and urban areas. To illustrate the distribution of different facilities and amenities between rural and urban areas, data in respect of educational facilities upto secondary levels, public health, power supply, post office and banks have been examined (table 4). Except the Primary schools and Power supply, the percentage of villages having any one facility is below 23. Only 1.23 per cent of the total villages have high schools, 2.37 percent of them have dispensaries, 5.33 per cent have a branch of a commercial bank, while 22.40 percent of them have post offices. On the

**Table 4: Units of a facility in rural areas and the percentage of villages having it**

S. No.	Facility	Year	Units in rural areas	Percentage of villages having the facility
1.	Primary School	1986	4,75,938	82.26
2.	Middle School	1986	38,720	6.72
3.	High School	1986	7,225	1.25
4.	Dispensaries	1989	13,667	2.37
5.	Power Supply	1986	3,90,293	67.75
6.	Post Office	1989	1,29,045	22.40
7.	Branch of commercial Bank	1987	30,724	5.33

Note: The last column assumes that there are 5.76 lakh villages in India and the units of each facility are distributed on the basis of one unit in one village.

Sources: For 1 to 3 : NCERT (1986).  
 For 4th : Ministry of Health and Family Welfare, "(1989)".  
 For 5th : CSO (1989).  
 For 6th : CSO (1990).  
 For 7th : RBI (1990).

contrary we may not find even a single town which does not have all these facilities and amenities.

It may be argued that the facilities and services located in the urban areas are also enjoyed by the rural population. This may be true, but the trend could have been the reverse. In the present circumstances the village population has to travel a long distance for reaching the facility which consumes their time and financial resources. The impact of location of various services and facilities at urban centres can be well understood in terms of cost difference of land for residential purposes. In the big cities the cost of one unit land is around 200 times higher than that in rural areas.

### Conclusion

Except progressive property tax, all other taxes assume that inequality of income and wealth exists and it will

continue in future also. Therefore, to depend upon the taxation for improving the distribution of income and wealth between rural and urban areas may not yield the desired results. It is true that public expenditure is a powerful instrument for removing the rural-urban dichotomy. Unfortunately this instrument has been used for widening the gap. (Chakravarthy & Khanna, 1984 : 124). "In short the import of western technology had created and bolstered the metropolitan pockets of western oriented affluence amongst vast expanses of rural poverty. In order to reduce the gap between rural and urban sectors it seems necessary that greater emphasis should be given to the "construction" aspect of the Gross Fixed Capital Formation. This needs decentralisation of political and economic powers upto village level (Singh 1989 : 326-32). This may raise the productivity of rural work force from the existing abysmally low levels.

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# Logistics in Developing Countries : Problems & Challenges

Prem Vrat

*This paper surveys the status of logistics in developing countries with special references to India using SWOT analysis framework. Some cases of well-managed or otherwise logistical systems are cited and the role of OR/MS in evolving optimal logistic management is highlighted.*

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In this paper, the term 'logistics' is interpreted in a total systems perspective implying linking of production, distribution and marketing. Logistics is the science of movement of materials, intermediaries and final products from the producer to the consumer. Its main objective is to fulfill the demand at the right place at the right time with the right quality at the lowest possible cost.

This concept of integrated logistics consists of two interrelated efforts—logistical operations and logistical coordination. The concept of integrated logistics is relatively new to organizations. The growth of integrated logistics has resulted from an acute need to improve movement and storage efficiency. Logistical operations can be basically grouped into physical distribution management, materials management and internal inventory transfer. Logistical coordination pertains to forecasting, order processing, operational planning and product procurement or MRP.

Logistical mission of an enterprise is to develop a system that meets service policies at the lowest possible cost. Logistical performance is measured through availability, capability, and quality while the cost of logical system pertains to the overall cost at which the performance level is achieved. An optimal balance between both is called for.

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### Components of logistical system

Five components combine to form the logistical system. These are:

- 1) Facility structure
- 2) Transportation
- 3) Inventory
- 4) Communication
- 5) Warehousing and packaging

These issues have been conventionally examined in isolation in the past though they have interdependencies. Integrated systems approach to design, planning and control of logistical system is a phenomenon of the past decade because it is being increasingly recognised that only through a systems approach can various trade-offs be properly balanced.

This paper attempts to review the current status of logistics in developing countries with particular reference to India. Some comments are offered on Thailand about which the author has some understanding. Being a survey-type paper, the approach adopted here is to trace the current logistical scene in developing economies, identifying the strengths, weaknesses, opportunities and threats (SWOT) so as to recognise the problems and challenges of logistics in developing countries. Based on this SWOT analysis, future strategies can be evolved in designing an appropriate logistical system for these countries.

### Logistical Environment

The outer and inner environments of the logistical system play a dominant role and possibly constitute the biggest single factor which distinguishes logistics in developed and developing countries. Supply environment in many developing countries is full of uncertainties and comprises a "just-in-case" (JIC) environment as opposed to "just-in-time" (JIT) environment being so much talked about now a days. Unless the operating environment and

work culture are changed, any force fitting of JIT design in JIC environment will be counter-productive. It may probably be the reason why despite so much publicity to JIT, a really-successful JIT system hardly exists in any enterprise in the developing countries.

### Logistics In Developing Countries

The term 'logistics' itself is not very well understood though its individual components are often over-emphasized without seeing the interrelationships. For example, in India logistics is the most important aspect given the country's size, geographical heterogeneity, population pressures, natural calamities, shortage of essential commodities etc, yet there is no professional society or association which professes integrated systems approach to logistics. The Indian Institute of Materials Management

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(IIMM) was primarily an off-shoot of purchasing and the emphasis is still on that aspect. There are giant government or public sector organization like the DGS & D, Central Warehousing Corporation (CWC) and Food Corporation of India (FCI) where total logistic system concepts can improve the supply performance with lowest overall cost. But it is hardly in evidence. Even educational institutions do not emphasize logistics in their curriculum. Unless awareness of the concept spreads, one cannot expect major changes in the existing pattern. Thus, training in logistic systems management is a vital but missing component in countries like India.

The customer hardly plays a role and is invariably at the receiving end literally. Due to the lack of consumer

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protection, competition, and service attitude on the part of those who are supposed to serve, managers of the logistical system hardly realise that the customer is the very cause of their existence. This is particularly true of the state-controlled public distribution system (PDS)—a network of 'fair price shops' supplying rationed commodities of essential nature. Though PDS has recently come under a programme for operational improvement, the bureaucracy of operations and the indifferent attitude of its managers lead to a huge number of manhours wasted in queuing up to avail those so-called 'fair price' or low quality supplies. If the indirect cost of waiting and lower quality of supplies are taken into account, the 'fair price' may not really be so fair.

Performance-appraisal systems for logistical systems are hardly clear about what constitutes a good performance. Reducing visible cost at the expense of significant increase in invisible (hidden) costs is taken to be a measure of system performance, whereas quality, availability and timeliness of supplies are taken for granted. Even costs are narrowly interpreted rather than on life-cycle cost basis. Short-term gains dominate over total cost considerations.

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Quality of service is neither explicitly defined nor is objective monitored. Optimal level of service quality by judicious balancing of performance and cost is an exception rather than a rule in management of logistics operations.

There is a visible difference in the management styles of public sector logical systems with its private counterparts. In public sector, supply systems tend to be over-controlled and under-managed, sluggish to accept change, high in overhead cost and low in performance levels, particularly in the quality of service. On the other hand, the privately-managed systems consider profits to be the sole corporate objective and tend to exploit the shortage economy by fleecing the customer. Thus, in the real sense, none could be considered to be doing very well. A change of attitude is called for, even if attempts are made to privatise the huge PDS structure because, without an

**Computerization can and should play a vital role in improving logistical performance.**

attitudinal change, an appropriate work culture and concern for the customer, mere change of ownership cannot achieve wonders.

Technological upgradation is an urgent requirement in most logistical operations in India. Thailand has an edge over India on this front. In transportation, communication, storage and warehousing, the level of technology employed is much lower than India can afford, given the large base of technological institutions and R&D laboratories the country possesses. The extent of mechanization, automation and the decision-support systems employed in Indian situation is much lower than required leading to poor traffic management, delays, wastage of materials, high lead times and excessive inventories. Computerization can and should play a vital role in improving logistical performance.

Managerial decision making often does not relate to total system cost considerations. Narrow sub-system segmented considerations and risk-avoiding, 'play-safe' approaches (particularly in public sector systems) hardly lend any degree of professionalism or objectivity to the decision process. Even tools/techniques of decision-making like systems analysis/operations research are more talked about than really used to improve the quality of decisions. Many times, these are used as 'cosmetics' to give signals of professional image to outside world or used to 'justify' the predesigned options rather than seeking truly optimal solutions to problems.

Vendors' reliability and dependability are dubious. Source development and vendor performance play a vital role in improving the supply environment but unfortunately they are an ignored factor in Indian logistical systems, by and large.

Inadequate transport facilities—lack of well developed road networks, poor quality of roads and bad maintenance level, paucity of rail-road co-ordination, poor communication, non-exploitation of waterways and unscientific storage methods constitute major infrastructural bottleneck/constraints in efficient logistics.

The human element—training, skills, motivation, attitudes, value system, work ethics and team work is a major stumbling block. Logistics being primarily service systems, a high degree of sensitivity and concern for the customer, in short a good service attitude is called for. In the absence of inspiring performance-appraisal systems to distinguish performance from non-performance, indifference sets in. The situation is beyond repair in public systems with assured job security. The lack of concern for the customer can play havoc with systems performance. There is an urgent need to mould these values. Unfortunately, there is not much cause for optimism on this front in the present scenario. There is perceptible difference between work culture in India and Thailand, the latter having more favourable outlook in terms of service attitude and time discipline.

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### SWOT analysis for micro-level components

Since this paper is basically an attempt on situation analysis (of logistics in developing countries) a more detailed micro-level scenario can be developed if we examine the constituent components. We will take the five components of logistics outlined earlier for performing SWOT analysis though Bowerson et. al. (1986), indicate 12 factors for situational analysis in the context of logistics. We enumerate the componentwise strengths and weaknesses in the Indian context and opportunities and threats in the futuristic framework as follows. (This analysis is not exhaustive.)

#### 1. Facility Structure

Strengths	Weaknesses	Opportunities	Threats
Vast geographical area for design of distribution network	Inadequate facilities	Need to develop a total system network	Clustering of facilities.
Land cost generally not high	Facility location decisions are not professionally taken  Budget constraints, Poor maintenance	Optimal location of facilities	Congestion, pollution

#### 2. Transportation

Strengths	Weaknesses	Opportunities	Threats
Possible multiple modes of transportation	Poor road quality & maintenance	Distribution planning	Pollution
Vast rail network	Non-coordinated rail-road systems	Exploit water ways	Hazard accidents
Cheap and abundant manpower	Inadequate transport facilities/equipment	Cost control	Congestion
Indigenous technology base	Budget constraint  Oil crisis fuel bill  Delays at toll booths Maintenance of fleet Difficult to reach terrains due to geographical and climatic heterogeneity Low level of technology employed in equipment  Handling damages/losses	Energy Conservation through better maintenance Freight consolidation	

#### 3. Inventory Control

Inventories may be taken as a barometer of effectiveness of materials function. Inventory turnover ratio in the Indian scene is very low due to a variety of reasons. This is due partly to a volatile supply environment with excessive lead times and its uncertainties. A case study of a large public sector organisation revealed the gigantic nature of the problem. The plant was processing 2,27,000 different items every year, out of which about 30 per cent were non-moving items. The inventory turnover ratio was just 1.6, though 129 executive staff were supposed to be managing the materials management function. There were 8000 vendors to be managed every year and the vendor's supply-reliability can be gauged by the fact that mean external lead time was 175 days with a standard deviation of 104 days. Internal lead time was 118 days with a standard deviation of 56 days as an indent to order passes through 20 stages of processing. Mean lead time was 293 days with a standard deviation of 118 days. Compare this scenario with a JIT situation to know the status of inventory control in Indian public sector organizations.

The SWOT framework which provides insights into inventory control is as follows:

Strengths	Weaknesses	Opportunities	Threats
Indigenous supply of material possible for most cases	Excessive lead time	Lead time reduction	Shortages
Materials cost a major factor	Uncertain vendors	Source Development	Black-marketing
Knowledge base exists	Excess variety	Vendor rating	
	Too much dead stock		
	Low inventory turnover ratio		
	Demand uncertainties		
	Record keeping poor		
	Quality-assurance problems		
	Inflationary Pressures		

#### 4. Communication

Coordination and communication are very important in effective logistics management. Unfortunately, one of the weakest links in developing countries is communication—both in hardware and software terms. As a result, it is impossible to implement the integrated logistics systems. Some reflections of communication in SWOT framework are as follows:-

Strengths	Weaknesses	Opportunities	Threats
Technology base	Inadequate hardware	Technology upgradation	Work culture
Tech. know-how	Poor maintenance culture	Design of effective communication network	Attitude towards customer
Trained manpower in software	Misuse of facilities	Spreading communication network to far-flung areas	
PCs easily available	Low level of technology employed		
	Low productivity of communication sector		
	Lack of coordination and teamwork		

#### 5. Warehousing and Packaging

Packaging, storage and retrieval methods employed in Indian situation are not the best and there is tremendous room for improvement on packaging and warehousing front. Though there is an Indian Institute of Packaging in Bombay, an average Indian does not understand the implications of packaging and storage methods. Many times, poor storage of materials leads to damage, loss, pilferage and even hazards. There is a need to update the quality of storage methods with a high degree of mechanization and automation. Unfortunately, most stores/warehouses in India are conventional with poor maintenance and little technological innovation. In SWOT framework, a preliminary listing will be as follows:

Strengths	Weaknesses	Opportunities	Threats
Technology base	Package poor	Value analysis in packaging	Hazards
Manufacturing base	Excessive packaging cost	Mechanization	Pilferage
Manpower base	Insufficient storage with excessive retrieval time	Automation	Budget constraint for AS/RS
Lot of challenge for improvement	Poor house-keeping, low technology	Store layout planning	Maintenance of mechanized system
	Damage during storage	improved work environment	

In addition to these five components of logistical systems, there is need to change the organisation structure. Our experience indicates that the kind of organization structure prevailing does not facilitate integrated approach to logistical management—it rather hinders it. Given the existing work ethics, and attitude towards service there is even greater need to design organization structure and

**Given the existing work ethics, and attitude towards service, there is even greater need to design organization structure and create a climate of performance-monitoring based on objectivity and introduce a system of incentives and disincentives.**

# Trends & Structure of Wages in Indian Industry (1971-88)

Pramod Verma

*Wage trends across industries and states in India have always been under the influence of three factors, viz, consumer prices, productivity as well as capital intensity. The author analyses the varying impact of these factors on wage disparities and comes to the conclusion that a judicious balancing of market and institutional forces is required to achieve the twin objectives of efficiency and equity in wage structure.*

Wage behaviour in Indian industry is influenced by such factors as productivity, capital intensity and inflation. Over the years, the importance of these factors has been varying (Fonseca, 1964; Horowitz, 1974; Verma, 1972, 1992). During the 1950s and 60s, consumer prices played a very significant role in determining wages. At the same time, productivity also had an impact on wages. Prices and productivity continued to have a sway over wages until the late 1970s, when wage increases started outpacing both price increases and productivity growth. In more recent years, capital intensity has also emerged as a crucial variable in explaining wage movement. However, productivity continues to influence wage variations across industries and states. In this study, we analyse time series data on wages pertaining to the years 1971 to 1987-88, examine cross-section data for the year 1987-88, and, finally, draw a few conclusions.

**Prices and productivity continued to have a sway over wages until the late 1970s, when wage increases started outpacing both price increases and productivity growth. In more recent years, capital intensity has also emerged as a crucial variable in explaining wage movement.**

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## Wage Trends from 1971 to 1987-88

The data for the years 1971 to 1987-88 are presented in tables 1 and 2. The wage index rose to 621.54 (1971-100) in 1987-88, showing an average annual growth of nearly 31 per cent. Large increases were registered from 1971 to 1975, 1978-79, 1980-81, and 1985-86. On the whole, sustained increases took place during 1971 to 1975 and 1980-81 to 1987-88.

**Table 1: Wages, Productivity, Capital Intensity and Prices, 1971 to 1988**

Year	Productivity	Wages	Capital intensity	Consumer Price Index
1971	100.00	100.00	100.00	100.00
1973	126.33	121.80	110.98	130.21
1974	163.35	102.35	120.30	165.10
1975	163.57	155.72	134.90	163.02
1976	179.16	157.75	149.23	156.77
1977-1978	187.57	165.13	168.99	168.75
1978-1979	215.67	193.88	194.32	172.40
1979-1980	233.11	213.14	216.51	187.50
1980-1981	252.37	272.12	237.95	208.85
1981-1982	304.94	302.43	273.47	234.90
1982-1983	337.89	342.07	312.54	253.13
1983-1984	418.27	404.38	379.71	284.90
1984-1985	438.65	466.36	433.17	303.12
1985-1986	496.10	515.46	496.81	322.92
1986-1987	562.90	571.80	557.03	351.04
1987-1988	597.93	621.54	622.85	383.33

Source: Annual Survey of Industries, Various Issues, Economic Survey

**Table 2: Wages, Productivity and Capital Intensity at Constant Prices, 1981-1988**

Years	Wages	Productivity	Capital Intensity
1971	100.00	100.00	100.00
1973	93.54	99.26	94.75
1974	61.99	106.32	80.97
1975	95.52	105.22	81.87
1976	100.62	112.62	92.17
1977-1978	97.86	115.26	102.56
1978-1979	112.46	131.80	110.89
1979-1980	113.68	118.71	105.25
1980-1981	130.30	108.02	104.54
1981-1982	128.75	123.78	108.35
1982-1983	135.14	136.65	118.05
1983-1984	141.94	155.44	137.48
1984-1985	153.85	150.78	147.20
1985-1986	159.62	159.10	154.33
1986-1987	162.89	172.48	164.30
1987-1988	162.14	171.28	175.81

Source: As in table 1.

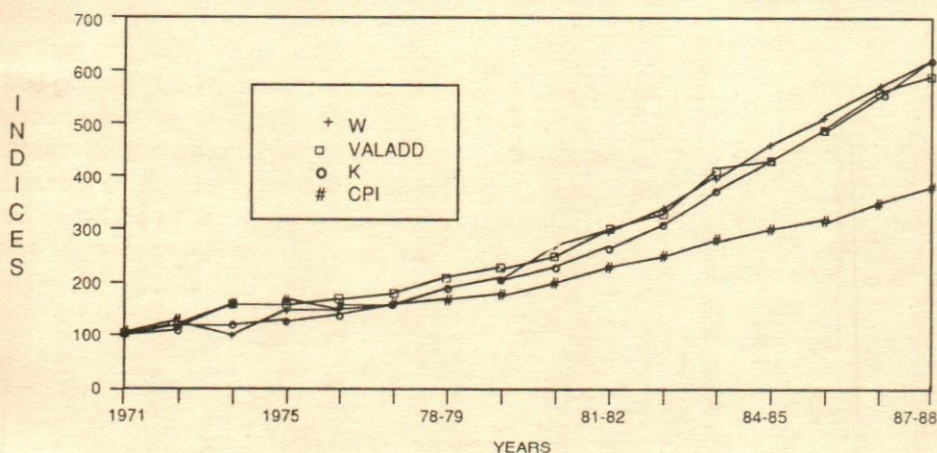


Fig. 1 W, V, K & CPI 1971 - 1988

In contrast, price increases have been moderate. In 1987-88, the consumer price index had reached the level of 383.33 (1971=100). There was however a spurt during 1973-74 and again a sustained increase from 1979-80 to 1983-84 at less than 10 per cent level. It declined in the next two years and again picked up.

The movement in real wages has also been erratic. Real wages declined during 1973, 1974, 1977, 1979-80, 1981-82, and 1987-88. On the other hand, real wages spurted during 1975, 1976, 1977-78, and 1980-81 and rose at a moderate pace during 1982-83 to 1986-87.

Figures 1 and 2 indicate that wages have outpaced price since 1978-79. It also outpaced productivity in 1980-81, 1982-83 and from 1984-85 to 1987-88. Wage indices were also higher than capital intensity indices in 1973, 1975, and 1976, and then from 1980-81 to 1986-87.

However, real wages have usually lagged behind real productivity, except during 1980-81, 1981-82, 1984-85, and 1985-86. On the other hand, real wages have been higher than real capital intensity, except during the periods 1973, 1974, 1977-78, 1986-87 and 1987-88.

We may also note that variations in wages, productivity, and capital intensity (as measured by the coefficient of variation) were of a similar order, although the

consumer price index was more stable. The structural characteristics also indicate that, in real terms, the variations have been much smaller. Even then, the variation in real productivity was smaller than variations in real wages and real capacity intensity.

### Structural Characteristics

Variables	Mean	S.D.	C.V.
V	298.61	159.06	53.26
K	281.80	168.49	59.79
CPI	224.12	83.827	37.40
W	294.12	173.81	59.09
V <sub>r</sub>	129.17	25.376	19.64
K <sub>r</sub>	117.41	29.401	25.04
W <sub>r</sub>	121.89	29.658	24.33



On the whole, the wage situation has improved considerably since 1978-79. It may therefore be interesting to examine the impact of productivity, capital intensity, and prices on wages.

**On the whole, the wage situation has improved considerably since 1978-79.**

We hypothesize that productivity, capital intensity, and prices had a positive influence on wages. Accordingly, the following equation may be proposed;

$$W = \alpha + \beta_1 V + \beta_2 K + \beta_3 CPI \dots(1)$$

where V = productivity, K = capital intensity, CPI = consumer price index, and  $\alpha, \beta$  = constant and regression coefficients, respectively.

We test the hypothesis, by using multiple regression analysis.

The following correlation matrix emerged:

	V	K	CPI	W
V	1.00	.996	.995	.995
K	.996	1.00	.987	.996
CPI	.994	.987	1.00	.998
W	.995	.996	.988	1.00

This matrix shows that all the four variables are highly correlated. However, the regression results show varying influences of the independent variables:

$$W = -26.96 + .023V + .830^{**} K + .358 CPI \dots (2)$$

(.046) (2.689) ( .696)

$$\bar{R}^2 = .992; F \text{ with D.F. } (3, 12) = 604.813 \text{ D.W.} = 1.858$$

$$W = -5.878 + .309^{***} V + .736^{*} K \dots (3)$$

(1.973) (2.705)

$$\bar{R}^2 = .992; F \text{ with D.F. } (2, 13) = 944.466 \text{ D.W.} = 1.906$$

\* significant at 1%; \*\* - significant at 5%; \*\*\* significant at 10%

Equations (2) and (3) suggest that capital intensity has both positive and statistically-significant influence on wages. Interestingly, while productivity and consumer price index show a positive impact, the magnitude of this impact is quite negligible. However, the three variables taken together explain the variations in wages.

Turning next to real wages, we modify equation (1) as:

$$W_r = \alpha + \beta_1 V_r + \beta_2 K_r$$

where  $W_r$  - real wages  $V_r$  = real productivity, and  $K_r$  = real capital intensity.

The correlation matrix was:

	$V_r$	$K_r$	$W_r$
$V_r$	1.00	.956	.880
$K_r$	.956	1.00	.922
$W_r$	.880	.922	1.00

This again shows that the three variables are highly correlated, However, regression results do not completely

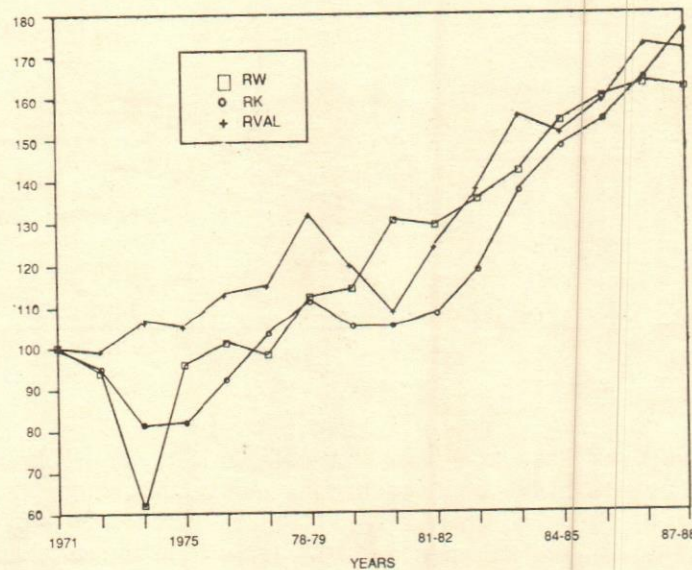


Fig. 2 REAL WAGES & PRODUCTIVITY  
1971 - 1988

agree with the above view:

$$W_r = 13.109 - .012 V_r + .940^{**} K_r \dots (5)$$

(.028) (2.55)

$$\bar{R}^2 = .827; F \text{ with D.F. } (2, 13) = 36.771; \text{ D.W.} = 1.164$$

$$W_r = -10.973 + 1.029^{*} V_r \dots (6)$$

(6.937)

$$\bar{R}^2 = .758; F \text{ with D.F. } (1, 14) = 48.112; \text{ D.W.} = 1.573$$

\* significant at 1%; \*\* significant at 5%

These results indicate that real capital intensity has a positive and statistically significant impact on real wages. On the contrary, the regression coefficient for real productivity is both negative and insignificant in equation (5), although individually, it is positive and statistically significant in equation (6). The results imply that real productivity still exerted some influence on real wages, although this influence has admittedly become weak.

### Wage Structure 1987-88

Both inter-industry and inter-state wage variations have become pronounced in recent years. Data are presented in tables 3 and 4. The coefficient of variation is 39.57 per cent for inter-industry differentials and 27.10 per cent for inter-state differentials. However, wage variations are much less compared to variations in capital intensity, net value added per worker, and profits per worker.

Table 3: Inter-Industry Wage Differentials 1987-88

Industry Code	Wages	Capital Intensity	Productivity	Profits
20-21	53.07	27.29	58.46	120.13
22	35.34	9.73	36.33	153.85
23	95.23	24.34	44.92	-113.84
24	92.01	57.47	73.74	14.21
25	98.52	9.17	34.48	-105.18
26	60.82	26.31	69.32	184.83
27	52.18	20.19	44.91	170.69
28	107.40	77.70	84.81	-43.46
29	74.59	19.60	62.57	68.83
30	114.55	157.43	307.22	1528.92
31	131.05	160.69	211.40	370.79
32	64.76	84.28	68.15	83.67
33	134.96	164.86	114.30	34.99
34	9.58	3.38	9.83	134.85
35	119.78	51.19	139.63	198.46
36	138.20	68.46	189.69	355.50
37	148.88	67.07	109.98	43.50
38	111.05	46.41	122.29	281.66
40	134.48	437.34	145.16	-224.82
41	115.45	339.82	208.80	775.97
42	105.87	44.71	62.38	167.41
74	53.64	78.96	36.01	-150.94
97	128.24	9.63	62.90	19.22

Source : Annual Survey of Industries.

### Inter-industry Wages : Structural Characteristics

Variable	Mean	S.D.	C.V.
K	86.349	107.61	124.62
V	99.882	72.324	72.40
P	172.58	361.53	209.48
W	94.767	37.508	39.57

### Inter-State Wages : Structural Characteristics

Variable	Mean	S.D.	C.V.
K	93.226	62.409	66.94
V	87.614	35.591	40.62
P	31.972	382.38	1195.98
W	90.753	24.598	27.10

Table 4: Inter-State Wage Differentials 1987-88

States	Wages	Capital Intensity	Productivity	Profits
Andhra Pradesh	58.45	57.80	44.15	-61.48
Assam	43.23	57.29	116.98	763.02
Bihar	130.07	153.03	135.59	240.25
Gujarat	90.38	112.50	115.28	235.09
Haryana	93.59	101.36	96.83	-46.61
Himachal Pradesh	86.53	237.69	116.40	19.97
Jammu and Kashmir	66.70	87.79	41.36	-27.38
Karnataka	103.30	81.67	98.50	28.18
Kerala	85.89	69.32	91.44	211.50
Madhya Pradesh	104.10	201.15	126.07	166.48
Maharashtra	145.01	105.82	150.30	156.16
Manipur	19.44	59.90	14.03	35.60
Meghalaya	100.28	65.30	62.06	-52.23
Orissa	104.19	236.21	81.67	-1595.58
Punjab	74.58	98.60	72.20	-9.73
Rajasthan	99.88	136.59	82.42	-83.61
Tamilnadu	88.52	70.85	84.85	102.90
Tripura	40.66	13.16	15.10	-37.85
Uttar Pradesh	89.50	110.69	91.99	96.51
West Bengal	121.89	68.06	93.75	74.72
Andaman and Nicobar	82.76	13.01	41.42	40.48
Chandigarh	89.28	22.05	69.32	96.61
Delhi	93.40	44.01	109.91	90.99
Goa	111.48	19.72	148.34	364.03
Pondicherry	105.26	52.91	68.82	7.44
Total	100.00	100.00	100.00	100.00

Source : Same as for table 3

Data indicate that wages are high in some industries and regions. For instance, wages are relatively high in industries such as transport equipment; electrical machinery; basic metals and alloys; electricity; chemicals and chemical products. On the contrary, they are fairly low in such industries as metal products; beverages, tobacco, and tobacco products; wood and wood products; and food products. Likewise, wages are above average in Maharashtra, Bihar, West Bengal, Goa, Pondicherry, Orissa, Madhya Pradesh, and Karnataka. Low-wage states include Tripura, Assam, Andhra Pradesh, Manipur, and Jammu and Kashmir. It should be noted that the structure of wages has not appreciably changed over the past two decades.

Figures 3 and 4 plot the indices of wages, productivity, and capital intensity for industries and regions. The comparative pictures indicate that there is closer correspondence between wages and productivity than between wages and capital intensity. However, this correspondence is much closer in the case of industries than in the case of states. Thus, we may expect that, in general, high-wage industries/states would also have higher level of productivity. No such assertion can be made about the relationship between wages and capital intensity.

The following correlation matrix is computed for wages and other variables pertaining to inter-industry variations:

	K	V	P	W
K	1.00	.587	.220	.454
V	.587	1.00	.789	.627
P	.220	.789	1.00	.162
W	.454	.627	.162	1.00

**Any step to improve capacity utilization and optimize productivity would have a positive impact on wages.**

Productivity, capital intensity, and profits are positively correlated but there is a stronger correlation between wages and productivity than between wages and other variables. This is further confirmed by the regression results:

$$W = 38.01 - .090K + .835 \cdot V - .109 \cdot P \quad \dots\dots\dots (8)$$

(1.511) (5.894) (4.641)

$$\bar{R}^2 = .677; F \text{ with D.F. } (3, 19) = 16.36; D.W. = 2.162$$

$$W = 62.327 + .046K + .285 \cdot V \quad \dots\dots\dots (9)$$

(.617) (2.58)

$$\bar{R}^2 = .345; F \text{ with D.F. } (2, 20) = 6.795; D.W. = 2.217$$

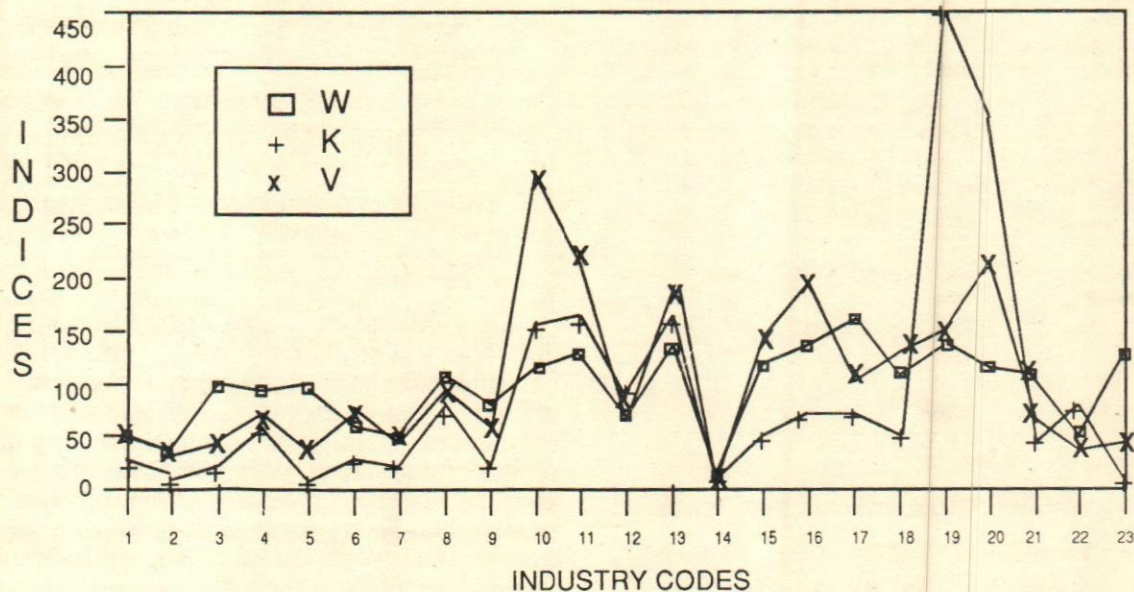
\* Significant at 1%; \*\* Significant at 5%

Equations (8) and (9) show that the regression coefficient for productivity is both positive and statistically significant. At the same time, the coefficient for capital intensity

We, therefore, hypothesize that wage variation is positively influenced by capital intensity, productivity, and profits. Thus,

$$W = \alpha + \beta_1 K + \beta_2 V + \beta_3 P \quad \dots\dots(7)$$

where  $W$  = wage variation across industries and regions;  $K$  = capital intensity;  $V$  = productivity of labour;  $P$  = profits per worker, and  $\alpha$  and  $\beta$  constant and regression coefficients, respectively.



**FIG. 3 WAGES, PRODUCTIVITY & CAPITAL INTER-INDUSTRY DIFFERENTIALS 1987-88**

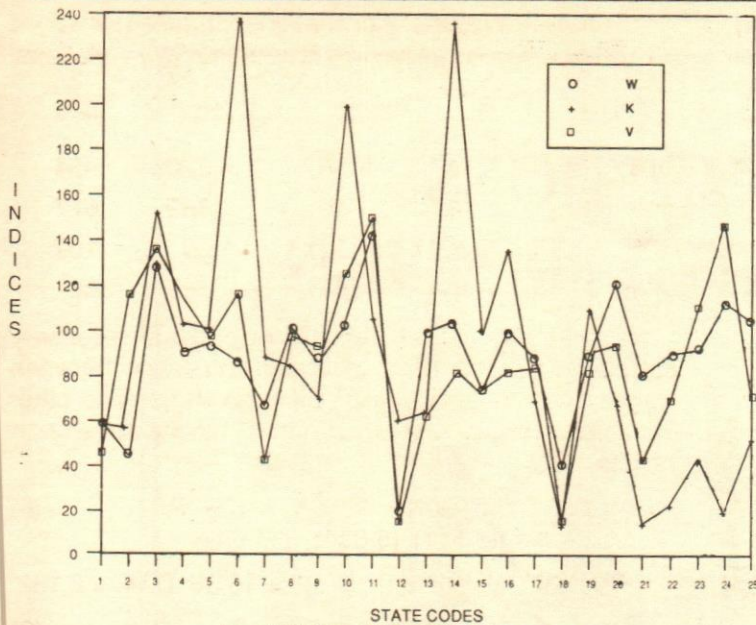


Fig. 4 WAGES, PRODUCTIVITY & CAPITAL INTERSTATE DIFFERENTIALS 1987-88

is negative and insignificant in equation (8) and positive but insignificant in equation (9). The coefficient for profits is negative but significant. These equations imply that productivity is still the most crucial variable influencing wage variations across industries. However, the three variables together can explain only 68 per cent variation in wage dispersion.

The correlation matrix for inter-state variations is given below:

	K	V	P	W
K	1.00	.541	-.394	.409
V	.541	1.00	.294	.651
P	-.394	.294	1.00	-.116
W	.409	.651	-.116	1.00

Wages are positively correlated with productivity and capital intensity but are negatively correlated with profits. This finding is further confirmed by regression equations (10) and (11):

$$W = 44.106 - .137K + .691 \cdot V - .035 \cdot P \quad \dots (10)$$

(1.484) (4.448) (2.659)

$$R^2 = .511; F \text{ with D.F. } (3, 21) = 9.376 \text{ D.W.} = 2.207$$

$$W = 50.998 + .032K + .420 \cdot V \quad \dots (11)$$

(.420) (3.171)

$$R^2 = .377; F \text{ with D.F. } (2, 22) = 8.253; \text{ D.W.} = 2.034$$

\*significant at 1%; \*\* significant at 5%

The two equations taken together suggest that pro-

ductivity is still the most crucial factor in explaining wage variations across the states. In both equations, the regression coefficient for productivity is positive and statistically significant. As for capital intensity, the coefficient for capital intensity is negative in equation (10) and positive in equation (11), but insignificant in both. The coefficient for profits is negative but statistically significant in equation (10). The three variables together explain a little over 51 per cent of the variation in wages across the states. These results indicate that productivity and to some extent, capital intensity influence dispersion of wages.

### Conclusions

To conclude, real wages in Indian industry have of late tended to improve and capital intensity seems to have had an influence in improving wage levels. On the contrary, the impact of productivity has considerably weakened. However, inter-industry and inter-re-

gional wage disparities are still influenced by differences in productivity levels.

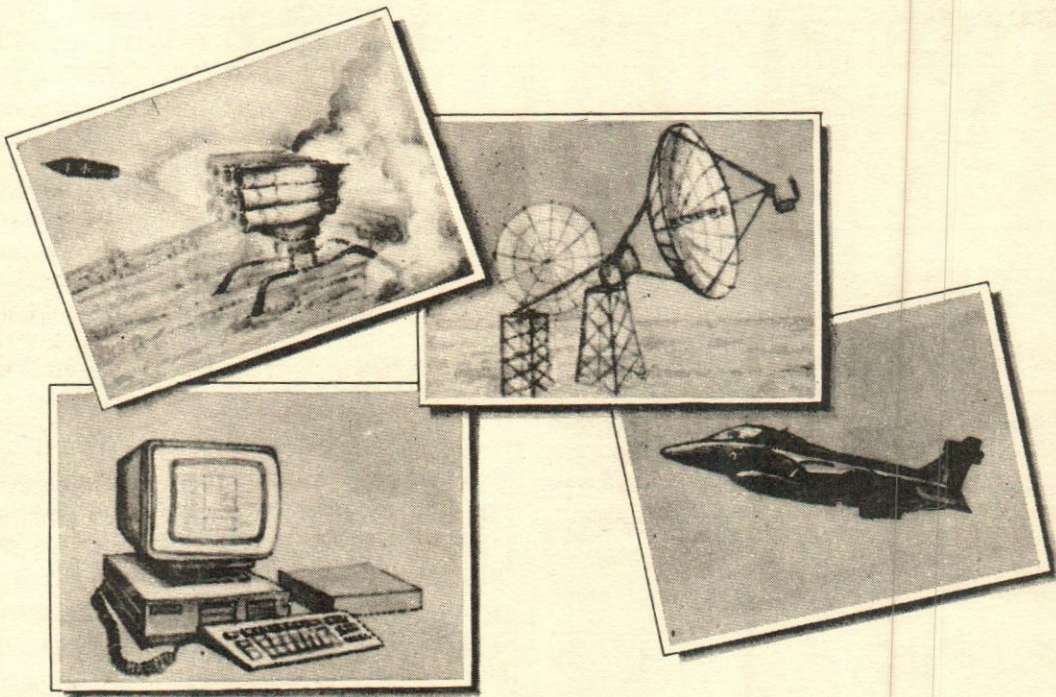
Any step to improve capacity utilization and optimize productivity would have a positive impact on wages. But such improvements may also further accentuate the existing wage disparities across industries and regions. A judicious balancing of market and institutional forces may thus be required to ensure the twin objectives of achieving efficiency and equity in wage trends and wage structure.

An improvement in real wages has also taken place owing to stable consumer prices. *The Economic Survey*, 1991-92, states that prices have gone up during the past two years (13.6 per cent in 1990-91 and 13.1 per cent in 1991-92). Through a variety of policy measures, the inflationary trend is sought to be brought under control. We can, therefore, conjecture that real wages might have suffered during the past two years and that, unless inflation is checked, real wages might deteriorate further.

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# Corporate Plan in Oil & Gas Exploration Industry

Sanjib Chowdhury & K.C. Sahu

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*This paper identifies some suitable control measures that are to be incorporated in the planning process for successful implementation of the corporate plan in oil and gas exploration/exploitation industry. It identifies and redresses the problems associated with the implementation of the control system. It also discusses the design aspects of management information system and project management control system.*

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Oil exploration is a capital intensive and high risk activity. It involves a series of interconnected activities from prognostication to delineation of reserves with in-built looping mechanism. The realisation of investment in exploration is uncertain and usually takes a long time—it is not possible to be assured that a given input will produce output (discovery of hydrocarbon) within a specified time. The input in oil and gas exploration/exploitation industry is deterministic, but the output is probabilistic. Hydrocarbon exploration and exploitation are associated with high technology and expertised services. Moreover, this industry usually operates in diverse geographical conditions—in dense forests, tricky terrains, deserts, high-altitude snow-bound areas, marshy lands, gulfs and the seas. The identification of control measures has great bearing on successful implementation of a corporate plan in this key industry.

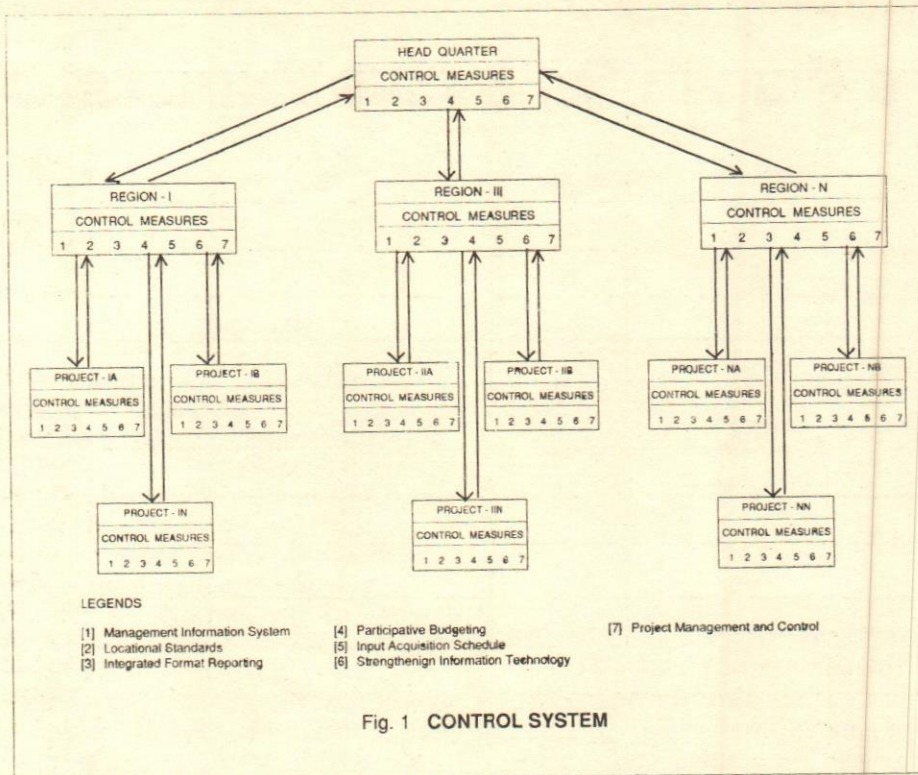
## Identification of Control Measures

The suggested control system for oil and gas exploration/exploitation industry covering the grass root/project level to board/head quarters level for effective implementation of the corporate plan is depicted in fig. 1. It mainly consists of seven control measures to be incorporated in the planning system. They are as follows :

**Management information system (MIS) is an organised method of providing past, present and projected future information relating to internal operations**

## Management Information System

Walter Kenneron (1970) defines—"a management information system (MIS) is an organised method of providing past, present and projected future information relating to internal operations and external intelligence. It supports the planning, control and operational functions of an organisation by furnishing uniform information in the



proper time frame to assist the decision-maker". Anthony (1965) classifies managerial activity into three categories namely, strategic planning, management control, and operational control.

Simon (1960) discusses the evolution of MIS. He classifies decision as structured (programmable) or unstructured (unprogrammable) depending on possession of various levels of knowledge, search space, novelty, apprehension, time constraints, need for quantifiable data. He classifies the decision - making into three processes namely.

- \* Searching the environment for conditions
- \* Inventing, developing and analysing possible courses of action.
- \* Selecting a course of action.

The categorisation by Anthony is based on the purpose of the management activity and the classification by Simon is based on the way of tackling a problem when confronted by the manager. These are synthesised by Gorry & Scott Morton in (1971) order to develop a useful framework of MIS.

The fundamental character of information requirements of these three activities is quite different. Strategic planning is concerned with setting broad policies and goals for the organisation. It is confined to a small number of high level people who operate it in a nonrepetitive and

creative way. Control system of strategic planning may include :

- \* Periodic review meeting, and
- \* Mid-course correction.

Management control relates to assuring effectiveness in acquisition and use of resources. It is most often concerned with people. Operational control is concerned with tasks related to assuring effectiveness in acquisition and use of resources.

The information domain required for strategic planning is not well - defined or accurate; it is unstructured. In contrast, the information required for operational control is structured, well - defined and accurate. As a result, operational control is more realistic and found fairly successful in terms of applicability and usefulness in business. The information requirement for management control lies within these two extremes. Since it is mostly people-oriented, the information domain is largely unstructured.

Important activities namely, accretion of recoverable oil and gas reserves, oil and gas production, exploratory and development drilling, in respect of each project/region are to be closely monitored over different time horizon. Integrated format of daily drilling progress report of oil and gas exploration/exploitation industry covering each region and each project as shown in format 1 will be of immense help. This is an important source of operational information

Format 1 Daily Drilling Progress Report

Date :

Region	Project	Rig name	Well name	Projected depth (meter)	Operations	Date of commencement	Yesterday's depth (meter)	Present depth (meter)	Day's meter age	Operation summary	
I	I-A	I-A1									
		I-A2									
		I-AN									
	Project	Total									
	I-N	I-N1									
		I-N2									
		I-NN									
	Project	Total									
Region	Total										
N	N-A	N-A1									
		N-A2									
		N-AN									
	Project	Total									
	N-N	N-N1									
		N-N2									
		N-NN									
	Project	Total									
Region	Total :										
Grand	Total :										

widely and frequently used by the managers for close monitoring of daily operations and also for regional and project levels. Exceptional reports may also be generated from this format.

**Locational Standards**

Control system should be tailored to suit the local environment and need. A uniform standard all over the country would certainly result in failure. For instance, the performance indicators of drilling namely, cycle speed, commercial speed, and meterage drilled fluctuate widely in different geological conditions. The variations of the performance indicators are appreciable for offshore and onshore, shallow field and deep field, and for different lithology and technology used. Similarly, performance indicators of production activities like oil and gas production, differ considerably from field to field as the reserves potential, formation pressure, viscosity, specific gravity and gas content to oil differ from reservoir to reservoir. Similarly seismic survey in offshore and onshore, in hilly-terrain

**Control system should be tailored to suit the local environment and need.**

and planes, forests and deserts vary widely. Moreover, various degrees of political instability, work culture, and lack of distribution infrastructure (as prevalent in North-Eastern part of the country) considerably affect the performance indicators. Since, operational standards are greatly influenced by the local conditions, locational standards are appropriate for operational and management control.



To the extent practicable, reporting of operational control should be integrated in one format so that the performance of interlinked activities is projected together. Efforts should be made to integrate operational performance with the financial performance.

### Participative budgeting process

Budgeting should be two-way traffic. It should simultaneously move from the strategic level to project level and vice-versa. Participative budgeting process involves face to face interaction and negotiations between managers. It helps in eliminating non achievable and problematic parts, to make the budget realistic.

### Input acquisition schedule

Most of the equipment, services and materials related to the oil and gas exploration/exploitation industry are high cost, high technology and imported items. It is important to control the input acquisition schedule; otherwise it would jeopardize the planned operational targets. The steps involved with the time standards for procurement schedule, in respect of both the imported and indigenous items are given in table 1. Slippage in one step would have cumulative delay effects. Duration of each step is obtained from the historical data and subsequent consultations with the experts. The critical items required for the oil and gas exploration and exploitation are to be identified and their acquisition schedule (with the help of table 1) may be drawn.

Table 1: Steps and time standards in procurement schedule

Sl No	Imported Procurement Activity	No of Days	Indigenous Procurement Activity	No of Days
1.	Finalise Specifications	0	Finalise Specifications	0
2.	Financial Sanction	30	Financial Sanction	30
3.	Receipt of Indent By S & P	5	Receipt of Indent by S&P	5
4.	Finalise Tender Document	15	Finalise Tender Document	15
5.	Issue of NIT	20	Issue of NIT	20
6.	Opening of Unpriced Bids	60	Opening of Unpriced Bids	45
7.	Start Tech. Evaluation	5	Start Tech. Evaluation	5
8.	Complete Tech. Evaluation	21	Complete Tech. Evaluation	21
9.	Tech. Tender Committee	2	Tech. Tender Committee	2
10.	Receipt of Clarifications	22	Receipt of Clarifications	15
11.	Final Tech. Tender Committee	5	Final Tech. Tender Committee	5
12.	Opening of Price Bids	25	Opening of Price Bids	15
13.	Complete Vetting of C.S.	30	Complete Vetting of C.S.	15
14.	Final Tender Committee	3	Final Tender Committee	5
15.	Purchase Committee	30	Competent Authority's Approval	7
16.	Steering Committee	30	Purchase Approval	30
17.	Submit FE Proposal	5	Detailed Order	7
18.	Receipt FE Approval/LOI	21	Availability	
19.	Open LC	30		
20.	Availability			
	Computer Code		Computer Code	

### Strengthening of information technology

The information technology particularly, in the following domain is to be strengthened :

- \* Computer based management information system
- \* Computerisation on libraries for efficient database, compilation, retrieval and transmission of information.
- \* Communication network linking the corporate head quarters, regional head quarters and remote work sites.

### Project management and control

With the increase in exploration and production activities in future, a number of high cost and high technology projects are to be executed like production installations (GGS, CTF, Process Platforms), LPG Plants, gas terminals, laying of trunk pipelines both offshore (sub-sea) and onshore, enhanced oil recovery (EOR) techniques (Polymer flooding, high pressure gas injection), to mention a few. These projects will be executed by the expertised companies selected through global tender, on a turn key basis. In order to maintain the time schedule of project execution the project management and its control would play a significant role in future. Some of the important aspects related to the project management and its control in oil and gas exploration/exploitation industry have been identified in fig. 2.

### Managerial Style

It should be directed to move :

- \* Towards entrusting higher responsibility and control.
- \* From poor diagnosis to strong formal periodical diagnosis.
- \* From technical piecemeal view to overall managerial view. (Technical piecemeal view may attain the goal of one sector but may adversely affect the other sectors. In order to attain the optimality in respect of goals in all the sectors it is desirable to adapt an overall managerial view rather than technical piecemeal view).

### Communication

It is desirable to have a strong communication and adequate clarity in respect of organisational and system goals, and processes. To ensure clarity regarding organisational goal and system goal -

- \* Encourage general meeting.
- \* Issue circulars, letters.

The absence of conceptual clarity may be

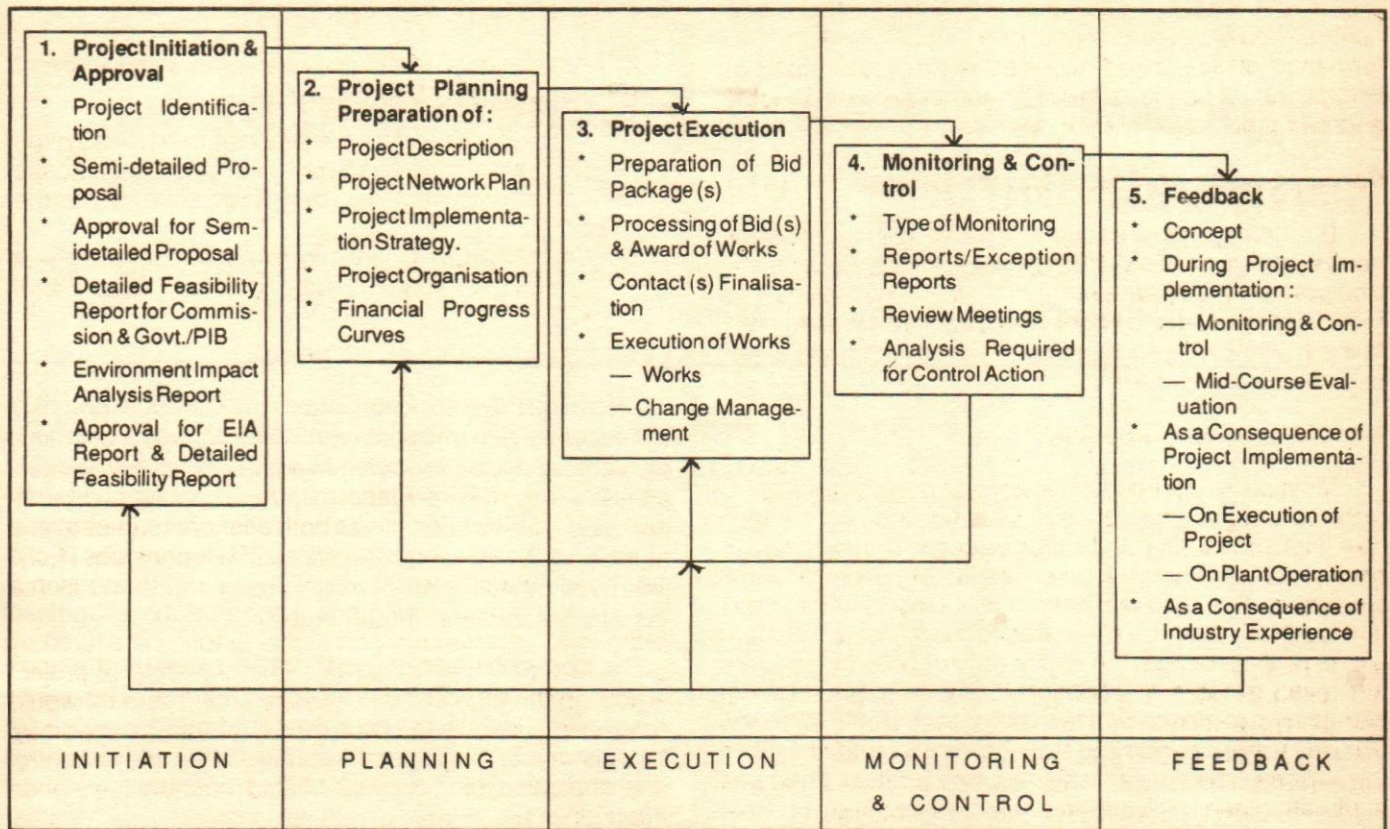


FIG. 2: PROJECT MANAGEMENT AND CONTROL SYSTEM

removed by

- \* Small group technique
- \* Formal review meetings
- \* Correspondence
- \* Manuals

Gradual introduction of the system will help in improving the process clarity.

### Back-up information system

A strong back-up information system is essential for an effective control system. Zero level reporting system is to be introduced at the originating level of physical activities. MIS Cell being a staff function, competent executives from line function do not like to shift to this section. The posting in MIS Cell from line function is even considered by the executives as side tracking. This feeling needs to be changed and efforts should be made to post competent people in the MIS Cell.

### Conclusion

For successful execution of corporate plan of oil and gas exploration/exploitation industry, seven control meas-

ures have been identified. They are management information system, locational standard, integrated format reporting, participative budgeting process, strengthening of information technology, input acquisition schedule, and project management and control. These control measures are to be incorporated in the planning process.

### Acknowledgements

"The views expressed are those of the author and not necessarily of the organisation to which the author belongs".

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**The process of manpower planning begins with the conception of an enterprise and thereafter never ceases.**

organisations and work methods, quality of personnel and their productivity. The number and type of persons engaged must be carefully assessed and translated into the plan. Problems of overstaffing, improperly trained manpower, low productivity, misfits and disgruntled individuals, etc., are all symptoms of defective planning and failure to recognise the impact of various factors governing manpower.

The purpose of manpower planning is to match the supply of right jobs at the right point of time. Manpower in technical sense is defined as managerial, scientific, engineering, technical, skilled, semi-skilled and unskilled human resources employed in erecting, designing, developing, managing and operating productive and service enterprises and economic institutions. The process of manpower planning begins with the conception of an enterprise and thereafter never ceases. It is a dynamic and continuing process, suitably changing in its content and emphasis as the enterprise advances from conception to completion and steady operation and subsequent stages of further development (Mukherjee & Singh, 1968).

The methods generally adopted for manpower estimations are (Ghosh 1981-82, 157-194).

- i. Managerial Judgement
- ii. Work Study
- iii. Imitation of existing practices in similar plants
- iv. Planned Productivity Techniques
- v. Statistical Techniques
- vi. Superannuation cum Replacement Charts.

Generally, one or a combination of the above methods is used, taking into consideration the organisation's special situations and availability of extensive past data about the manpower needs related to sales or production.

In this study, the work content of each activity is estimated using Time Study. Various constraints force some of the workers to be idle at times. The utilisation of men depends on the number of people available at work place, crew size and the way in which these men are assigned to various activities. A simple approach to man-

power requirement will be to calculate the daily man-hours. In coal mine production, the managers have prior information about the total amount of coal that can be obtained (C) from a coal face and the total workload in man-hours (TWL) to produce this amount of coal. If daily production target (TR) is fixed as per the expectation of the management, then the man-hours required each day (MH) to meet this production target is

$$MH = \frac{TWL \times TR}{C}$$

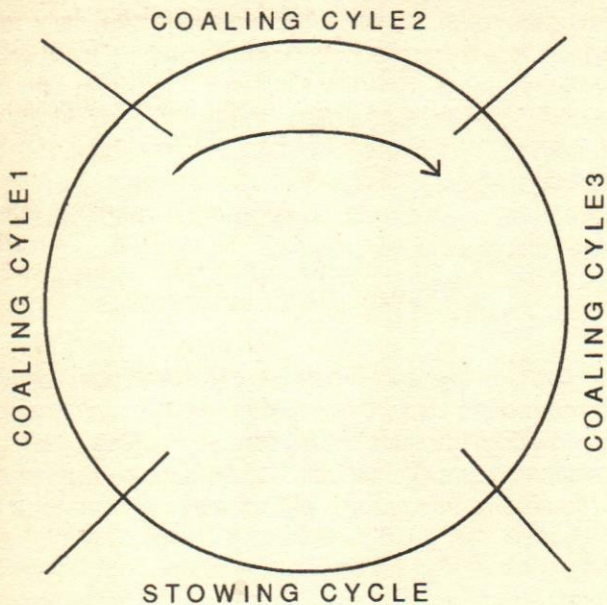
Had the utilisation of men been hundred percent, the men required in each shift could be easily calculated by simply dividing the man-hours required each day (MH) by the working hours in each day. But since some of the men are required to be kept idle during working hours due to precedence relationships among activities, the men required in each shift cannot be calculated in this simple fashion. A computer program is developed to determine the least time taken for a given crew size to complete the required production. The program is also used to make manpower allocation among various activities.

### Longwall Process & Activities

The colliery where the study has been conducted practises Longwall Advancing with stowing method for extraction of coal. The length of the coal face is 82.29m, and height is 1.98m. The Longwall process with stowing involves coaling and stowing cycles. A coaling cycle is a sequence of operations aimed primarily at drilling, blasting and raising of coal, whereas the stowing cycle is the sequence of activities for filling the excavated space with sand. It is not economical to do stowing very frequently because it requires lot of materials for preparation and at the same time, big voids should not be allowed to form for safety reasons. Keeping these two points in view stowing is done once after three coaling cycles; i.e., after a face advance of 4.11 m. (void size will be  $82.29 \times 1.98 \times 4.11$  cu. m.) sand stowing is done. Hence, each full working cycle consists of three coaling cycles and one stowing cycle as shown in fig. 1.

The coaling cycle consists of the following ten activities.

- C<sub>1</sub> : Drilling of holes in the coal face.
- C<sub>2</sub> : Carrying of explosive from magazine to the coal face.
- C<sub>3</sub> : Shifting of A.C.C. (Armoured Chain Conveyor) nearer to the coal face.



**Fig. 1 : Constituents of one full cycle**

- C<sub>4</sub> : Charging and stemming of holes in the coal face.
- C<sub>5</sub> : Blasting of holes.
- C<sub>6</sub> : Water spraying at the coal face for dust suppression.
- C<sub>7</sub> : Resetting of dislodged hydraulic props due to blasting.
- C<sub>8</sub> : Dressing of freshly exposed roofs.
- C<sub>9</sub> : Link bar extension and hydraulic prop setting to support the freshly exposed roof.
- C<sub>10</sub> : Raising of blasted coal by shovelling on to A.C.C.

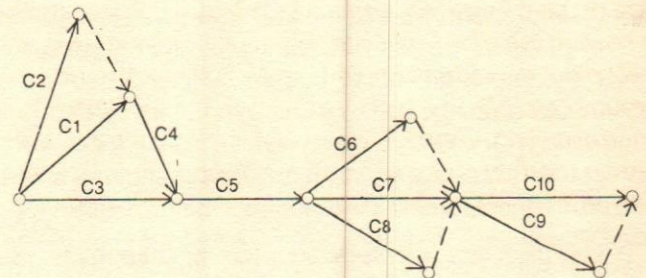
After three coaling cycles are completed, stowing cycle starts consisting of the following ten activities.

- S<sub>1</sub> : Special barricading at the bottom gate.
- S<sub>2</sub> : Bend jointing at the top gate.
- S<sub>3</sub> : Joining of stowing pipes along the area to be stowed.
- S<sub>4</sub> : Material required for preparation of boxing is transported to the area to be stowed.
- S<sub>5</sub> : Withdrawal of hydraulic props and link bars from the area to be stowed.
- S<sub>6</sub> : Preparation of boxing for stowing.
- S<sub>7</sub> : Stage loader pan transport.
- S<sub>8</sub> : Stage loader pan extension.
- S<sub>9</sub> : Special barricading at top gate.
- S<sub>10</sub> : Sand stowing.

In both coaling and stowing cycles, some activities can be done in parallel and some are to be done in series due to constraints in working procedure.

### Precedence Relationship of the Activities

In both coaling and stowing cycles, some activities can be done in parallel and some are to be done in series due to constraints in working procedure. Figures 2 and 3 show the precedence relationships for coaling and stowing cycles respectively. The precedence relationships as discussed above hold good for any colliery practising Longwall advancing with stowing. Given the production target and the workloads, it is necessary to find the minimum manpower requirement with optimum allocation of workers for different activities.



**Fig. 2 PRECEDENCE RELATIONS FOR COALING CYCLE.**

### Work Content for Each Activity

Work content can be estimated by Industrial Engineering Techniques like Time Study, Work Sampling, etc. (Maynard, 1971). The work content for different activities changes from colliery to colliery, depending on the dimension of the Longwall face, working condition, geological disturbances present in the strata, etc., The work content in manhours for the colliery, where the case study has been conducted is as follows. The notations used are the same as that in fig. 2 and fig. 3 for the activities and the prefix letter W is used to represent work content.

For Coaling Cycle :				(in manhours)
WC <sub>1</sub> = 11.41	WC <sub>2</sub> = 18.00	WC <sub>3</sub> = 18.5	WC <sub>4</sub> = 36.84	
WC <sub>5</sub> = 9.6	WC <sub>6</sub> = 2.0	WC <sub>7</sub> = 8.67	WC <sub>8</sub> = 2.16	
WC <sub>9</sub> = 36.0	WC <sub>10</sub> = 218.0			

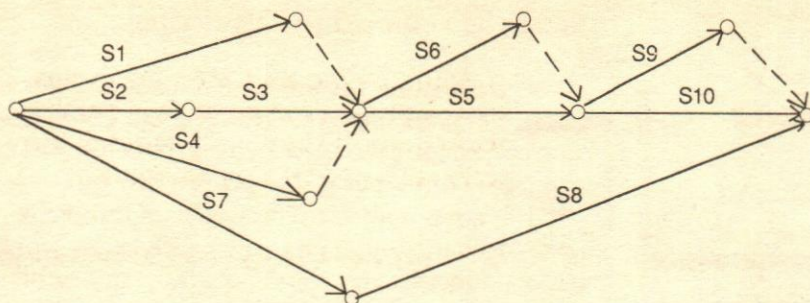


Fig. 3 PRECEDENCE RELATIONS FOR STOWING CYCLE.

For Stowing Cycle : (in manhours)

$WS_1 = 6.02$     $WS_2 = 4.41$     $WS_3 = 33.85$     $WS_4 = 40.76$   
 $WS_5 = 104.1$     $WS_6 = 165.08$     $WS_7 = 18.0$   
 $WS_8 = 2.0$     $WS_9 = 5.54$     $WS_{10} = 12.0$

### Assignment of Manpower for Each Activity

The duration for each activity is not constant; it depends on the number of men employed for that activity. Each activity is done by a group of people and the group size or the gang size varies with the activity. For example, in coaling cycle for Activity 1 (drilling), the group size is two. Technical considerations limit the maximum number of groups or gangs that can be employed for each activity. In case of drilling, there are only two drill machines available, hence the maximum number of gangs that can be employed for drilling is two. The men employed for this activity must be either two or four. Similarly, the gang sizes and maximum number of gangs that can be employed for each activity are as follows.

Let ASSIGN denote the number of men that can be assigned to an activity considering the gang size and maximum number of gangs.

Table 1: Manpower for Coaling Cycle

Activity	Gang Size (No. of Persons)	Max. Number of Gangs
C <sub>1</sub>	2	2
C <sub>2</sub>	11	1
C <sub>3</sub>	5	2
C <sub>4</sub>	1	12
C <sub>5</sub>	6	1
C <sub>6</sub>	4	1
C <sub>7</sub>	1	12
C <sub>8</sub>	3	2
C <sub>9</sub>	3	3
C <sub>10</sub>	1	No limit but a minimum of three persons is necessary.

For the drilling activity, ASSIGN can take the value 0, which means not assigning any person, i.e. not carrying drilling activity at present or ASSIGN can take the value 2 or 4.

So, ASSIGN 1 (0,2,4) for activity 1, i.e., for drilling. Similarly ASSIGN 10 (3,4,5,.....) for activity 10, i.e., raising of coal.

According to fig. 2, the activities 1, 2 and 3 are the starting activities of the coaling cycle.

Table 2 : Manpower for Stowing Cycle

Activity	Gang Size (No. of Persons)	Max. Number of Gangs
S <sub>1</sub>	4	1
S <sub>2</sub>	4	1
S <sub>3</sub>	4	1
S <sub>4</sub>	1	No maximum limit
S <sub>5</sub>	3	2
S <sub>6</sub>	1	No maximum limit but a minimum of eight persons is necessary
S <sub>7</sub>	4	1
S <sub>8</sub>	4	1
S <sub>9</sub>	4	1
S <sub>10</sub>	1	No maximum limit

Technical considerations limit the maximum number of groups or gangs that can be employed for each activity.

ASSIGN 1 (0,2,4)

ASSIGN 2 (0,11)

ASSIGN 3 (0,5,10)

There are three ways of assigning the persons to Activity 1, two ways for activity 2 and three ways for Activity 3 giving a total of 18 (3 × 2 × 3) combinations of assigning men to activities 1, 2 and 3. In any particular combination, out of the three activities, if one activity is completed first, the men employed for that activity are released and they can be used for other activities. Like this, the assigning of men to various activities goes on until all activities are completed. There are a number of ways of assigning persons to various activities. To minimise the time it takes to complete the activities, out of all possible combinations, a

**Manual allocation is cumbersome and time - consuming.**

particular combination in which there is maximum utilisation of men has to be taken. Manual allocation is cumbersome and time - consuming. Manual allocation need not be the best allocation as there are other allocations possible, which are not evaluated. Hence, a computer package is developed to serve this purpose. The package gives the minimum possible time to complete all activities and also gives the assigning and scheduling of men to different activities for a given number of people (crew size). The Flow Diagram of the computer package is presented in fig. 4.

In colliery, production takes place in three shifts of eight hours each. In each shift, ninety minutes are non-working, which are used for reporting the attendance, taking the lamp and reaching the coal face, etc. Again five minutes allowance is given as and when gang size changes.

A sample output of assignment of manpower for each activity of coaling i.e. cycle with 23 crew size is shown in the appendix. For each activity starting time (TIME1), finishing time (TIME2), and number of allocated men are shown in the computer output. The output also shows timewise progress of activities and manpower deployment. Knowing the timewise actual manpower deployment figures and the crew size, one can work out the number of idle manpower at any point of time. Thus for crew size of 23 men the idle manpower is as in table 3.

**Table 3: Idle Manpower**

Duration (cumulative time in minutes)	No. of Men Idle
0.0 - 90.0	0
95.0 - 113.0	9
118.0 - 288.9	19
293.4 - 390.0	11
480.0 - 554.7	11
559.7 - 648.5	17
653.5 - 675.1	1
680.1 - 688.5	7
693.5 - 706.8	11
711.85 - 870.0	2
960.0 - 1350.0	2
1440.0 - 1580.2	2
1585.2 - 1825.2	14

## Production - Crew Size Relationship

The computer program is also useful for knowing the change in production rate with change of the crew size. One can change the crew size and note the time taken to complete one full cycle. The production rate is then calculated for each crew size. This calculated production rate is compared with target production rate to see whether the target has been achieved or not. If the target production is not reached, the crew size is then modified suitably and the new production rate is obtained. This process will continue till the calculated production rate equals the target and the crew size thus obtained is minimum.

For the colliery, the total amount of coal that can be obtained in one full cycle is 825 tonnes (i.e., 275 tonnes in each coaling cycle). The target production rate is fixed at 140 tonnes per day.

After allowing time for shift changes, the number of working minutes available in each day is 1170 minutes (i.e.,  $480 \times 3 - 3 \times 90 = 1170$ ). For a crew size of 17 men, the time taken to complete all the activities is 8094.34 minutes (excluding the time for shift changes).

Hence the production rate with 17 men is

$$\frac{1170 \times 825}{8094.34} = 119.25 \text{ tonnes / day}$$

As the production rate with crew size 17 men is not reaching the target production the number of men employed for production is increased and the production rates with a crew size of 18, 22 and 33 men are calculated. The achievable production obtained as output of the computer package with different crew sizes are presented in table 4.

**Table 4: Production Rate**

Crew size	Minimum Time to complete all activities (minutes)	Total Time Miners are at Workplace (minutes)	No. of minutes available in each shift (minutes)	Achievable Production per day (tonnes/day)
17	9894.34	8094.34	1170	119.25
18	8976.92	7356.92	1170	131.2
22	8527.12	6997.12	1170	137.8
23	8367.54	6837.54	1170	141.13

Hence to meet the production target of the colliery, the crew size required is 23 men in each shift. The crew size of 23 men per shift means on a full working day of three shifts, the colliery should have a pool of 69 men, assuming a worker can work for only one shift. However, in reality, the number of persons in the pool should be more than 69 men to take care of absenteeism, sickness etc. Last two years' attendance data reveal a high absenteeism—about

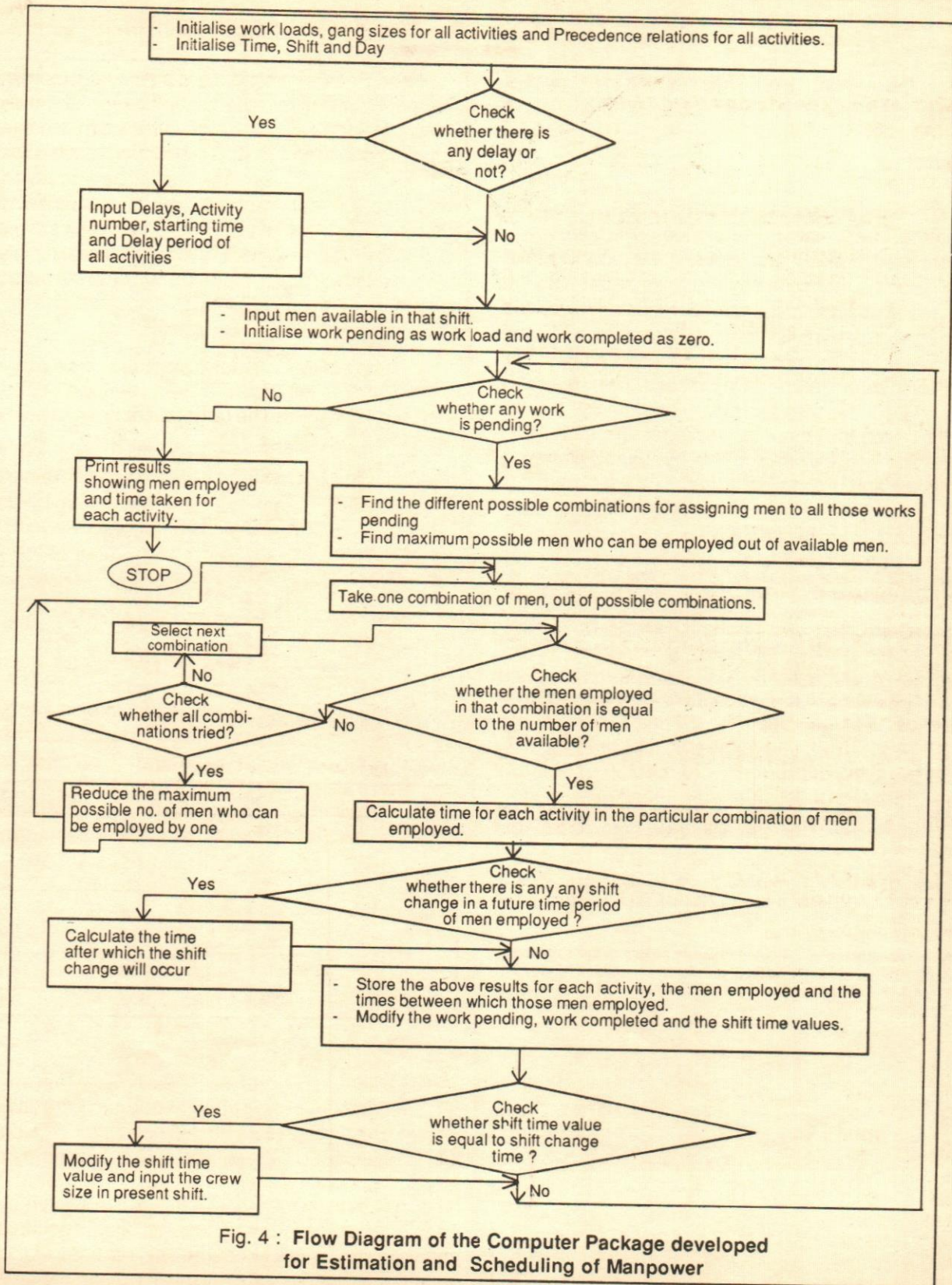


Fig. 4 : Flow Diagram of the Computer Package developed for Estimation and Scheduling of Manpower

# Second Phase of Green Revolution: Rainfed Agriculture

S.P. Singh & C. Prasad

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*The production trends in the present agricultural scenario reveal that there has been a marked positive relationship between increase in productivity with concomitant increase in irrigation. On the contrary, production of crops has been lagging far behind in the rainfed areas where irrigation facility has not increased appreciably. This paper examines the availability and application of resources and technologies to improve rainfed farming in the context of ushering in the second phase of green revolution*

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Rainfed agriculture is the type of agriculture which solely depends on rain water and does not receive any additional water through irrigation at any crop stage. Rainfed agriculture is synonymous with non-irrigated agriculture. The term 'rainfed' refers to a wide range of patterns from arid to humid conditions. This type of agriculture is also called dryland farming or dryland agriculture. These two terms are often used interchangeably, though, there are some distinctions. In general, rainfed agriculture can be divided into two main categories: rainfed wetlands and rainfed drylands. Rainfed wetland farming refers to conditions where rainfall is adequate and relatively well distributed during the crop season and drainage of excess water is a major concern. On the contrary, dryland farming refers to farming under conditions where rainfall is low, erratic and is concentrated within a short period during the year. The water balance is often negative; according to FAO World Soil Resources Report (1978), the rainfall is less than half the potential evapotranspiration in drylands. In these areas, moisture conservation is the prime concern. However, both dry and wetlands in tropics experience water stress for certain periods when evapotranspiration exceeds precipitation, the stress periods being much shorter in wetlands. The assured rainfall dependent wetlands are analogous to irrigated areas and pose no special problems from the point of view of intensive agricultural management and stable production except occasional moisture stress due to monsoon aberrations.

## Types of Rainfed Areas

The rainfed areas of the country can be broadly divided into the following 4 categories:

1. **Arid Zone:** having less than 400 mm annual rainfall with less than 75 days of crop growing period. These areas can accommodate only seasonal grazing of livestock. The cultivation of short duration crops is possible only with irrigation.



2. **Semi-Arid Zone:** receives 400 to 1000 mm annual rainfall; this zone can be further divided into two sub-zones:

- a) **Sub-Zone I** receives annual rainfall between 400-700 mm with 75 to 120 days of crop-growing period. Both dryland crops and livestock can be supported in this area.
- b) **Sub-Zone II** receives annual rainfall between 700-1000 mm with 120-140 days of crop growing period. These areas are suitable for crop production. Strategy in these areas is to make best use of limited water supply by conserving it in-situ or adoption of crop production technologies giving higher water use efficiency.

3. **Semi-Wetland Zone:** receives annual rainfall of 1000-2000 mm distributed over a period of 4 to 7 months with crop growth period of 140 to 210 days. Rice and other major food crops can easily be grown in these areas. Long duration crops/varieties and multiple cropping are adopted in this zone.

4. **Wet Zone:** receives more than 2000 mm mean annual well-distributed rainfall over a period of 7 to 10 months with more than 200 days crop growing period. In this zone, perennial tropical plantation crops such as oilpalm, coconut, rubber, cocoa, coffee, etc. are predominant, besides multiple cropping of rice and other tropical crops.

### Present Agricultural Production Scenario

The growth rate for production of all crops for the pre-HYV era was higher (3.13 per cent) but the rate or productivity was low (1.30 per cent) (table 1). In the post-HYV era, it was mainly crop productivity which contributed to the 2.64 per cent growth rate of production. The coarse cereals, predominantly rainfed crops, had positive but very low growth rates. In the case of pulses (about 92 per cent rainfed), there has not been much improvement in either production or pro-

ductivity. Oilseed crops, with an average 1.5 per cent irrigated area had slightly better rate than pulses. On the whole, it could be inferred from these data that crops grown in better resource situations had higher growth rates compared to the crops grown in poor resource situations.

A critical look at the trends in production, productivity and area coverage under irrigation during the period 1950-51 to 1988-89 (table 2) shows maximum increase in production in wheat (8.5 times) followed by maize (5 times). Increases greater than 3 times have also been observed in rice, pearl millet, total oilseed crops, cotton and sugarcane. But the picture is not so satisfactory in the case of total coarse cereals whose production has only doubled during a long span of about 40 years. The production of chickpea, pigeonpea and total pulses and also groundnut, the most important oilseed crop of the country, has been much below the desired level. The production trends of important cereals over time depicted in fig. 1 show that rice and wheat had marked increase, but the increase was only marginal in the case of sorghum, pearl millet and maize. These trends clearly reveal that there has been marked positive relationship between in-

**Table 1: Compound growth rate of area (A), Production (P) and average yield (Y) of principal crops in India (% per annum).**

Crop	1949-50 To 1989-90			1949-50 To 1964-65			1967-68 To 1989-90		
	A	P	Y	A	P	Y	A	P	Y
<b>Cereals</b>									
Rice	0.83	2.58	1.73	1.33	3.49	2.13	0.57	2.74	2.19
Wheat	2.53	5.82	3.21	2.68	3.99	1.27	1.91	5.12	3.14
Sorghum	0.27	1.21	1.49	0.99	2.50	1.50	-0.68	1.31	2.00
Pearl Millet	0.09	1.66	1.57	1.08	2.34	1.24	-0.81	0.26	1.08
Maize	1.46	2.40	0.92	2.66	3.87	1.18	-0.10	1.15	1.26
Finger Millets	0.08	1.57	1.49	0.84	3.08	2.22	-0.07	1.52	1.59
Small Millets	-1.32	-1.38	-0.06	-0.30	-0.20	0.09	-2.77	-2.37	0.41
Coarse Cereals	-0.19	1.23	1.28	0.90	2.23	1.29	-0.98	0.57	1.50
Total Cereals	0.68	2.99	1.95	1.30	3.24	1.68	0.18	2.95	2.35
<b>Pulses</b>									
Chickpea	-0.69	-0.12	0.57	1.64	2.66	1.00	-0.75	-0.52	0.21
Pigeon Pea	0.86	0.78	-0.08	0.57	-1.34	-1.90	1.52	2.08	0.55
Other Pulses	0.70	0.76	0.06	2.07	1.28	-0.77	0.59	1.44	0.85
Total Pulses	0.26	0.40	0.29	1.90	1.39	-0.22	0.28	0.78	0.57
Food-Grains	0.59	2.67	1.76	1.41	2.93	1.43	0.20	2.74	2.18
<b>Oil Seeds</b>									
Ground Nut	1.17	1.85	0.67	4.01	4.33	0.31	0.29	1.45	1.15
Sesamum	-0.03	0.71	0.74	0.14	-0.32	-0.46	-0.35	1.53	1.89
Rapeseed & Mustard	1.77	3.63	1.83	2.97	3.36	0.37	1.63	4.27	2.60
Total Oilseeds	0.82	2.11	0.87	2.69	3.11	0.20	0.16	2.15	1.51
Non-Food-Grains	0.99	2.65	1.23	2.52	3.54	0.93	0.48	2.72	1.69
All Crops	0.67	2.66	1.60	1.61	3.13	1.30	0.26	2.74	2.02

Source: Agricultural Statistics at a glance, 1991.

**Table 2 : Increase in production, productivity and irrigation coverage of some crops during 1950-51 to 1988-89**

Crop	Production (million tonnes)		Productivity (kg/ha)		Irrigation coverage (%)	
	Range	Average	Range	Average	Range	Average
Wheat	6.39 - 54.14	847	655-2046	312	31.5 - 74.0	235
Rice	20.58 - 70.43	342	668-1552	232	31.7 - 43.0	136
Maize	1.73 - 8.75	506	545-1456	266	9.5 - 23.5	247
Sorghum	5.50 - 12.06	219	353- 727	206	3.0 - 5.0	170
Pearlmillet	2.35 - 7.72	329	255- 653	256	2.3 - 5.9	257
Chickpea	3.39 - 4.56	171	449- 742	165	9.0 - 20.5	228
Pigeonpea	1.02 - 2.58	253	452- 819	182	0.3 - 3.2	1067
Total pulses	8.16 - 14.92	183	377- 548	145	7.2 - 10.9	151
Total foodgrains	50.82-172.18	339	522-1175	225	17.8 - 31.5	174
Rapeseed and Mustard	0.76 - 3.07	404	368- 771	210	10.4 - 48.0	470
Total oilseeds	4.73 - 17.79	376	424- 684	161	0.8 - 18.3	2288

Source: Calculated from the year-wise data reported in Agricultural Statistics At A Glance, 1990.

**Present Resource Use Scenario**

**Land:**

Total geographical area of the country is 329 m.ha, out of which only 143 m.ha area is under cultivation, which could be extended upto 155 m.ha as per National Commission on Agriculture (NCA) estimates. At present, per capita availability of cultivated land is only 0.21 ha which is estimated to shrink to 0.15 ha in the next 10 years owing to population increase. The land distribution in different size categories of operational holdings is given in table 3 which shows land distribution is highly skewed: 76.4 per cent holdings (small and marginal) occupy only 28.8 per cent of the cultivated lands.

**Water:**

(1) **Rainfall-** The average rainfall of India on per unit basis is one of the highest in the world, i.e., 1170 mm per annum. However, it can broadly be divided into three zones, viz. dry (less than 750 mm), medium (750-1150 mm), and assured (more than 1150 mm) occupying 30, 42 and 28 per cent of total area, respectively. The distribution of net sown area (143 m ha) according to rainfall, shows that about 51m. ha of net shown area (37.7 per cent) falls in the rainfall range of less than 750 mm. About the same area (51 mha) experiences an annual average rainfall of 750-1125 mm). Net sown area having assured rainfall (more than 1125 mm) is 41 m ha (28.6 per cent). The area under rainfed cropping in different rainfall categories is given in table 4.

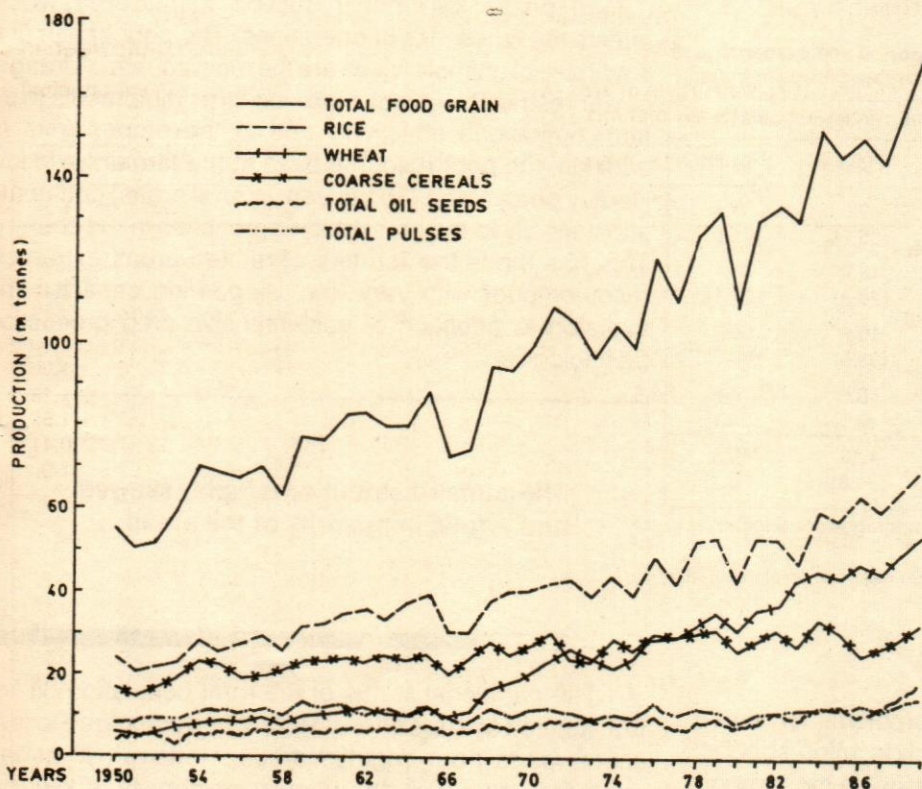


FIG.1 : PRODUCTION TRENDS OF CEREALS, PULSES, AND OIL SEED CROPS.

crease in production/productivity with concomitant increase in irrigation (table 2). On the contrary, the production and productivity of crops have been lagging far behind in the areas where irrigation facility has not increased appreciably.

(ii) **Irrigation:** At present, nearly 30 per cent of the total gross cropped area is irrigated but there are high regional variations. The distribution of irrigation water indicates that 31.5 per cent of total foodgrains area is irrigated, whereas oilseed crops have only 18.3 per cent of total area irrigated.

**Table 3 : Distribution of operational land holding in India in 1985-86**

Category of Holding	No. of Holdings ('000 number)	Area operated ('000 ha)	Average size holding (%)
Marginal (Less than 1 ha)	56748 (58.1)	21606 (13.2)	0.38
Small (1.0 to 2.0 ha)	17881 (18.3)	25533 (15.6)	1.43
Semi-Medium (2.0 to 4.0 ha)	13253 (13.5)	36579 (22.3)	2.76
Medium (4.0 to 10.0 ha)	7920 (8.1)	47008 (28.7)	5.94
Large (10.0 and above)	1929 (2.0)	33187 (20.2)	17.20
All Holdings	97731 (100.0)	163913 (100.0)	1.68

*Note :* Figures in brackets indicate the percentage in respective column totals. Percentages are on the basis of absolute values.

*Source :* Agricultural Statistics At A Glance, 1990.

**Table 4 : Area under different rainfall categories and percentage of net sown area under rainfed and irrigated crops in India.**

Rainfall mm	Geographical (m ha)	Net sown area (m ha)	Area under cropping (m ha)	
			Irrigated	Rainfed
<400	23.8	9.8	2.5 (25.1)	7.4 (74.9)
400-1000	135.0	69.0	19.9 (28.9)	49.1 (71.1)
1000-1800	157.4	58.6	19.7 (33.5)	39.0 (66.5)
1800>	12.5	5.3	0.5 (9.5)	4.8 (90.1)
Total	328.8	142.76	42.6 (29.8)	110.3 (70.2)

*Note :* Figures in parenthesis indicate percentages corresponding to net sown area.

*Source :* Fertilizer Statistics, 1985-86, Fertilizer Association of India, New Delhi.

### Problems of Rainfed Agriculture

Rainfed areas are beset with problems of varied nature, however, the magnitude is highly location-specific. Among climatic features, rainfall is the single most important factor affecting not only crop production but every aspect of life in rainfed areas. The rainfall distribution is highly skewed and erratic in majority of the areas. There is a high co-efficient of variability with regard to quantum, onset and recession of rainfall, besides high unpredictability which has great bearing on crop performance. There are periods of excess and scarcity of water during the year

in almost every region. The high evapotranspiration potential further adds to the woes of the rainfed areas.

The soils of rainfed areas are severely affected by erosion; nearly 85 m ha of cultivated lands are eroded by water or wind. This has made the lands undulating also resulting in considerable reduction of productivity. The erosion of these soils has not only made them thinner resulting in poor moisture holding capacity but has also impoverished them in nutrients, thereby making them less productive.

Crops and varieties currently grown in rainfed areas are of longer duration than the moisture availability period, have low yield low conversion efficiency, and have poor responsiveness to improved environment and inputs. Most of these crops are not efficient in moisture use. The crop selection is subsistence - oriented with little emphasis to their suitability to resource availability.

The draught power available in the country is low, i.e., 0.75 HP per ha. It is further reduced in rainfed areas which affects the timeliness of operations. The poor health and small size of animals which are the main source of draught power restrict the use of improved farm implements to do farm operations effectively and at the proper time. In addition, the poor resource base of the farmers and low literacy percentage (30 per cent in rural areas) contribute substantially to the present low production in the country. This has made the farmers of rainfed areas extremely resource-poor with very low risk-bearing capacity and aversion to adoption of cost-intensive crop production technologies.

**The rainfall distribution is highly skewed and erratic in majority of the areas.**

The nutritional status of the rural population hailing from rainfed areas is often inferior when compared to their counterparts from irrigated areas. However, in certain rainfed areas where the population density is low, per capita production is as much or even higher than that of irrigated areas. This is mainly due to the fact that there is the tendency of livestock production in low rainfall situations.

Studies reveal that the cost of production per unit for rainfed crops is high for obvious reasons. Further, rainfed

farmers, of necessity, grow risk-avoiding crops such as coarse grains and pulses which are often low yielding. The production trends of rainfed crops clearly show that during the preceding 40 years, there has been very low growth in the productivity of these crops. On the contrary, the cost of different components of cultivation has increased considerably.

### Improved Technologies Available

Efforts to develop improved technologies for stepping up the production of rainfed lands are being made since long in the country. Consequently, new technologies capable of increasing land productivity 2 to 3 times over the existing level have been generated but these technologies are highly location-specific—they cannot be applied very widely. A sound technology should consist of soil and rain water management, crop management, efficient cropping system and alternate land use systems as analysed in the following paragraphs.

**The production trends of rainfed crops clearly show that during the preceding 40 years, there has been very low growth in the productivity of these crops. On the contrary, the cost of different components of cultivation has increased considerably.**

- (i) **Soil and Rain Water Management:** The proper management of rain water and soil conservation are the kingpin of the whole technology package of rainfed agriculture. In the high rainfall areas, it is the management of excess rain water which is very critical, whereas in semi-arid and arid areas, better soil erosion control with rain water conservation improves the basic resources for crop production. In the selection of soil and water conservation measures, the emphasis should be on 'on-farm' rain water management in low rainfall situation. The important approaches are contour farming, mechanical measures, different land configurations for *in situ* rain water conservation, vegetative barriers, and *ex situ* rain water conservation practices. In high rainfall conditions, efforts have to be made to drain water from the fields and store it for later use for increasing crop productivity, cropping intensity, and also for protecting crops from drought in case of dry spells.
- (ii) **Crop Management:** The constraints leading to low and uncertain production should be identified and

small but critical changes which could be easily implemented over large areas should be effected instead of converting entire rainfed areas into high investment agriculture. High energy systems using high cost inputs are risk-prone and require sound base and infrastructural support. Therefore, in rainfed agriculture, external inputs should be used as critical supplement only, instead of as a substitute. A proper blending of both, would be the best strategy for accelerating the productivity of rainfed lands.

A paradoxical situation of low monetary systems as well as high monetary inputs exists in India. Greater research efforts are on the use of costly inputs viz. mechanical soil conservation structures, fertilizers, pesticides, machinery, etc., while the poor rainfed farmers have so far not been able to fully adopt even the low-cost technologies. Out of the two approaches—i.e., spectacular gains on a small area by a small number of farmers by adoption of cost-intensive technologies and modest gains over large areas by a large number of farmers through less costly technologies—the latter approach should be adopted.

- (iii) **Efficient Cropping System:** Rainfed areas are generally mono-cropped and crop selection is based mainly on the needs of the farm-family rather than resource availability. With the help of rainfall amount and pattern, and the moisture holding capacity of soils, moisture availability periods have been computed and potential cropping systems have been worked out for the entire country. Ecologically benign, economically viable, operationally feasible and socially acceptable cropping systems involving new high yielding cultivars of predominant crops of different regions, have been developed during the recent past. In these efforts, adequate emphasis has been laid on crop diversification.
- (iv) **Alternate Land Use Systems:** All rainfed lands are not suited for arable cropping. Recognition of this fact has led to the adoption of more stable and remunerative alternate land use systems keeping the land capability, environment and domestic needs

**The constraints leading to low and uncertain production should be identified and small but critical changes which could be easily implemented over large areas should be effected instead of converting entire rainfed areas into high investment agriculture.**

**Ecologically benign, economically viable, operationally feasible and socially acceptable cropping systems involving new high yielding cultivars of predominant crops of different regions, have been developed during the recent past.**

of the farm family in consideration. These systems are sure means of stabilizing both the productivity and income of the farmers of these areas. In the recent past, several systems have been developed for both arable and non-arable lands.

**Table 5: Crop productivity in different rainfall zones of India**

Mean Annual rainfall (mm)	Crop grown under rainfed conditions	Productivity (t/ha)
<400	Pearlmillet	0.2 to 0.8
400-1000	Pearlmillet	0.3 to 1.1
	Sorghum	0.4. to 1.2
	Groundnut	0.6. to 1.2
1000-1800	Maize	1.0 to 2.5
	Paddy	0.9 to 2.2
	Wheat	0.9 to 2.5
1800>	Paddy	1.0 to 2.0

Source: Singh, R.B. (1989).

**Table 6 : Average yields (q/ha) of selected upland crops under irrigated and rainfed conditions in India**

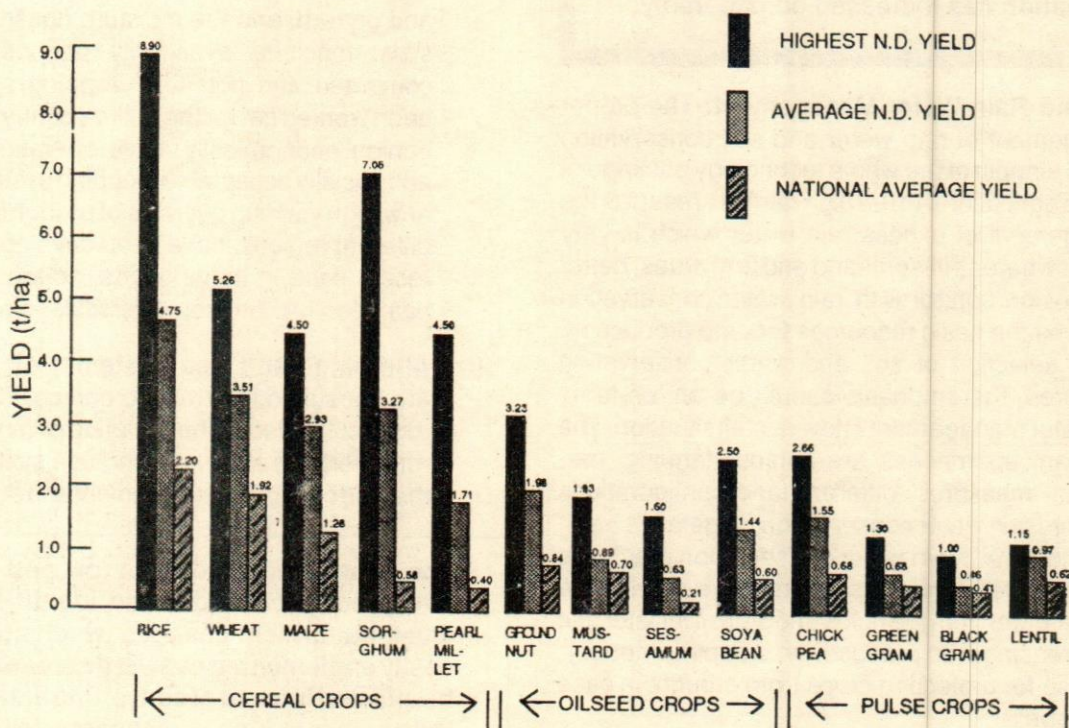
Crop	Irrigated	Rainfed
Sorghum	11.0	6.35
Pearlmillet	12.0	6.50
Maize	19.0	11.90
Wheat	19.5	9.80
Chickpea	7.9	6.28
Peanuts	12.7	7.95
Rapeseeds,mustard	8.47	5.43
Cotton (lint)	3.62	1.25
Jute (fibre)	18.80	14.12

Source : Compiled from the data of different crops reported in ICAR reports.

### Yield Potential of Rainfed Crops

The biological productivity is directly related to the amount of water availability. Therefore, the productivity of rainfed crops in the country is very low and has not changed much in the past few decades (tables 5 and 6).

Under the National Demonstration Project, performance of new technologies has been tested in farmer's fields. The results of such demonstrations in 1986-87 summarised in fig 2 also clearly establish that there is potential in the new technologies and if they are properly



**FIG. 2 : YIELD GAPS IN DIFFERENT CROPS**

The gap in average yields obtained in National Demonstrations and the National average yield of rainfed crops is greater than irrigated crops.

utilized, the productivity of rainfed crops can easily be increased at least two to three times. The gap in average yields obtained in National Demonstrations and the National average yield of rainfed crops is greater than in irrigated crops. This clearly supports the earlier mentioned point that the next green revolution will be possible from rainfed areas.

The improved technologies have been followed in fields in watersheds in the country. The approach of development was holistic and based on the needs of the area i.e. use of land for crops or horticulture or agroforestry or pasture, based on its capability. A unique feature of these projects was the active involvement of farmers in the planning and execution work. The impact of these projects is very encouraging as indicated below:

- (i) **Increase in cropping intensity:** There is appreciable increase in cropped area due to various soil and water conservation works. Total cultivated areas increased from 658 to 737 ha in Siha and 987 to 1411 ha in Bajar-Guniyar, 1284 to 1965 ha in Aril; and 520 to 651 ha in Tejpura watersheds. As a result of soil and water conservation measures adopted in the watersheds, there has been marked increase in ground water availability resulting in rise in water table and water yield in wells (table 7)\*. Therefore, the number of wells has increased

Table 7: Ground water level in open wells

Watershed	District	Water level (m) (Pre-project)	Rise in water level (m) in 1988
Yernal	Bijapur	10.0	3.0
G.R. Halli	Chitradurga	15.0	1.5
Pathwa	Mirzapur	14.0	2.5
Rendhar	Jalaun	9.8	2.3
Tejpura	Jhansi	12.0	7.0
Aril	Bareilly	10.5	3.1
Sasure	Solapur	10.0	3.7
Navamota	Sabarkantha	11.6	2.5
Sunga	Ambala	—	1.8
Barkhedahat	Guna	3.5	1.0

\* Data for table 7—13 are compiled from the progress reports of different watershed development projects for various years.

appreciably. The cropping intensity increased markedly in all the watersheds (Table 8). The most striking increase in cropping intensity was in Bunga (50 to 200 per cent), Aril (86 to 173 per cent) Tejpura (83 to 183 per cent) Bazar-Ganiyar (129 to 184 per cent) and Rendhar (101 to 156 per cent).

Table 8: Change in cropping intensity in watershed

Watershed	District State	Crop intensity (%)	
		Pre-project	1988
Siha	Mahendragarh (Haryana)	155	174
		129	184
Bajar-Ganiyar	Mahendragarh (Haryana)	129	184
Yernal	Bijapur (Karnataka)	112	184
Padalsingi	Beed (Maharashtra)	106	127
Thakarda	Dungarpur (Rajasthan)	108	148
Chinnatekur	Kumool (Andhra Pradesh)	147	178
Rendhar	Jalaun (Uttar Pradesh)	101	156
Tejpura	Jhansi (Uttar Pradesh)	83	183
Aril Chevella	Bareilly Medak (Andhra Pradesh)	86	173
		105	163
Gunj Seasure	Akola Solapur (Maharashtra)	105	123
		95	134
Mittemari	Kolar (Karnataka)	115	150
Nibhua	Sidhi (Madhya Pradesh)	128	154
Bunga	Ambala (Haryana)	50	200

- (ii) **Increase in fertilizer use:** One of the important factors of low yields in these watersheds was no or little fertilizer use. In these watersheds, average fertilizer use was less than 10 kg NPK/ha in more than half of the area which has now increased substantially. However, in some watersheds, the fertilizer consumption has not increased appreciably. This calls for thorough examination of the situation to know the reasons so that corrective measures could be taken.

- (iii) **Increase in productivity:** There was 2 to 3-fold increase in the production of crops in most of the wa-

**Table 9 : Change in Fertilizer Consumption in model Watersheds**

Watershed	District	Total NPK consumption (t/ha)		NPK (kg/ha)	
		(1983)	1988	1983	1988
Siha	Mahendragarh	34.7	56.8	82	112
Bajar-Ganiyar	Mahendragarh	3.4	34.2	4	40
G.R. Halli	Chitradurga	0.3	4.0	2	18
Yarracheruvu	Anantapur	21.3	42.0	48	94
Chinatekur	Kurnool	36.8	86.3	45	76
Rendhar	Jalaun	4.7	89.6	7	126
Tejpura	Jhansi	0.61	58.7	1	112
Aril	Bareilly	97.7	317.7	42	152
Mittemari	Kolar	0.0	83.8	0	126
Bunga	Ambala	39.0	85.0	-	-
Fakot	Tehri	0.7	10.2	5	39
Raugoli	Chattarpur	0.0	15.8	0	24

tersheds. The productivity of sorghum increased from 5.24 q/ha in 1983-84 to 17.08 q/ha in 1988 (table 10). Likewise groundnut (10 locations) productivity increased from 4.14 to 11.94 q/ha. Similar increases have been recorded in other crops. In addition, there has been marked change in cropping pattern with the introduction of more efficient and remunerative crops and cropping systems. The use of improved farm implements has been increased markedly.

**Table 10 : Change in Crop Yields in Watersheds**

Crop	No. of Watersheds	Crop yield (kg/ha)		Increase in yields (%)
		Pre-project	1988	
Sorghum	13	524	1708	226
Pearlmillet	10	490	938	91
Fingermillet	3	526	1045	99
Wheat (unirrigated)	6	1000	2195	120
Wheat (irrigated)	6	2215	2674	21
Groundnut	10	414	1194	188
Mustard	8	653	1030	58
Sunflower	5	291	635	118
Greengram	8	370	705	91
Chickpea	11	605	1143	89
Pigeonpea	6	460	901	96
Average				109

- (iv) **Increase in employment opportunities and income:** The watershed development programme has generated sufficient additional employment owing to new construction of plantation works in development phase, subsequently followed by improved cropping programme and increase in animal-based activities (Tables 11 and 12). All these improvements have resulted in appreciable increase in employment opportunities to the farmers which has augmented their income by 100 to 200 per cent

**Table 11 : Employment generation in model watershed**

Watershed	Employment (Man days year)	
	Pre-project	in 1989
Kolhewadi	16,301	22,266
Yernal	18,268	28,200
Yerracheruvu	56,604	66,144
Rendhar	43,911	87,766
Aril	NA	36,741

**Table 12 : Additional Employment Created in Model Watershed due to land development works**

Watershed	Mandays
Kolhewadi	32,000
Yernal	99,000
Yerracheruvu	1,05,000
Rendhar	44,000
Fakot	2,53,000
Aril	1,47,000
Gunj	47,296
Una	23,000

in comparison to the income in base year (table 13).

**Table 13 : Increase in per capita income (Rupees) due to adoption of new technologies in the watersheds**

Watershed	Pre-project	1989
Kolhewadi	1004	1165
Yernal	4903	7439
Padalsinghi	—	2240
Thakarda	—	1510
Yerracheruvu	752	1460
Patihwa	1300	1300
Rendhar	144	1079
Dhanawal	—	1440
Aril	—	1206
Chevella	1500	4000
Gunj	812	1837
Sasure	1500	1051
Munsiguda	3000	9581
Raugoli	3589	5780
Berkhedahat	3700	4500

With a view to use land as per its capability, alternate land use systems including afforestation, pastures, horticulture and agro-forestry systems have been introduced. These developments have enhanced production and availability of good quality fodder resulting in better animal production. The alternate land use systems will effect marked improvement in the ecology of the area besides making available more wood, fruits and other tree products.

### Selected Developmental Issues

Though sufficient technologies for different rainfed

areas are available which have proved to be economically viable and operationally feasible, the diffusion rate of these technologies is much slower than expected. This is very disturbing and needs critical examination. Following issues related to it are raised with a view to alleviating the problems of rainfed farmers and also reducing risk in rainfed agriculture.

1. The new technologies generated for rainfed areas have proved their feasibility and viability in on-farm trials but are being accepted by the farmers at a very slow pace. ORP experiences broadly show that nearly 25 per cent of the research station recommendations are found unsuitable and referred back to the research system for refinement. About 30 per cent of the remaining recommendations (75 per cent of the total) have shown high profitability and rapid rate of diffusion among the farmers. The rest of the recommendations do not spread in spite of their successful performance in the verification trials. Therefore, detailed studies have been conducted in ORPs which show firstly that the biophysical and socioeconomic conditions of the rainfed farmers are highly variable and secondly, that the new technologies, though technically sound do not suit the resource situations of these poor farmers. Therefore, there is need to tailor the technologies to suit different resource conditions. This could be achieved by having more on-farm trials by adopting farming systems and farmers' participatory approaches. This calls for a drastic change in the present technology generation approach.
2. Rainfed areas are mainly put to arable farming without paying heed to the suitability of the land for the purpose. This has resulted in the twin problems of low productivity and high risk. The recent experiences of ORPs clearly show that the productivity of rainfed lands could be stepped up with greater resilience to weather aberrations, by scientific use of lands. There is a need to use lands according to their production capacity: say for crops, animal husbandry, agroforestry, horticulture, singly or in combination. In other words, diversification is one way to augment the income and minimise risk in rainfed agriculture.
3. The benefit-cost ratios (BCRs) in rainfed farming are always lower than those of irrigated farming. Within rainfed farming itself, depending upon the choice of crops and their combinations, and crop-livestock combination and their management practices, there are wide differences in BCRs. For

**The benefit-cost ratios (BCRs) in rainfed farming are always lower than those of irrigated farming.**

example, fertilizer use alone has yielded a marginal benefit-cost ratio of 1 to 5 depending upon the nature of crops and the type of rainfed environment in India. The results of other studies conducted on farmers' fields show the BCR of 1.49 (safflower) to 2.49 (sorghum) with technical supervision and 0.52 (groundnut) to 2.33 (pigeonpea) without supervision. Further, the BCR was higher in double cropping and inter-cropping as compared with mono or sole cropping (Singh, 1989, 65-67).

In the area development projects based on watershed development approach, the BCRs have been much higher. The experiences of Resource Management ORPs on Watershed basis indicate that some of the rainfed technologies are viable and have satisfactory BCRs. These programmes also have far-reaching permanent influence on the stability of production systems in rainfed areas. These programmes clearly show that the rainfed farmers being resource-poor are not in a position to invest the money needed for creation of permanent assets as well as in land development activities. Therefore, the Government must provide the necessary funds for permanent development works and also credit supports for imports and market facilities. Crop insurance at a reasonable level of premium rate will go a long way in alleviating the socioeconomic disparity between rainfed farmers and irrigated farmers.

4. Due to the low income levels of rainfed farmers, the access to food and other necessities is much lower than that of irrigated farmers. The inequity is exacerbated in the event of drought and/or flood induced production shortfalls causing price hikes and lower food availability. The development plans should pay attention to narrowing, if not completely eliminating, this ever-widening disparity. Government/institutional interventions are needed to increase access to food for this vulnerable section of the population. These measures may include general food subsidies, rationed food subsidies, food for work, disaster relief and rehabilitation, etc.



5. Rainfed areas are, in general, discriminated against in the allocation of fertilizers, seeds, credit support and other production inputs. The predominance of low value crops in rainfed areas further adds to this discrimination. In rainfed areas, because of the risk factor, low investment capacity of farmers, non-availability of appropriate technologies for different resource situations and poor institutional support, the use of fertilizers and improved seeds is very low compared to the irrigated areas. There is need to make these inputs available in the villages in smaller packets before the start of crop season to accelerate the rate of use of these inputs.
6. The rainfed farmers generally have poorer access to credit compared to the farmers of irrigated areas. This is attributed partly to the low income and lower solvency of rainfed farmers and the high risk associated with rainfed farming. The present mechanisms and norms adopted by credit institutions are not conducive to facilitate credit flow to rainfed farming. Necessary credit support should be extended for rainfed farming so that the vicious circle of high risk, low investment, low productivity, low returns, and low credit-worthiness is broken.
7. The recent experiences of watershed development programme taken up in different parts of the country, very clearly show that even if one - tenth of the investments which have gone in irrigated agriculture are diverted to the development of rainfed agriculture, the pay-off will be fairly high and greater equity will be attained. There is urgent need in investing from the public exchequer for permanent and semi-permanent structures for water harvesting and soil conservation in rainfed areas.
8. Various infrastructural provisions like cooperatives, marketing inputs supply, processing and transportation, etc. have important role in helping and motivating the rainfed farmers to use improved technology as well as diversify the farming system. In general, the demand for inputs in rainfed areas is very low for the reasons already explained. This becomes a disincentive for the input agency to open distribution points as they are likely to be economically unviable. In addition, the distribution points usually are poorly stocked for fear of loss, due to poor off-take. The recent experiments conducted in dryland areas clearly suggest that timely availability of inputs like seed, fertilizers, pesticides, etc. at cartable distance will ensure greater off-take resulting in higher crop productivity. Subsidised distribution programmes available at cartable distance in such areas will be of great help in adoption of new technology.
9. The economic incentives like subsidies, support prices, crop insurance, etc. are much less in rainfed agriculture compared to irrigated agriculture. Further, the pricing policy has been more beneficial to irrigated areas since there has been greater incentive for irrigated crops like wheat and paddy. It is only in the recent past that some incentives have been given to oilseeds and pulses. Similar incentives need to be given for coarse cereals and other rainfed crops. Special production programmes should also be initiated for rainfed crops on the lines of the programmes already existing for irrigated crops. The massive National Watershed Project for Rainfed Agriculture (NWDPR) of the Ministry of Agriculture is a development step in the right direction.
10. The marketable surpluses in the rainfed areas are small and scattered and the marketing facilities are not adequate. Non-remunerative price policies further compound the situation. Establishment of appropriate policies and programmes for development of improved marketing facilities, rural credit, price support, cooperatives and community inputs and land reforms should receive higher priority than in the past. This will help in better development of rainfed areas.

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# Sustaining Growth of Potato Production in Punjab

I.S. Chatha & Balwinder Singh

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*The potato has been one of the most important cash crops of Punjab. The area under cultivation and the production of the crop had shown phenomenal increase during the seventies but stagnation set in during the eighties. This paper analyses the causes behind this slump and the measures to be adopted for sustaining growth of potato production in Punjab.*

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The potato is one of the most important cash crops in Punjab. It yielded an estimated gross income of about Rs 88.55 crores during 1988-89 to the Punjab farmers. Owing to its high yield potential, potato gives handsome net returns to the producers during a favourable marketing year. Potato can be consumed both as a general food and as a vegetable, though in our country it is mostly used as a vegetable. Besides, potato is a short-duration crop and its inclusion in the cropping pattern increases the cropping intensity. The area and production of potato in the State had been increasing consistently upto 1978-79 (area touched 55.5 thousand hectares and production 10.72 lakh tonnes) but became stagnant after that. The area under the crop fluctuated between 25 and 40 thousand hectares and the production around 5 to 7 lakh tonnes during the eighties. The specific objectives of this analysis were i) to identify the causes of stagnation and ii) to suggest ways and means for sustaining growth in area and production of potato in the state.

## Methodology

The study was conducted during 1991 and was based on secondary data. The data of acreage, production and productivity of the crop for India and for Punjab were collected for the period 1970-71 to 1988-89 from the Statistical Abstracts of Punjab. The growth rates for the seventies and eighties were worked out separately as well as together for the entire period to know the trends. The estimates of total consumption in the state were based on actual market arrivals collected from the secondary sources and the estimated seed requirements which are mostly

**The area and production of potato in the State had been increasing consistently upto 1978-79 (area touched 55.5 thousand hectares and production 10.72 lakh tonnes) but became stagnant after that.**

met from domestic production. The data on monthly average prices for the state, as a whole, was also collected from the secondary sources to examine the price behaviour. The trend in prices was studied by working out the annual average prices through 12-month moving average method. The seasonal price index was worked out by dividing the original data by 12-month moving average and the adjusted seasonal index was worked out.

## Results

### The trends of potato production in India

Table 1 shows the area, production and productivity of potato in the country from 1970-71 to 1988-89. Potato production in the country increased at a tremendous rate during the study period from 48.07 lakh tonnes in 1970-71 to 148.92 lakh tonnes in 1988-89 i.e. an increase of 209.80 per cent. This was the result of constant increase in both the area and the productivity. The area increased from 4.82 to 9.83 lakh hectares (an increase of about 95 per cent and the yield from 9976 to 15870 kg per hectare (an increase of about 59 per cent). The compound growth rates of area, productivity and production for both the sub-

Table 1 : Area, Production and Yield of Potato in India

Year	Area (000 ha.)	Production (000 tonnes)	Yield per hect. (kg.)
1970-71	481.9	4807.2	9976
1971-72	491.9	4825.5	9810
1972-73	504.6	4451.0	8821
1973-74	543.4	4861.1	8496
1974-75	587.4	6225.4	10598
1975-76	622.4	7306.0	11738
1976-77	619.6	7170.7	11573
1977-78	665.3	8135.4	12228
1978-79	807.1	10133.0	12555
1979-80	685.1	8326.0	12152
	(5.27)*	(9.17)*	(3.81)*
1980-81	729.2	9667.5	13526
1981-82	762.7	9911.8	12996
1982-83	734.8	9955.8	13549
1983-84	794.3	12151.8	15299
1984-85	849.0	12570.6	14806
1985-86	843.0	10422.8	12364
1986-87	831.5	12740.3	15322
1987-88	885.4	14138.4	15968
1988-89	938.4	14892.5	15870
	(2.98)*	(5.36)*	(2.31)***
Compound growth rate percent (1970-71 to 1988-89)	3.63*	6.82*	3.13*

Source : Statistical Abstracts of Punjab.

Figures in parentheses indicate compound growth rate for the decade.

\* Significant at 1 per cent level

\*\*\* Significant at 10 per cent level

periods, i.e. seventies and eighties were positive and highly significant except in the case of productivity during eighties when it was significant at 10 per cent level. The compound growth rates for the entire period under study were 3.63, 3.13 and 6.82 per cent per year for acreage, productivity and production respectively.

### Trends of Potato Production in Punjab

The area, yield and production of potato in the Punjab from 1970-71 to 1988-89 are given in Table 2.

Potato production in the state rose from 2.16 lakh tonnes in 1970-71 to 7.38 lakh tonnes in 1977-78 but jumped to 10.72 lakh tonnes during 1978-79. However, the heavy increase in production in the State as well as in the country (Table 1) in a single year (1978-79) led to a crash in prices as a result of which area under the crop was reduced considerably during 1979-80 and the production came down to 7.33 lakh tonnes. After that, the production could not accelerate and remained fluctuating around 5 to 7 lakh tonnes during the eighties.

As in the case of production, the trend of area during the seventies was upward from 16.9 thousand hectares in

Table 2 : Area, Production and Yield of Potato in Punjab

Year	Area '000 ha	Production '000 tonnes	Yield per ha (kg.)
1970-71	16.9	216.0	12871
1971-72	16.5	221.6	13430
1972-73	18.8	240.1	12771
1973-74	23.1	316.8	13714
1974-75	28.9	448.4	15515
1975-76	26.7	444.5	16648
1976-77	29.3	618.0	21092
1977-78	37.2	738.0	19839
1978-79	55.5	1072.3	19320
1979-80	40.6	733.2	18060
	(13.18)*	(19.88)*	(5.75)*
1980-81	39.7	767.4	19330
1981-82	32.7	635.0	19419
1982-83	32.7	685.0	20948
1983-84	30.1	587.6	19521
1984-85	34.3	668.6	19493
1985-86	43.3	427.3	9868
1986-87	28.3	521.5	18430
1987-88	33.4	641.8	19215
1988-89	24.9	513.8	20635
	(-1.43)	(-2.7)	(-1.35)
Compound growth rate per cent (1970-71 to 1988-89)	3.35 **	5.05 *	1.64 ***

Source : Statistical Abstracts of Punjab.

Figures in parentheses indicate compound growth rate for the decade.

\* Significant at 1 per cent level

\*\* Significant at 5 per cent level

\*\*\* Significant at 10 per cent level

1970-71 to 37.2 thousand hectares in 1977-78 and then having an upward kink during 1978-79 (55.5 thousand). It came down to 40.6 thousand hectares during 1979-80. During the eighties, the area remained fluctuating around 30 to 40 thousand hectares resulting in similar trend in potato production.

In the case of yield gradual upward trend was observed from 1970-71 to 1976-76. A major breakthrough occurred after this period and the yield rose to 21092 kg during 1976-77 from the previous level of 16648 kg per hectare in 1975-76. From 1977-78 to 1988-89, the productivity remained almost stable around 20,000 kg, except during 1985-86, when it was adversely affected due to the attack of blight in epidemic form.

The compound growth rates of area, productivity and production for the entire study period (1970-71 to 1988-89) were 3.35, 1.64 and 5.05 per cent per annum, respectively. However, the respective growth rates for the seventies were worked out to be 13.18, 5.75 and 19.68 per cent per annum. The relatively high positive growth rate of area during this decade was the result of favourable factors such as the availability of good seed locally, the expansion of cold storage industry, the higher profitability from the potato-wheat rotation, etc. The increase in productivity may be attributed to the greater adoption of improved technology. (The improved technology here implies a shift to single crop of potato in place of two crops a season, the higher and balanced use of fertilizers and the use of better quality seed produced through the seed plot technique). The area, productivity and production during the eighties did not show any growth—rather the growth rates were negative though insignificantly. This happened because the potato production in the country observed a continuous upward trend as a result of consistent increase in area and productivity during the period under study (table 1). Thus, the scope of marketing Punjab potato outside the State in big consuming markets of the country like Delhi, Calcutta, Bombay, Madras, etc. narrowed down and the farmers could not get better prices. The Government did not undertake any price support programme and make arrangement for the disposal of the increased production. Hence, in the absence of assured market for potato, the farmers in general preferred to put more area under paddy-wheat rotation which, in view of the assured market was considered to be less risky and more economical. The productivity remained stagnant also because

**In the absence of assured market for potato, the farmers in general preferred to put more area under paddy-wheat rotation which, in view of the assured market was considered to be less risky and more economical.**

much higher levels on this front had already been attained in this state after mid seventies due to the introduction of improved technology; and no further breakthrough in technology could be achieved afterwards.

### Consumption of Potato in Punjab

The estimated total consumption of potato in the State has been shown in table 3. These estimates are based on actual quantities marketed in the State markets and the quantities retained by the producers for seed purposes. The quantities retained by the farmers for home consumption were only nominal and hence were not accounted for. The estimates of quantities required for seed purpose were based on the following assumptions;

1. Owing to the availability of good seed locally through the seed plot technique, since early seventies, most of the farmers in Punjab have shifted to a single crop of potato in place of two crops a season. Thus, out of the total area under potato in this State, it is estimated that about 95 per cent has been put under the major (autumn) crop. The requirements of seed for this crop are mostly met from domestic production.

**Table 3 : Estimated Consumption of Potato in Punjab and the Quantities Marketed Outside the State, 1974-75 to 1987-88 ('000 tonnes)**

Year	Production	Market arrivals	Seed requirements	Total (3+4)	Surpluses (2-5)	Surplus as percentage of production
1	2	3	4	5	6	7
1974-75	448.4	158.1	88.8	246.9	201.5	44.9
1975-76	444.5	195.3	97.4	292.7	151.8	34.2
1976-77	618.0	225.0	123.7	348.7	269.3	43.6
1977-78	738.0	188.3	184.5	372.8	365.2	49.5
1978-79	1072.3	305.8	135.0	440.8	631.5	58.9
1979-80	733.2	198.3	132.0	330.3	402.9	54.9
1980-81	767.4	174.7	108.7	283.4	484.0	63.1
1981-82	635.0	213.9	108.7	322.6	312.4	49.2
1982-83	685.0	231.2	100.1	331.3	353.7	51.6
1983-84	587.6	185.5	114.0	299.5	288.1	49.0
1984-85	668.6	179.6	144.0	323.6	345.0	51.6
1985-86	427.3	197.2	94.1	291.3	136.0	31.8
1986-87	521.5	169.0	111.0	280.0	241.5	46.3
1987-88	641.8	200.8	102.7	303.5	338.3	52.7

2. The seed requirements of the farmers were found to be 3.5 tonnes per hectare.
3. Based on these facts, the quantities retained for seed purpose from the production of a particular year were estimated by multiplying the area under potato during the succeeding year with seed rate.

The total consumption in the State during study periods fluctuated around 3 lakh tonnes except in 1978-79 when it was exceptionally high (over 4.40 lakh tonnes) due to record production during the year and the consequent crash in prices in the country markets and large quantities dumped in the local markets. The consumption estimates in the State did not observe any definite trend and remained fluctuating depending upon the availability of substitutes of potato in the markets and fluctuations in the area under potato.

### Quantities Marketed Outside Punjab

Since large quantities of potato are exported to other states through trucks in addition to railways, the exact data on quantities marketed in other State markets is not available. However, the estimates of such quantities have been arrived at by deducting the quantities consumed in the State from the total production of the respective years. (table 3). It may be observed that a sizeable proportion of the potato production has been surplus in this State and had to be disposed of in other State markets. The estimate of surplus production for the period under study ranged between 34 per cent in 1975-76 and 63 per cent in 1980-81. In view of the fact that the production of potato in the country has shown a linear trend, the scope for marketing surplus production from Punjab in other State markets has narrowed down considerably. This is one of the important reasons why the area under potato in the State has remained stagnant during the eighties.

### Price Behaviour

The trend in potato prices was worked out by applying the 12 month moving average method (table 4). It may be

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**Table 4 : Twelve month moving average trend in potato prices and the procurement prices of paddy and wheat in Punjab, 1972-73 to 1988-89**

Year	Twelve month moving average price of potato	Procurement price of	
		Paddy (superfine)	Wheat
1972-73	49.71	53.00	76.00
1973-74	61.18	70.00	81.00
1974-75	59.98	74.00	105.00
1975-76	50.44	76.00	113.00
1976-77	66.61	76.00	105.00
1977-78	81.41	79.00	110.00
1978-79	63.95	87.00	112.50
1979-80	51.20	97.00	115.00
1980-81	91.90	113.00	117.00
1981-82	69.94	123.00	130.00
1982-83	79.85	130.00	142.00
1983-84	114.64	140.00	151.00
1984-85	81.72	148.00	152.00
1985-86	104.43	150.00	162.00
1986-87	181.60	154.00	162.00
1987-88	123.17	175.00	166.00
1988-89	124.86	180.00	173.00

Source : Deptt. of Economics and Sociology, Punjab Agricultural University

observed that there was an upward trend in the prices of potato during the study period and the prices on the whole, were much higher during the eighties as compared with those in the seventies. However, the year-to-year fluctuations were substantial. Thus, there was an element of uncertainty regarding the price of potato. As against this, the procurement prices of paddy and wheat were assured by the Govt. and had moved up consistently. Therefore, the farmers in general preferred to go in for paddy-wheat rotation rather than sowing a cost intensive and risky crop like potato.

### Seasonal price variation

The seasonal price fluctuations have been examined in table 5 by working out the seasonal index for the seventies and eighties separately. It can be seen that seasonal variations during the periods virtually observed similar pattern and were almost of the same magnitude. The price index remained below average (100) from December to May and above average from June to November. The same was lowest in January and highest in October in both the cases. The coefficient of variation worked out to 23.37 for the period 1972-73 to 1979-80 and 22.74 for 1980-81 to 1988-89. The differences between the peak season prices and the net lean season prices after accounting for the storage costs are given in table 6. It is obvious that the lean season price was up by 12 per cent in the seventies and by about 29 per cent in the

**Table 5 : The Index of Seasonal Price Variation with Respect to Potato in Punjab 1972-73 to 1988-89**

Month	1972-73 to 1979-80	1980-81 to 1988-89
April	79.57	85.67
May	87.98	92.99
June	104.52	109.81
July	129.33	123.18
August	125.50	120.27
September	125.27	123.99
October	129.67	128.45
November	118.93	123.85
December	77.94	75.99
January	70.38	69.09
February	72.90	73.15
March	78.01	73.56
Average	100.00	100.00
Coefficient of variation	23.37	22.74

**Table 6 : The Average Peak and Lean Season Prices of Potato in Punjab, 1972-73 to 1979-80 and 1980-81 to 1988-89**

Particulars	Rs/ qtl.	
	1972-73 to 1979-80	1980-81 1988-89
Peak season (Jan. & Feb.)	44.15	84.52
Lean season (July to Oct.) (Gross price)	74.45	154.28
Estimated storage Lean season (July to Oct.) (Net price)	25.00	45.00
	49.45	109.28
Percentage increase of net lean season price over peak season price	12.00	29.29

eighties. Evidently, the marketing techniques do not seem to have made any advancement over time in reducing the seasonal price variations. No doubt, the cold storage capacity in the State has been increased from 3.54 lakh tonnes in 1978-79 to over 4 lakh tonnes in 1988-89. To ensure reasonable income to the producers and encourage potato cultivation, the seasonal price fluctuations need to be smoothened.

### Conclusion

The study highlighted that the area and production of potato in Punjab have become stagnant during the eighties. The main causes were (i) limited demand for the commodity in the state; (ii) increased production in other states thereby narrowing down the scope for marketing

surplus produce in big consuming markets (Delhi, Calcutta, Bombay, Madras, etc.) (iii) stagnation in productivity; (iv) unassured market; (v) steep inter-year and intra-year price fluctuations and (vi) preference of paddy-wheat rotation for relative profitability. The following steps need to be taken for sustaining growth in area and production of potato in the State.

1. In view of the increasing trends in area and production of potato in the country and the consequent narrowing down of the scope for marketing Punjab potato in big consuming markets, the domestic as well as the foreign demand need to be stimulated through demand creation activities, processing, exploring export avenues, etc.
2. For providing assured market to the producers by minimizing price fluctuations, especially inter-year ones the Govt. should implement the price support policy on a regular basis and ensure some minimum price to the producer - sellers as is being done in the case of other cash crops such as cotton, sugarcane, oil seeds, etc. Intra-year price fluctuations can be minimized to some extent by staggering the sowing and the harvesting periods of the main crop, each of which can be extended to over two months, by increasing the cold storage capacity and by establishing processing units for potato.

**In view of the increasing trends in area and production of potato in the country and the consequent narrowing down of the scope of marketing Punjab potato in big consuming markets, the domestic as well as the foreign demand need to be stimulated through demand creation activities, processing, exploring export avenues, etc.**

3. The stagnation in productivity for the last one decade and a half should receive the attention of the experts in the field of agriculture. Concerted efforts need to be made to evolve better varieties and to improve the production technology so that the crop becomes more remunerative.
4. Above all, the producers need to be advised to improve their production efficiency so as to reduce the gap between the realized average yield of about 20,000 kg and the existing potential yield of 25,000 kg per hectare. Also the farmers should be persuaded and helped to resort to orderly marketing of their produce in order to get better returns.

# Productivity in Household Energy Consumption

S. Giriappa

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*The role of renewable energy sources especially in the developing countries is becoming very crucial. An attempt has been made in this paper to evaluate energy consumption in rural households belonging to various social groups using different biomass fuels (fuelwood, fuelstick, crop residues and cattle dung) and modern resources (electricity, kerosene, liquid petroleum gas) including biogas. The proportion of effective energy consumption is compared between the groups and energy productivity is computed. Inefficiency in use is revealed in both endowment and non-endowment cases. It is inferred that proper energy management alone can mitigate the problem and sustain rural development.*

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Most of the renewables are not primarily intended for use as fuel, and they require conversion for energy transformation and appropriation according to the urgency and periodicity of the end use. Renewables unlike exhaustibles are less intense and recovery cost increases with the scale of operation. Though interest in renewables was stimulated especially after the two major oil crises, their development has not yet become significant and competitive with the fossils. Relative short-term stability of fossils and the fear of the oil cartels that if oil price is kept very high, it will affect their longrun prospects via cheaper renewables (quicker R and D), have made the development of renewable sources tardy and time-consuming (Hines, 1988).

Commercialisation and increasing efficiencies of different energy sources depend upon the nature of technology that is available to convert the particular source (direct or indirect) into competitive use. Even among the fossils, a more sophisticated technology will emerge when the existing less sophisticated levels become uncompetitive and inefficient.

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Though the block of recoverable oil is not that encouraging when compared to that of, say, coal, in terms of exploration and distribution, oil is still the cheapest fuel in spite of recent price increase. At a time when oil price quadrupled, researches in renewable development and oil conservation methods were initiated. It took over 6 to 8 years to introduce fuel efficient devices and other conservation measures such that dependency on imported oil

was reduced to a great extent in developed countries like the United States and Japan. Also, solar and wind energy development, sophisticated processing of coal, nuclear energy, bioenergy, etc, received added importance (Pirog & Stamas, 1987, 7-9). In the oil - importing developing countries, the process of conservation, recycling and adaptation to new sources has been slower. Energy has not been the prime factor of development in such countries; nonetheless, its importance is being felt in recent times. It could be that the developing countries are still in the lower stages of energy development and their achieving the most sophisticated conversion technology would result from high economic growth rather than any other factors (Chern, 1985, 303-309).

Since biomass is the principal primary energy resource in the oil importing developing countries and owing to the scarcity of fossils, it is but natural to expect these countries to evince interest in renewable resources. Failure or slow progress in this regard leads to problems not only in the renewables but also in the case of fossils which may not be able to cope with the rising expectations of growth. The intensity of the problem may or may not be uniform throughout the economy. In the interfuel economy, exhaustible and commercial sources would be normally appropriated by the urban, industrial, transport and trade sectors. Agriculture and rural domestic sectors have long been associated with non-commercial and biomass sources of energy for their end uses. The generation, distribution and efficiency of different energy sources differ according to the resource endowment and use patterns. For example, the landed households by virtue of possessing fuel biomass base, may not experience energy crisis in normal times. Whereas in the landless and poor households, the crisis may be reflected either in the form of very low energy consumption or effecting transfers between different energy sources including labour. Thus, human labour may be expended in fuel gathering to ameliorate the fuelwood crisis resulting from low bargaining power (Bhagavan Giriappa, 1987, 57-69).

### Energy use in a micro-region

In spite of modern energy sources being infused into the developing systems, biomass energy is the major source in household, agriculture or industry sectors. An attempt is made to view the energy consumption in the household sector and evaluate the energy productivity of different sources in different groups having variegated fuel endowment and consumption patterns.

### Agriculture and rural domestic sectors have long been associated with non-commercial and biomass sources of energy for their end uses.

The study is based on primary data collected in Udupi taluk of Dakshina Kannada district in Karnataka which has been one of the integrated rural energy programme (IREP) blocks since 1981-82. (Giriappa, 1991). Development of biogas, cooking stoves, farm forestry besides solar cookers, solar water heaters, solar street lights, solar stills, wind mills, etc in the block has been progressing slowly. The proportion of forests to total geographical area is about 5 per cent, but the area under miscellaneous trees and groves and private forestry amounts to over 20 per cent of the land area. If wasteland is also included (scrub vegetation), the proportion may be higher. The proportion of net area sown is 40 per cent with a cropping intensity of 1.5 per cent. The percentage of net irrigated area is 25, with an average annual rainfall of about 400 cm. However, the irrigation intensity is only 1.1 per cent. Of the total crop area, rice is about 55 per cent, other important crops being pulses, coconut and cashewnut.

Marginal and small holdings account for about 88 per cent of the total number of operational holdings and 49 per cent of the operated area. Semi-medium holdings account for 8 per cent of the holdings and 24 per cent of the area. Medium holdings share 3 per cent of the holdings and 19 per cent of the area. Large holdings share less than 0.5 per cent of the holdings and 8 per cent of the area. Area per holding is one of the lowest in the block at 0.97 ha.

The results pertain to about 12 per cent of villages of rural Udupi with reference to 1988-89. About 1200 households belonging to big farmers, medium farmers, small farmers, marginal farmers, rural industries and artisans, fishermen, service and business people, agricultural labourers and non-agricultural labourers were covered.

Table 1 shows the per capita annual energy consumption in the ten groups as regards rural domestic sector. The average quantity of fuelwood consumption was 350 kg, being higher in the three farmer groups and lower in all others. Fuelwood was used for cooking (83.4 per cent) and heating (16.6 per cent) only.

Per capita consumption in fuelstick has been 297 kgs, higher for the big and marginal farmers and agricultural labourers and lower for others; that in crop residues (246



**Table 1: Energy consumption by households of various sources: (per capita/p.a.)**

Group	No of H/H	Fuelwood Kg	Fuelstick Kg	Crop residues Kg	Cattle dung (Kg)	Kerosene l	Electricity Kwh	LPG Kg	Biogas m <sup>3</sup>
Big farmers	23	501	475	445	—	4.6	17.4	0.5	25.0
Medium farmers	168	560	279	296	0.9	6.7	14.2	1.3	20.7
Small farmers	164	471	250	199	4.4	9.4	11.6	0.5	25.6
Marginal farmers	227	269	365	277	3.4	8.9	11.6	0.7	14.6
Rural industries	117	345	262	239	1.0	9.2	12.3	0.3	3.4
Fishermen	40	167	53	192	—	8.0	7.9	—	—
Services	138	261	207	258	0.4	11.0	14.4	1.8	7.0
Business	59	278	222	265	1.1	11.6	22.2	1.4	1.2
Agri labour	118	176	556	175	-0.8	8.8	6.5	—	—
Non-agri labour	146	294	255	202	4.3	10.8	6.4	0.02	—
Average	1200	350	297	246	2.1	9.0	11.8	0.6	11.7

kgs); big, medium and marginal farmers, services and business recorded higher per capita consumption levels. Fuelstick was used for heating (78 per cent) rather than for cooking. Cattle dung consumption was very low at 2 kgs, small and marginal farmers and non-agricultural labourers reporting a higher consumption level.

Kerosene was used mainly for lighting (97.1 per cent); cooking (2.3 per cent) and heating (0.6 per cent) were minor end uses. The average kerosene consumption was 9 litres, lower in the big and medium farmer groups and higher or average in all others. The proportion used for cooking was higher in the upper groups. Average per capita electricity consumption was 11.8 kwh, the labour groups reporting a very low average. Electricity was used mainly for lighting purpose (91.6 per cent); cooking, heating and other uses shared more or less equally the remainder. Liquid petroleum gas (0.7 kg) and biogas (11.8 cubic meter) were consumed at a higher level by the farmer and service groups and very little or nil by the labour households.

### Energy Purchase

The proportion of owned and gathered fuelwood, fuelstick and crop residues was lower for the farmer and labour groups but higher for others. The proportion of purchased fuelwood for all groups was 21.1 per cent (table 2)—higher for rural industries, fishermen, services and business, moderate for medium farmers and the labour groups, very low for small and marginal farmers and nil for the big farmers. Big and small farmers had no purchase of fuelstick and crop residues; medium and marginal farmers had very low purchases. Rural industries, services, business and non-agricultural labourers had a higher proportion of purchase than the average purchase ratio. In crop residues also, these classes reported a higher proportion of purchase (over 10 per cent as against 6.4 per cent average). Fishermen had the highest proportion of purchases in fuelwood (70.3 per cent) and crop residues (19.4 per cent) and rural industries in fuelstick (20.7 per cent). It is evident that non-agricultural labourers, rural industries, fishermen, services and business had to depend upon external sources of fuel biomass when compared to the four farmer groups and agricultural labourers.

**Table 2 : Energy Purchase and deficit situations**

Groups	All Fuels to income %	Purchased Energy %			Deficit Energy%			
		Fuelwood	Residues	%	Fuelwood	Residues	Kerosene	Electricity
Big farmers	12.7	—	—	1.7	—	—	1.5	18.5
Medium farmers	14.6	13.7	2.5	3.9	1.5	3.0	13.0	12.0
Small farmers	7.1	6.3	—	2.7	4.5	4.0	4.5	11.0
Marginal farmers	11.6	6.3	4.2	4.2	7.0	—	8.0	10.0
Rural Industries	19.4	66.3	18.3	12.7	5.0	3.0	15.0	14.0
Fishermen	9.2	70.3	9.3	6.5	10.0	5.0	10.0	10.0
Services	15.8	56.5	14.8	4.3	5.0	—	12.5	14.5
Business	15.9	59.7	17.4	5.6	5.0	—	10.0	20.0
Agri Labour	3.9	15.2	4.2	3.8	3.0	5.0	10.0	12.5
Non-agri labour	7.4	23.0	11.5	6.6	5.0	5.0	10.0	7.5
All	12.1	21.1	6.1	4.6	5.6	1.7	8.5	11.9

Note : Residues include fuelstick and crop residues.

The nature of the problem could also be seen by considering the proportion of household income spent on different energy sources across the different groups. On an average, 4.6 per cent of household income was spent on purchased energy in the domestic sector. The proportion was lowest for the big (1.7 per cent), small (2.7 per cent), medium (3.9 per cent), and marginal farmers (4.2 per cent), services (4.3 per cent), and agricultural labourers (3.8 per cent); rural industries had the highest proportion (12.7 per cent) followed by non-agricultural labourers (6.6 per cent), fishermen (6.5 per cent) and business units (5.6 per cent). When energy use for domestic purposes, agriculture, industry and personal transport was considered, the proportion of household income spent on purchased energy increased to 12.1 per cent for all the groups. Big and medium farmers, rural industries, services and business units had a higher proportion while agricultural labourers, non-agricultural labourers, small farmers and fishermen had lower averages.

### Energy deficit

Big farmers faced energy deficit only in kerosene (1.5 per cent) and electricity (18.5 per cent). In others, the kerosene deficit was slightly higher and that of electricity lower. The business group had a larger deficit of electricity (20 per cent). For all the groups, kerosene deficit was 8.5 per cent and that of electricity 11.9 per cent, fuelwood deficit 4.6 per cent and that of fuelstick and crop residues 1.7 per cent. The fuelwood deficit was higher for the marginal farmers, and fishermen and that of fuelstick and crop residues in rural industries, fishermen and the labour households.

### Energy productivity

It is a paradox that with higher energy consumption, the households reported energy deficit also. The reason is due to inefficient usage as explained in table 3. The per capita gross energy consumption for all the groups was 15.5 giga joules ( $10^9$ ), aggregating all the energy resources (1 as in table 1) based on equivalent joules. The consumption level was higher for all the four farmer

**On an average, 4.6 per cent of household income was spent on purchased energy in the domestic sector.**

**When effective energy consumption (in terms of thermal efficiency of different energy sources) was considered, the average rate of energy efficiency was 14 per cent.**

**Table 3 : Effective energy usage in different groups**

Group	P.C. gross En cons (GJ)	Effective En <sup>a</sup> %	Biomass fuel %		Effective KJ/RS <sup>b</sup>
			Gross	Effective	
Big farmers	24.08	13.5	95.8	86.8	117.4
Medium farmers	21.16	13.8	91.8	85.4	204.0
Small farmers	16.81	15.2	93.5	80.3	214.1
Marginal farmers	17.35	12.1	95.0	82.7	297.1
Rural Industries	14.00	13.6	95.7	88.2	229.2
Fishermen	7.19	14.0	95.2	84.6	86.7
Services	12.55	14.4	94.4	80.3	102.4
Business	13.17	14.0	95.1	83.2	121.7
Agri Labour	14.51	12.1	97.2	90.4	226.7
Non-agri labour	12.92	13.5	96.4	88.2	258.1
All	15.50	14.0	95.0	84.2	195.3

1. GJ -  $10^9$  joules: energy equivalence @ 19.7 MJ (106 joules) /kg of fuelwood, 14.6 MJ/kg of residues, 9.2 MJ/kg of cattle dung, 35.7 MJ/l of k oil, 3.6 MJ/kwh of el, 41.8 MJ/kg of LPG and 19.7 KJ/MP of biogas.
2. Effective energy @ 15 per cent thermal efficiency in fuelwood, 10 per cent in residues, 50 per cent in k oil, 60 per cent in electricity, LPG and biogas.
3. Effective kilojoule consumption per rupee of household income per annum.

groups, more or less average for the rural industries, agricultural labourers and lower for all others. While the big and medium farmers had highest per capita consumption owing to high woodstock endowments, agricultural labourers (and also non-agricultural labourers) had average energy consumption owing to a large proportion of collected residues. The consumption level was very low in the case of fishermen who had very poor endowment and average energy purchase only. Rural industries had a larger energy purchase followed by business, fishermen and non-agricultural labourers.

When effective energy consumption (in terms of thermal efficiency of different energy sources) was considered, the average rate of energy efficiency was 14 per cent. Small farmers had the highest rate (15.2 per cent) followed by services, business and fishermen who had similar or slightly above the sample area. Marginal farmers and agricultural labourers had the lowest rate (12.1 per cent) possibly due to the fact that in those cases, consumption of low thermal efficient fuelstick and crop residues was highest.

In almost all the cases, biomass fuel (fuelwood, fuelstick, crop residues and cattle dung) constituted the bulk of gross energy (95 per cent) but in effective terms, the share was lower (84.2 per cent). Whether energy was considered in gross or effective terms, biomass fuel was the major fuel (conventional and non-commercial but renewable with a time lag) in all the groups. Agricultural labourers, non-agricultural labourers and rural industries followed by the rest had the highest share for biomass fuels. The rate of effective energy was higher especially when the biomass fuel share was lower.

If household annual income was considered with reference to effective energy consumption, those households having lower annual income (marginal farmers, rural industries, agricultural labourers and non-agricultural labourers) showed a higher energy consumption per unit of income (over 200 kilo J per rupee). The lowest energy consumption intensity was in the case of fishermen (86.7 KJ/RS). In addition, big farmers, services and business had a lower intensity when compared to others.

### Conclusion

Since renewable sources dominate the energy scenario in developing countries, it is but natural to expect that greater attention be paid to better utilisation of these resources toward increasing their productivity. The rural household sector still depends on biomass fuels such as fuelwood, fuelstick, crop residues and cattle dung. In the sample area, the proportion of biomass fuel to total domestic energy consumption was very high at 95 per cent. Among the biomass fuels, the proportion of fuelwood was 39 per cent, the major share being accounted by fuelsticks and crop residues. The region also consumed moderate quantum of kerosene, electricity, liquid petroleum gas and biogas.

With widening deficits for electricity and kerosene, such deficits were also encountered in the case of fuelwood and residues, though the intensity was less. Unless corrective measures are undertaken, sooner or later the crisis will intensify. If this is the position with well-endowed regions, elsewhere the problem may acquire catastrophic dimensions. This calls for greater attention and developmental efforts in the renewables.

However, it has been found that energy productivity has been very low not only because of low thermal efficiency rates in the biomass fuels, but also due to the fact that among different social groups the per capita energy consumption shows no particular trend of conser-

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vation. Resource endowment, (not only owning woodlot but having the capacity to gather biomass fuels as in the case of labourers) if favourably appropriated, may show different intensities depending upon the consumption patterns and lifestyles. What seems to be lacking is a proper resource management from the viewpoint of efficient utilisation and conservation. Biomass fuel consumption has little to do with the income levels of different social groups and since it is available in ample quantity (either through endowment, collection or transfer), crisis is not really felt even by those having deficit situations. For a viable renewable future, not only should the technology be made sophisticated with higher intensity and scale of operation (as in the case of photovoltaics and wind farms) but integration between the less sophisticated technologies like biogas, energy plantations, diversification of resources and activities and improving the thermal efficiency have also to be accomplished. The current efforts need much strengthening and priority allocation.

The problem facing the developing systems is that the traditional sources of energy (mainly biomass) have become inefficient because of inappropriate use and seem to face in some measure increasing commercialisation as the sophisticated fossils which have come to be preferred in spite of being scarce. There is a vast potential in the biomass renewables and unless a concerted effort is made towards their sustainable appropriation (sustenance of fossils, renewables and the rural systems), the situation may go beyond redemption.

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# Effective Communication in Agricultural Extension

Chukwudi Obinne

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*Effective communication is necessary if extension is to reach, inform and motivate the farmers. The basic and practical principles and models of communication including the systems approach are discussed in this paper. The concepts of homophily and heterophily and other guidelines are explained as essential tools in development communication.*

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Information people almost completely forget an important aspect of dissemination—that before knowledge can get across specified concepts, the vehicles carrying it must be structured. Truly, there is quantitative and qualitative information surplus. Paradoxically, what obtains, apparently, is information shortage occasioned by physical and psychological distribution problems. Quite a lot of our people are not aware of the availability of particular information and in what form it exists. Much more painful is the observation that many prospective information users may not even understand what information is, merely 'entertaining a pleasing parlour game of pseudo-communication'. When individuals are involved in development activities, the implication is that information, education and training—that is communication—will be brought to the forefront as a development tool. If the emphasis in extension is on working *with* people, not *for* them, and thus the focus is on what the people recognise as important (Esminger, 1954), then the people must of course want to change (Bailey, 1966) and because the people are rational individuals (Blair, 1971), there must be acceptable reasons for any agency to attempt to convince them to change (Norman, 1974).

## Information Transfer & Communication

Extension in agriculture is particularly concerned with the transfer of scientific knowledge from research to the farmer in suitable language and in simple steps and manner which is easy for him to understand and then apply. To this extent, the directors, subject matter special-

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ists, supervisors, and extension agents are all involved in communication, and need to understand the process. Put differently, the agricultural extension staff must not only understand *what* and *why* to teach, they must know *how* and *when* best to teach.

Our job as development communication workers in agriculture is largely to reword research results in a form that the extension agents can adopt in teaching the farmers so that the latter can understand and apply the skills on their farms. This approach is similar to what prevails in many public extension agencies—the production of topical ‘packages involving the re-stating of research findings in simple, topical steps which the agent can easily use with farmers. We are concerned also with the creation of awareness, arousing of interest and motivating farmers to accept and utilize recommended farm practices (information transfer). At every stage in the research-extension-farmer linkage, information transfer experts, who in this case include all extension workers, remain most valuable. This applies to developing new knowledge, testing, and feed-back mechanisms.

**In Nigeria today, the main problem is no longer the lack of research result in agriculture needed for economic growth and rural transformation, but that of converting and using them as instruments of increased food production as well as for economic development and social progress.**

If farmers have not learned improved farming methods and practices, then the extension service has failed to teach. Effective communication is essential in order to reach, inform and motivate the farmers whose participation in food production programmes is important for success. Communication itself is a social process because whenever individuals interact, they communicate.

In Nigeria today, the main problem is no longer the lack of research result in agriculture needed for economic growth and rural transformation, but that of converting and using them as instruments of increased food production as well as for economic development and social progress. There are numerous research/scientific findings but many of us had not been aware of their existence or had not had the opportunity to observe and use them.

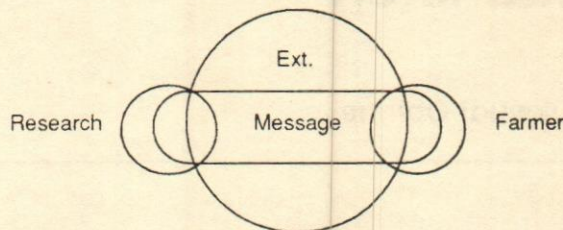
The transfer of information from a source to a receiving unit is described by the following equation:

$$\Delta K_r = K_r (a priori) + I_s + e$$

This equation is explained by Hunt and Paulsen

(1981) to mean that a change in the receiver knowledge ( $\Delta K_r$ ) is a function of *a priori* knowledge ( $K_r$ , *a priori*) integrated with received sender and environmental information ( $I_s + e$ ).

Connections in the Linkage are as follows



### Principles & Models of Communication

Communication is a continuous, never-ending means of transferring messages (ideas, innovation, skills, knowledge or practices) from a source to the ultimate users in order to modify the behaviour or reaction of receivers in the desired direction. It implies a connection between persons with the purpose of passing on information or a message.

In describing two essential components of the act of communication, Little (1970, 3) explains that a channel exists when access to the receiver ( $R_x$ ) is provided for the transmitter ( $T_x$ ) or sender. When the channel is used, the message has to be transmitted by some medium (e.g. verbal language). Feedback must subsequently be provided from  $R_x$  to  $T_x$ . To be fully effective, communication must be two-way, such that  $R_x$  can ask questions of  $T_x$  to clarify the message further and can also immediately respond to  $T_x$ . Thus, communication is action and reaction. This concept of cyclical process is illustrated in fig. 1.

“Noise” refers to any distortion of a message, distraction of the receiver, or competing stimulus from outside the channel.

The field of discourse in the communication process indicates a shift from the linear to the systems approach which emphasizes the synergistic interdependence of the elements in the process. The systems approach recog-

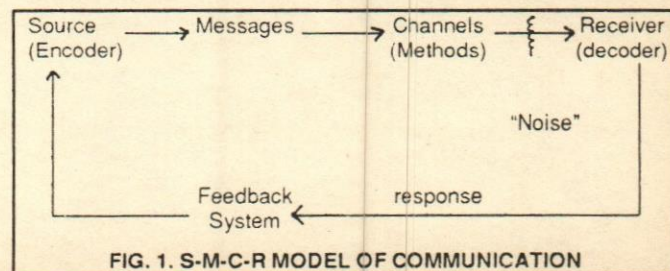
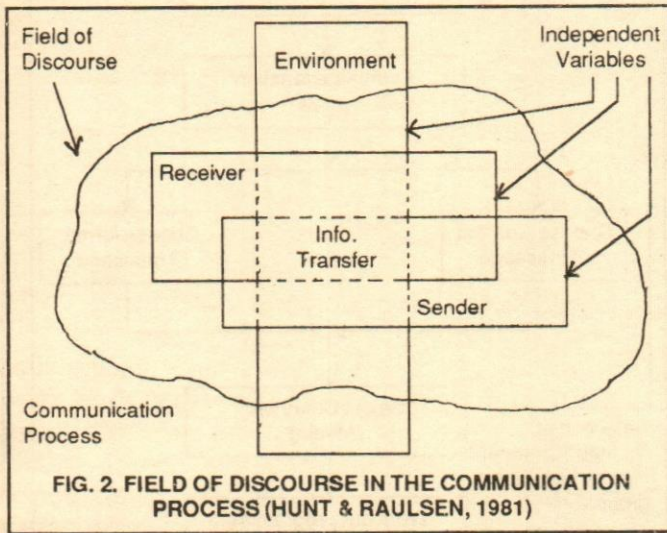


FIG. 1. S-M-C-R MODEL OF COMMUNICATION

nises the influence of the attributes of innovations and communication variables with the sender-receiver independent variables as well as the environmental or situational factors in order to observe and register their total individual and collective impact on innovation-decision.



The participation of the people in development, states Lindstrom (Ottander, 1982), cannot come about unless information and education activities are developed into a meaningful process of communication with the public or end-users. Development communication workers should, therefore, enter into a continuous dialogue with their subjects and systematically base their activities and decisions on the feedback received from the field.

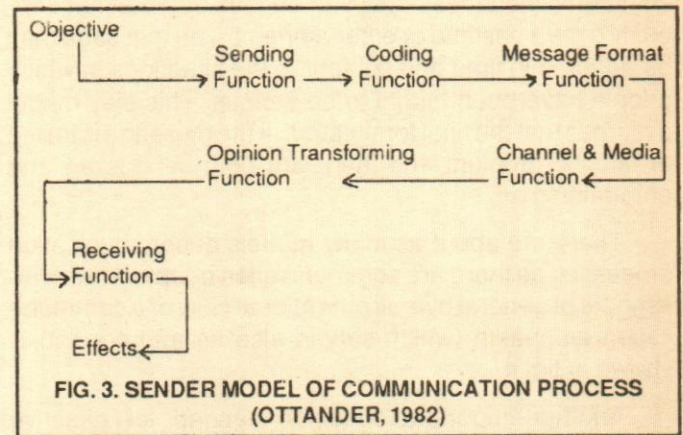
In agriculture, we are interested more in the level of Applied Communication. This is on the micro-level, in which the human aspect is important. Here, the determinant factors include the motivation of farmers, their individual attitudes and personal contact. On the other hand, communication at the macrolevel tends to be abstract, sophisticated models and promotes the description of complex diffusion processes (this is the Communication Theory).

Ottander (1982) describes four different MODELS of communication processes. The types differ in four respects:

- Their *purpose*;
- Their conception of *cause* and effect in the communication process;
- Their conception of the essential *characteristics* in the communication process; and

- The kind of communication *situations* they describe. The types are the sender, user, situation, and play models.

The *Sender* model is the oldest, with the purpose of describing the essential functions in the communication process. It provides a good tool for the planning and execution of an information campaign, that is, it serves as a check list. The pattern of the model is represented in Fig. 3.



The model assumes that the cause-and-effect flow goes from the sender to the receivers. It is common, in effect, to concentrate too much on the message content and format stages and the channels and media-selection problems. The receivers are sometimes under-estimated and regarded as passive.

In the *User* model, the receivers are regarded as the active group that determines the communication process. The cause-and-effect flow (as in fig. 3) is thus reverse. The receivers are active and selective in their behaviour and handle information quite independently of sender objectives. This model demands that in addition to locating and describing our receiver units (as in sender model), we should understand the receivers' own objectives.

The user model greatly emphasizes the need for development communication workers to deal with the sender's convictions and beliefs about the receiver groups. We, as subject matter specialists, managers, and supervisors, must be educated as to why the knowledge of receiver groups is very essential in planning daily programmes.

*Situation* model analyses the factors in the receiver's actual situation which determine the outcome of an information campaign. The situation assumes importance because it is in it that the sender and receiver operate. Thus, the frame *i* analysis is widened further in this model.

**Another important condition needed for effective communication is the mutual understanding of the content of information transfer by both the sender and receiver.**

It is a basic assumption of the *Play* model that all communication messages can be consumed either seriously or as a pastime or entertainment. The message may be adapted in time and content to the situations in which people have been taught to be serious. This play model assumes that the final formulation of the message is in part an artistic problem and there are both serious art and entertaining art.

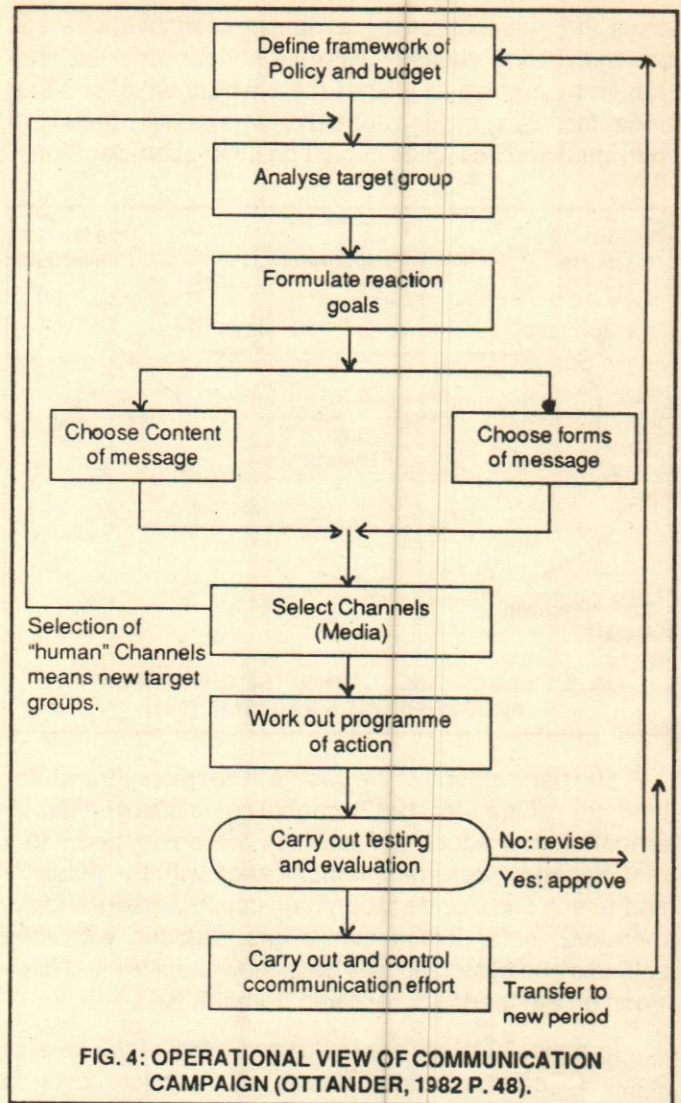
There are about as many models of communication processes as there are communication people. However, a model of general overall operational view of a communication campaign (which serves also as a check-list) is shown in fig. 4.

Another important condition needed for effective communication is the mutual understanding of the content of information transfer by both the sender and receiver. Really, only sound waves or pictures are transferred in interpersonal discussions between the partners. The receiver picks up the impulses (message) and attributes his own meanings to them. The meaning intended by the sender may not be what is interpreted by the receiver. Often there is a kind of distortion in the intended meaning. Accurate encoding and decoding are much more likely where the sender shares similar experiences with the receiver.

It is when others respond to us that we can assess ourselves and adjust our views or behaviour. Experts in communication state that what we communicate is so much a part of us that we perhaps communicate more than the message we work so hard at generating. We can enhance our understanding of interpersonal communication by briefly explaining the concepts of homophily, heterophily, and empathy.

### The Concept of Homophily and Heterophily

In 1903, Tarde (Rogers & Shoemaker, 1971: 210) stated that social relations were much closer between individuals who resemble each other in occupation and education. This recognition of the existence of homophilic behaviour was further explained in 1964 by Lazarsfeld and



**FIG. 4: OPERATIONAL VIEW OF COMMUNICATION CAMPAIGN (OTTANDER, 1982 P. 48).**

Merton. This conceptual label is one of the most obvious and fundamental principles of human communication which implies that the transfer of ideas most frequently occurs between a source and a receiver who are alike/similar/homophilous. The more nearly equal in social status persons are, the more frequently they will interact with themselves.

*Homophily*, therefore, refers to the degree to which pairs of individuals who interact are similar in such attributes as education, social status, values and beliefs. Better communication occurs when source and receiver are homophilous. Rogers with Shoemaker opine that communication between source and receiver is likely to be effective when both of them share common meanings, attitudes and beliefs, and a mutual language. Homophily produces effective communication, and vice versa.

**Better communication occurs when source and receiver are homophilous.**

The degree to which pairs of individuals who interact are different in certain attributes is referred to as *heterophily*. Some studies have shown that heterophilous communication leads to message distortion, one type of ineffective communication.

One major problem in communication, particularly of innovations, is that the source is usually quite heterophilous to the receiver. Some degree of heterophily is necessary—the source (s) is expected to be more technically competent than the receiver. Generally, receivers such as small farmers often seek sources that are slightly technically more competent about innovations than themselves.

In effect, most individuals would prefer interacting with persons who are very similar in outlook. Interaction with persons who are very different from us often involves greater effort to make communication effective. In other words, heterophilic interaction is likely to result in cognitive dissonance because the receiving unit is exposed to messages that are likely to be inconsistent with his existing beliefs, an uncomfortable psychological condition (Rogers & Shoemaker, 1971, 211). Managers in organisations are, therefore, expected to relate as much as possible with their subordinates in order to ensure the attainment of organizational goals through effective acts of communication. Heterophilous individuals who have high empathy are, in a social psychological sense, really homophilous. *Empathy* is the ability of a person to project himself into the role of another.

### Effectiveness of Communication: Some Factors

#### (a) Perception of Farmers About Message

Farmers tend to utilize technologies based on their perception of innovations. Attributes of innovation as identified by Rogers and Shoemaker (1971) include:

- (i) *Compatibility*, or the degree to which an innovation is perceived as consistent with the existing needs of the receiver; his past experience and values;
- (ii) *Relative advantage*, or the degree to which an innovation is perceived as better than the idea it supersedes:

- (iii) *Complexity*, or the degree to which an innovation is perceived as relatively difficult to understand and use;
- (iv) *Trialability*, or the degree to which an innovation could be tried on a limited (small) scale; and
- (v) *Observability*, or the degree to which the results of the innovation are visible or could be felt by others.

Farmers' ranking of relative importance of the attributes of any innovation is summarized in table 1 from the work of Roy in 1966 (Singh, 1981).

**Table 1: Relative Importance of Attributes of Message**

Attributes	Scale values	Rank
Profitability	1.954	1
Cost of innovation	1.949	2
Simplicity - complexity	1.924	3
Physical compatibility	1.910	4
Cultural compatibility	1.663	5
Communicability	0.728	6
Saving of labour and time	0.462	7
Triability (Divisibility)	0.000	8

#### (b) Farmers' Preference for Information Sources

Obinne (1989) studied the preferential information source utilization by small scale Cassava farmers and his findings are summarized in table 2. Similar results have also been reported by other researchers.

**Table 2: Preferences of Farmers for Information Sources**

Information Source	Freq.	Percentage
Extension worker	51	54.83
Field demonstrations	18	19.35
Other farmers	15	16.12
Radio	3	3.2
Cooperative Society/Farmer Unions	3	3.2
Television	1	1.1
Agricultural shows	1	1.1
Short farm production courses	1	1.1
Total	N = 93	100.0

**Managers in organisations are, therefore, expected to relate as much as possible with their subordinates in order to ensure the attainment of organizational goals through effective acts of communication.**



### (c) **Creditibility of the Communicator/Source**

Even though no one channel of communication alone is effective for all situations, among "nonprogressive" village farmers of India, Chamala in 1969 (Singh, 1981, 23) listed the order of information source credibility with demonstration ranking the first or most frequent (table 3).

**Table 3: Credibility of Information Source**

Progressive Village Farmers	Non-progressive Village Farmers
1. Specialists	1. Demonstration
2. Radio	2. Progressive farmers
3. Progressive farmers	3. Specialists
4. Block extension agency	4. Block extension agency
5. Demonstrations	5. Radio
6. Folders	6. Folders
7. Newspapers	7. Newspapers

Non-progressive farmers are often not quite literate in English Language, possess low academic qualification, are relatively poor and farm small holdings. The apparent differences observed in tables 2 and 3 may be due to difference in socio-cultural environments. It is obvious that the mass media are not popular with farmers of low level of literacy and of low capital.

**Apart from the obvious need for socio-cultural and language compatibility, the communicator should understand the felt needs of his clients.**

In addition, the expertise knowledge level about the innovation and trustworthiness with which a communicator is viewed by the recipient farmers influence the degree of success achieved by the source as a communicator. This is *credibility*, or the degree to which a communicator (who, in this case, may be the subject matter specialist, manager, extension agent) is perceived as competent and trustworthy by the receivers.

Berlow *et al* (Okereke, 1983 : 44) describe two dimensions of credibility as

- competence credibility, and
- "Safety" credibility

The change agent possesses competence credibility if he is more knowledgeable about the innovation he introduces than his clientele (farmers) such that the latter will regard him as an expert (heterophily). A communicator

regarded as having safety credibility is seen by the clientele as their peer, especially at the persuasive communication stage when the farmer is developing positive attitude toward the new practice (homophily).

### (d) **Compatibility of Innovation with Farmers' Needs**

Apart from the obvious need for socio-cultural and language compatibility, the communicator should understand the felt needs of his clients. Often there is differential need perception between the farmers and the extension personnel. Under this condition, little or no success is attained.

### **Selection & Use of Methods & Tools**

We need to keep up to date in our noble work of helping people feed themselves. We must constantly remind ourselves that there are innovators of ideas and practices, early adopters, late adopters, and laggards among professional extension workers as with farmers. Agricultural administrators should then resolve to continue reviewing their methodologies and acquire new, improved techniques of running the extension service. Studies have shown that different methods are suitable for different audience.

The method selected should enhance the acquaintance of the farmer with the extension personnel. Examples of this are farm and home visits, result and method demonstrations, and small discussion groups, among others. Other basic considerations in selecting extension methods are the need for the extension worker to know and understand the clients and the socio-cultural, economic and political conditions in which they (audience) live.

Adult farmers want their education in agriculture to help solve social and economic problems. They also want competent extension workers who have a thorough knowledge of technical agriculture and who have the ability to relate the technical to the practical aspects. Furthermore, our farmers want to be actively involved in order to ensure their commitment interest. Above all, adult-farmers look forward to extension methods which are effective in terms of developing useful knowledge and skills.

**Other basic considerations in selecting extension methods are the need for the extension worker to know and understand the clients and the socio-cultural, economic and political conditions in which they (audience) live.**

In choosing a method to be used with a particular audience, extension staff must remember that the farmers actually want to learn because they know that new developments demand new adaptations in their situations. Similarly, farmers will actively participate in our programmes if they feel wanted and if they can have a desirable social experience—they want to be with others who have similar interests and standards.

This is why the *demonstration* methods are quite popular. The method used must clearly show results under practical farm and community conditions. As much as possible, demonstrations should involve large audience participation. The stages in the planning and execution of an agricultural demonstration have been described in some detail by Singh (1985). These stages and the suggested activities are presented in table 4. Singh advises that only locally tested, technically and economically feasible and socially acceptable message should be selected for demonstration. He regrets that monocropping which was introduced in Nigeria, without field verification trials, as a profitable substitute to mixed cropping has done a great damage to both scientists and extension workers.

**Table 4: Stages and Elements in a Demonstration**

Pre-Demo	Actual Demo	Post-Demo
Selection of message	Conduct of demonstration	Economics of demonstration
Selection of farmer	Practice by farmer	Publicity of results
Selection of field	Calendar of operations	Reminding the farmers next season
Training of workers	Organization of field days	
Arrangement of inputs	Crop cutting (harvesting) - later	Arrangement of inputs and services
Fixing date and time	Record of yield	

The farmers must be prepared for each demonstration. Part of the requirements is the need to publicise the date, time, place and subject of the demonstration. In presenting the demonstration, the demonstrator must initially explain the principles/guidelines and should point out the possible hazards. Participating farmers should be well seated to ensure their clear view of the demonstrator. Operations must be carried out step by step.

Thereafter there should be try-out performance by all or most of the farmers. There should be a question-answer session. The necessary follow-up would include informing

farmers about the calendar of operations to be followed. All essential materials for demonstration should be assembled before the scheduled date and time. Farmers should be invited later to see the results of the demonstration plots. One obvious merit of the demonstration method is its appeal to logic and reason. Another is that farmers believe what they see more than what they merely hear or read about. It is also realistic and impressive.

Demonstrations, however, have the limitations of not being well adapted to every subject matter and only very few people can be accommodated.

**One obvious merit of the demonstration method is its appeal to logic and reason.**

It is the task of the extension worker to choose the teaching method that will be most effective or appropriate in achieving his educational objectives. Actually, it is recommended that a number of methods should be used to carry out a programme, since methods may overlap, for example, a demonstration could stimulate group discussion (Kang & Song, 1984).

Other suitable group teaching tools include discussion group, lecture, field trip, field day, and conference/farmer forum. Well planned *group discussions* can be very effective means of exchanging farming information and ideas among farmers in a locality. Held once a week, or once a month, such discussion groups enhance the deliberation on common farming problems. Extension workers should encourage grassroot discussion of public agricultural issues.

Kelsey & Hearne (1963, 273) are of the opinion that the individual-contact methods furnish the most direct opportunities for influencing people, although they agree that several methods are better than any one method.

Adaptable individual methods, in which the extension worker interacts on a one-to-one basis with the farmers, include farm and home visit by the extension staff, and the use of a selected model farmer. For the *farm and home visit* to be a success, careful planning and preparation should be carried out by the extension worker. An activity calendar should be maintained. The extension worker should discuss his observations with the farmer on each visit.

Radio and television broadcasts as well as newspaper publications should be arranged on a daily or weekly basis to supplement existing methods of extension teaching. The *mass media* (newspapers, television, radio) assist and support the field extension worker. They serve to reach mass audiences quickly. The acquired ability to comprehend mass media messages is, however, often not developed among village people. The missing links include absence of control of information generation and flow, lack of feedback report, and poor evaluation. The only solution then is to employ the face-to-face communication, such as personal visits by the extension staff.

**In planning the audio-visual presentation, the extension staff must have a specific objective and an understanding of the nature and characteristics of his audience.**

Of all the senses, sight and hearing are the most active particularly in the reception of new information. In most cases, visual symbols are accompanied by some form of simultaneous or nearly simultaneous auditory utterance (audio-visual). Audio-visual is thus a specific synonym for a philosophy of idea transmission. In the use of audio-visual system, which does not permit immediate feedback, it is imperative that the presentation follow a logical, interesting sequence, built about a clear understanding of the audience's interest in the subject-matter presented. In planning the audio-visual presentation, the extension staff must have a specific objective and an understanding of the nature and characteristics of his audience. Thereafter, the idea elements and mechanical elements must be selected and arranged logically into an unified whole needed to achieve the desired objective. All extraneous materials should be omitted. Messages must be specific.

Messages to farmers must be repeated to produce a potent forcefulness which they cannot ignore. As Kelsey & Hearne (1963) point out, when a symbolism is seen in a talk, a poster, and an exhibit on the same subject, that symbolism takes on a fuller meaning to the audience. Every material prepared for the television or radio should satisfy the stated principles. The extension agents must be trained to use the camera, slide projector, motion picture projector (sound), tape recorder, square projection screen, public address system, and portable flannel board, magnet board or chalkboard.

Communication among small-scale farmers is dependent on visual aids because many of them are illiterate.

Films, slides, posters, and so on, should be able to transfer knowledge where oral language fails. However, it has been reported that in some remote villages, pictorial illiteracy is almost as widespread as illiteracy itself. When people's experience in reading pictures is very limited, they may misread the details and thereby interpret the whole picture wrongly (Fuglesang, 1982, 89).

### **Improving Inter-Personal Communication with Farmers**

Experts have suggested the use of the traditional mass media as credible channels to reach the most disadvantaged audiences, for example, poor, low literacy small farmers. Change agents should be homophilous in their dealings with farmers. Alternatively, change agent aides may be chosen from among the disadvantaged clientele to work for the Extension Service in contacting their homophilous peers.

The establishment of a special agency, called Small Farmer Development Centre, should be given priority by the Federal and State governments. The primary purpose of the agency would be to inform, educate and train only small scale farmers. This is significant because over 70 per cent of our present food producers are small farmers.

Generally, extension workers must show empathy—they should be able to understand and appreciate their clientele.

**Experts have suggested the use of the traditional mass media as credible channels to reach the most disadvantaged audiences, for example, poor, low literacy small farmers.**

In addition to the strategies discussed above, the following hints will be of immense benefit to both the extension worker and his farmer audience:

- Use clear and simple words that have similar intended meaning to the farmer.
- Discuss only matters that are of interest or concern to the farmers, without forcing your ideas on them.
- A good rapport with your farmers will eliminate doubts, suspicion and misunderstanding. Therefore, cultivate this.
- Appreciate and respect the beliefs and customs of the farmers.

- Ensure a two-way flow of ideas—listen also to the farmers.
- As a friend, be helpful, warm, sincere, and patient with your audience.

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## THE HEALTH OF PAST STRATEGIES

Some facts on health status confirm the failure of past development strategies and the double burden shouldered by developing countries—of poverty-related communicable diseases, as well as the noncommunicable and chronic diseases we associate with the industrialized countries. In developing countries, diarrheal diseases kill 5 million children and adults annually, while measles is responsible for 1.5 million deaths and malaria for at least 1 million deaths. Pneumonia kills 5 million in the developing world compared to 400,000 in developed countries and 40,000 in the developing world. Cardiovascular diseases kill 12 million people, half of them in developing countries. Cancer claims 2.5 million lives in developing countries and 2.3 million in the developed nations. Apart from these, there are health problems related to behaviour, such as smoking, drug addiction, violent crime and AIDS, which affect nearly all countries.

Source: World Link No. 2 1992.

# Least Developed Countries : A New Definition

Udo E. Simonis

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*In view of the changing world scenario, a review of the criteria for identifying the least developed countries has become imperative. The author presents the efforts and recommendations of the United Nations Committee for Development Planning in this direction.*

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The United Nations Committee for Development Planning (CDP) in its annual report 1991 has attempted to redefine and update the list of countries classified as least developed in order to give guidance to donor agencies and countries about an equitable allocation of foreign assistance, and on investment priorities. In view of the growing environmental problems and unsettled distributional conflicts, the consensus on the concept of development and underdevelopment has crumbled away. The Committee for Development Planning of the United Nations (CDP) has therefore been reviewing the adequacy of the established criteria for identifying the least developed among the developing countries since 1988. The Second United Nations Conference on the Least Developed Countries in 1990 gave impetus to this work by requesting the CDP to expedite the review of criteria for identifying the least developed countries. The Conference also endorsed the introduction of a dynamic element into the application of the criteria, and recommended that the review be submitted to ECOSOC for consideration, and subsequently forwarded to the United Nations General Assembly. The CDP completed its review in April 1991, which is going to be published as a United Nations publication. In the following, the main findings and recommendations of the CDP report are presented and the criteria for defining the group of the least developed countries are put forward.

## General Considerations

The original set of criteria for identifying the least developed countries was adopted by the CDP in 1971

**In view of the growing environmental problems and unsettled distributional conflicts, the consensus on the concept of development and underdevelopment has crumbled away.**

The Committee wished to reiterate that the existing criteria, which were tentatively formulated some two decades ago under the constraint of a paucity of data on development indicators for developing countries, were not adequate to bring out in a conclusive manner the long-term structural weaknesses which underlay the concept of 'least developed'.

(Official Records, ECOSOC, 1971). Modifications were made in 1973 (Official Records ECOSOC, 1973, 31) and again in 1981 (Report of Working Group, CDP, 1980, 6-7, Official Records, ECOSOC 1981, 27). Since 1981, the CDP has recommended countries for inclusion in the list of the least developed countries based on cut-off points for three indicators:

- \* upper and low cut-off points for per capita GDP,
- \* a manufacturing share of 10 per cent or less in total GDP and
- \* a literacy rate of 20 per cent or less.

A country would be recommended for inclusion in the list:

- (a) if it satisfied the last two criteria, even if its per capita GDP exceeded the lower cut-off point, as long as it did not exceed the upper cut-off point; or
- (b) if its per capita GDP fell below the lower cut-off point and it had a manufacturing share of 10 per cent or less in the total GDP even if its literacy rate exceeded 20 per cent.

In a 1980 review of the criteria, a CDP Working Group concluded that the *per capita income* criterion continued to be important but noted that since the quality of the underlying information varied a great deal among countries, the magnitude of per capita GDP had to be viewed as a broad rather than a precise estimate. It expressed reservations about the other criteria (*adult literacy rate* and *share of manufacturing in GDP*) which were meant to bring out the structural weaknesses of countries. In 1990, the CDP summed up its position on the issue as follows:

The Committee wished to reiterate that the existing criteria, which were tentatively formulated some two decades ago under the constraint of a paucity of data on development indicators for developing countries, were not adequate to bring out in a conclusive manner the long-term structural weaknesses which underlay the concept of 'least developed'.

The CDP suggests a number of factors for formulating a new set of criteria:

\* The criteria should bring out the salient characteristics of the least developed countries which give rise to special concern for them. These are, in brief, poverty combined with structural impediments which make it more difficult for them to achieve sustained development without special assistance from the international community.

\* The indicators selected should be robust so as to minimize the likelihood of easy reversibility from least developed status to non-least developed status and vice versa, as a result of dramatic fluctuations in one or another single indicator; and they should introduce a dynamic element that would serve as a reliable basis for deciding as to whether countries should be added to, or removed from (so-called *graduation*), the list of least developed countries.

\* The indicators selected should only be those for which data are reliable and available on a regular basis. Combinations of indicators serving as criteria should be transparent and easily intelligible, and should be consistently applied.

\* The criteria should be formulated so as to lend themselves to automatic application, but should not be so rigid as to make it mechanical. In the application of the criteria either for purposes of inclusion in, or graduation from the list, the CDP would have to exercise judgement, especially in borderline cases.

The CDP also considered the issues of *human rights* and *methods of governance*. It stressed the importance of these issues in their own right as well as their relation to economic and social progress. It took the position, however, that it would be inappropriate to use such considerations for decisions regarding inclusion in, or exclusion from, the list of least developed countries. However, in the future *policy performance* should be taken into account in a more systematic way, and defining indicators should get top priority in social science research.

### The Criteria

Least developed countries shall be defined as those low-income countries that are suffering from long-term handicaps to development, in particular, low levels of human resources development and /or severe structural weaknesses. The relative level of poverty may be measured by per capita income. Various methods of measuring the per capita income were considered: per capita GDP, per capita GNP, per capita GDP based on purchasing

**Least developed countries shall be defined as those low-income countries that are suffering from long-term handicaps to development, in particular, low levels of human resources development and /or severe structural weaknesses.**

power parity (PPP), GNP adjusted for compensatory or defensive expenditure. For the time being, however, the per capita GDP (annual average for the latest three years for which data are available) was still thought to be the most practical.

In the view of the CDP, evaluating human resources development should focus on achievements in health and education, as a measure of the capacity of a country to take advantage of opportunities for development. In this connection, an *Augmented Physical Quality of Life Index* (APQLI), comprising four indicators—life expectancy at birth, per capita calorie supplies, combined primary and secondary school enrollment ratio, and adult literacy rate,—was considered to be an appropriate measure. (Morris et al., 1978, 1979)

The CDP considered two main kinds of structural weaknesses, namely

- (a) *natural handicaps* such as small population geographical isolation (e.g. island countries), landlockedness, high climatic risks which may be measured by an index of instability of agricultural production on a case by case basis; and
- (b) *low economic diversification*. Economic diversification might be measured by a composite index, EDI, comprising share of manufacturing in GDP, share of employment in industry, per capita electricity consumption, and export concentration ratio.

The proposed cut-off points on the *per capita income indicator* (GDP) and the *composite indices* (APQLI and EDI) and procedures for their application are described below. (Simonis 1990)

### Application of the Criteria

As for the per capita income criterion, the World Bank cut-off point for low-income countries as measured by GNP plus 10 per cent, to derive an approximate GDP equivalent for less developed countries is recommended. For 1991 the cut-off point on this basis might be US \$ 600 (base year 1987), which corresponds roughly to the upper

cut-off point of the per capita GDP used by CDP so far. For additional information a per capita PPP estimate of GDP, if available might be used in 1991, equal to or less than US \$ 1,000 in 1987. Updated estimates of these measures (US \$ 600 GDP resp. US \$ 1,000 PPP) would be used in subsequent reviews. Countries will be considered for least developed status only if they meet these per capita income and population criteria.

Inclusion in the list on the basis of the GDP, APQLI and EDI criteria should not be automatic, but also be subject to a review of a number of other indicators representing structural characteristics affecting the state and prospects of development of individual countries, particularly:

- (a) the *Natural Endowment Index* (NDI) and its component indicators, namely, agricultural land per capita, exports of minerals as percentage of total exports, average rainfall and rainfall variability;
- (b) the *Instability of Agricultural Production Index* or specific climatic risks;
- (c) per capita exports in relation to country size;
- (d) *Official Development Assistance* (ODA) as percentage of GNP;
- (e) exports of petroleum as percentage of total exports.

These specific indicators had been tested empirically in a study by the CDP Secretariat, but were not included in the officially accepted CDP report. Therefore, in the following we shall focus only on GDP, the APQLI and the EDI criteria. After examining the data for the EDI and the APQLI, the CDP decided to set the benchmarks at the third quartile on each index for the low income countries, i.e., 22 for the EDI and 47 for the APQLI. For those developing countries that met the per capita GDP criterion and whose *population size* did not exceed 75 million, eligibility for least developed status was determined in three stages: First, a core list of least developed countries was identified among those that fall below the cut-off point on *both* indices. Next, the remaining countries were assessed on the basis of a set of more qualitative indicators, namely: landlockedness, small population (1 million or less), islands, climatic

**Countries will be considered for least developed status only if they meet these per capita income and population criteria.**

risks, such as susceptibility to droughts, floods, and cyclones. If any of these countries falls below the cut-off point on the APQLI or the EDI and is landlocked or an island, or has a population of one million or less, or suffers from frequent incidence of cyclones, droughts and floods, it should be included in the list. At each stage of assessment, the CDP considered the APQLI or the EDI or both as well as the component indicators of the indexes. Moreover, in borderline cases, consideration was given to the additional structural characteristics mentioned above. Should the assessment of eligibility on the basis of the selected criteria and procedures turn out to be inconclusive with regard to one or more countries, the CDP suggests commissioning in-depth country studies before reaching a definitive conclusion. The above procedure constitutes the *inclusion rule*, which applies only to countries that are not currently on the list of the least developed countries. For countries that are already on the list, the *graduation rule* as set out in the next paragraph will apply.

The CDP recommends that a country should be considered no longer eligible for least developed status after it has exceeded the cut-off point on the GDP criterion, relevant at the time the review is carried out, and the cut-off point on either the APQLI or the EDI for at least three years. However, certain margins are suggested: margins by which the cut-off points need to be exceeded were set at US \$ 100 on per capita GDP, 5 points on the APQLI and 3 points on the EDI. A country might also be graduated from the list if it exceeds the cut-off points by the margins indicated for both the APQLI and the EDI (i.e., 52 APQLI and 25 EDI), even if per capita income remains below the cut-off point US \$ 600 resp. 700) of GDP. The CDP suggests that a general review of the list of the least developed countries should be undertaken once in every three years. This review should automatically include all low-income countries; thus, it would no longer be necessary for countries to request their inclusion in the list.

## Recommendations

On the basis of the criteria and their application the CDP has assessed the eligibility of countries as follows:

**Should the assessment of eligibility on the basis of the selected criteria and procedures turn out to be inconclusive with regard to one or more countries, the CDP suggests commissioning in-depth country studies before reaching a definitive conclusion.**

**The CDP suggests that a general review of the list of the least developed countries should be undertaken once every three years.**

At the *first* stage, countries were identified regarding per capita GDP (US \$ 600 or less), APQLI (47 or less), EDI (22 or less), and population (75 million or less). 35 countries (*Group I*) meet all four criteria (table 1).

**Table 1: Criteria for Identifying the Least Developed Group I Countries (per capita GDP of US \$ 600 or less, population of 75 million or less, APQLI of 47 or less, and EDI of 22 or less)**

	Per capita GDP (US Dollar) Annual average 1987-89	APQLI	EDI
Afghanistan	276	17	19
Benin	385	26	18
Bhutan	195	27	20
Burkina Faso	200	16	17
Burundi	215	27	8
Central African Republic	375	28	18
Chad	177	18	15
Comoros	431	44	8
Djibouti	below 400*	15	15
Equatorial Guinea	400	32	14
Ethiopia	120	19	14
Gambia	313	26	16
Ghana*	360	42	19
Guinea	435	17	4
Guinea Bissau	174	31	15
Kampuchea*	82	44	21
Kenya*	375	44	22
Liberia	474	32	14
Madagascar*	149	47	19
Malawi	171	26	17
Mali	233	16	13
Mauritania	466	28	13
Nepal	131	30	22
Niger	305	18	9
Rwanda	327	26	9
Sao Tome & Principe	430	46	10
Sierra Leone	289	18	21
Solomon Islands*	566	23	21
Somalia	216	9	9
Sudan	302	26	21
Tanzania	127	35	19
Togo	389	37	18
Uganda	231	35	3
Zaire*	95	41	22
Zambia*	367	45	14

\* not on current list of least developed countries  
a estimated per capita GDP accruing to Djiboutians



Of these 35 countries, seven countries, namely Ghana, Kampuchea, Kenya, Madagascar, Solomon Islands, Zaire and Zambia are not currently on the list of the least developed countries. However, Kenya is right on the cut-off point on the EDI, and Madagascar is on the cut-off point on the APQLI. These two countries are both of medium size. Kenya suffers from frequent droughts, and Madagascar is prone to cyclones and drought. These countries are borderline cases, Madagascar having a stronger case for inclusion than Kenya. On balance, the CDP therefore recommends the inclusion of Madagascar.

The *second* stage of assessment was based on the APQLI and the other indicators relevant for countries in *Group II*. Two countries, namely, Haiti and Mozambique are eligible as they both meet the per capita GDP criterion and the APQLI, but not the EDI criterion. Both are already on the list and should be retained since they do not meet the graduation rule.

**Table 2 : Criteria for Identifying the Least Developed Group II Countries (per capita GDP of US \$ 600 or less, population of 75 million or less, APQLI of 47 less, but with EDI above 22)**

	Per capita GDP (US Dollar) Annual average 1987-1989	APQLI	EDI
Haiti	358	34	28
Mozambique	78	24	24

The *third* stage of assessment was based on the EDI and the other indicators relevant for countries in *Group III*. Five countries, namely, Kiribati, Laos, Lesotho, Maldives, and Tuvalu are eligible on these considerations. They all meet the per capita GDP and the EDI criteria but not the APQLI criterion. Moreover, Kiribati, Maldives and Tuvalu are islands with very small populations; Lesotho is landlocked, and Laos is both landlocked and suffers from frequent incidence of droughts and floods. These countries are already on the list and should be retained since they do not meet the graduation rule.

**Table 3 : Criteria for Identifying the Least Developed Group III Countries (per capita GDP of US \$ 600 or less, population of 75 million or less, EDI of 22 or less, but APQLI above 47)**

	Per capita GDP (US Dollar) Annual average 1987-1989	APQLI	EDI
Kiribati	405	73	3
Laos	178	53	21
Lesotho	240	51	18
Maldives	441	50	18
Tuvalu	245	65	19

Four countries, namely Guyana, Myanmar, Nicaragua and Vietnam (*Group IV*) have a per capita GDP well below the cut-off point, but do not meet either the APQLI or the EDI. Myanmar, which is already on the list, does not meet the graduation rule and the CDP recommends it be retained.

**Table 4: Criteria for Identifying the Least Developed Group IV Countries (per capita GDP of US \$ 600 or less, population of 75 million or less, but with APQLI above 47 and EDI above 22)**

	Per capita GDP (US Dollar) Annual average 1987-1989	APQLI	EDI
Guayana*	376	68	23
Myanmar	318	57	24
Nicaragua*	393	61	25
Vietnam*	119	58	25

\* not on current list of least developed countries

Six countries have a per capita income below US \$ 600 but have a population greater than 75 million (*Group V*). Of these countries, only Bangladesh is presently on the list. Since it does not meet the graduation rule, the CDP recommends it be retained.

**Table 5 : Criteria for Identifying the Least Developed Group V Countries (per capita GDP of US \$ 600 or less, but with population greater than 75 million)**

	Per capita GDP (US Dollar) Annual average 1987-1989	APQLI	EDI
Bangladesh	202	27	22
China*	291	68	34
India*	328	42	31
Indonesia*	477	58	22
Nigeria*	230	35	5
Pakistan*	366	31	29

\* not on current list of least developed countries

The foregoing assessment was done for all low-income countries, defined as those whose per capita GDP falls below the cut-off point on the per capita GDP criterion (US \$ 600). The per capita GDP of five countries presently on the list of least developed countries (*Group VI*), namely, Botswana, Cape Verde, Samoa, Vanuatu, and Yemen exceeds the cut-off point. Therefore, these countries have been assessed separately in the light of the graduation rule proposed. (Yemen A.R. and Yemen P.D.R. have been kept separate for the purpose of the exercise because integrated data on all the indicators used are not yet available for the unified country, the Republic of Yemen.) At any rate, Yemen will be retained since both the former

Yemen A.R. and Yemen P.D.R. met both the APQLI and the EDI, and their combined annual average per capita GDP (period 1987-1989) was estimated at US \$ 674. The country, therefore, does not meet graduation rule.

of all the developing countries assessed, satisfies the graduation rule, and should therefore be removed from the list.

## Conclusions

The work of the CDP has improved the methodology of defining development—and underdevelopment. New, additional indicators have been introduced, particularly the APQLI and EDI, to complement the major conventional development criterion, per capita GDP. Applying this new system of indicators in defining respective cut-off points including additional qualitative information, and using a clear graduation rule, the following list of least developed countries emerges.

All the countries currently on the list are retained, except Botswana, and six countries, namely, Ghana, Kampuchea, Madagascar, Solomon Islands, Zaire and Zambia are included in the list. Thus, counting the former Yemen A.R. and Yemen P.D.R. as one country, there are now 47 countries on the list of the least developed countries. As regards Asia, the list is as given in table 7.

**Table 7 : Asian countries on the new list of Least Developed Countries**

	Per capita GDP (US Dollar) Annual average 1987-1989	APQLI	EDI
Afghanistan	276	17	19
Bangladesh	202	27	22
Bhutan	195	27	20
China	291	68	34
India	328	42	31
Indonesia	477	58	22
Kampuchea	82	44	21
Kiribati	405	73	3
Laos	178	53	21
Maldives	441	50	18
Myanmar	318	57	24
Nepal	131	30	22
Pakistan	366	31	29
Samoa	748	68	14
Solomon Islands	566	23	21
Tuvalu	245	65	19
Vanuatu	881	48	14
Vietnam	119	58	25

It could well be that the sophisticated methodological basis of this new list will have important implications for development assistance and investment in general and for the Programme of Action for the least developed countries in the 1990s in particular. (Simonis, 1990)

**Table 6 : Criteria for Identifying the Least Developed Group VI Countries with per capita GDP above US \$ 600**

	Per capita GDP (US Dollar) Annual average 1987-1989	APQLI	EDI
Botswana	1,625	52	12
Cape Verde	741	49	17
Samoa	748	68	14
Vanuatu	881	48	14
Yemen	663	29 <sup>a</sup>	14 <sup>a</sup>
		34 <sup>b</sup>	6 <sup>b</sup>

<sup>a</sup> for the former Yemen, Arab Republic

<sup>b</sup> for the former Yemen, People's Democratic Republic

Cape Verde, Samoa and Vanuatu are all micro-states and islands. All of them have very low values on the EDI. Vanuatu and Cape Verde are marginally above the cut-off point on the APQLI, much less than required for the purpose of graduation; Samoa, however, is well above it (APQLI: 68). The current per capita GDP of all three countries is above the cut-off point on the per capita GDP criterion, and they are even above the US \$ 100 margin required for graduation. In the case of Cape Verde, however, the current level of per capita GDP is a result of strong currency appreciation since 1986, which is to say that the current level is highly unrealistic and has been that high only for a few years. All three countries are recipients of substantial official development assistance. For the period 1970-1987, ODA as a percentage of GDP was estimated at 60.0 for Cape Verde, 25.3 for Samoa and 51.2 for Vanuatu. This suggests that the levels of incomes in these countries have for a long time been dependent on external assistance, without which they could not be sustained. While such high levels of ODA are typical for very small countries and do not directly affect the calculation of GDP measured in local currency units, it is also true that their exchange rates are influenced by such flows. In the absence of such flows, their exchange rates would be much higher, and their GDP expressed in US dollars lower. At any rate, Cape Verde and Vanuatu do not meet the graduation rule. Because of the above considerations, the CDP suggests that all these three countries should be retained on the list. By contrast, Botswana, as the only one

### Inclusion rule

A country will qualify for inclusion in the list of least developed countries if:

- \* It meets all four formal criteria, namely, population size, per capita income, the APQLI and the EDI, subject to the judgement of the Committee for Development Planning on (a) the natural endowment index and its component indicators, (b) exports of petroleum as a percentage of total exports, and (c) Official Development Assistance as a percentage of GNP; or
- \* it meets the population and per capita income criterion, and the APQLI or the EDI, and is land-locked, is a small country with a population of one million or less, suffers from frequent severe climatic risks such as droughts, floods and cyclones. Inclusion will be subject to the judgement of the Committee for Development Planning on other considerations just as above.

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### Graduation rule

A country will be graduated from the list of least developed countries if;

- \* it has exceeded the cut-off point on the per capita income criterion relevant at the time a review is carried out, and the cut-off point on either the APQLI or the EDI for three years; or
- \* it has exceeded the cut-off points on both the APQLI and the EDI even if its per capita income remained below the cut-off point on the per capita income criterion. The margins by which the cut-off points need to be exceeded are set at US \$ 100 on per capita income, 5 points on the APQLI, and 3 points on the EDI.

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## WASTAGE

Currently, around 20% of Soviet oil, coal and gas brought out of the ground never reaches the end consumer. In addition, the actual usage by various consumers is inefficient. Figures prepared by John Wellemeyer show that if savings of 20% were achieved energy equivalent to 1.8 billion barrels per year, at an oil price of \$20 per barrel, or \$36 billion savings, might be possible. If even half of this were saved and exported, it could balance the books. Because of this different economic structure, energy usage is 100% more per unit of GNP than in the average OECD country.

In agriculture as well, around 20% of the Soviet crop never reaches consumers, due to poor harvesting, storage and distribution (in 1990 the wastage was even higher). At a wheat price of \$190 per metric ton this wastage is equivalent to \$9 billion, a figure matching to total food import bill of the former Soviet Union.

The lesson from this is that foreign investment in industries in the former Soviet Union (and the rest of eastern Europe) is vital to improve efficiency and boost foreign exchange earnings, and it would be of benefit to western investors and Soviet citizens alike.

*Source* : World Link, May/June, 1992

# Grass Roots Approach to Community Development Programmes

Binayak Rath

The pioneers of Indian Five-Year Plans had conceived planning as a tool of the people, for the people, and by the people. But unfortunately, a critical evaluation of our performance under various Five-Year Plans upto 1970s revealed that poverty, instead of being reduced had perpetuated further. Planners, policy-makers, and academicians diverted their concern towards the problems of the poor and downtrodden since 1970s. Thus from the Fourth Plan onwards promotion of equity and social justice by eradication of poverty became our slogan. A number of special programmes and schemes were incorporated into planning to improve the conditions of the downtrodden, particularly in the rural areas. The Integrated Rural Development Programmes (IRDP), first introduced on a pilot basis in the later part of 70s, acquired a nation-wide scale in the 1980s and became the main instrument for socio-economic change in the rural areas. However, post-evaluation studies of these programmes have revealed the utter failure of most of the schemes (Rath, 1986). Among the causes of their failure, many studies have established that there is no involvement of the people in most of the schemes. There has been alienation of the people from the government sponsored programmes. The growing indifference and the defeatist compromise with harsh realities by the rural masses have further aggravated their problems. In order to overcome such an impasse, a number of alternative measures have been investigated and suggested by the planners and policy-makers from time to time. This paper examines the scope of one such possibility namely, the Grass-Roots Approach (GRA) for implementation of our community development programmes where

involvement of the common man is given top priority. With the help of our field experiences from different parts of the country, a model based on Grass-Roots Approach has been developed, where the institutional professionals and voluntary organisations could play the key role in rural development.

## Need for a Grass-Roots Approach

Though from Fourth Plan onwards, one of the basic goals of our Five-Year Plans had been rapid increase in the standard of living of the people with emphasis on the common man, the weaker sections and the less privileged, no opportunities were provided for their involvement in the process of development. The tools of planning being primarily influenced by the top-down approach, where programmes and policies were determined on a centralised basis, neglected the regional, group, or individual requirements. The mismatch between the local/individual requirements and the programmes led to failure of most of the schemes. The development planners and policy-makers emphasis on the number games and excessive controls turned investment into illusions. The development fashions (Haq, 1976) relegated the common man to the back seat. Due to the utter failure of the schemes, the common man developed a disenchantment towards planning. In spite of democratic decentralisation policies through Panchayat Raj System, the common man could not find a place for himself. The colonial heritage of 'subordination' and 'exploitation' continued to dominate the rural society. The subordination of poor people to rich patrons, of sharecroppers to land owners, of overworked domestic servants to their masters, and of women to men continued to exist. This led to a dangerous phenomenon of dependency with a marked pessimism among the rural poor (Reddy, 1991). Thus, by the end of 1970s, the euphoria of development in the rural areas through Panchayat Raj institutions had died down.

**The Integrated Rural Development Programmes (IRDP), first introduced on a pilot basis in the later part of 70s, acquired a nation-wide scale in the 1980s and became the main instrument for socio-economic change in the rural areas.**

**Due to the utter failure of the schemes, the common man developed a disenchantment towards planning.**

The failures of the rural development strategies led to a rethinking in the 1980s for integration of development with 'liberation' and with emphasis on people's participation in the development programmes. The 'top-down' approach was proposed to be partially replaced by a 'bottom-up' approach and accordingly, emphasis was laid on decentralised planning. This bottom-up approach, otherwise known as grass-roots approach (GRA) has found a place in our Seventh Five-Year Plan document. Even the Eighth Plan has emphasised people's participation in the promotion of various social overhead facilities in our rural areas. To quote the former Prime Minister Mr. Rajiv Gandhi, "owing to too many leakages, nearly 85 per cent of the poverty alleviation funds fail to reach the poor. It is expected that this decentralised approach will check the many leakages associated with the implementation of the rural development programmes".

### **The GRA Model: A Theoretical Perspective**

The theoretical perspective of the GRA model is based on the political philosophy of Rousseau that "*the vital requirement is for each man to own some property—the most sacred of the citizen's rights—because the security and independence that this gives to the individual is the necessary basis on which rest his political equality and political independence*". To build up material assets the individual ought to be self-reliant and should participate in the development process. Therefore, Oakley and Marsden had reiterated that "*Self-reliance is highlighted in the context of participatory democracy. Emphasis is placed on an empowering process, which, through organisation gives people the strength to create a space for themselves, and to build up material assets to support their own self-reliant development.*"

In order to develop such a self-reliant system for rural development, one should take into account the available resources (financial, human, physical, and cultural) of the specific region, the attitudes of the people towards development, socio-political structures, and the structure of government as well as non-government organisations existing in the area. Furthermore, the role of outside organisations with professional and financial resources available for local use should be considered in framing

such a model. The model should aim at bringing together of these resources with a feeling of involvement. Thus, the basic approach of the GRA model should be an approach of Partnership for Rural Improvement (PRI) (Lassey et.al, 1985) With regard to the advantages of participation approach, Chopra et.al. (1990) have observed that the participatory approach has brought about changes in the organisation of work and is economically viable.

Taking into account the available resources and the socio-political factors, the GRA model can be viewed from the following holistic dimensions :

- \* Determination of a sequential process of developmental activities in the rural areas

**To build up material assets the individual ought to be self-reliant and should participate in the development process.**

- \* Identification of the collaborative structure or pattern of organisation
- \* Availability of functional knowledge and skill for operation of the system
- \* Intervention to initiate development
- \* Effective implementation of the development programmes/schemes

### **The GRA Model: An Operational Perspective**

The operational perspective of the model is based on social development, for which the Indian Planning Commission has recommended the Panchayat Raj and decentralised decision-making, where people's participation is viewed as the cornerstone. As regards the importance of social development, the World Development Report, 1990 has observed that in countries that neglect social development (like Brazil), poverty reduction has been less dramatic than those that have consciously sought to reduce inequalities (like Columbia).

The grass-roots approach or participatory approach being an alternative means for resource management where the conventional mechanism/government control did not register significant success, should emphasise micro/regional problems. For example, when we studied (Rath, & Sai, 1985), some typical problems of a backward region of U.P., viz. Jamo-Jagadipur area of Sultanpur district, we observed that most of the infrastructural devel-

operational activities like schooling, health, market and road network development have failed to deliver results to the common man. The people in general expressed their apathy and indifference towards most of the schemes undertaken under IRDP. With a view to finding a solution, we examined various socio-economic parameters and developed a model based on participatory approach. The operational perspective of such an approach is presented in a seven-unit view of development (fig. 1).

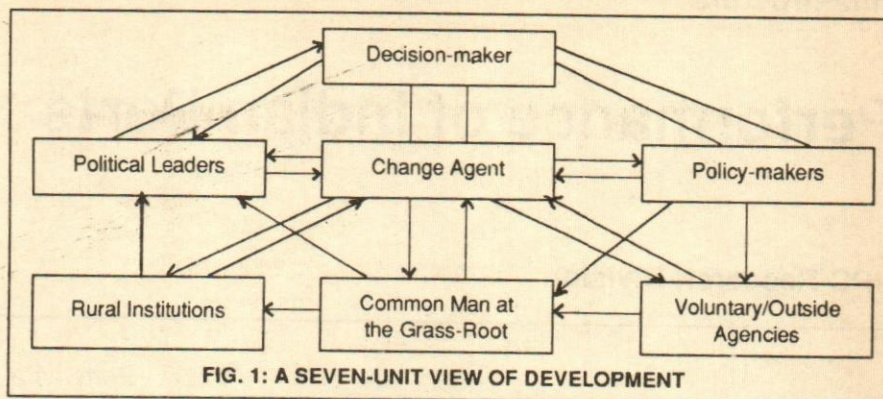


FIG. 1: A SEVEN-UNIT VIEW OF DEVELOPMENT

An analysis of the above mentioned interactive system shows that the 'change agent' plays a key role in this approach. He has to interact with all the parties involved in rural development, get the feedback from them, examine the problems and prospects in a holistic perspective, and then suggest a method of execution of the best schemes for removal of poverty in rural areas. Each of the agents/parties involved should have a willingness to work hand-in-hand or in co-operation with the change agent.

The best example of such a system has been recently reported from a village in Maharashtra named Ralegaon Shidhi in Ahmednagar district. The change agent's role has been played by Sri Anna Hazare in promoting this model village and the same has been an eye-opener for others who believe in the GRA model. The village which was earlier acutely draught-prone with all sorts of rural miseries, is marching ahead to self-sufficiency. While in 1976 the per capita income of Ralegaon Shidhi was Rs 250 to Rs 300, today it is over Rs. 2000. Now all modern amenities of cooking through biogas and solar system are available in the village. Windmills are used to pump water for irrigation and drinking purposes. There is active participation of women in the Panchayat Raj activities. The watershed development and nalla bunding have brought significant rise in agricultural productivity. There is a model school in the village. The twin mottoes of this success have been the spirit of community participation, and rural development through Student Labour (Shram Shakti Dwara Grameen Vikas).

### Concluding Observation

For promotion of the underdeveloped infrastructure facilities (for instance, the dilapidated school building structures, poor road networks, poor health facilities etc.) in the rural areas, the experts of Non-Government Organisations (NGOs) or academic institutions like University or technical institutions should come forward to play a cata-

lytic or change agent's role in their neighbourhood. In recent years, the NGOs have assumed a very significant role in the socio-economic development of the Third World countries. The activities of these organisations have fast expanded to diverse fields and areas. In order to operationalise GRA model, the academic institutions should undertake more field researches, interact with field officials, the common man, and other voluntary agencies. The new knowledge and skill of the experts should flow for the benefit of the common man. Of course, such an approach cannot attain success without the co-operation of all parties involved in development. In order to create such an awareness, we should develop a participatory scheme to improve the educational opportunities for the children in the rural areas. Such a scheme would bring about the involvement of the students, teachers, village youths, leading personalities of the region/area, voluntary organisation, Government officials, and above all, the common man at the grass-roots.

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# Performance of Indian Ports

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*The sea-ports of the developing countries are going through a process of rejuvenation in recent years due partly to the competition among the nations to capture the world market and partly to the introduction of sophisticated cargo handling techniques and innovations in the shipping vessels. The organisational set up and the work climate in the ports are also under-going phenomenal changes. This review presents an assessment of the performance of major Indian ports during the 1980s. The review also examines the scope of private-sector participation in port-related activities.*

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Ports as a subsystem of the total transport network and as a meeting point of other modes of transport serve a vital role in Indian economic development. A major part of India's foreign trade (about 95% in tonnage) is transported through her sea-ports; about 90 per cent of it being handled by the ten major ports and the remaining by 168 minor ports. The volume of cargo handled by our major ports has gone up from 50 million tonnes in 1965-66 to 153 m.t. in 1990-91. According to the Working Group Report on Port-sector for the VIIIth Plan, it is expected to reach upto 213 m.t. by 1994-95. With a drastically changing world trade scenario and changes in vessel-size, cargo handling etc., modernisation of port facilities assumes top priority. The economies of the developing nations are heavily dependent on their sea-ports as a transshipment point for most of their capital and intermediate goods. Normally more than half the value of an imported article is the cost of transportation. Therefore, performance of the ports can significantly affect the pace of development through changes in the prices of imported items, particularly raw-materials, intermediate goods, energy, machinery, spares and other consumables. Similar is the case with exports, it becoming cheaper in the overseas markets to the extent port operations reduce the incidence of costs on account of freight. Ports can facilitate transportation within the domestic market also by linking efficiently the sources of raw materials with the producers and the latter in turn with the market. As the port operations become efficient, i.e., by improving the speed and care of cargo handling, thereby reducing the *turn round time* (TRT) of the ships, discernible changes can be brought about in almost all sectors of the economy. The speed at which the sea-going

**Performance of the ports can significantly affect the pace of development**

traffic(freight) is transferred to road or rail is another factor which affects a port's efficiency. Therefore, any attempt to improve the port operations needs to be focussed on its cargo handling and related inter-model freight transfer. This study presents a detailed analysis of the performance of ten major ports in India.

The sea-ports of the developing countries are going through a process of rejuvenation in recent years due partly to the competition among the nations to capture the world market and partly to the introduction of sophisticated cargo handling techniques and innovations in the shipping vessels. The strides in the technology of port activities during the past two decades had drastically changed the methods of cargo handling. The organizational setup and the work climate in the ports also had undergone extraordinary changes. The modern cargo handling techniques(containerisation for instance) are bound to improve the efficiency of port operations significantly. The changes in the equipment and organisation of ports will have a positive impact on the skill composition of the workforce which in turn improves the productivity.

The development and performance of ports depend on a host of factors; a few of them being internal to the ports and the others external. An efficient port system ensures the development of an integrated domestic transport network. Here linking the ports with the inter-model transport system of roads and rail networks play a crucial role in reducing the cost of transportation. Modernisation of the cargo handling facilities in the ports is one of the issues that need urgent attention for the development of Indian ports.

**The stature of ports has increased significantly in recent years as one of the cheapest and environmentally harmless modes of bulk transport systems, compared to roads and rail networks.**

### Port Development in India

From the ancient times, Indian ports were engaged in trade and commerce with other parts of the world. The stature of ports has increased significantly in recent years as one of the cheapest and environmentally harmless modes of bulk transport systems, compared to roads and rail networks. Given the scattered nature of economic activities in the vast Indian sub-continent, only a well co-ordinated and integrated inter-model transport network can deliver the goods and services at the cheapest cost. In this context, port planning in India has a critical role in the

total transport planning. The investment decisions for a port must, therefore, comply with the pattern and content of trade for which the particular port caters to. For this, a thorough understanding of each port's hinterland potential(both demand and supply) should be analysed and updated from time to time. Also the investment for future port facilities should be governed by the trade and economic policies adopted by the country rather than considerations such as political pressures, backward area development etc..

In India the growth of port activities depends mainly on the pattern and content of trade which in turn depend on our Five Year Plan priorities. Port development was extended some importance only since the Fourth Plan—the investments undertaken during this plan period being more than the total investments undertaken in the port sector during all the three previous plans and the three annual plans(table 1). Since then the percentage of actual expenditure to allocation has shown a declining trend,

**Table 1: Plan-wise Investment in the major ports (Rs. crores)**

Five Year Plan	Allocation	Actual Expenditure	Act. Expend. as % to Allocation
Ist, 1951-1956	64.27	26.32	41.00
IIInd, 1956-1961	98.05	45.50	46.40
IIIrd, 1961-1966	110.30	92.95	84.30
Annual plan 66/67	37.38	23.66	63.30
Annual plan 67/68	43.48	25.49	58.60
Annual plan 68/69	42.72	39.67	92.80
IVth, 1969-1974	303.88	289.09	95.06
Vth, 1974-1978	533.60	414.35	77.65
Annual plan 78/79	92.99	58.60	63.02
Annual plan 79/80	81.00	42.38	52.32
VIth, 1980-1985	647.00*	765.00	118.20
VIIth, 1985-1990	1231.00*	126.00	10.24
Annual plan 90/91	271.98	194.95	71.68

\* includes minor ports also.

Source: Basic Port Statistics of India 1989, 1990.

except during the Sixth plan. A significant drop after the Fifth plan can be observed in the share of ports in total transport sector expenditure(table 2). This decline will have an adverse impact not only on port activities but the foreign trade as well, as more than 80 per cent of our foreign trade(in value terms) has been passing through the sea-ports up to 1986, which consistently declined to about 68 per cent in 1989-90(table 3).

In spite of substantial achievements during the post-independence period, our major ports are still confronted by low productivity, over-manning(30 - 40 per cent according to the Seventh Plan Mid-term Appraisal estimates), unsatisfactory operating ratios, and the inability of some ports to meet even the operating costs etc. According to the Port Planning Group's Report(1987), the handling rate



**Table 2: Plan-wise Outlay and Expenditure in the major ports**

(Rs.crores)

Five Year Plan Period	Port Sector Outlay	Trans-port Sector Outlay	Share of Ports in Trans-port Sector Outlay	Ports Sector Expenditure	Trans-port Sector Expenditure	Share of Ports in Trans-port Sector Expenditure
1951/56	37	506	7.3	28	434	6.5
1956/61	45	1299	3.5	33	1100	3.0
1961/66	86	1398	6.2	93	1983	4.7
1966/69	54	1079	5.0	53	1032	5.1
1969/74	195	2571	7.6	243	2522	9.9
1974/79	571	5420	10.5	488	5543	8.8
1979/80	97	1651	5.9	57	1668	3.4
1980/85	647	12080	5.4	765	13857	5.5
1985/90	1231	22596	5.4	126	6324	2.0

Source: Basic Port Statistics of India, 1989, 1990.

**Table 3: Foreign Trade by Sea In Total Foreign Trade in India**

Year	Total Exports (Rs. crores)	Share in Exports (%)	Total Imports (Rs. Crores)	Share in Imports (%)	Share of Sea-Trade in Total Foreign Trade (%)
1979/80	640467	76.7	901944	39.8	84.4
1980/81	671071	79.1	1254915	90.8	86.7
1981/82	780592	79.2	1360755	91.9	87.2
1982/83	880336	79.0	1429274	86.5	83.7
1983/84	977071	74.4	1583146	85.4	81.2
1984-85	117468	77.3	1713420	87.7	83.6
1985-86	1089459	71.7	1965760	87.9	82.2
1986-87	1256933	65.8	2020065	82.7	76.1
1987-88	1574123	64.8	2239897	80.5	74.3
1988-89	2028092	60.0	2769287	78.8	70.9
1989-90	2768147	60.1	3541188	73.9	67.8

Source: Basic Port Statistics of India, 1989, 1990.

'per tonne' at the Indian ports is cheaper in comparison to the ports of Singapore, Srilanka etc.. The vessel's waiting time in our ports, on the other hand, ranges from 2 to 30 days compared to 2 to 5 days in the developed country's ports with modern equipments. The total cost goes up as the cost of idle time also is added to the freight cost. The Seventh Plan Appraisal(1985-90) perceived an emerging crisis in this sector, which has its moorings in both physical and financial performance of the port sector. To avoid it, the Mid-term Appraisal advocates specific steps like capital restructuring, tariff reforms and adoption of more economical ways of working including reduction in staff strength. It also recommends mono-commodity berths for handling commodities in order to make optimum use of available capacity and assets. It is imperative to examine aspects like equipment productivity, operational performance, manning standards, and financial returns. As each major port enjoys its own advantages, a detailed port study must

envisage a close perusal of its origin, development and recent activities in comparison to its hinterland's development potential.

### Port Productivity: Conceptual Background

The growth of a port is dependent on its sound operating economics and financial performance. The two main components of the operational efficiency of a port are its employees' performance and the efficiency in equipment use. While its physical performance can be measured by the conventional productivity ratios based on the methodology followed in the case of a firm, the general measures of efficiency of the port can be analysed by the more specific port efficiency indicators such as, the average turn round time(TRT,in days), average pre-berthing waiting time(days), percentage of idle time to time at berth, output per ship berthday(tonnes)<sup>1</sup> and the like (Anil Kumar, 1988).

The conventional measure of productivity viz, output per unit of input is inadequate to capture port's efficiency due to its specificity in terms of nature of activities. The output per worker also does not convey the efficiency fully, as the average daily employment differs with the level of output. This leads us to use specific port performance indicators such as the average productivity per effective hook-hour, average output per man-shift, turn round time, etc. Table 4 gives a list of direct and indirect port efficiency indicators which are normally followed in the context of productivity evaluation of a port.

Usually, port studies in India are in the form of reports/inquiries undertaken by committees appointed to review some specific aspects of port activities. These reports are mostly technical in nature and rarely look into the entire working of the ports. Johri & Aggarwal (1968), for instance, measured labour productivity of Indian ports for the period 1954 to 1966, by the turn round time(TRT) of ships, cargo handled per unit of labour and the direct labour cost of cargo handling. The TRT is defined as the time taken by the vessel to enter the yard, load and unload and also return to the main channel. This study has shown that the proportion of idle hours to total shift hours among Indian ports varies from 25 to 40 per cent. This leads us to the concept of 'effective time worked' by the labour. As the

1. When we consider the port as a firm/unit, the output is measured as cargo handled(import and export) measured in tonnes. The employees and workers of the port are of two types, fixed and variable. While the former is paid irrespective of the level of activities, the latter varies according to the volume of output. The capital stock is measured in terms of book value of net block(excluding the work in progress) following the perpetual inventory method.

**Table 4: Port Efficiency Indices**

Direct Measures	Indirect Measures
1. Performance of Employees	1. Turn Round Time(hours)
2. Efficiency in Capital Use	2. Ave. Output per Effective hook-hour
3. Partial Productivity Ratios	3. Ave. Output per man-shift
4. Cost per tonne of cargo handled	4. Percentage of idle time to time at berth
5. Cost of stevedoring operations	5. Output per ship berth -day
6. Cost of ships time in ports	6. Ave. pre-berthing waiting time
7. Technological change	7. Vessels waited more than 5 days before berthing(number)
8. Operating ratio	8. Effective time worked
9. Net surplus or deficit	9. Ave. berth occupancy(%)
10. No. of vessels sailed	10. Vessels waited more than 5 days

port work consists mainly of cargo handling operations, one of the ways to monitor the efficiency is to see how fast the ships are being cleared from the port, i.e., the 'turn round time'(TRT) of ships calling at the port. Eventhough the TRT is influenced by many other factors like the berthing and mechanical facilities available, co-ordination and supervision within the port, etc., labour efficiency is its most important determinant. Therefore, the trends in TRT can be taken as an indication of the corresponding labour efficiency in cargo handling operations.

Port studies conducted by United Nations Conference on Trade and Development UNCTAD(1978) came to the conclusion that increase in cargo-handling productivity will not alone suffice for a higher berth throughput and an increase in ship handling rate; there should be a similar gearing-up of related activities like storage, customs clearance etc. The UNCTAD study also introduced concepts like the 'rated productivity' and 'effective productivity' as the two basic elements to measure the cargo-handling performance of a port. While the former is defined as tonnes of cargo each gang handled when the port works for one hour without interruption, the latter also takes into account the interruptions during the shift working. According to the UNCTAD study, the experience of many ports has shown that the productivity of labour and of administrative personnel depends not only on their professional skills alone but, to a great extent, on their satisfaction with the conditions of work and their interest in it.

**Increase in cargo-handling productivity will not alone suffice for a higher berth throughput and an increase in ship handling rate; there should be a similar gearing-up of related activities like storage, customs clearance etc.**

Partial productivity indices are the average products of the respective factors of production(labour and capital). Both Salter(1966) and Kendrick(1961) have started their analysis by drawing attention to the very limited usefulness of the time honoured but 'partial'(Kendrick's term) productivity ratio of output per unit of labour(in terms of either man-days or man-hours). The partial labour(or any other factor) productivity ratio can be useful in measuring the saving in that input which is achieved over time. The volume of output, the numerator of the ratio, is dependent upon factors such as labour and capital employed, the state of technology, organisational characteristics, the scale of operations, the degree of capacity utilisation, changes in demand, competition, relative factor prices, and also external factors of various kinds.

Labour productivity is the ratio between output and labour input. In the present study we measure both output and labour in physical terms, i.e., output is measured as cargo handled in lakh tonnes and labour input in terms of total number of employees. A more meaningful picture of the trends in labour productivity can be obtained from the disaggregated data on labour input(e.g., shore and casual labour) and also output(e.g., break bulk cargo, POL cargo, containerised cargo.). The efficiency in capital use is captured through the measurement of capital productivity and capital intensity of the port concerned. The capital stock is measured in terms of the value of net block(excluding the work in progress) following the perpetual inventory method. For purposes of the present study, following Banerji(1975), we took the net block of capital assets as the book value. For the base year, capital stock has been reckoned as double the book value for 1982 at 1982 prices. For subsequent years deflated yearly investments at 1982 prices were added to the base year. We have also estimated the total factor productivity(TFP) growth of different ports in order to capture the effect of technical progress on their performance. The TFP has been defined as the ratio of output to a weighted combination of labour and capital; the weights being the shares respectively of capital and labour in value added. Value added by the port has been defined as the sum of the wages and salaries, depreciation, gross surplus and finance and miscellaneous incomes. For purposes of estimating the TFP in ports we have taken value added as the output, and the share of labour is calculated as the share of wages and salaries in value added. The share of capital is calculated by subtracting the labour share from unity. This implies the assumption of constant returns to scale in the port operations. The required data have been obtained from the Annual Administration Report of the respective ports. We have used the wholesale price indices of

machinery and machine tools including electrical machinery for deflating capital and depreciation, and the general index of wholesale price is used for deflating the gross surplus and finance and miscellaneous incomes. The Index of Consumer Prices (Industrial workers) is used for deflating the wages and salaries. The year 1982 has been taken as the base year for all these calculations.

### Port Performance: A Disaggregated Analysis

We have taken ten major ports for our analysis. They are being grouped into two: the first group consists of the older ports of Bombay, Calcutta, Madras, and Cochin, Visakhapatnam and the second group includes the newer ones viz. Kandla, Paradip, Mormagoa, Tuticorin, and New Mangalore. A close perusal of the history of development of our major ports reveals that each came into existence at various points of time catering to the typical development needs of the region concerned. The ports at Calcutta, Madras, Bombay, Cochin and Visakhapatnam developed during the inter-war (1914-1944) period and Kandla, Mormagao, Paradip, and Tuticorin came up since independence. One can pinpoint the emergence of various interest groups and other landmarks in the development of transportation such as the expansion of railways and the opening of the Suez Canal, as the reasons behind the spurt in traffic growth in our older ports. However it appears that in recent years, traffic related economic factors were given less weightage in the investment decisions on these ports. Table 5 gives a glimpse of the Indian port sector.

Table 5: Glimpse of Indian Port Sector

Major Ports	Establishment (Year)	Pilotage length (km)	General Cargo berth (no.)	Transit Sheds (no.)	Warehouses (no.)
Calcutta	1893	232.0	20	27	59
Bombay	1875	9.6	25	35	27
Madras	1916	8.0	8	10	12
Cochin	1930	10.5	8	11	7
Vizag	1933	2.2	8	7	3
Kandla	1955	14.5	6	9	4
Mormagoa	1963	5.0	5	4	6
New Mangalore	1974	6.0	-	2	2
Tuticorin	1974	4.0	6	15	3
Paradip	1966	2.0	3	5	4

Source: Basic Port Statistics of India, 1989

### Traffic Handled

Appendices 1-5 give details of the traffic handled through the major ports of India. There is a definite increase in tonnage for items like petroleum oil &

lubricants (POL), break bulk cargo and others & containerised traffic. A disaggregated picture of the traffic handled shows increase in tonnage of iron ore and coal, followed by a substantial decline in the traffic of foodgrains, fertilizers, etc. (Appendix.1). In fact, this trend clearly shows the emergence of certain commodity combinations each Indian port typically caters to. Port-wise details of cargo handled (Appendix.2) reveal some advantage accruing to a few ports in the case of specific group of commodities. For instance if we take the POL group, an impressive increase in tonnage share can be observed in the ports of Bombay, Kandla and Madras only, whereas the need for this commodity in all the centres of economic activity is beyond doubt. The issues arising out of this kind of a biased commodity transportation, such as limited capacity of the refineries operated in these ports' hinterland and the additional cost of transportation incurred by other modes etc. need to be reconciled with a balanced regional growth approach in mind. The port planners can make decisions for future investments based on the above port-utilization trend. Similarly in the case of containerised cargo an overall increase across the board is witnessed. This indicates less concentration in investments in modern equipments for the ports which enjoy certain advantages for operating this new technique. Appendix 3 reveals that the commodity-wise capacity utilisation of the major ports of India has not been satisfactory. In some cases the utilisation exceeds the capacity, this needs careful scrutiny. It is forecasted that Indian ports will handle 280 million tonnes of traffic by 2000 A.D. against the current capacity of 150 m.t. It is also predicted that there will be a spectacular growth in coastal traffic from 48.2 m.t. in 1989/90 to 90 m.t. in 2000, due to the increase of coastal coal and iron ore traffic (Appendix 4). This implies another 90 per cent addition to coastal traffic by 2000 A.D. The growth of coastal traffic is another potential area for increased revenue to Indian ports sector, provided the investment and planning are guided by such considerations. In both the overseas and coastal traffic handled the 'unloaded' traffic is more than the loaded item. This aspect also needs careful analysis.

### Containerisation

Containerisation of freight was first introduced in the United States in 1956 and was confined to the developed countries which were faced with acute shortage of port labour. This was later extended also to their trading partners in the developing countries. Due to its many advantages, the Third-World ports adopted this new freight transport technique. The growing break-bulk international

container trade necessitated changes in both the existing facilities of the developing country's ports and the skill of its workforce. The first fully containerised vessel called at Cochin port in 1973. And from then onwards most of the round-the-world mariner class fully containerised vessels started visiting the ports of Bombay, Madras, Calcutta and Cochin. In 1982-83 these ports shared about 96.85 per cent of the total container traffic handled by Indian ports which declined to 90.89 per cent in 1988-89.

The full utilisation of containerisation warrants a co-ordinated effort by both the road and rail networks, such as increasing the road width so as to enable door to door delivery. There should also be a whole hearted effort to develop dry ports, container stuffing and destuffing centres, and also Container Freight Stations(CFS) to improve the efficiency of this mode of transportation. The report of the Port Planning Group(1987) revealed that by the year 2000 A.D. the container traffic of Bombay is likely to reach about 6.5 lakh twenty equivalent units(TEUs). But as of 1989-90 it can service only 1.8 lakh TEUs. Similar gap in actual capacity can be observed in the case of the ports of Calcutta, Madras and Cochin. This calls for immediate augmentation of container handling capacity in selected ports.

Technological change in the port activities may be defined as the percentage of containerisation in the total general cargo. It can be observed that the ports of Bombay, Calcutta, Madras and Cochin are far ahead of others(Appendix 5). However, the capacity utilisation of the main port implements of these ports does not give a satisfactory record for the last three years(Appendix 6).

### Labour & Employment

There is a decline in the number of port employees during the period 1980-1990, from 112934 to 98760 (excluding class I & II officers). Ports at Bombay, Calcutta & Haldia, Madras and Cochin have shown significant declines(Appendix. 7). The decline was sharp in the case of Dock Labour Board employees(Appendix.8), partly reflecting the impact of technological changes on employment. The fall in the number of cargo handling workers is more prominent among the ports at Calcutta, Bombay etc. This is an encouraging trend given the historic over-manning or surplus labour problems prevailing in the Indian port sector. The number of cargo handling workers in all the major ports also has shown a steady decline during the period 1987-89 but by a lower order.(Appendix. 9). Further, the experiences of the developed nations' port activities clearly show that the efficiency of port operations

can be enhanced by enforcing reduced manning standards. The reduction in port labour due to technological development in the ports of Rotterdam and Antwerp of England, which ranked first and second in cargo handling is presented in table 6.

**Table 6: Employment in the Ports of Rotterdam and Antwerp**

Year	Rotterdam (Nos.)	Year	Antwerp (Nos.)
1971	12433	1970	15000
1981	9598	1982	9158
1991	900	1991	9000

Source:National Institute of Port Management News, January 1992.

For reducing port labour, the U.K. ports adopted multi-skilling of labour. This reduced their gang-sizes to half. Most of their ports were privatised and the work has been entrusted with the stevedore companies. The port authority's job is only to spare berths, transit sheds and equipment to the stevedores. The improvement in their port productivity is given in table 7.

**Table 7: Comparison of Employment & Output Handled in UK and Indian Ports**

UK Ports	No. of Employees as on March 1990	Total cargo Handled during 1990 (million tonnes)
New port	125	2
King's Lynn	51	1.2
Immingham	120	39
Hull	130	7
Liverpool	600	23
Southampton	290	29
Thamesport	150	25
Indian Ports	No. of Employees as on 1990	Total Cargo handled during 1990 (million tonnes)
Bombay	29349	27.75
Cochin	5781	7.12
Calcutta	23643 *	14.69
Kandla	4603	18.92
Madras	11346	23.94
Mormagoa	3614	14.17
Newmangalore	1328	7.66
Paradip	4841	6.18
Tuticorin	2270	5.32
Vizag	10848	21.12

Source: 1. National Institute of Port Management News , January 1992.

2. Basic Port Statistics of India, 1990.

\* includes Haldia also.

The case studies made by the World Bank on the ports of Chittagong, Singapore, and Hongkong reveal that these ports also made strides in productivity of their cargo-handling labour, equipment and facilities over the last few decades. The study noted that some increase in produc-

tivity occurred because of changes in the mix of labour and equipment used for different activities. The experiences of some of these ports are given in table 8.

**Table 8: Improvements in Output handled at Some Foreign Ports**

Port of Chittagong (Bangladesh)		
Cargo type	Total Cargo handled(tonnage) (million tonnes)	
	1977	1982
Total	3447.0	5650.0
Imports	2936.0	5147.0
Exports	511.0	503.0
Containers	0.2	75.0
<b>Dry Cargo</b>		
No. of vessels	631.0	944.0
Avg. tons per vessel(1000's)	3.0	4.0
Avg. days at berth/vessel	5.8	5.7
Avg. tons per Vessel/day(1000's)	0.52	0.70
Port of Singapore		
Cargo Type	Tonnage growth(million tonnes)	
	1977	1982
Containerised traffic	5.73	15.60
Gen. cargo	12.19	18.36
Oil & bulk	45.31	61.96
Other bulk	2.59	5.48
Total	65.82	101.49
Singapore port		
Cargo type	Tonnage (million tonnes)	
	Ten year increase(%)	Average annual increase
Container traffic	943	26.4
Gen. cargo	50	4.1
Oil & bulk	35	3.1
Other bulk	135	9.0
Total	67	5.3
Port of HongKong		
Cargo Type	Tonnage Handled (million tonnes)	
	1977	1982
Total(handled & discharged)	23.80	38.00
Total container throughput*	1.26	1.66
No. of Vessels(1000's)	8.90	11.10

\* % of TEU accounted for by transshipment boxes ranges 30-40 per cent.

Source: John Arnold, 'Port Tariffs, Current Practices and Trends', The World Bank Discussion paper, Feb. 1988.

## Financial Performance

According to the Major Ports Reforms Committee (MPRC), depreciation was a major source of generation of internal funds in the Indian ports. The committee also found the ratio of net profits to net capital employed to be

**The failure of the major ports to achieve a reasonable rate of return, can be traced to the delayed investment policies or managerial failures to ensure optimal utilisation of assets.**

low. The Bombay Port and to a lesser extent Calcutta and Madras ports have been generating surpluses from oil revenues, demurrage earnings and estate rentals. According to MPRC, the failure of the major ports to achieve a reasonable rate of return, can be traced to the delayed investment policies or managerial failures to ensure optimal utilisation of assets, other factors being outside the control of the port management.

The details of the operating ratio and the net surplus/deficit of the major ports are given in Appendix 10. The operating ratio is defined as the percentage of operating expenditure to operating revenue. The operating expenditure of most ports has been increasing at a faster rate than the operating revenue. The Major Ports Reforms Committee(MPRC) felt that even as a service industry, the ports should be run on commercial principles, implying that the ports should be operated in a competitive environment. The committee recommended restructuring of the port pricing policies and thereby generating their own resources for development. The record of the physical and financial performance of our ports suggests that even with the availability of inputs, physical facilities and skilled labour the port operations could not be performed well. The returns are lower in relation to the investments which have gone into these ports. The profits made by the stevedoring operators with negligible investments in the port's infrastructure were quite prominent. The stevedoring operators have hardly made any capital investment in physical facilities except providing handling gear and supervisory staff.

## Operational Performance

Some crucial port performance indicators of major ports in India are given in table 9. While we can observe improvements in the case of such aspects as average turn round time(TRT) and output per ship berth-day, the experience with regard to average pre-berth in detention has been mixed; first a fall to 1.8 in 1986-87 followed by a sharp rise to 2.6 in 1989-90.

The operational performance of the major ports based on selected port performance indicators such as the aver-

**Table 9: Selected Performance Indicators for Indian Ports**

Year	Employment (000)	Total Vessels (No.)	Average Turn Round Time (days)	Ave. Pre-berth in Detention (days)	Output per Ship berth day (tonne)
1982/83	113	7457	9.9	2.9	2216
1983/84	108	7044	10.8	3.2	2401
1984/85	106	7433	11.9	3.6	2314
1985/86	105	8263	10.8	3.2	2585
1986/87	102	8505	7.3	1.8	3080
1987/88	102	8514	7.4	2.1	3391
1988/89	101	8778	8.4	2.7	3347
1989/90	99	8873	8.8	2.6	3273

Source: Basic Port Statistics of India, 1989, 1990.

age pre-berthing time(days), average berth occupancy(%), average TRT(days), output per berth day(tonnes), percentage idle time to time at berth, vessels which waited more than 5 days before berthing(no), and cargo handled(million tonnes) are given in Appendix 11. Among them the output per ship-berthday indicator reflects the efficiency of an amalgamation of several port activities like pilotage, towage, cargo handling, shed management, railway operations, customs operations etc. The percentage of idle-time at berth at various major ports constitutes, on an average, 36 per cent of the total time at berth, the range being 16—56 per cent. Minimisation of the idle time of vessels at berth will improve the TRT of vessels and, thereby, labour productivity. Appendices 12, 13, 14, and 15 give the vessel category-wise performance of the above indicators. The unsatisfactory performance of the container vessels in the case of all the indicators is clear.

### Productivity Indicators

The output per employee of major ports is given in table 10. The performance of Calcutta and Bombay were significantly lower compared to the ports of Madras, Cochin, Kandla etc.. Mormagoa doesn't show much change in the ratio. The average output per employee at all major ports for different types of cargo is given in table 11. In the case

**Table 10: Labour Productivity in Major Ports (Tonnes/Employee)**

Year	Calcutta	Cochin	Madras	Bombay	Kandla	Mormagoa	New Mangalore	Tuticorin	Vizag
1982	304 *	871	968	595	2375	3911	1384	1182	994
1983	325	891	1003	675	2962	3603	1856	1435	858
1984	345	750	1079	750	3011	3301	2175	1502	844
1985	351	678	1189	868	3499	3709	2656	1671	1000
1986	446	872	1496	790	3497	4250	2868	1846	1331
1987	471	1156	1720	810	3596	4052	4164	1797	1358
1988	525	1139	1989	954	3985	3617	4648	1863	1395
1989	576	1333	2077	967	3843	4220	5399	2243	1854
1990	621	1231	2109	945	4110	3920	5768	2343	1946

\* Includes Haldia also

**Table 11: Output per Employee\* in Indian Ports during 1980-89 (tonne)**

Ports	POL	Brk. Bulk	Others	Total
Calcutta	0.187	0.103	0.097	0.387
Madras	0.541	0.496	0.287	1.325
Bombay	0.466	0.049	0.230	0.747
Cochin	0.564	0.702	0.121	0.930
Kandla	2.279	0.215	0.534	3.028
Vizag	0.351	0.699	0.083	1.132
Mangalore	0.321	1.607	0.747	2.675
Mormagoa	0.225	3.534	0.128	3.887
Tuticorin	0.190	1.131	0.260	1.581

Source: calculated from given data.

\* Employment figure excludes class I & II officers.

of total cargo, labour productivity is clearly high for newer ports of Kandla and Mormagoa, compared to the older ports of Bombay and Calcutta. Whereas for POL, Bulk cargo and Containerised cargo it is difficult to identify any such group showing better performance.

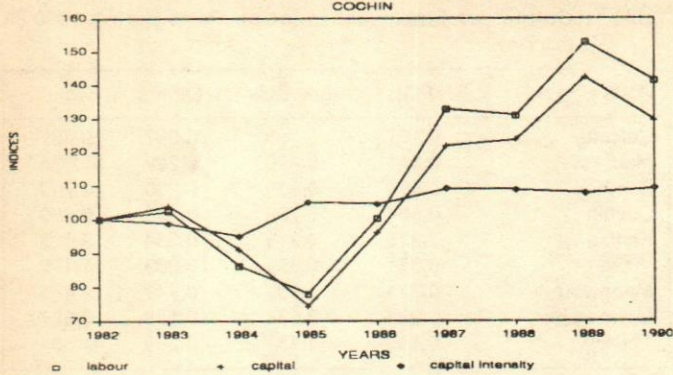
The capital productivity, i.e., output per unit of capital employed is calculated for all the major ports(table 12). In the case of Bombay it increased from 0.013 in 1982 to 0.019 in 1989. In the case of capital intensity, defined as the capital per unit of labour, a steady or declining trend in most of the ports can be observed. For Bombay and Calcutta the ratio doesn't show much change over the period(table 13). In order to see a comparative picture of these partial productivity ratios, we have plotted their indices with base 1982 = 100.(figure 1). The labour productivity has shown a higher growth than the capital productivity for the ports of Calcutta, Visakhapatnam, Bombay, Madras and Cochin, and a lower magnitude for Tuticorin, Newmangalore and Kandla. The capital intensity for most of the ports has shown a declining trend except for Bombay and Calcutta.

The port-wise details of man-days lost per 1000 man-days employed for certain ports also support the above finding of increasing trend in labour productivity; compared to 1985 the indicator shows a clear improvement in 1990 in most of the ports(table 14).

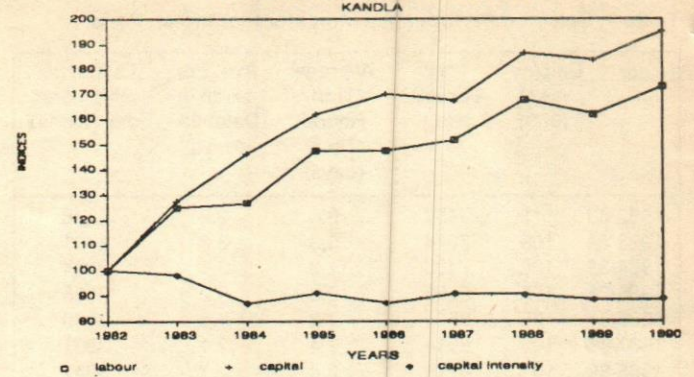
### Total Factor Productivity

The TFP measurement partly reveals how far the technological factors contributed to the performance of the port concerned. The TFP as a residual brings out the

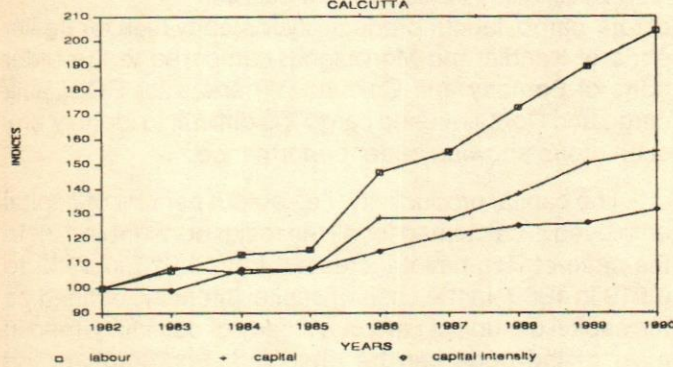
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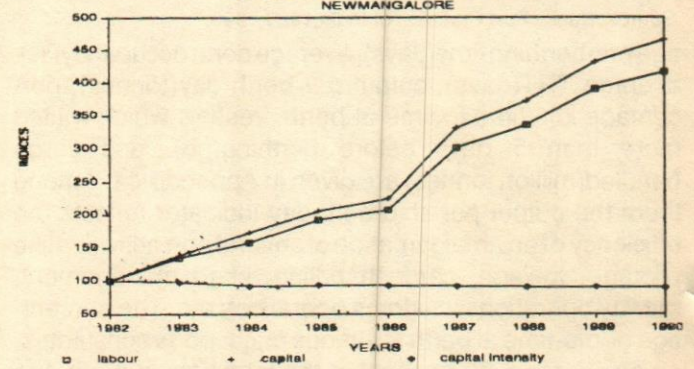
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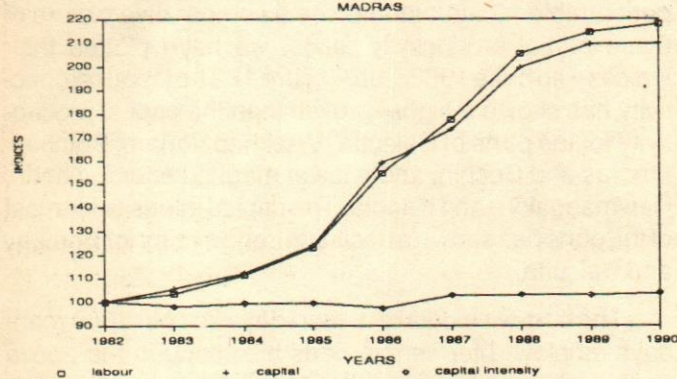
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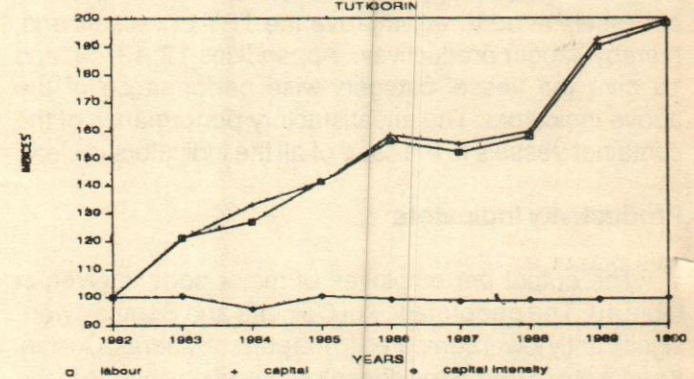
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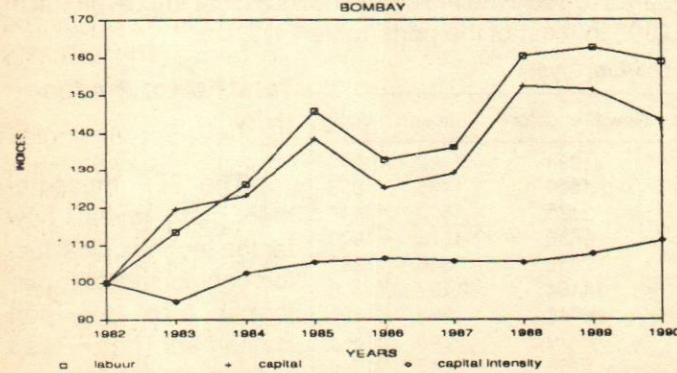
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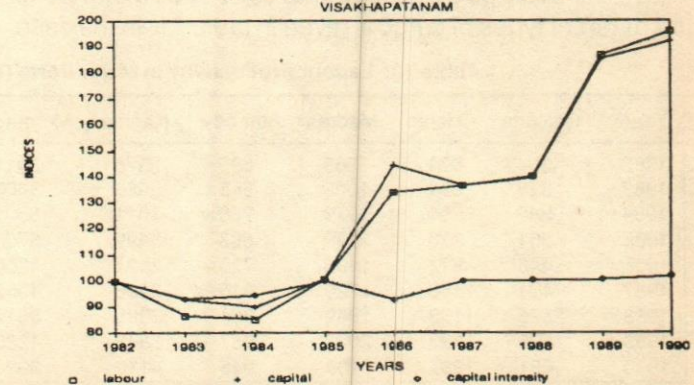


FIG. 1: PRODUCTIVITY AND CAPITAL INTENSITY INDICES (1982=100)

**Table 12: Capital Productivity in Major Ports (Lakh tonne/Rs. Lakh)**

Year	Calcutta	Cochin	Madras	Bombay	Kandla	Mormagoa	New Mangalore	Tuticorin	Vizag.
1982	0.005 *	0.027	0.007	0.013	0.012	0.158	0.001	0.003	0.003
1983	0.005	0.028	0.008	0.016	0.015	0.135	0.001	0.004	0.002
1984	0.005	0.024	0.008	0.017	0.018	0.134	0.001	0.004	0.002
1985	0.006	0.020	0.009	0.019	0.020	0.150	0.002	0.004	0.003
1986	0.006	0.026	0.012	0.017	0.021	0.161	0.002	0.005	0.004
1987	0.006	0.033	0.013	0.017	0.020	0.156	0.003	0.005	0.004
1988	0.006	0.033	0.015	0.021	0.023	0.140	0.003	0.005	0.004
1989	0.007	0.038	0.016	0.020	0.023	0.161	0.004	0.006	0.005
1990	0.007	0.035	0.016	0.019	0.024	0.149	0.004	0.006	0.006

\* Includes Haldia

**Table 13: Capital Intensity in Major Ports (Rs. Lakhs/Employee)**

Year	Calcutta	Cochin	Madras	Bombay	Kandla	Mormagoa	New Mangalore	Tuticorin	Vizag
1982	0.601 *	0.320	1.246	0.430	1.895	0.247	13.26	3.494	3.100
1983	0.594	0.315	1.221	0.408	1.855	0.266	12.85	3.508	2.884
1984	0.645	0.303	1.238	0.441	1.645	0.245	12.06	3.344	2.932
1985	0.646	0.336	1.239	0.453	1.724	0.247	12.37	3.505	3.098
1986	0.689	0.334	1.212	0.458	1.648	0.263	12.24	3.453	2.871
1987	0.730	0.349	1.279	0.454	1.718	0.273	12.06	3.432	3.099
1988	0.752	0.348	1.283	0.453	1.706	0.260	11.97	3.451	3.114
1989	0.758	0.344	1.281	0.463	1.672	0.262	11.99	3.453	3.123
1990	0.791	0.349	1.294	0.478	1.681	0.263	11.84	3.473	3.163

\* Includes Haldia

**Table 14: Port-Wise Details of Man-days Lost Per 1000 Man-days Employed**

Year	Kandla	Bombay	Mormagoa	New Mangalore	Cochin	Tuticorin	Madras	Vizag	Paradip	Calcutta/ Haldia	Total
1985	Neg.	1	62	-	3	5	2	Neg.	21	1	2
1986	1	1	15	-	2	1	Neg.	1	50	1	3
1987	Neg.	11	3	Neg	Neg	Neg	1	Neg	18	1	5
1988	Neg	1	18	2	Neg	6	1	Neg	-	2	1
1989	17	19	97	28	22	20	23	20	18	15	20
1990	4	Neg	47	Neg	1	4	2	Neg	-	Neg	1

Source: Annual Administration Reports of various ports.

role played by factors other than capital and labour that have contributed to the performance of the port such as managerial and organisational factors, skill improvement through learning by doing, size of the port and economies of scale etc. The TFP index based on three different approaches (Kendrick, Solow, and Translog) (Goldar, 1986) has been calculated for the nine major ports. The ports of Mangalore and Paradip have been excluded due to lack of data from their annual administration reports. Most strikingly all the above indices show a similar growth

physical productivity indices of both labour and capital in the case of Bombay. Thus the decline in TFP in Bombay port could be attributed to the declining realised net income per tonne of output handled or the value added per tonne of output handled at major ports (tables 16 & 17). In other words, the port tariff has not risen to the extent warranted by the rise in the price indices used for deflating the value added i.e., index number of wholesale prices and consumer price index for industrial workers. This indicates to the urgent need for restructuring the port tariff.

Our analysis reveals that while the financial perform-

**Table 15: Average Growth Rates in TFP (1982-90) (In percentage)**

Indices	Calcutta	Cochin	Madras	Bombay	Haldia	Kandla	N. Mangalore	Tuticorin	Vizag.
Kendrick Index	5.83	8.48	9.13	-2.31	12.95	5.14	14.20	15.01	10.37
Sollow Index	7.43	11.68	8.63	-4.36	9.72	5.14	11.32	10.59	7.26
Translog Index	5.36	9.83	8.95	-3.17	12.27	4.29	16.66	9.00	9.70

Source: Calculated from the given data.

ance of Indian ports has not been satisfactory until the 90s, there has been moderate growth in their productivity. In general, both labour productivity

pattern. For instance, according to Solow index, the contribution of technology for growth in output for the ports of Calcutta, Madras, Haldia and Tuticorin were 7%, 8%, 9% and 10% respectively. Bombay port has shown a negative growth index (table 15). At the same time there is no decline in the



**Table 16: Income\*\* per tonne of output (Rs. in 1982 prices)**

Year	Calcutta*	Cochin	Madras	Bombay	Kandla	Mormagoa	New Mangalore	Tuticorin	Vizag.
1982	65.6	-	35.1	47.6	-	17.1	-	20.1	33.1
1983	73.1	29.5	34.2	43.1	-	17.4	23.9	19.1	33.4
1984	58.0	30.3	31.8	35.9	17.6	19.9	22.0	19.7	34.2
1985	72.4	46.6	39.2	38.5	18.0	20.3	-	23.5	39.2
1986	48.2	42.3	31.8	44.6	17.4	18.1	24.5	24.4	30.8
1987	50.9	36.3	27.8	40.9	16.1	18.9	21.6	22.2	33.9
1988	42.0	33.5	23.4	35.7	14.8	18.3	19.4	19.4	30.8
1989	47.2	35.5	24.8	41.5	19.4	18.5	17.8	21.0	29.1
1990	45.6	44.1	23.6	46.0	17.9	19.2	16.0	22.1	30.3

\* Includes Haldia.

\*\* Covers cargo handling and storage charges and port and dock charges including pilotage.

**Table 17: Value added\*\* per tonne of output (Rs. in 1982 prices)**

Year	Calcutta	Cochin	Madras	Bombay	Kandla	Mormagoa	New Mangalore	Tuticorin	Vizag.
1982	60.2	25.3	34.1	57.7	23.5	0.29	24.9	16.9	27.4
1983	68.1	20.9	31.6	53.9	18.9	0.25	15.4	17.8	29.5
1984	49.7	26.5	30.8	50.3	14.9	0.38	15.8	17.7	28.3
1985	67.9	32.0	40.8	51.8	16.7	0.38	18.3	22.4	32.5
1986	41.1	28.3	35.8	59.5	17.9	2.09	17.4	104.6	27.7
1987	46.6	26.1	32.1	57.8	16.7	2.88	17.4	98.9	27.2
1988	39.9	27.7	28.7	47.4	15.4	2.69	14.9	108.7	30.1
1989	45.6	27.5	30.7	55.1	17.6	2.22	18.7	133.6	33.6
1990	45.2	35.9	31.9	53.7	18.1	2.63	12.6	117.9	29.7

\* Includes Haldia.

\*\* Definition value added see text.

**Time bound studies on the demand and supply potential of each port's hinterland, thorough review based on recent developments in the nearby international ports (the competitors) etc., need also be undertaken in order to make our ports more efficient, economical and financially sound.**

indices and capital productivity indices have been growing at satisfactory rates. Consequently the total factor productivity (TFP) also increased at impressive rates in majority of the ports. The only exception seemed to be the case of Bombay where the total factor productivity (TFP) actually declined. This might have happened in the case of Calcutta also. However, the merger of data from Haldia into Calcutta might have obscured its real trends. While the case for improvements in operational performance is clear in all the ports there is an immediate case for a comprehensive approach towards 'Ports reforms'. Areas such as capital restructuring, tariff reforms and investments in modern cargo handling equipment are those which are likely to yield high returns in the context of the performance of our major ports. Simultaneously time bound studies on the demand and supply potential of each port's hinterland, thorough review based on recent developments in the nearby international ports (the competitors) etc., need also

be undertaken in order to make our ports more efficient, economical and financially sound. It should also emphasise on co-ordinating and adapting economical ways of working and transportation, like implementation of the mono-commodity berth, multi-skilling of the existing labour and a well planned inter-modal transportation network to deliver the goods and services at different locations with least cost. For this a concerted effort by the different modes of transport systems is essential.

## Recent Developments

The recent liberalisation trends in the Indian economy have brought into focus the need for radical changes in our port sector to meet the growing requirements of the trading and transport sectors. The issue of private sector participation for modernisation and expansion of port facilities is also receiving widespread attention in recent debates.

The history of private port dates back to the Anglo-Saxon trade regimes. The sixties of the present century witnessed the emergence of public or national port organisations and nationalised cargo handling companies mostly in the developing countries. The private sector ports re-emerged in subsequent years in countries like Malaysia and Jamaica to operate specialised terminals, especially container terminals. The UK privatised its 19 ports, which handle more than one quarter of their national port traffic. But the experiences of the ports of Singapore and Morocco reveal that public ports can also function equally well.

**The recent liberalisation trends in the Indian economy have brought into focus the need for radical changes in our port sector to meet the growing requirements of the trading and transport sectors.**

**A modern port should play a new role as a logistical platform for international trade and the integrated chain of door-to-door transport.**

Often, privatisation has been perceived as a means to end the inefficiencies prevailing in publically managed ports. Obviously, the ineffectiveness of any system arises mainly from the lack of flexibility in its mechanisms to adapt to a dynamic environment. However, irrespective of the nature of the ownership of the ports each port's objective should be clear and attainable. Privatisation can be one of the ways to reach it's objectives. But, before deciding on the nature of ownership the economic environment of the port system vis-a-vis the evolution of the international trade should be assessed as most of the nations have recently shifted their emphasis from the 'captive hinterland' of a port to a 'competitive single world market'. The main factors behind this transition are: (1) the shift from an import-substitution policy to an export promotion strategy, (2) the replacement of port-to-port routes by the network built around transshipment ports, made possible by the containerisation of freight.

In effect a modern port should play a new role as a logistical platform for international trade and the integrated chain of door-to-door transport. The authorities should rejuvenate the main catalysts in the system such as the forwarders, multi-mode transport operators, ship owners, port operators etc. In other words, though the share of the port cost is a meagre 5 per cent of the total transport cost, it must not be a debilitating factor for the whole of the port community's functioning. The port should be recognised as a crucial link in the functioning of an integrated delivery system.

In one sense the move towards private sector participation in port activities can be viewed as a genuine response to promote the development of a viable, competitive and commercially oriented sector. Broadly this may: (a) increase the choice of services offered to users, (b) reduce the cost to the state and (c) make personnel and organisations aware of their responsibilities towards increasing the effectiveness of management and the profitability of investments. But it has its lacunae as well: being unorganised the private sector looks for mainly short-term profits besides being unwilling to make heavy and long-term investments and to develop human resources. It may result in minimizing the cost for the operator and not necessarily for the user. This may necessitate prescribing

limits to the involvement of the private sector to prevent the port from losing its basic purpose. Further this may involve strengthening of the regulatory mechanisms so that either the transfer of port installations or their rental or leasing and operation avoid excesses in economic (pricing), technical (maintenance), and social (employment) domains.

**The move towards private sector participation in port activities can be viewed as a genuine response to promote the development of a viable, competitive and commercially oriented sector.**

In the emerging competitive environment, in order to achieve efficiency, privatisation has become a necessity due to the huge financial burden involved. Simultaneously a thorough restructuring of the organisational, operational and ownership aspects will have to be carried out extensively. In other words privatisation will have to be in a phased manner particularly after a detailed examination of the limits and advantages of the existing system. It may be necessary to create a reserve fund for renewing and improving inherited investments, a major part of which is old and obsolete.

Recent estimates placed the additional investment requirements in Indian Ports to be about Rs. 4,200 crores during the 8th Plan. It may be necessary to involve the private sector to meet this order of investment target. A recent World Bank study on Indian ports (it took only five major ports representing both the coasts, analysed the factors involved in the movement of break bulk, general and containerised cargo) observed that in India there exists a growing conflict between trade and transport, and if ports, as a renderer of services for both these sectors were not improved in terms of efficiency, our current emphasis on export led growth would run the risk of getting diluted. The study observes that, "India's trade performance will deteriorate if it does not adapt to the changing environment in international trade and distribution logistics". This report also highlights the present glaring lack of

**Privatisation will have to be in a phased manner particularly after a detailed examination of the limits and advantages of the existing system.**

interface between the port system and land transport and argues for a pronounced need for investment in the interest of this improved interface.

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Appendix 1: Commodity -wise Traffic Handled at Major Ports(%)

Year	POL	Fertiliser	Raw Material	Iron Ore	Coal	Food Grains	Others	Total (in million tonnes)
1950-51	8.3	1.5	.63	2.8	15.72	17.4	53.6	19.2
1955-56	28.5	1.52	0.26	12.32	11.65	9.38	36.3	22.9
1960-61	31.1	1.74	0.53	18.65	5.42	13.19	29.38	39.5
1965-66	32.5	2.25	1.47	20.8	3.9	11.88	27.14	50.2
1970-71	33.9	3.72	2.4	34.56	1.21	5.75	20.40	55.5
1972-73	36.3	3.72	2.4	34.3	1.51	2.03	19.71	58.2
1974-75	35.6	4.02	2.59	31.49	2.04	7.85	16.45	65.7
1976-77	33.8	2.43	2.80	32.17	2.13	7.20	20.17	67.7
1978-79	38.9	5.02	7.06	28.61	1.96	1.32	17.05	70.3
1980-81	41.8	5.33	2.41	28.45	2.63	1.21	18.14	80.2
1982-83	48.4	2.97	1.33	23.71	5.2	2.5	15.89	93.6
1984-85	46.3	3.99	2.75	24.61	4.18	1.24	16.92	105.8
1986-87	45.3	2.3	2.88	24.6	7.63	1.13	16.18	124.3
1988-89	44.4	1.57	2.79	22.31	10.63	2.33	15.91	146.7
1989-90	41.9	1.98	3.04	22.49	11.94	1.01	17.56	147.5

Source: Basic Port Statistics of India 1989 & 1990.

Appendix 2: Share of Cargo Traffic Handled at Major Ports (for specific commodities) (Percentage)

Year	Calcutta	Cochin	Madras	Bombay	Kandla	Tuticorin	Vizag	Mormagoa	New Mangalore	Paradip
Petroleum, Oil & Lubricants										
1961-62	12.64	5.76	5.1	58.4	5.65	-	12.76	0.35	-	-
1969-70	7.85	18.76	11.8	45.62	4.95	-	10.24	0.76	-	-
1974-75	9.74	15.14	13.81	43.98	7.35	0.32	7.14	2.52	-	-
1979-80	17.19	14.51	13.97	27.47	11.41	1.65	9.75	2.73	1.32	-
1980-81	15.35	11.81	13.48	26.79	22.72	1.32	7.11	1.75	0.75	-
1985-86	11.04	7.22	16.74	28.18	22.48	0.61	11.43	1.72	0.92	-
1988-89	9.92	9.61	13.45	29.23	20.3	0.72	10.73	2.01	0.78	-
1989-90	10.39	9.02	13.64	29.39	23.16	0.77	11.02	1.68	0.93	-
Fertiliser & Its Raw Materials										
1961-62	12.81	16.32	30.99	31.2	4.13	-	4.13	0.31	-	-
1969-70	8.41	6.31	11.91	39.39	12.69	-	19.47	1.82	-	-
1974-75	11.26	16.51	16.51	24.83	17.2	3.91	17.45	1.68	0.55	-
1979-80	7.23	11.19	12.52	23.42	11.97	11.7	14.5	3.39	3.42	0.66
1980-81	10.86	10.66	16.65	20.54	10.72	9.42	13.22	3.171	3.33	1.42
1985-86	14.27	11.3	14.35	15.46	9.27	13.58	14.25	4.53	3.22	2.72
1988-89	7.14	10.74	11.49	22.3	6.85	10.57	13.21	5.43	0.72	10.12
1989-90	9.14	12.01	9.9	16.52	7.74	7.91	7.37	5.28	1.55	6.19
Iron Ore and Coal										
1961-62	22.6	4.94	11.24	1.56	-	-	1.27	60.16	-	-
1969-70	7.58	0.36	12.53	-	-	-	24.7	45.41	-	9.42
1974-75	4.56	0.14	10.7	-	-	1.01	16.27	57	0.23	9.94
1979-80	3.29	-	11.71	-	-	1.74	24.31	51.46	-	7.49
1980-81	3.59	-	11.22	-	-	4.19	24.09	50.5	0.01	7.58
1985-86	6.37	-	13.67	-	-	6.62	20.52	39	6.21	7.52
1988-89	7.46	-	17.21	-	-	6.17	22.73	27.63	6.79	8.35
1989-90	8.22	-	19.07	-	-	5.76	21.68	24.46	11.57	9.39
Foodgrains										
1961-62	30.08	5.59	9.85	37.11	9.93	-	6.23	1.09	-	-
1969-70	19.16	4.52	23.09	34.21	12.79	-	5.57	0.66	-	-
1974-75	21.71	0.17	10.68	39.26	13.51	3.41	9.34	0.72	-	1.18
1979-80	-	1.98	29.04	24.53	-	20.65	19.75	-	1.26	2.79
1980-81	6.97	1.54	22.56	8.92	38.36	8.21	13.23	-	0.41	-
1985-86	-	0.44	12	53.66	26.65	-	7.24	-	-	1.06
1988-89	13.06	5.11	13.76	25.12	16.94	11.92	7.74	2.04	2.8	1.46
1989-90	4.55	3.01	11.39	28.94	29.2	10.65	7.23	0.8	-	0.4
Others (Includes Container Cargo)										
1961-62	35.09	7.33	8.65	38.32	2.29	-	5.86	1.67	-	-
1969-70	27.61	7.51	6.38	37.32	2.67	-	11.14	6.71	-	0.66
1974-75	24.14	8.38	9.81	41.32	3.5	3.63	6.06	8.03	0.16	3.86
1979-80	14.22	4.72	14.09	36.95	18.7	3.16	2.52	4.01	1.74	1.96
1980-81	17.01	4.07	9.59	45.45	35.2	4.9	5.35	2.61	3.02	1.81
1985-86	14.59	3.14	14.07	35.19	15.75	2.71	3.82	3.3	3.92	2
1988-89	12.39	2.97	23.86	34.23	15.21	2.53	6.37	1.32	13.24	5.56
1989-90	11.39	2.32	18.89	30.03	13.75	4.54	6.35	1.13	4.21	3.67

Calculated from given data.

**Appendix 3: Port-wise Commodity-wise Capacity and its Utilisation During 1989-90 (Million tonnes)**

	Calcutta	Cochin	Madras	Bombay	Kandla	Tuticorin	Vizag	Mormagoa	New Mangalore	Paradip	Total
<b>Pol</b>											
Capacity	4	4.5	8	19.25	18	1	6	1.5	1	-	63.25
Utilisation	6.39	5.56	9.75	17.55	14.35	0.477	6.828	1.042	0.576	-	62.52
<b>Iron Ore</b>											
Capacity	-	-	8	-	-	-	8	14	7.5	4	41.5
Utilisation	-	-	6.03	0.004	0.02	-	6.79	12.41	5.8	2.05	33.2
<b>Coal</b>											
Capacity	5	-	-	-	-	2.25	-	-	-	-	7.25
Utilisation	4.176	-	3.74	-	-	2.89	4.22	-	-	2.678	17.71
<b>Fertiliser &amp; Raw material</b>											
Capacity	1.8	0.6	0.6	-	0.6	-	0.3	-	-	1.2	8
Utilisation	0.628	0.659	0.756	1.293	0.616	0.586	1.32	0.387	0.105	0.182	6.766
<b>Total</b>											
Capacity	15.5	7.11	20.41	26.25	20.2	5.45	16.7	16.1	9.55	6.05	149.22
Utilisation	14.689	7.11	23.94	27.46	18.92	5.32	21.117	14.16	7.66	6.18	147.28

Source: Basic Port Statistics of India 1990.

**Appendix 4: Growth of Cargo handled at Major Ports**

(in million tonnes)

Year	Overseas		Coastal		Total	
	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded
1960-61	17.89	12.57	4.87	4.19	22.76	16.76
1965-66	22.41	16.62	5.94	5.25	28.35	21.87
1970-71	21.50	26.58	4.06	3.44	25.56	30.02
1975-76	28.71	28.78	3.95	3.48	32.66	32.26
1980-81	39.09	28.50	7.73	4.95	46.82	33.45
1981-82	39.78	32.23	8.61	7.36	48.39	39.59
1982-83	41.08	29.16	10.57	12.89	51.65	42.05
1983-84	38.80	29.07	13.41	15.10	52.21	44.17
1984-85	39.62	33.97	15.71	16.52	55.33	50.49
1985-86	45.82	36.73	22.16	14.91	67.98	51.64
1986-87	43.58	39.79	23.36	17.64	66.94	57.43
1987-88	49.95	40.15	23.39	21.11	73.34	61.26
1988-89	55.34	43.73	25.80	21.84	81.14	65.57
1989-90	54.13	45.26	26.72	21.46	80.85	66.72

Source: Basic Port Statistics of India, 1989, 1990

**Appendix 5: Technological Change\* in General Cargo Traffic**

	Percentage of Containerised Cargo to General Cargo				Percentage of total Cont. cargo to General cargo	
	Export		Import		1989-90	1989-90
	1988-89	1989-90	1988-89	1989-90		
Calcutta	48.3	48.8	16.4	20.5	25.8	29.3
Haldia	100	100	51.2	58.4	74.1	82.2
Madras	55.0	51.7	39.0	38.8	45.3	44.4
Cochin	62.9	64.9	19.7	12.7	45.2	43.9
Tuticorin	20.1	22.9	10.8	10.2	14.4	15.4
Kandla	33.9	31.4	21.2	27.4	27.8	29.9
Bombay	74.4	71.7	50.2	57.4	58.2	62.2
New Mangalore	10.4	1.4	11.3	0.7	10.9	1.1
All Major Ports	55.5	50.9	34.9	39.2	42.5	47.29

Source: Basic Port Statistics of India 1989, 1990.

\* % of Containerised Cargo to General Cargo

**Appendix 6: Capacity Utilisation of the main port implements (%)**

Year	Calcutta	Bombay	Madras	Cochin	Vizag	Kandla	Mormagoa	New Mangalore	Tuticorin	Paradip
<b>1987-88</b>										
Wharf-crane Utilisation	40.0	25.6	59.0	07.8	18.0	29.6	15	04.5	14	13.0
Mobile crane Utilisation	51	42.5	49.0	30.0	25.0	06.3	no use	07.5	12.5	12.0
Fork lift trucks Utilisation	40	50.0	48	25.7	27.4	31.8	no	08.3	15	05.0
<b>1988-89</b>										
Wharf-crane Utilisation	38.0	33.5	56.4	14.8	19.2	29.9	17	4.5	14	15.3
Mobile crane Utilisation	52	-	46.3	29.2	33.3	11.5	6.0	7.5	12.5	14.0
Fork lift trucks Utilisation	55	56.5	46	23.4	87.4	28.8	35	6.3	15	5.0
<b>1989-90</b>										
Wharf-crane Utilisation	30.0	25.0	50.0	12.0	26.0	33.0	23.0	03.0	23	27
Mobile crane Utilisation	26	24	46.0	24.0	16.0	03.0	19.0	02.0	10.0	10.0
Fork lift trucks Utilisation	34	33.0	41	20.0	19.0	35.0	18	03.0	16	06.0

Source: Basic Port Statistics of India 1989, 1990.

**Appendix 7: Number of Employees at Major Ports (actual number)**

Year	Kandla	Bombay	Mormagoa	New Mangalore	Cochin	Tuticorin	Madras	Vizag	Paradip	Calcutta/Haldia	All major ports
1980	5434	31846	3314	1155	6635	2124	11743	12122	5006	33555	112934
1981	4050	30793	3600	1184	6664	2258	11917	12047	5670	32665	110848
1982	4079	32572	3829	1186	6310	2256	11780	11059	5624	31114	109809
1983	4171	34365	3556	1224	6405	2249	12028	11894	5592	31498	112982
1984	4702	31830	3889	1304	6664	2361	11892	11701	5530	29008	108881
1985	4499	31026	3855	1273	6010	2253	11885	11075	5495	29066	106437
1986	4713	30736	3791	1285	6047	2286	12128	11950	4803	27180	104919
1987	4503	30939	3681	1304	5950	2298	11492	11068	5390	25619	102244
1988	4537	30987	3683	1314	5967	2286	11469	11013	5590	24873	101719
1989	4633	30319	3646	1312	5868	2284	11489	10986	5388	24658	100583
1990	4603	29349	3614	1328	5781	2270	11346	10848	4841	23643	98760

Note: Class I and II officers not included.

Source: Basic Port Statistics of India, 1989, 1990.

**Appendix 8: Number of Employees in Dock Labour Board at Major Ports**

	Employees in Group A & B				Employees in Group C & D				Registered Workers			
	1987	1988	1989	1990	1987	1988	1989	1990	1987	1988	1989	1990
Calcutta	58	49	52	44	1366	1279	1038	1186	6885	6249	5941	5689
Vizag.	24	21	22	22	423	419	412	419	816	685	665	641
Madras	32	46	48	48	434	562	558	547	1558	1483	1394	1341
Cochin	25	25	25	25	183	180	173	175	919	823	757	665
Mormagoa	9	9	8	8	114	111	111	110	1101	968	961	955
Bombay	30	30	32	29	811	796	814	831	10354	10121	9903	7848
Kandla	5	5	4	4	57	63	69	79	863	871	869	875
All DLBs	183	185	191	180	3388	3410	3175	3347	22496	21200	20490	18014

Source: Basic Port Statistics of India, 1989, 1990.

**Appendix 9: Strength of Employees in Major Ports**

	Number of Non-Cargo Handling Employees				Number of Cargo Handling Workers			
	1987	1988	1989	1990	1987	1988	1989	1990
Calcutta/Haldia	23017	21954	20514	20332	3837	3994	5192	4359
Madras	9516	9487	9752	9607	2575	2584	2397	2332
Cochin	4915	4252	4315	4522	1246	1936	1770	1432
Bombay	18345	18433	21400	17603	13105	13080	9507	12348
Kandla	3338	3260	3511	3428	1298	1421	1267	1316
Mormagoa	3478	3482	3491	3468	379	368	342	336
New Mangalore	1378	1384	1373	1406	1191 *	1181 *	1169 *	-
Tuticorin	2409	2400	2409	2376	2436 **	2388 **	2355 **	-
Vizag	7573	7519	7495	7457	3849	3846	3852	3759
Paradip	2909	3112	2976	3159	2655	2650	2593	1876

Note: \* Not employees of the port trust but included in a port

\*\* Managed by independent committees of the respective ports.

Source: Basic Port Statistics of India, 1989, 1990.

**Appendix 10: Port-wise Details of Operating Surplus (Rs. Lakhs) Net surplus (Rs. Lakhs) and Operating Ratio (%)**

Year/Indicators	Kandla	Bombay	Mormagoa	N. Mangalore	Cochin	Tuticorin	Madras	Vizag.	Paradip	Haldia	Calcutta
<b>1984-85</b>											
Operating Surplus	1536	5445	1368	223	166	416	3508	1908	-692	1342	2138
Net Surplus	1976	5468	792	178	-80	214	2969	792	-1025	665	1025
Operating Ratio	57.18	64.11	62.09	79.10	93.44	64.19	56.92	68.01	147.04	70.30	78.38
<b>1985-86</b>											
Operating Surplus	1825	5708	1398	273	-340	549	4047	2305	30	1560	-266
Net Surplus	2277	7259	886	95	-665	322	3674	864	-412	1095	-1286
Operating Ratio	51.72	65.09	63.02	79.22	88.94	60.16	55.62	66.64	98.86	69.87	103.13
<b>1986-87</b>											
Operating Surplus	1533	4742	899	670	493	404	4171	2366	973	1677	337
Net Surplus	2119	8029	586	324	-349	156	3537	823	-259	1484	-343
Operating Ratio	57.63	64.82	76.64	62.57	87.66	68.88	54.46	69.68	75.10	71.08	96.35
<b>1987-88</b>											
Operating Surplus	1586	4444	1025	645	665	253	4161	1873	995	1175	-45
Net Surplus	2193	6962	637	288	-282	-9	3634	786	-168	946	-2252
Operating Ratio	60.25	75.34	71.57	67.16	80.87	80.08	59.05	76.87	76.01	81.39	100.49
<b>1988-89</b>											
Operating Surplus	2019	7363	1609	1113	1105	660	5548	3447	1462	3956	1450
Net Surplus	3046	10319	1324	951	-67	430	5256	3789	530	3842	128
Operating Ratio	59.06	66.95	64.46	50.64	75.57	62.50	54.41	67.87	69.72	56.45	87.46
<b>1989-90</b>											
Operating Surplus	2379	6207	1619	649	1743	816	5780	5265	2356	3950	1876
Net Surplus	3507	7430	1450	386	497	201	5950	3967	803	4590	255
Operating Ratio	59.31	72.21	65.25	72.50	68.34	60.96	55.88	57.00	60.98	59.72	85.05

Source: Basic Port Statistics of India 1989, 1990.

**Appendix 11: Selected Port Performance Indicators**

	1985/86	1986/87	1987/88	1988/89	1989/90	1985/86	1986/87	1987/88	1988/89	1989/90
	Calcutta					Cochin				
Ave. preberth waiting time (days)	2.8	0.9	0.8	0.5	0.6	1.5	1	0.9	1.1	1
Average berth occupancy(%)	74	71.9	67.3	58.2	-	59.5	48.9	41.7	47.8	-
Ave. turn round time (days)	17.2	12	11.3	9.7	12	8.6	5.8	5.3	4.7	4.7
Output per ship berth day (tonnes)	437	490	564	659	571	1880	3299	3696	3573	3153
Percentage idle time at berth (%)	33	40	39	40	48	54	46	44	44	48.8
Vessels waited more than 5 days (No.)	142	37	48	12	20	30	21	7	21	21
Cargo handled (million tonnes)	4.2	4.1	4.4	4.3	4.3	5.3	6.9	6.8	7.8	7.1
	Bombay					Haldia				
Ave. preberth waiting time (days)	4.8	3.1	4.7	4.9	5.6	2.5	2	1.5	1.7	1.7
Average berth occupancy(%)	76.8	69.7	73.5	81	-	74	57.8	57.8	67.6	-
Ave. turn round time (days)	13	10.2	11.9	12.2	14.4	7.9	6.3	5.6	5.8	6.3
Output per ship berth day (tonnes)	2155	2516	2765	2122	1911	3994	5381	6693	5928	5616
Percentage idle time at berth (%)	38	35	38	48	53.4	24	35	38	48	51.7
Vessels waited more than 5 days (No.)	456	288	473	603	528	67	61	38	66	48
Cargo handled (million tonnes)	24.3	25.1	28.6	28.7	27.5	8	8	8.7	9.9	10.4
	Mormogao					New Mangalore				
Ave. preberth waiting time (days)	3	2.4	1.5	1.7	0.6	2.5	2.2	2.3	4	4.3
Average berth occupancy(%)	70	58	43	63	-	73.3	73	78	79.1	-
Ave. turn round time (days)	9.5	7.8	5.1	6.9	9.1	10.9	7.9	7.8	10.2	10
Output per ship berth day (tonnes)	6493	8266	11689	8425	7188	1476	2496	2613	2769	3872
Percentage idle time at berth (%)	28	29	27	34	55.4	56	51	52	52	52.7
Vessels waited more than 5 days (No.)	28	29	27	56	10	48	58	49	122	93
Cargo handled (million tonnes)	16	14.9	13.3	15.4	14.2	3.7	5.4	6.1	7.1	7.7
	Vizag					Paradip				
Ave. preberth waiting time (days)	2.6	1.2	1	1.1	1.3	3.5	2.7	1	1.6	3
Average berth occupancy(%)	69.3	61.4	52.1	56.9	-	56.1	55.5	51.2	64.2	-
Ave. turn round time (days)	8.9	6.4	5.6	5.7	6.4	11.1	9.6	6	6.8	9.8
Output per ship berth day (tonnes)	3896	5127	6152	6882	5997	2448	3335	4674	4276	3866
Percentage idle time at berth (%)	37	38	36	38	30.2	31	30	22	23	26.8
Vessels waited more than 5 days (No.)	93	38	36	31	45	33	31	5	27	42
Cargo handled (million tonnes)	15.9	15	15.4	20.4	21.1	3.3	4.8	5.2	6	6.2
	Madras					Kandla				
Ave. preberth waiting time (days)	2.3	1.2	1.7	2.3	2.2	4.4	2.9	2.5	4.1	4.2
Average berth occupancy(%)	77.8	71.3	79.1	84.7	-	82.7	79	80	84	-
Ave. turn round time (days)	8.5	5.9	6.8	7.2	6.7	9.1	7.1	6.5	9	9.7
Output per ship berth day (tonnes)	3358	4184	4364	4040	4070	5392	5403	5893	4824	4487
Percentage idle time at berth (%)	38	37	38	46	47.4	16	17	16	24	32.4
Vessels waited more than 5 days (No.)	135	53	93	205	164	166	145	122	227	236
Cargo handled (million tonnes)	18.1	19.8	22.9	23.9	23.9	16.5	16.2	18.1	17.8	18.9
	Tuticorin									
Ave. preberth waiting time (days)	2.2	0.9	1	0.7	1.5					
Average berth occupancy(%)	60.9	45.5	52.3	63.5	-					
Ave. turn round time (days)	8.3	5	5.6	4.9	5.7					
Output per ship berth day (tonnes)	2279	3362	3069	297	2350					
Percentage idle time at berth (%)	38	38	35	28	38.4					
Vessels waited more than 5 days (No.)	38	38	35	15	42					
Cargo handled (million tonnes)	4.2	4.2	4.3	5.1	5.3					

Source: Basic Port Statistics of India, 1989, 1990.



**Appendix 12: Category-Wise Selected Port Performance Indicators—Dry Bulk Vessels**

	1987/88	1988/89	1989/90	1987/88	1988/89	1989/90
	Calcutta			Cochin		
Number of vessels sailed	71	51	55	30	35	32
Ave. preberthing waiting time (days)	1.2	0.5	1	4.5	6.3	5
Ave. turn round time (days)	16.1	12.4	20	27.4	28.4	27.7
% of idle time to time at berth	41	43	45.3	46	49	47.8
Output per ship berth day (tonnes)	554	672	530	834	910	809
	Bombay			Haldia		
Number of vessels sailed	107	134	154	145	172	165
Ave. preberthing waiting time (days)	18.4	20.7	23.7	1.8	2.6	2.6
Ave. turn round time (days)	34.9	39.4	45.4	8.8	10.3	10.6
% of idle time to time at berth	31	48	50.7	44	50	54.8
Output per ship berth day (tonnes)	1065	810	738	5606	4106	4356
	Mormagoa			New Mangalore		
Number of vessels sailed	186	225	170	122	168	145
Ave. preberthing waiting time (days)	1.8	2.8	0.2	4.8	7.5	6.8
Ave. turn round time (days)	6.5	8.8	14.1	10	15	12.2
% of idle time to time at berth	27	26	57	49	48	47.3
Output per ship berth day (tonnes)	25789	21230	7984	7325	4509	8354
	Vizag			Paradip		
Number of vessels sailed	198	307	312	176	202	184
Ave. preberthing waiting time (days)	1	0.2	2.1	0.8	1	3.4
Ave. turn round time (days)	8.5	8	9.7	6.5	8	11.1
% of idle time to time at berth	38	34	28.2	23	22	27.2
Output per ship berth day (tonnes)	6334	6571	5597	7444	4220	3871
	Madras			Kandla		
Number of vessels sailed	203	244	247	93	102	100
Ave. preberthing waiting time (days)	1.4	2.6	3.4	6.6	13.6	10.1
Ave. turn round time (days)	9.7	12.4	11.9	17.2	27.6	27.2
% of idle time to time at berth	39	44	42.1	9	13	28
Output per ship berth day (tonnes)	5266	4959	5547	1641	1248	1144
	Tuticorin					
Number of vessels sailed	145	169	-			
Ave. preberthing waiting time (days)	1.6	1.1	2.4			
Ave. turn round time (days)	7.4	7.9	9.3			
% of idle time to time at berth	28	22	32			
Output per ship berth day (tonnes)	4499	3379	3369			

Source: Basic Port. Statistics of India 1989, 1990.

Appendix 13: Category-Wise Selected Port Performance Indicators—Tanker Vessels

	1987/88	1988/89	1989/90	1987/88	1988/89	1989/90
	Calcutta			Cochin		
Number of vessels sailed	155	143	118	238	268	205
Ave. preberthing waiting time (days)	0.6	0.4	0.8	0.8	1	0.7
Ave. turn round time (days)	4.7	4.6	5.2	2.8	2.9	2.5
% of idle time to time at berth	47	49	48.7	29	30	31.5
Output per ship berth day (tonnes)	2205	2660	2452	13352	14467	16812
	Bombay			Haldia		
Number of vessels sailed	678	675	587	306	330	292
Ave. preberthing waiting time (days)	2.2	2.1	2.6	0.8	1.4	1.3
Ave. turn round time (days)	5.4	5.4	5.9	3.4	3.7	3.6
% of idle time to time at berth	30	37	59.9	36	43	42.7
Output per ship berth day (tonnes)	13055	12583	12525	13215	11808	12994
	Mormogao			New Mangalore		
Number of vessels sailed	198	211	160	107	129	103
Ave. preberthing waiting time (days)	1.4	1.9	1.1	0.9	0.3	0.3
Ave. turn round time (days)	2.9	3.6	3.6	1.5	1.3	1.3
% of idle time to time at berth	25	19	50.5	35	43	41.2
Output per ship berth day (tonnes)	6869	6938	5767	6404	6252	6875
	Vizag			Paradip		
Number of vessels sailed	255	298	269	22	43	20
Ave. preberthing waiting time (days)	1.1	1.2	0.5	0.3	0.4	0.2
Ave. turn round time (days)	3.1	3.4	2.7	1.5	1.7	1.6
% of idle time to time at berth	36	46	41.1	-	6	-
Output per ship berth day (tonnes)	12236	12574	14201	10769	1185	10416
	Madras			Kandla		
Number of vessels sailed	460	484	400	539	514	292
Ave. preberthing waiting time (days)	2.6	2	2.1	1.3	8.4	1.3
Ave. turn round time (days)	5.9	4	4.3	3.2	3.3	3.6
% of idle time to time at berth	26	32	45	26	29	42.7
Output per ship berth day (tonnes)	10782	13844	14250	16989	17769	12994
	Tuticorin					
Number of vessels sailed	91	117	-			
Ave. preberthing waiting time (days)	0.7	0.5	0.7			
Ave. turn round time (days)	2.3	1.8	2.5			
% of idle time to time at berth	51	40	39.9			
Output per ship berth day (tonnes)	4333	5394	4820			

Source: Basic Port.. Statistics of India 1989, 1990.

**Appendix 14: Category-Wise Selected Port Performance Indicators—Container Vessels**

	1987/88	1988/89	1989/90	1987/88	1988/89	1989/90
	Calcutta			Cochin		
Ave. preberthing waiting time (days)	-	-	0.2	0.3	0.4	0.5
Ave. turn round time (days)	-	-	5.6	2.2	2.3	2.1
% of idle time to time at berth	-	-	32.6	43	46	47.9
Output per ship berth day (tonnes)	-	-	1014	1366	1116	1062
	Bombay			Haldia		
Number of vessels sailed	459	518	483	77	66	70
Ave. preberthing waiting time (days)	0.2	3.2	3.4	0.2	0.1	0.5
Ave. turn round time (days)	5.7	7.9	8.5	2.5	2.7	4.2
% of idle time to time at berth	30	47	46.8	45	52	48.6
Output per ship berth day (tonnes)	1868	1359	1390	1166	1391	1663
	Mormagao			New Mangalore		
Number of vessels sailed	-	2	3	5	16	10
Ave. preberthing waiting time (days)	-	0	0.1	-	0.6	0.1
Ave. turn round time (days)	-	0.5	0.8	1.6	2.2	1.2
% of idle time to time at berth	-	-	43.2	50	44	54.1
Output per ship berth day (tonnes)	-	1000	510	356	731	568
	Vizag			Paradip		
Number of vessels sailed	9	-	15	-	-	-
Ave. preberthing waiting time (days)	0.1	-	0.2	-	-	-
Ave. turn round time (days)	1.2	-	1.9	-	-	-
% of idle time to time at berth	33	-	17	-	-	-
Output per ship berth day (tonnes)	725	-	707	-	-	-
	Madras			Kandla		
Number of vessels sailed	288	265	345	86	100	90
Ave. preberthing waiting time (days)	0.4	1.1	0.7	1.3	3.1	4
Ave. turn round time (days)	1.9	3.4	2.1	3.6	5.6	8.3
% of idle time to time at berth	58	61	56.5	16	17	26
Output per ship berth day (tonnes)	1460	1605	1901	1713	1620	1577
	Tuticorin					
Number of vessels sailed	85	78	-			
Ave. preberthing waiting time (days)	0.1	0.1	0.3			
Ave. turn round time (days)	1.1	1.4	1.2			
% of idle time to time at berth	44	44	47.5			
Output per ship berth day (tonnes)	1097	825	1030			

Source: Basic Port Statistics of India 1989, 1990.

**Appendix 15: Category-Wise Selected Port Performance Indicators—Break Bulk Vessels**

	1987/88	1988/89	1989/90	1987/88	1988/89	1989/90
	Calcutta			Cochin		
Number of vessels sailed	671	613	375	155	144	136
Ave. preberthing waiting time (days)	0.8	0.5	0.7	0.5	0.8	1.2
Ave. turn round time (days)	14.3	10.7	13.3	5	5.6	6.7
% of idle time to time at berth	38	38	49.8	51	49	58.2
Output per ship berth day (tonnes)	459	528	399	327	393	384
	Bombay			Haldia		
Number of vessels sailed	830	795	630	26	20	15
Ave. preberthing waiting time (days)	4.9	5.6	5.7	4	4.3	5.5
Ave. turn round time (days)	14.2	16.2	19.2	14.3	10.5	20.5
% of idle time to time at berth	42	51	54.8	26	47	55
Output per ship berth day (tonnes)	567	539	433	535	798	624
	Mormagoa			New Mangalore		
Number of vessels sailed	33	39	9	186	113	100
Ave. preberthing waiting time (days)	0.6	1.6	0.2	1.4	3.6	5.1
Ave. turn round time (days)	9.8	13.6	16.8	9.9	14.1	16.8
% of idle time to time at berth	28	24	43	55	57	57.3
Output per ship berth day (tonnes)	700	551	526	467	616	602
	Vizag			Paradip		
Number of vessels sailed	117	94	106	20	25	17
Ave. preberthing waiting time (days)	0.8	0.7	1.2	3.8	1.2	1.8
Ave. turn round time (days)	5.9	5.7	6.9	6.6	5.8	5.6
% of idle time to time at berth	34	40	28.7	32	26	28.2
Output per ship berth day (tonnes)	653	797	807	625	1075	1346
	Madras			Kandla		
Number of vessels sailed	439	378	342	232	195	211
Ave. preberthing waiting time (days)	0.9	2.6	2.8	3.8	8.4	6.1
Ave. turn round time (days)	6.5	10.2	10.4	9.9	16	14.2
% of idle time to time at berth	34	48	50.5	14	17	32.4
Output per ship berth day (tonnes)	612	612	510	1019	864	1002
	Tuticorin					
Number of vessels sailed	96	97	-			
Ave. preberthing waiting time (days)	0.4	0.8	2.1			
Ave. turn round time (days)	6.2	6.2	7.8			
% of idle time to time at berth	41	35	44.4			
Output per ship berth day (tonnes)	621	796	822			

Source: Basic Port Statistics of India 1989, 1990.

# Productivity in Public Sector Heavy Engineering Units

N.C. Gupta

*Heavy engineering industry provides the base and the key to the linkages that promote growth. The paper deals with the need for a new economic paradigm that focuses on technological opportunities and the cumulateness of technical change, trade and technological gaps. It gives an account of the items that constitute heavy engineering to serve as a backdrop, taking help from material both at the international and national levels. The paper analyses productivity performance at the firm level taking data from the Public Enterprises Survey in respect of public sector firms in industrial machinery and mechanical engineering equipment over the period 1980-81 to 1990-91. Technical progress is observed in the case of both the groups of heavy engineering industry. Returns to scale is not significantly different from unity.*

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## The Context

Heavy engineering industry provides the base and the key to the linkages that promote growth. It is essential therefore to build up the relationship between technology, R & D and the growth potential emerging from heavy engineering prior to an attempt on examination of productivity in this industry.

The 'winds of creative destruction'—to use Schumpeter's phrase—which are represented by basic research and technological diffusion, will only increase in importance as we move into the twenty first century. 'Schumpeterian comparative advantage' or 'Schumpeterian efficiencies', if developed theoretically and adopted, promise to enhance significantly the economic performance of trading nations. In coming to an understanding of the new competitive agenda that will face firms and governments, a number of complex and interrelated features will need attention. This calls for development of a new economic paradigm that focuses on technological opportunities and the cumulateness of technical change, trade and technological gaps. Dosi *et al.* (1990) analyse the distinction between three different kinds of knowledge generated by R & D and innovation suggested by Krugman (1987):

1. Knowledge, such as production process knowledge reflected in firm-specific curves, that can be internalised within a firm and is therefore largely appropriate;

**It is essential therefore to build up the relationship between technology, R & D and the growth potential emerging from heavy engineering prior to an attempt on examination of productivity in this industry.**

**Optimal resource allocation from a long term dynamic view point cannot be accomplished by the market mechanism alone. This is an area in which industrial policy can and should play a useful role'.**

2. Knowledge of product design that once generated can often be captured by competitors through reverse engineering exercises; and
3. Knowledge which spreads beyond the innovating firm but not necessarily easily beyond national or sometimes even regional boundaries.

The third kind of knowledge is often embodied in people and spread through social and academic networks. Both the second and third kinds of knowledge generate benefits that are not completely appropriable by the innovating agent. In industries experiencing rapid technological progress, firms routinely take each other's product apart to see how they work and how they are made and (at least in the USA) firms routinely 'raid' one another's R & D talent in order to secure the knowledge they embody.

When knowledge is not completely appropriable, the social returns to R & D investment activities are likely to exceed the private. This is the standard externality argument in support of policies to promote improvement in national economic welfare. (Flamm, 1987) It applies equally both to domestic industries and to those involved in international trade. The resultant knowledge has the potential to benefit everyone regardless of national boundaries. In contrast, there is a potential conflict of interest if knowledge spills over within a country but not between countries. Such conflict of interest in the support of high-tech industries (viz. heavy engineering) becomes even more pronounced once one recognises that such industries are never perfectly competitive. Investment in knowledge inevitably has a fixed-cost component: once a firm has improved its product or technique the unit cost of that improvement falls as more is produced. The result is dynamic economies of scale that undermine perfect competition. Under this premise, government policies that promote the R & D activities of hi-tech industries may win a larger share of the world returns from such industries for domestic producers and workers and at the same time generate externalities primarily for domestic producers and only secondarily for foreign ones.

It would be useful to examine policies at the interna-

tional arena. The rationale behind Japanese developmental policy has different intellectual roots. Japanese policy makers have been critically concerned about the links between current resource allocation decisions and the future evolution of the economy. In the words of one MITI official '... optimal resource allocation from a long term dynamic view point cannot be accomplished by the market mechanism alone. This is an area in which industrial policy can and should play a useful role' (Fukukawa, 1987).

Dosi *et al.* (1990) draw a distinction between 'Ricardian' or allocative efficiency and 'Schumpeterian' or growth efficiency. The allocation of resources amongst industries and activities in response to current measures of social profitability is 'Ricardian' efficient in the sense that it maximises current economic welfare. In the case of market imperfections and externalities, realisation of allocative efficiency may require government intervention. The allocation of resources amongst industries and activities can also be evaluated according to two other performance criteria: (1) its growth efficiency, (2) its effects on the pace and direction of technological change (Schumpeterian efficiency). Japanese economic policy making has been dominated in a self-conscious way by these two criteria. 'MITI' saw as one of its key functions the promotion of the most advanced technologies with world wide market potential in the long run (Freeman, 1987: 35). Per force circumstances, similar choices are being adopted and defended by a variety of developing countries around the world.

If firms confront difficulties in raising external capital to finance their R & D investment, then their R & D activities may be constrained by their current returns, and higher returns resulting from a targeted government policy may result in a higher R & D effort to improve their competitive position tomorrow. This insight may explain in part why Japanese semi-conductor firms were able to mount a huge R & D and investment drive in the late 1970s while the efforts of their US competitors pale by comparison. As the Japanese firms captured a growing share of the world market from US producers and as the profit margins of Japanese firms were bolstered by the dramatic appreciation of the dollar, Japanese producers were able to finance massive R & D investments in both process and product innovations that allowed them to surpass the technological levels of their US competitors. Nations which support the competitive success of their high-tech (viz. heavy engineering) industries in world markets can strengthen the incentives to innovate by domestic producers. The results may be greater technological dynamisms and more rapid economic growth in the long run.

Bajaj Automobiles, Bharat Heavy Electricals, Bharat Earth Movers and Indian Telephone Industries. However, it would be useful to make use of data for a larger number of years (as and when available) can lead to meaningful conclusions. The present study analyses the productivity performance of public sector heavy engineering units based on data from Public Enterprises Survey over the period 1980-81 to 1990-91.

### Capacity Utilisation

In a country like India, characterised by deficiency of capital relative to labour, the importance of full utilisation of productive capacity created by investment cannot be over-emphasised. Fuller utilisation of existing capacity enables faster expansion in output and employment, increased efficiency and reduction in cost, saving in capital, etc. Capacity utilisation is usually defined as the ratio of actual output to some measure of potential output. Two different definitions of potential output have been suggested. The first definition by Cassels (1937) and Hickman (1964) corresponds to the output at which the short-term average total cost curve reaches its minimum. The other advocated by Klein (1960) corresponds to the output at which the long run and short run average total cost curves are tangent. Corresponding to these definitions, Suresh, (1991) obtains economic measures of capacity utilisation for non-electrical machinery and electrical machinery, among others. She specifies and estimates a translog variable cost function where the variable inputs are labour, energy and intermediate inputs. The method of Maximum Likelihood Estimation is employed for estimation purposes. Besides,  $CU_m$  and  $CU_i$ , she also presents estimates of  $CU_o$ , constructing a traditional measure using data on installed capacity and production and adopting a method similar to the one used by Paul (1974).

Table 1 shows that non-electrical machinery industry recorded high growth rates in output, gross fixed assets as well as the number of employees. These rates are higher

**In a country like India, characterised by deficiency of capital relative to labour, the importance of full utilisation of productive capacity created by investment cannot be over-emphasised.**

**Table 1: Compound Growth Rate of Some Important Variables: 1960-61 to 1982-83: Non-electrical machinery and electrical machinery**

(Per cent per annum)

Variable	Non-Electrical Machinery			Electrical Machinery		
	1960-61-1982-83	1960-61-1970-71	1971-72-1982-83	1960-61-1982-83	1960-61-1970-71	1971-72-1982-83
Y	9.78	14.59	7.28	10.61	13.87	7.71
GFK	10.05	19.20	6.06	9.75	16.92	5.47
L	4.58	8.58	3.07	5.24	9.00	2.48
$S_L$	-2.07	-1.45	-1.74	-0.85	-0.02	-1.05
$S_E$	0.02	-1.11	1.39	1.88	0.28	4.07
$S_M$	0.68	0.60	0.44	0.15	-0.008	0.13

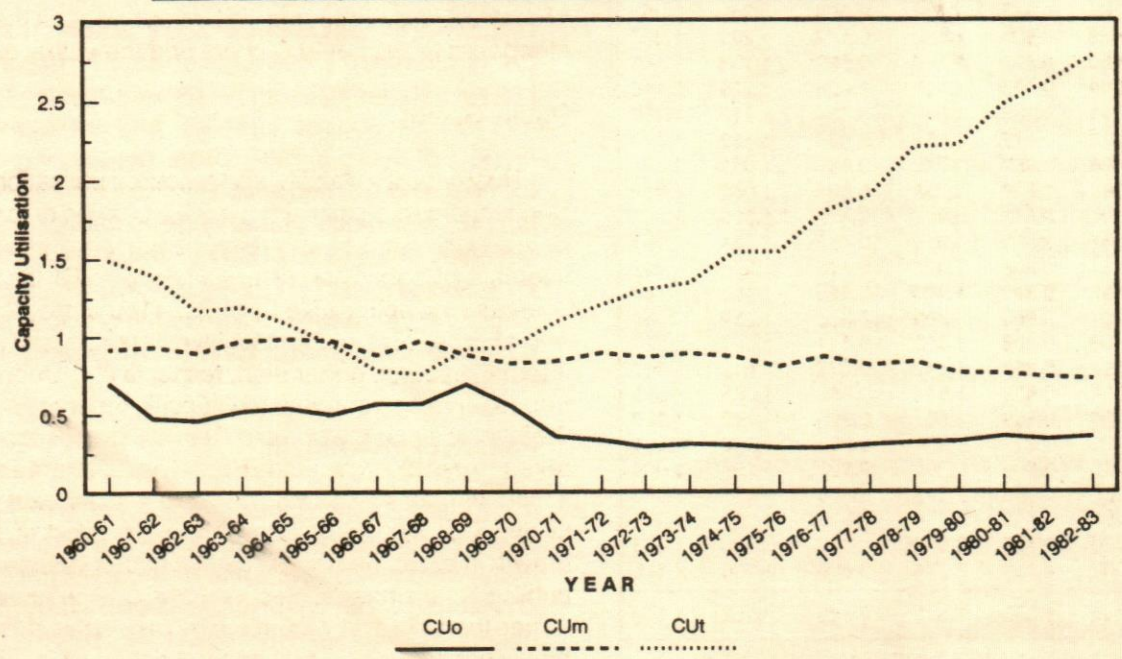
Note:

- Y = Value of output at constant (1970-71) prices
  - GFK = Gross fixed assets at constant (1970-71) prices
  - L = No. of employees
  - $S_L$  = Share of labour in variable cost
  - $S_E$  = Share of energy in variable cost
  - $S_M$  = Share of intermediate input in variable cost
- Compound growth rate obtained as regression coefficient b by estimating  $\log Y = a + bt$ .

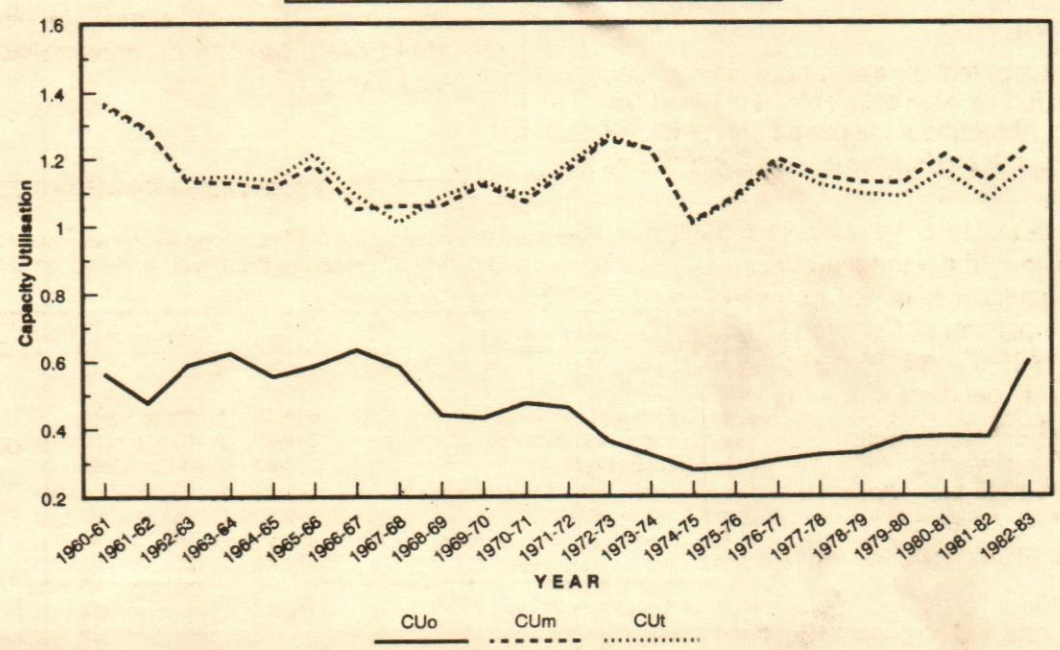
for the first sub-period viz. 1960-61 to 1970-71 in comparison to 1971-72 to 1982-83. The share of labour declined continuously, while the share of energy in variable costs has recorded higher growth rate during 1971-72 to 1982-83. While value of output, gross fixed assets and number of employees in respect of electrical machinery grew very rapidly during 1960-61 to 1970-71, these showed much slower growth rates during 1971-72 to 1982-83. Also, the share of energy in total variable cost grew rapidly after 1971-72, while the share of labour costs has declined throughout the period.

Table 2 giving figures for  $CU_o$ ,  $CU_m$  and  $CU_i$  in respect of non-electrical machinery, shows that  $CU_o$  being less than unity during 1960-61 to 1982-83 indicates existence of a large degree of excess capacity in this group, the average being only 0.422. Results from  $CU_m$  are similar.  $CU_i$ , on the other hand, is greater than unity throughout the period. The figures for 1960-61 and 1961-62 are rather high. Estimates of  $CU_i$  are very high, particularly after 1972-73 till 1982-83. In fact, the estimates for  $CU_i$  do not seem plausible at all, suggesting perhaps that the estimated parameters of the translog variable cost function for this industry do not provide a good fit for the model. Berndt & Hesse (1986) point out that use of the translog variable cost function involves the use of iterative numerical techniques to solve for capacity output. The problem arises because the computational algorithm need not necessarily converge. Although the computational algorithm does converge in Suresh, exercise (1991), capacity output relations are very low since 1972-73, resulting in very high levels of  $CU_i$ , which do not seem economically plausible.

### Capacity Utilisation Rates Non-Electrical Machinery (1960-61 to 1982-83)



### Capacity Utilisation Rates Electrical Machinery (1960-61 to 1982-83)



Source: Suresh, M. Padma, (1991)



for this state of affairs. Productivity measurement at the firm level could provide some clues with regard to labour productivity, capital productivity, capital-labour substitution, and returns to scale in heavy engineering firms. For the purpose of analysis, these are divided into two broad categories:

(1) Industrial Machinery

1. Bharat Heavy Plate & Vessels Ltd.
2. Braithwaite & Co. Ltd.
3. Heavy Engineering Corporation Ltd.
4. Jessop and Co. Ltd.
5. Lagan Jute Machinery Co. Ltd.
6. Mining and Allied Machinery Corporation Ltd.

(2) Mechanical Engineering Equipment

7. Bharat Heavy Electricals Ltd.
8. Bharat Wagon and Engineering Co. Ltd.
9. Bridge and Roof Co. (I) Ltd.
10. Burn Standard Co. Ltd.
11. Triveni Structurals Ltd.
12. Tungbhadra Steel Products Ltd.

There are sixteen public sector undertakings operating in the Heavy Engineering Sector. Bharat Bhari Udyog Nigam Ltd. and Bharat Yantra Nigam Ltd. are holding companies. Information in respect of other two companies is not available. Information relating to capacity utilisation in respect of 12 companies is given table 4. The figures capacity utilisation in the case of Bharat Heavy Electricals Ltd. reveal a fall in respect of steam turbine in 1989-90 and 1990-91 as against 1988-89, and an improvement in respect of hydro turbine, hydro generator, power transformers and traction machines over the corresponding period. Not much of a change in capacity utilisation is observed in the case of BHPV. Fall in capacity utilisation in respect of towers and tanks is seen in the case of Triveni Structural Ltd. Gradual increase in capacity utilisation is observed in the case of BWECL, engaged in the production of wagon.

**Pattern of Investment**

Enterprises producing goods account for 77 percent of public sector investment as on 31.5.85 (table 5). Of this heavy engineering accounts for around 4 per cent. Of the investment of Rs. 63504 crore as on 31.3.89, heavy engineering accounts for Rs. 1852 crore. There is fall in public

sector investment of the order of Rs. 18 crore during 1989-90, as a consequence, the percentage of heavy engineering falls to 1.85 in the investment in enterprises producing goods.

Gross turnover of heavy engineering in public sector undertakings (table 6) increased from Rs. 3695.20 crore in 1988-89 to Rs. 4136.37 crore in 1989-90, registering growth rate of 12 per cent during the

**Table 4: Capacity Utilisation (%) in Heavy Engineering Firms**

Name of Enterprise	Products	1987-88	1988-89	1989-90	1990-91
Bharat Heavy Plates and Vessels Ltd.	Process Plant Cryogenic Equipment and Ind. boilers	71	82	74	77
Braithwaite & Co. Ltd.	Railway wagons		91	103	100
Heavy Engineering Corporation Ltd.	Castings, Forgings		22	45	37
	Machinery		24	53	24
Jessop & Co.	Mach. Tools		—	70	70
	Cranes and Struct.		—	11	35
	Road Constn. Eq.		—	7	6
Lagan Jute Machinery Co. Ltd.	Rolling Stock		—	52	59
	Machines	9	45	53	55
Mining and Allied Machinery Co. Ltd.	Mining and non-mining equipments	57	53	67	51
Bharat Heavy Electricals Ltd.	<b>Thermal Sets</b>				
	Steam Turbine	39	77	64	52
	Turbo Generator		74	71	72
	<b>Hydro Sets</b>				
	Hydro Turbine	25	21	42	59
	Hydro Generator		15	36	49
	Boiler and Valves	99	97	90	86
	Power Transformers	86	102	111	120
	Traction Machines		109	102	110
	Wagon	65	88	96	107
Bharat Wagon & Engineering Co. Ltd.	Structural and Equipment	39	54	69	56
Bridge & Roof Co. (India) Ltd.					
Burn Standard Co. Ltd.					
Howrah	Wagons	32	57	62	66
Burnpur	Wagons	33	81	82	81
Triveni Structurals Ltd.	Towers,	178	145	126	104
	Pressure Vessels & tanks	—	—	51	19
Tungbhadra Steel Products Ltd.	Steel Structurals	61	124	108	88
	Weighing Mcs.	—	—	30	28
	Spring	—	—	53	47

**Table 5: Cognate Groupwise Pattern of Public Sector Investment**

(Rs. crore)

Cognate group	6th Plan Profile				7th Plan Profile				
	As on 1.4.80	As on 31.3.85	Total during 6th Plan Period	% share as on 31.3.85	As on 31.3.89	As on 31.3.90	Increment during 1989-90	Total during 7th Plan period	% age share as on 31.3.90
Enterprises Producing Goods									
Heavy Engineering	978.16	1697.62	721.46	3.98	1852.44	1834.04	-18.40	136.42	1.85
Total	13319.48	32725.56	19406.08	76.69	63503.83	72059.14	8555.31	39333.58	72.55

**Table 6: Groupwise Gross/Net turnover, Growth Rate and ratio of Net Turnover to Capital Employed**

Group	Gross Turnover (Rs. crore)		% age growth (+)/decline (-)	Net Turnover (Rs. crore)		Capital Employed (Rs. crore)		% age of Net turnover to CE	
	1988-89	1989-90		1988-89	1989-90	1988-89	1989-90	1988-89	1989-90
Enterprises Producing Goods									
Heavy Engineering	3695.20	4136.37	+11.94	3377.28	3740.74	1733.57	1974.80	194.82	189.42
Total	71701.42	82516.44	+15.08	64679.06	73916.13	47503.74	58521.64	136.18	126.31

Government of India, Ministry of Programme Implementation, Department of Public Enterprises Survey 1989-90, Vol. 1, New Delhi, Table 1.2, Table 1.7.

year. Percentage of net turnover to capital employed declined in 1989-90 to 189.42 as against 194.82 in 1988-89.

Table 7 reveals that among public sectors firms producing industrial machinery under heavy engineering, annual average rate of growth of output was highest in respect of Bharat Heavy Plate and Vessels (16.7 per cent), followed by Heavy Engineering Corporation (10.3). Braithwaite & Co. Ltd., Jessop & Co. and M.A.M.C. recorded an annual average rate of growth of output of the order of 7.7, 6.4 and 4.7 per cent, respectively, over the period 1980-81 to 1990-91. Lagan Jute Machinery Co. Ltd. showed an annual average rate of decline of the order of 1.8 per cent.

The annual average rate of growth of value added was highest in respect of Mining and Allied Mach. Corp. Ltd. (20.7 per cent), followed by Braithwaite & Co. Ltd. (11.6 per cent), Bharat Heavy Plate and Vessels (9.1 per cent), Heavy Engineering Corp. Ltd. (8.4 per cent) and Jessop & Co. Ltd. (2.6 per cent). Lagan Jute Machinery Co. Ltd. showed average rate of decline of the order of 2.5 per cent over the corresponding period of 1980-81 to 1990-91.

Labour has registered a decline in the case of public sector firms in heavy engineering engaged in the manufacture of industrial machinery. The decline in the rate of growth varies from 0.2 to 2.9 per cent. There was marginal increase in labour employed in respect of Bharat Heavy Plates and Vessels Ltd.

to the base year figures of capital employed by different firms in Public Enterprises Survey.

Table 7 reveals that among the public sector firms producing Mechanical Engineering equipment, annual average rate of growth of output was highest in respect of Bharat Wagon & Engg. Co. Ltd. (14.9 per cent), followed by Bharat Heavy Electricals Ltd.

**Table 7: Public Sector Firms in Heavy Engineering, Annual Average Rate of Growth of Output (O), Value Added (V), Labour (L) and Capital (K): 1980-81 to 1990-91 (Per cent)**

Name of the Firm	O	V	L	K
Industrial Machinery				
1. Bharat Heavy Plates & Vessels	16.7	9.1	0.51	4.2
2. Braithwaite & Co. Ltd.	7.7	11.6	-0.2	1.4
3. Heavy Engineering Corp. Ltd.	10.3	8.4	-1.9	3.4
4. Jessop & Co. Ltd.	6.4	2.6	-2.9	1.3
5. Lagan Jute Machinery Co. Ltd.	-1.8	-2.5	-0.7	0.3
6. Mining and Allied Mach. Corp. Ltd.	4.7	20.7	-0.9	0.6
Mechanical Engineering Equipments				
7. Bharat Heavy Electricals Co. Ltd.	8.7	8.8	0.7	1.2
8. Bharat Wagon & Engg. Co. Ltd.	14.9	18.8	2.5	6.6
9. Bridge & Roof Co. (I) Ltd.	3.1	2.7	-0.3	3.0
14. Eurn Standard Co. Ltd.	6.4	5.0	-0.8	3.5
15. Triveni Structurals Co. Ltd.	5.3	13.3	-1.0	3.0
16. Tungbhadra Steel Products Ltd.	8.5	13.1	-1.8	3.2

Rate of growth of capital in public sector firms in heavy engineering varied from 0.3 per cent in respect of Lagan Jute to 3.4 per cent in the case of Heavy Engineering Corporation. Capital series have been built using Perpetual Inventory Method a B.N. Goldar (1986), Gupta (1991) and Kohli (1989). Base year figures were turned into replacement cost using 1.6 as the ratio to change the figures from purchase price. Subsequent investment figures deflated by combined wholesale price index for machinery other than electrical and electrical were added

(8.7 per cent), Tungbhadra Steel Products Ltd. (8.5 per cent), and Burn Standard Co. Ltd. (6.4 per cent) Triveni Structural Ltd. (5.3 per cent) and Bridge and Roof Co. (I) Ltd. (3.1 per cent) respectively, over the period 1980-81 to 1990-91.

The highest annual average rate of growth of value added among the public sector firms producing Mechanical Engineering Equipment was observed in the case of Bharat Wagon & Engg. Co. Ltd. (18.8 per cent). This was followed by Triveni Structural Ltd., Tungbhadra Steel Products Ltd. (13 per cent). BHEL stands fourth in growth with (9 per cent) and Burn Standard Co. Ltd. (5 per cent). Bridge & Roof Co. (I) Ltd. reveal an annual average rate of growth of value added of the order of 3 per cent over the period 1980-81 to 1990-91.

Annual average rate of growth of labour in respect of public sector firms engaged in the manufacture of mechanical engineering equipment under heavy engineering showed a decline varying from 0.3 to 1.8 per cent over the period 1980-81 to 1990-91. Annual average rate of growth was of the order of 2.5 per cent and 0.7 per cent, respectively, in the case of Bharat Wagon and Engineering Co. Ltd. and Bharat Heavy Electricals Ltd. This data relates only to employees other than casual.

Annual average rate of growth of capital varied from 1.2 per cent (Bharat Heavy Electricals Ltd.) and Bharat Wagon & Engg. Co. Ltd. (6.6 per cent). The other firms had annual average rate of growth of capital of around 3 per cent over the period under study.

Table 8 reveals annual average rate of growth in labour and capital productivity indices based on output and value added, and capital intensity in public sector firms in heavy engineering industry. The analysis has been di-

**Table 8: Public Sector Firms in Heavy Engineering—Annual average rate of growth of O/L, O/K, V/L, V/K and K/L: 1980-81 to 1990-91 (Per cent)**

Name of the Firm	O/L	O/K	V/L	V/K	K/L
<b>Industrial Machinery</b>					
1. Bharat Heavy Plates & Vessels	16.1	12.0	8.5	4.7	3.7
2. Braithwaite & Co. Ltd.	7.9	6.3	11.9	10.2	1.6
3. Heavy Engineering Corp. Ltd.	12.5	6.7	10.5	4.8	5.4
4. Jessop & Co. Ltd.	9.6	5.0	5.7	1.3	4.4
5. Lagan Jute Machinery Co. Ltd.	-1.1	-2.0	-1.9	-2.8	1.0
6. Mining & Allied Mach. Corp. Ltd.	5.6	4.0	21.8	20.0	1.5
<b>Mechanical Engineering Equipment</b>					
7. Bharat Heavy Electricals	7.9	7.5	8.0	7.5	0.4
8. Bharat Wagon & Engg. Co. Ltd.	12.2	7.8	15.9	11.4	4.0
9. Bridge & Roof Co. (I) Ltd.	3.4	0.1	3.0	-0.3	3.4
10. Burn Standard Co. Ltd.	7.3	2.8	5.9	1.5	4.3
11. Triveni Structural Ltd.	6.4	2.2	14.5	10.0	4.1
12. Tungbhadra Steel Products Ltd.	10.5	5.2	15.2	9.7	5.0

vided into two parts: (1) Industrial Machinery and (2) Mechanical Engineering Equipment, the two constituting 6 firms each.

**Industrial Machinery:** Taking output version, the rate of growth of labour and capital productivities is highest in Bharat Heavy Plates & Vessels. Labour productivity growth in Heavy Engineering Co. is of the order of 12.5 per cent, followed by that of Jessop & Co. Ltd. and Braithwaite & Co. Ltd. In the output version capital productivity growth for MAMC, Jessop, Braithwaite & HEC has been positive. It is negative in the case of Lagan Jute. Value added version rate of growth of labour and capital productivities are highest in respect of MAMC, followed by that of Braithwaite. Lagan Jute reveals negative rate of growth both in labour and capital productivities. Capital intensity rate of growth has been the highest in the case of HEC. It ranges from 1 to 1.6 per cent in the case of Lagan Jute, MAMC and Braithwaite. It is of the order of 4.4 per cent in the case of Jessop.

**Mechanical Engineering Equipment:** Labour and capital productivities are highest in the case of Bharat Wagon in output and value added versions, followed by Tungbhadra and BHEL. Bridge & Roof show least growth in both the versions. Triveni Structural show fast growth in labour and capital productivities in valued added version. Capital intensity has been the least in the case of BHEL. It is in the range of 3.4 to 5 per cent in the case of other five firms.

## Regression Results

Results relating to parameters of the Unrestricted Cobb-Douglas Production Function in respect of public sector firms in heavy engineering are divided into three sections for the purpose of analysis:

- (1) Pooled cross section of time series-heavy engineering firms (combined), table 9;
- (2) Pooled cross section of time series-industrial machinery under heavy engineering; and
- (3) Pooled cross section of time series-mechanical equipment under heavy engineering.

### 1. Heavy Engineering Public Sector Firms

The explanatory power of regression 1 is of the order of 86 per cent which is quite satisfactory. The coefficient of capital is both positive and significant. The coefficient of labour is positive but non-significant. The returns to scale is of the order of 0.96 which is not significantly different from unity. DW statistic being 0.63 there might be chances of serial correlation. The coef-

**Table 9: Production Function Estimates: Public Sector Firms in Heavy Engineering: 1980-81 to 1990-91**

Dependent variable: log V

No. of observations : 120

Regression No.	Constant	Coefficients of Independent Variables					R <sup>2</sup>	DW
		Log K	Log L	t	Sector Dummy			
(1)	-1.423* (4.300)	0.883* (8.680)	0.081 (0.726)			0.86	0.63	
(2)	-1.684* (5.347)	0.833* (8.704)	0.120 (1.145)	0.060* (4.272)		0.88	0.54	
(3)	-1.889 (6.789)	0.943* (10.973)	0.009 (0.098)	0.058* (4.703)	0.495* (5.986)	0.91	0.73	

\* Significant at 5 per cent level

coefficient of t being positive and significant in regressions 2 and 3, reveals the existence of technical progress. Sector dummy being positive and significant reveals better performance by firms in mechanical engineering equipment.

## 2. Industrial Machinery

The results relating to unrestricted Cobb-Douglas Production Function in respect of public sector firms in industrial machinery under heavy engineering are given in table 10.

The explanatory power of regressions 1, 2 and 3 lies in the range of 84 and 93 which is quite satisfactory. The coefficient of capital is both positive and significant in respect of regressions 1 and 2. It is, however, negative and non-significant in regression 3. The coefficient of labour is negative and non-significant in Reg. 1 and positive and non-significant in Reg. 2 and 3. The coefficient of t in regressions 2 and 3 being positive and significant reveals the existence of technical progress. Use of firms' dummies in

**Table 10: Cobb-Douglas Production Function Estimates: Public Sector Firms in Heavy Engineering Industrial Machinery 1980-81 to 1990-91**

Dependent Variable: log V

No. of observations: 60

Reg. No.	Constant	Coefficients of Independent variables								R <sup>2</sup>	DW
		log K	log L	t	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>		
(1)	-2.022* (4.112)	1.032* (5.863)	-0.025 (0.144)							0.84	0.72
(2)	-2.252* (5.085)	0.895* (5.563)	0.094 (0.595)	0.065* (3.942)						0.87	0.80
(3)	8.886 (0.880)	-0.396 (0.643)	0.118 (0.117)	0.083* (4.422)	-1.239* (2.582)	1.260 (0.671)	0.050 (0.056)	-3.131 (1.319)	-0.026 (0.043)	0.93	1.424

\* Significant at 5 per cent level.

**Table 11: Cobb-Douglas Production Function Estimates : Public Sector Firms in Heavy Engineering : Mechanical Engg. Equipment: 1980-81 to 1990-91**

Dependent Variable: log V

No. of observations: 60

Reg. No.	Constant	Coefficients of Independent variables								R <sup>2</sup>	DW
		log K	log L	t	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>		
(1)	-0.947* (2.410)	1.003* (8.664)	-0.062 (0.466)							0.92	0.71
(2)	-1.158* (3.054)	0.980* (8.929)	-0.051 (0.403)	0.052* (2.778)						0.92	0.57
(3)	-16.959* (2.046)	0.643 (1.180)	1.692* (2.152)	0.066* (3.442)	4.479 (1.500)	5.937* (2.137)	1.949 (1.227)	4.870 (1.746)	5.322 (1.746)	0.98	1.38

\* Significant at 5 per cent level.

regression 3 disturbs the coefficient of capital and results in its becoming negative. The coefficient of D1 representing Braithwaite shows lesser efficiency, it being negative.

## 3. Mechanical Engineering Equipment

Results of unrestricted Cobb-Douglas Production Function parameters relating to Mechanical Engineering Equipment firms under Heavy Engineering are given in table 11.

The explanatory power of the regressions lies between 92 and 98 per cent which is quite satisfactory. The coefficient of capital in regressions 1 and 2 is positive and significant, whereas that of labour is negative but non-significant. The coefficient of time in regression 2 shows existence of technical progress.

The introduction of firms' dummies results in not only reducing the magnitude of the coefficient of capital but also makes it non-significant.

## A Resume

Schumpeterian efficiencies, if developed theoretically and adopted, promise to enhance significantly the eco-

**It is not by accident that nations riding new sectors and new paradigm propel themselves into industrial prominence.**

conomic performance of trading nations. Investment in knowledge inevitably has a fixed cost component: Once a firm has improved its products or technique the unit cost of that improvement falls as more is produced. The result is dynamic economies of scale that undermine perfect competition. Japanese policy makers have been critically concerned about the links between current resource allocation decisions and the future evolution of the economy. Nations which support the competitive success of their hi-tech (heavy engineering) industries in world markets can strengthen the incentives to innovate by domestic producers. Policies to promote heavy engineering industries can result in lower cost inputs for a variety of user industries whose expansion in turn can feed back into still lower costs for these inputs. The technology emerges from and plays to, the national strength of the innovating country. It is not by accident that nations riding new sectors and new paradigm propel themselves into industrial prominence.

The American suppliers of heavy electrical items were able to sell to a much larger domestic market and were much less disrupted by world wars than their European competitors. Larger changes have been observed in the rise of the Japanese suppliers who have nearly trebled their share. A number of suppliers have been the subject of take overs or have withdrawn from the business.

India has had heavy electrical industry for more than 30 years but it has always struggled to keep abreast with the world technology leaders despite investment of considerable financial and human resources. Japan, USA, France, U.K. and Germany among others continue to supply a major share of engineering exports to India. In the case of India industrial machinery engineering is followed by instruments, mechanical engineering and electrical engineering. With a view to accelerate meaningful absorption and adaptation of importing technologies, the Government had decided that where technology payments are more than Rs. 2. crore during the period of foreign collaboration the Indian party would submit a time, bound programme for technology absorption.

Following Industrial Policy Resolution, 1956 wherein

public sector was assigned a pride of place and deserving attention was to be given to heavy engineering, substantial progress has been made in establishing capacity in industrial machinery and mechanical engineering equipment public sector firms, which has paved way for industrial growth all over, with the prevalence of spill-over effects. This has resulted in giving India a deserving place in the national and international arena, with the result that it has been able to attract not only collaboration agreements at reasonable terms but also manage funds from different quarters. If efforts are directed to implement measures for improving labour and capital productivities that enable the country to face international competition by improving technical proven ability, even with liberalisation attempts at different levels, there is no denying the fact that India would one day be one of the leading industrial developing countries.

The study has given an account of what constitutes heavy engineering and its present state of affairs. It has concentrated attention on public sector firms. To give a complete picture, study of private sector firms also is essential. Partial productivity ratios/indices and production function parameters do provide an inkling of the resultant changes in output via inputs. One could, however, employ other sophisticated models and tools to Indian data on heavy engineering as in the studies by Jorgenson (1990) and Goldar (1986). Returns to scale obtained in this exercise are not significantly different from one. Firm-specific effects are also captured with the use of firm dummies. But it would be a worthwhile effort if one could capture quality aspects of labour, capital, energy and material as well, in a future attempt on this industry.

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## TOOLS FOR QUALITY IMPROVEMENT

Tool	This Tool Will Help You
Bar Chart	Arrange data for quick and easy comparison
Barriers & Aids	Document the hindering and supporting factors that can or do influence a planned activity.
Brainstorming	Collect a large number of ideas from a group of people.
Cause-and-Effect Diagram	Identify a set of related causes that lead to an effect or problem.
Checksheet	Collect data in an organized manner.
Flowchart	Differentiate between the activities in a process.
Histogram	Determine how data are distributed.
Interview	Collect data from direct conversation.
Line Graph	Display the output of a process over time.
List Reduction	Reduce a large list of items to a manageable few.
Matrix	Make comparisons between two or more sets of information.
Pareto Chart	Arrange data so that the most significant element in a set of elements is easily identifiable.
Pie Chart	Display the volume or quantity of one item in relation to others.
Survey	Collect data from a large number of people.

Source: Manufacturing Competitiveness Frontiers, April 1992.

# Human Development in Indian States

## NPC Research Division

The conventional uni-dimensional definition of economic development as per capita income growth has come under increasing pressure of criticism in recent years. It is now being widely recognised that the broad concept of development relates to economic, social, cultural and political changes that enhance the welfare of the individual by permitting him to lead a better life than before. The Human Development Index (HDI) is one of the most innovative features of Human Development Report 1990, published by the United Nations Development Programme (UNDP). The index combines life expectancy, adult literacy and purchasing power (measured in terms of real gross domestic product per capita) into a single measure, focussing on how economic growth translates into human well being. The index clearly points out that there is no automatic link between economic growth and human development.

In the present study a similar exercise of ranking Indian States according to the level of human development achieved by them has been undertaken with some modification. The factors that contribute most to human development have been identified by the UNDP study as:

- (i) Longevity of life, life expectancy at birth being an indicator of it.
- (ii) Knowledge, literacy rate being only a crude reflection of access to education, particularly to the good quality education so necessary for productive life in modern society. But achieving literacy is a first step in learning and knowledge building, so literacy figures are essential in any measurement of human development.
- (iii) Command over resources needed for a decent living is perhaps the most difficult to measure. The per capita state domestic product has been taken as an indicator of it.

All the three measures of human development suffer from a common failure,—they are averages that conceal wide disparities, thus making a strong case for the inclu-

sion of distributional corrections. We thus include:

- (iv) Percentage of population below the poverty line as a distributional indicator.

The Human Development Index (HDI) thus arrived at could be an effective aid not only in regard to allocation of developmental outlays across these states, but also to the corporate sector in its investment decisions.

### Technical Note

HDI is constructed in three steps:

The first step is to define the measure of deprivation that a state suffers in each of the four basic variables, Life expectancy ( $X_1$ ), Literacy ( $X_2$ ), Per Capita State Domestic Product ( $X_3$ ) and percentage of population below poverty line ( $X_4$ ).

A maximum and a minimum value are determined for each of the four variables, given the actual values. The deprivation measure then places a state in the range of zero to one as defined by the difference between the maximum and the minimum. Thus  $I_{ij}$  is the deprivation indicator for the  $j$ th state with respect to the  $i$ th variable and it is defined as

$$I_{ij} = \frac{\max_j (X_{ij}) - X_{ij}}{\max_j X_{ij} - \min_j X_{ij}}$$

The second step is to define an average deprivation indicator ( $I_j$ ). This is done by taking a simple average of the four indicators

$$I_j = \sum_{i=1}^4 I_{ij}$$

The third step is to measure the HDI as one minus the average deprivation index.

$$(HDI)_j = 1 - I_j$$

**Table 1: Major States In a Descending Order of Human Development Index**

Rank	State	Life Expectancy (Years) (1990-91)	Literacy Rate (%) (1990-91)	Per Capita State Domestic Product (Rs.) (1989-90)	Population Below Poverty Line (%) (1987-88)	Human Development Index
1.	Punjab	65.45	57.14	8068	7.02	100.00
2.	Kerala	68.67	90.59	4081	14.92	94.82
3.	Haryana	62.69	55.33	6917	11.74	82.82
4.	Gujarat	59.91	60.91	5932	11.72	75.63
5.	Maharashtra	62.40	63.05	6512	29.07	68.56
6.	Tamil Nadu	60.82	63.72	4453	32.80	51.01
7.	Karnataka	62.75	55.98	4491	31.98	50.88
8.	West Bengal	59.79	57.72	3842 *	27.55	46.84
9.	Assam	55.48	53.42	3878	22.64	41.03
10.	Andhra Pradesh	60.66	45.11	3397 *	31.62	34.59
11.	Rajasthan	58.24	38.81	3139 *	23.57	32.32
12.	Orissa	56.14	48.55	3296	37.90	21.84
13.	Madhya Pradesh	55.47	43.45	2994	36.45	17.04
14.	Uttar Pradesh	51.89	41.71	3293	33.00	14.26
15.	Bihar	57.60	38.54	2390	40.74	10.73

\* Rates to 1988-89

- Source: (1) Life Expectancy: Report of the Expert Committee on population Projections, Census of India 1981, Occasional Paper no.4 (1988)  
 (2) Literacy rate: Census of India, 1991.  
 (3) Per capita state Domestic Product: Central Statistical Organisation, Estimates of state Domestic Product and Gross Fixed Capital Formation (1991)  
 (4) Percentage of population below poverty line, estimated by the Planning Commission, based on 43rd round of National Sample Survey results.

In the case of variable IV above, viz. the percentage of population below poverty line, the deprivation index has been subtracted from unity in order to take account of the negative relationship between HDI and the variable.

To make the study easily comprehensible the state ranking the highest in HDI, has been given a value 100 and the HDI for all other states have been computed as a proportion to it.

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## Energy Input - Output Analysis of a Distillery

### NPC Energy Management Division

The distillery industry produces rectified spirit (an aqueous solution of ethyl alcohol with strength about 94.6% v/v) by fractional distillation of the fermentation products of cane-sugar molasses, a waste product of the cane-sugar industry. The distillery industry is energy intensive and energy costs account for 27-30 per cent of the manufacturing cost. Reduction of energy consumption is therefore of major importance to the industry for cutting costs and improving productivity. Table 1 presents the energy input-output analysis for a distillery with a daily production of 50 Kl.

This input-output analysis has been carried out using actual measurements and data from an operating plant. All energy flows have been expressed in GJ/hr in order to have a common base for comparison. Electricity in kWh

has been converted to GJ by multiplying by a factor of 0.0036. The production efficiencies involved in the generation of electricity from primary energy sources have, thus, not been considered. The energy flows represent the sensible and latent heats associated with each stream. In the case of streams having value as fuel, the energy flow represents the calorific value. Nearly 75% of the electricity requirement is met by co-generation using steam turbine, while 82% of the fuel energy requirement (presently being met by coal) may be obtained from the bio-gas generated by effluent treatment of the spent wash. At the time of study the modification of boiler to gas firing had not been fully carried out and hence the fuel input to steam generation is shown as being entirely provided by coal. With utilization of bio-gas the coal input will be only 18% of its present value.



Table 1: Energy Input - Output Analysis of a Distillery

Sl. No.	Unit Operation	Stream	INPUT			Stream	OUTPUT		
			Flow TPH	Temperature degree C	Energy flow GJ/hr		Flow TPH	Temperature degree C	Energy flow GJ/hr
1.	Molasses Handling	Molasses	8.833	30	0.555	Molasses	8.833	30	0.555
		Electricity			0.014	Losses			0.014
2.	Fermentation	Molasses	8.833	30	0.555	Fermented Wash	30.65	36	4.712
		Dilution water	23.333	30	2.931	Carbon dioxide	1.516	36	0.050
		Yeast & Nutrients	Small		Small	Sludge	Small		Small
		Exothermic Heat		36	1.820	Cooling water	217	31	28.169
		Cooling Water	217	29	26.349	Losses			0.0288
		Electricity			0.0288				
3.	Distillation	Fermented Wash	30.65	36	4.712	Rectified Spirit	1.696	32	0.148
		Steam	5.490	106	14.768	Spent Wash	34.444	90	12.980
		Cooling Water	160	36	24.117	Cooling Water	160	45	30.146
		Electricity			0.0389	R & C Loss			0.198
						Other losses			0.0389
4.	Steam Generation	Coal	1.197	35	19.801	Steam	5.490	250	16.039
		Air	6.810	35	0.249	Flue gases (dry)	7.648	195	2.021
		Water	5.572	30	0.0007	Blowdown	0.082	250	0.086
		Electricity			0.346	Ash	0.359		0.523
						Flue gas moisture			0.982
						R & C, other boiler losses			0.500
						Other losses			0.346
5.	Steam Turbine	Steam	5.490	250	16.039	Steam	5.490	106	14.768
						Electricity generation			0.724
						Losses			0.546
6.	Cooling Tower (Distillation)	Warm Water	160	45	30.146	Cooled Water	160	36	24.117
		Electricity			0.101	Loss to air			6.029
						Other losses			0.101
7.	Cooling Tower (Fermentation)	Warm Water	217	31	28.169	Cooled Water	217	29	26.349
		Electricity			0.0828	Loss to air			1.82
						Other losses			0.0828
8.	Dilution water pumping and filtering	Electricity			0.0159	Losses			0.0159
9.	Effluent Treatment	Spent Wash	34.444		not considered	Biogas generated	0.488		16.248
		Electricity			0.345	Losses			0.345
		Miscellaneous Inputs			not considered	Miscellaneous outputs			not considered

Note: Base temperature 0° C.

Production Level 50 KLPD.

1 kWh of electricity = 0.0036 GJ

All electricity input is ultimately dissipated as heat and appears as loss in the output.

For streams having fuel value, energy flow represents calorific value.

Compiled by  
S. KrishnaMoorthy & J. Mishra



# Pollution Audit in Vanaspati Industry

## NPC Pollution Control Division

The Vanaspati industry is today a major organised sector with over 110 units licensed to manufacture vanaspati. The total installed capacity of these units is more than 23 lakh tonnes and the present capacity utilisation is around 58%. The installed capacity is found to vary from 50 to 150 TPD. The raw oil used for manufacturing vanaspati varies depending upon its availability and price.

### Status of Pollution

As a part of the project, Pollution Audit in Oilseed Processing Sector was carried out by NPC for the National Cooperative Development Corporation. Detailed Pollution Audit Studies were carried out in 6 representative units during 1991-92. Based on the production capacity, the units have been classified as large, medium and small scale units. For evolving specific pollution load generation factors, flow proportionate composite samples were collected from various wastewater generating sources. Subsequently the pollution load in terms of Kg BOD/tonne of Vanaspati manufactured was arrived at. (table 1)

The observed variations in specific wastewater volume and specific pollution load are due to the type of process employed viz. batch or continuous, variations in type and mix of raw oil used for vanaspati manufacturing and operational practices adopted for neutral oil recovery.

### Pollution Abatement Measures

More than 70% of the total pollution load is contributed by the gums removed from oil during degumming process.

**Table 1: Levels of Pollution from Vanaspati Manufacturing units and impact of Pollution prevention on Pollution reduction**

Scale of Operation	Flow (M <sup>3</sup> /day)	BOD (Kg/d)	Specific Pollution Load (Kg BOD/T)		
			Before Pollution Abatement	After Pollution Abatement	Reduction (%)
Large	680	340	2.9	2.1	28
Medium	136	244	2.8	2.6	32
Small	64	367	7.5	3.3	56

Since gums are valuable by-products, they should be separated by a separator and converted into Lecithin, a useful emulsifier for various industrial applications. Gums from oil like rice bran can be separated and used for soap making. Proper recovery and reuse of gums will reduce the pollution load in vanaspati manufacturing in terms of BOD by around 50%.

Neutral oil losses due to improper control of the lye dosed for neutralisation, excess hot water used to remove excess lye and poor design and maintenance of oil/grease recovery traps contribute substantially to oil and grease and BOD load from oil refining process. Therefore, proper control of lye dosage, hot water usage and recovery of free floating oil/grease should be introduced to reduce the total pollution load. Similarly, other measures like usage of high strength wastewater stream after neutralisation for ash quenching and coal wetting will reduce the total pollution load.

Required capital investment and the annualised operation and maintenance costs for wastewater treatment system before and after introduction of pollution abatement measures have been estimated (table-2). The treatment system has been designed to achieve wastewater disposal standard of 30 mg/l.

**Table 2: Impact of Pollution Prevention on Capital and operational costs for wastewater treatment plant**

(Rs. '000)

Category	Wastewater Treatment Costs					
	Before Poll. abatement			After Poll. abatement		
	Capital	Ann O&M	% Turnover	Capital	Ann O&M	% Turnover
Large	1210	1067	0.20	950	854	0.16
Medium	950	854	0.24	732	602	0.18
Small	1264	1113	0.63	730	598	0.36

Compiled by  
P.K. Gupta  
Rajeev Wadhwa

# Employee Involvement in JIT Success: The Eicher Experience

Sharad Singhvi

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*JIT emerged as one of the successful approaches to company success in recent years along with Total Quality Management (TQM). Originating from Japan, JIT had been doubted for its adaptability in India. The Eicher experience proves it other wise. The paper reinforces the belief that the fundamental principles underlying JIT-TQM philosophy are as applicable in Indian (or any) environment as they are in Japan.*

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Responding to the phenomenal Japanese success and an imminent challenge of survival in the market place, a host of companies have tried to introduce the concept of Total Quality Management (TQM) in one form or another. The approaches taken by them and their attempts to internalize the new philosophy are being avidly watched. Doubts about the relevance of Japanese techniques and their applicability in India have been raised time and again.

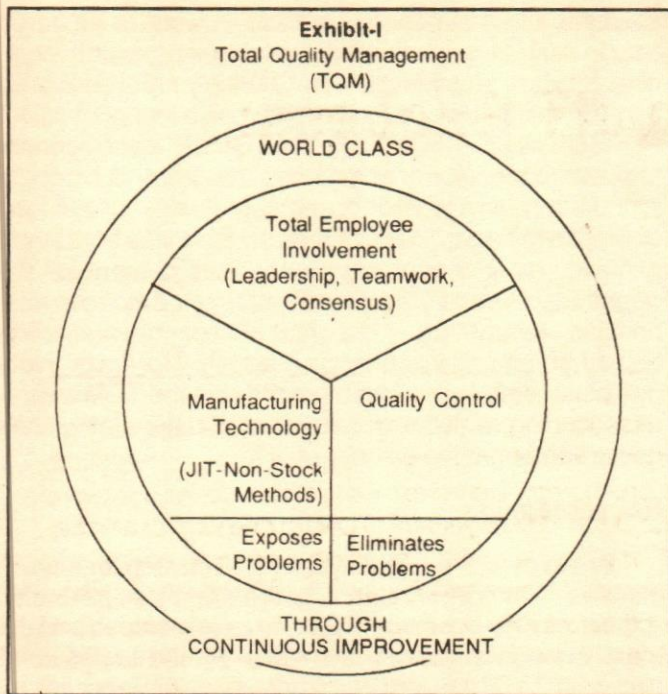
The Eicher experiment with the TQM approach has convincingly put at rest such doubts and proved that people's involvement coupled with the JIT philosophy could achieve dramatic improvements in productivity, quality and speed. Such landmark successes were achieved at all of our plants reinforcing our belief that the fundamental principles underlying the TQM philosophy are as applicable in Indian (or any) environment as they are in Japan.

## TQM At Eicher

Eicher introduced TQM as corporate philosophy in 1989-90 with a focus to build a sustainable competitive advantage and prepare the organiss for the nineties. A model of TQM was adopted which had three elements—Total Employee Involvement, Just-in-Time manufacturing and Total Quality Control. The process followed was:

- \* Development of shared vision

**People's involvement coupled with the JIT philosophy could achieve dramatic improvements in productivity, quality and speed.**



- \* Steering councils at corporate and divisional levels
- \* TQM training for each employee of the organisation
- \* Improvement projects
- \* Continuous improvement culture

As a part of the improvement projects, major JIT initiatives were taken at many of the EICHER divisions leading to dramatic improvements in productivity, quality and speed.

### The JIT Approach

The success stories of companies adopting the JIT approach, revealed that quantum improvements could be achieved in Productivity and Quality by implementing JIT principles in a structured manner. Contrary to the usual approach of assigning this task to the experts i.e. engineers in modernisation group, our company decided to

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**The entire approach was guided by the strong belief that dramatic improvements on the shopfloor could be achieved without major investments. The objectives of the exercise were to create a workplace with minimum inventory, consistent quality and very high responsiveness.**

take a unique approach of involving the workers, the supervisors and a few engineers to form vertically integrated small groups and achieve a transformation in the workplace.

The teams followed a structured problem-solving approach (often known as the QI story in Eicher) while implementing the changes in the workplace.

Following are the key steps followed by the teams:

1. Training on Demand Pull concepts
2. Identification of key performance parameters.
3. Assessing current performance on the above parameters.
4. Work content analysis of each operation.
5. New layouts based on U-shaped cells (wherever applicable)
6. Operation Standards
7. Material Handling trolleys-containers
8. Maintenance plan for each machine.
9. Housekeeping
10. Visual Control
11. Multiskill training

The entire approach was guided by the strong belief that dramatic improvements on the shopfloor could be achieved without major investments. The objectives of the exercise were to create a workplace with minimum inventory, consistent quality and very high responsiveness.

### Incentive System

Very soon we realised that the new production system based on JIT principles will require changes in some of the long established practices. In the past the incentive system in the shop floors had been introduced to get higher production. However it promoted only local maximization and had been the single largest contributor to high inventories in the shopfloor. The incentive system had to be abolished if JIT was to succeed. In retrospect, we feel this

**The incentive system had to be abolished if JIT was to succeed.**

has been the most significant factor leading to the success of our JIT efforts.

### **Performance Indicators**

Traditionally, plant performance was measured mainly by indicators like Labour efficiency, Machine utilization etc. In fact many of these performance indicators actually led to undesirable side effects like excess inventory, defects and unbalanced flow. Based on the success stories of other companies and published literature, we arrived at a totally new set of performance parameters consonant with the JIT philosophy. These were Thruput time, Total WIP, Straight pass %, Setup changeover times etc.

### **Operating Culture**

It was soon discovered that existing structure and operating styles where jobs were strictly classified and activities were supervisor controlled will not be conducive for the new philosophy. Recognising the fact that people working on the job knew best about it, we wanted to create a workplace where people will be working in a self coordinated and autonomous manner. This needed redefinition of jobs and cross training of workers. We adopted one-up-one-down operator training which meant that if needed, any operator would be able to work on his preceding operation as well as succeeding operation. This created a great deal of flexibility as well as a team-culture where people took ownership of the entire line rather than their own workstation.

### **Production-Quality-Maintenance Relations**

Conventionally, operators were expected to only produce and the responsibility of quality control was on the quality inspectors. Similarly, machine problems or breakdowns were considered to be the maintenance responsibility with practically no ownership of the operators. Under the new JIT system, where time was at premium and speed was the watchword, such rigid structures had to be broken. Self maintenance checklists were prepared where each operator took responsibility of maintaining his own

machine and maintenance personnel were to be called only in case of major breakdowns requiring expert attention. Similarly dependence on Quality for routine quality control was also stopped with the new concept of NEXT PERSON IN LINE AS YOUR CUSTOMER. Each operator took the responsibility of ensuring that every component produced by him was of acceptable quality for the next operation to be carried out. Obviously this was not easy to achieve, as it meant significant enlargement of the operator's responsibility. Good Employee-Employer relationship, mutual trust and a great deal of communication helped in making this change possible. Moreover every one of our employees had been through the TQM awareness training, which was instrumental in generating their conviction about the efficacy of JIT.

### **Housekeeping**

World over, Housekeeping is the first step for any JIT initiative. This not only cleans up the workplace but is also a great morale booster. People do take ownership of the plant when it is clean and shining. All the teams were trained in the 58 housekeeping principles. All unnecessary material was removed, every item was put in its appropriate place with visible controls and checklists were prepared to maintain the workplace. Behind all this was the belief that any searching, waiting, repeating etc was a non value adding activity, detrimental to the JIT success.

### **Investment**

Yet another change in mind-set was that major investments were NOT needed for transformation to JIT working. Our teams demonstrated this in ample measures by restricting the total investment to a few thousands of rupees, mainly on account of trolleys, containers, visual controls etc and not on machines and equipment. People actually went to the scrap yard and salvaged many broken and discarded items by fabricating hoists and containers using such scrap material. This proved that given encouragement, freedom and a sense of purpose, phenomenal amount of ingenuity and creativity could be unleashed.

### **Results**

We had expected quantum improvements in the new operational parameters, but the actual results surpassed

**Yet another change in mind-set was that major investments were NOT needed for transformation to JIT working.**

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even our most optimistic expectations. A reduction in thrupt time by 16 times (from 96 hrs to 6 hrs) was made possible by the new approach. Changeovers in tractor models which earlier took 2-3 days are now being done in less than 2 hrs. Significant and visible improvements could be seen by anyone visiting the plant after a gap of 12-18 months. The whole plant looks very compact with 30-40% reduction in space and virtual absence of any in-process inventory. Another major benefit has been the material handling which is practically non-existent. Quality levels, earlier in the range of 40-50% straight pass are more than 90% practically in all JIT lines. Tables 1 & 2 give complete details of JIT results in our two plants at Alwar and Faridabad.

### Learning

TQM at Eicher is still in its nascent stage and all our JIT initiatives were essentially bold experiments. The whole experience has been extremely valuable, leading to many paradigm shifts. Some of the key learnings have been:

1. It is not essential to invest large sums of money to implement JIT.
2. Given a chance workers may surprise us with their understanding, ingenuity and creativity.
3. The whole approach is essentially integrated, i.e. it is impossible to implement JIT without employee involvement, mutual trust and an unrelenting focus on quality.
4. Vendor is one of the key links in the entire chain of manufacturing. It is essential to have him as a part of the business as opposed to the adversarial relationship.
5. Yesterday's solutions may not work today.

**Table 1: Results: New Transmission Line**

Indices	Before Demand Pull	After Demand Pull
Lead Time (Throughput Time)	96 Hours	6Hours
Productivity	1.2 MDU	0.5 MDU
Quality		
* Straight Pass	50%	92%
* Demerit	No Data	0.1/G.B.
WIP	200 Sets	20 Sets
Space	500 m	325 m
No. of Kaizens/Month	No Data	15-20
No. of Product Design		15
Related Problems Resolved		
No. of Temporary Employees (Casuals)	18	Nil
Linearity	40%	90%
Material Movement	700m	300m

**Table 2: Achievements of JIT Approach**

Parameters	Cyl. Head Line		Internal Liner		Control MSG.		
	Old	New	Old	New	Old	New	
Inventory	250	75	176	43	400	86	
Material Movement	88M	24M	33M	10M			
Space (SQ. Meters)	150	100	60	35	206	155	
Production Per shift	40	55	40	55	40	45	
Manpower	Direct	-16	12	8	4	32	22
	Indirect	4	0.5	4	2	04	04
Quality	O.C	Self	O.C.	Self	O.C.	Self	
	Inspector	Inspection	Inspector	Inspection	Inspector	Inspection	
Straight Pass	22%	84%	91%	98%	80%		
TPT (Min)	2000	1000	1800	300	4592	815	
VAT (Min)	116	81	41	41	82	65	
NVAT (Min)	1884	908	1758	258	4500	520	

**There is nothing so JAPANESE about the JIT approach which could not be applied in INDIA.**

6. All performance measures must be critically examined for their contribution to the overall benefit of the company.
7. There is nothing so JAPANESE about the JIT approach which could not be applied in INDIA.
8. It's fun to implement JIT.

## News & Notes

### PARTICIPATIVE MANAGEMENT IN JAPAN

In Japan, QCCs and autonomous control (*jishu kanri*) groups are small work groups that engage in problem-solving discussions and activities in the pursuit of improved quality. The essential feature of such groups is the relatively widespread participation of rank-and-file workers. Although such groups as QCCs, autonomous control groups, and Zero Defects (ZD) groups are organized as parallel structures outside the direct line of authority, they are clearly oriented toward the goals of reducing costs and management errors and improving quality, safety, equipment, and efficiency. The two characters that make up the Japanese term *ringi* mean "submitting a proposal to one's superior for approval" (*rin*) and "deliberations and decisions" (*gi*). Some descriptions of the *ringi* system make it sound relatively decentralized: ideas flow from the bottom up rather than from the top down; all those with a stake in the decision are consulted; a consensus is reached before the decision is implemented. Decisions reached in this way are often a tedious process of collective compromise that can involve as many as 60 to 80 individuals in the organization, each of whom has veto power.

There is disagreement as to how participatory and democratic *ringi* decision making is. If we think of a continuum from the most decentralized types of organizations, it is possible that examples can be found of many points along this continuum in some Japanese organizations. At a minimum, however, we must distinguish among the following elements of the *ringi* process: suggestions or recommendations to make decision X; the veto power concerning decision X; and the lowest level in the organization that has the authority to decide the matter and take action on it without waiting for confirmation from above.

QCCs, autonomous control work groups, and the like enable Japanese rank-and-file personnel to make suggestions that their supervisors in the formal hierarchy may then incorporate into written *ringi* proposals. These supervisor-initiated *ringisho* are revised and approved as they move up the hierarchy, generating consensus. Workers' participation is institutionalized in QCC-type activities, but

does not directly extend into the *ringi* system. That system enables even lower-level supervisors and managers to participate in decision making. But where does veto power concerning a *ringi* proposal reside, and what is the lowest level in the organization that has the authority to take action on a decision without waiting for confirmation from above?

The "bottom-up, consensus" decision making in the *ringi* system should not be confused with "work place democracy." My findings based on the Aston measure of centralization of authority reveal a mean centralization score of 3.55 across 37 decision categories in 48 Japanese firms. This score corresponds to a level in the factory CEO (level 4) and employees whose orders come directly from the decision-making designed (to allow) laborers to participate.... on an equal footing with top management and decision-making through self-management by a workers' council". Claims that the Japanese have "participative" decision processes have sometimes obscured the crucial distinction between (1) the right of workers to present ideas and suggestions, which Japanese management acknowledges, and (2) authority to make and implement a decision, which Japanese management not only does not extend to workers but reserves, in most cases, for relatively high-level managerial personnel.

Moreover, even the kind of participating by lower-level managers that the *ringi* systems has encouraged has been seen as slowing decision making too much, and many Japanese firms have adopted the *Jyomikai*, or executives' meeting, as "the vehicle for reaching decisions on all important matters". The *jyomikai* moves Japanese decision making even further away from any "workplace democracy".

In short, there are significant kinds of "participation" by workers and lower-level managers in Japanese decision processes, but the decisions themselves are generally the prerogative of mid-to upper-level managers. Through Quality Control Circles, Zero Defect movements, self-management (*jishu kanri*), and the like, rank-and-file personnel can make suggestions that their supervisors may then incorporate into written *ringi* proposals. These managerial-initiated *ringisho* are revised and approved as

they move up the hierarchy, generating consensus. But only higher management has the authority to make the decision, especially in more organization-wide, strategic matters.

At the same time, there is the need to expose the decision process to the organization's corporate strategies, which tends to push the decision process upward. If the downward process is manifested in QCC-type arrangements, and the upward process is expressed through the *ringi* system, we may think of an equilibrium point for these two opposite organizational movements, which takes the form of varying levels at which decisions of various kinds can be authoritatively made. Deliberations that are consequential for corporate strategy will move up through the *ringi* system to a high level before an authoritative decision is made; decisions that tap the everyday knowledge and skill of rank-and-file workers, although still authoritatively concluded above the rank-and-file level, will be made at a lower level than that at which the more strategic decisions are made. By not usurping each other's "turf," both the relatively centralized formal system of decision making and the very decentralized participation systems such as QCCs and Zero Defects may operate more effectively.

The Aston measure of the degree of centralization in different categories of decision making is thus an important means of making sense out of contrasting tendencies toward decentralized worker participation and centralized *ringi* decision making in Japanese organizations. The Aston measure also helps in differentiating structural from cultural differences. It can show whether there are cultural differences in the average level at which a given decision is made. Japanese firms, for example, appear to have higher average levels of centralization than British firms for most categories of decisions. But the Aston measure can also show that particular decision matters tend to be ranked in about the same order of relative centralization of authority in organizations in different countries. Thus, despite cultural differences among nations, it is still possible to state a general proposition with cross-national application: Organizations universally tend to make strategic, non-programmed, and organization-wide decisions at higher levels and to delegate authority to make more routine, programmed, sub-unit and individual-level decisions at lower levels in the hierarchy.

Robert M. Marsh, *Industrial & Labour Relations Review*, 45(2), (Jan-1992).

## MANAGEMENT PHILOSOPHY IN JAPAN "GOOD WILL IS EVERYTHING."

Every Japanese company has its own corporate philosophy expressed in various forms, even including collective labour agreements. The most common are *shaze* (corporate constitution) and *shakum* (code of behaviour). Sincerity and harmony are the most favoured characteristics. Recently, it has been fashionable among companies to establish and propagate a corporate identity to improve the corporate image; some have changed the company song and emblem. *In the West, the basic role of management is to direct and control functions (importance attached to function); in Japan the basic role is to secure harmonious and effective relationship among three major factors: materials, money, and people (importance attached to relationship).*

Customer-oriented (not producer-oriented) production and marketing policy is common, and necessitates that Japanese companies be adaptable and innovative. *Customer-oriented production aims at continually producing better products at lower prices.* However, it has some negative effects and consequences. Consumers frequently replace items purchased earlier by new products. Over-time work is required by unexpected changes in market demand. *Excessive competition is created not only in developing new products but also in expanding overseas markets.*

Japanese management attaches great importance to workplace because it is there that employees are "born" and develop in terms of work (in the case of new graduates). Necessarily, Japanese employees tend to identify themselves with the company where they work, and not the job they do. Employees are not considered to be consumable physical resources, but as important corporate members in the corporate structure. Since decisions (by management) are made to be implemented and executed (by workers), greater importance is attached to the worksite and workers than to the office and managers. In such a context, the role of managers is to provide every possible assistance to the workers. Class-like distinctions by status and position within the company are insignificant, as exemplified by comparison of pay between the company president and the new employee. In fact, when the company is in financial difficulty, labour cost reduction starts at top management. Only after many measures have been taken is the company finally obliged to dismiss its regular employees (employee adjustments.)



Many Japanese companies calculate and disclose value added figures as an important indication of concern and appreciation for all those who have contributed to the creation of new value.

*Hideo Inohara, Training Manual On Japanese Management & Human Resources Development, Asian Productivity Organisation, 1991.*

### PRODUCTIVITY NOT A PRIORITY IN THE UK

As the UK moves closer to Europe, successful membership of the inevitable European Monetary Union is going to depend heavily on raising UK productivity levels. But there is disturbing evidence that industry is not giving productivity a high priority. New research shows that productivity improvement is a top goal for just 4 per cent of British middle managers and supervisors in medium-to-large manufacturing companies. Management consultant, Peter Chadwick, commissioned the research from Corporate Information, which spoke to 200 UK managers in companies employing 500 or more people during April and May 1991. It is hardly as if productivity is making way for other important goals like quality and delivery. Just 29 per cent saw product quality as the main reason for setting goals and standards, and only 23 per cent gave delivery as the main reason.

Chadwick defines productivity as "producing right first time, on time and to cost using the existing level of resources to optimum effect". Agreeing that specific productivity and delivery goals are important, Chadwick adds that overall productivity is critical to success: "Quality as a goal in isolation, without regard to the cost of people and the cost of waste, is neither competitive nor does it make commercial sense." Chadwick also found that 60 per cent of managers and supervisors had production and operational problems that were never resolved and kept coming back. One third of those questioned said their biggest problem was shortage of materials and parts. Some 83 per cent of managers said the problems were caused by factors outside their control. The research also shows that middle managers do not accept the now-common view that people, not processes, are the key to achieving change.

About three-quarters of the Chadwick group believed change was necessary to stay competitive. But only 48 per cent believe this could be achieved by changing individuals' behaviour and attitude. The same number thought

attempting such change "would cause staff problems". An astonishing 90 per cent think shopfloor training is irrelevant to improving productivity. Chadwick concludes that middle managers "are being given the wrong objectives based on inaccurate information and ineffective management and operational systems. Until managers focus on getting everything right first time, until they pay continuous attention to the basic detail of their systems, to the effectiveness and relevance of their training, until they are committed to continual improvement, they will waste resources and inefficiency will be the norm."

Recent Engineering Employers' Federation figures show that, since early 1990, productivity in engineering has been stagnant or falling. CBI figures show that the rises throughout the eighties still leave the UK streets behind Germany, the US and Japan.

*Works Management, February 1992*

### THE CEO'S ROLE

The head of a mid-sized business needs to have an increasingly wide range of skills. To start with, he needs entrepreneurial ability. He must be skilled at leading and motivating a team and defining project goals. This, in turn, calls for a certain degree of charisma and the capacity to stand to stress.

The CEO must also know how to master his environment. He requires an understanding of the modern world and the changes taking place in it. The CEO must have the capacity to anticipate economic and technological developments and to ride the crest of the market wave. Finally, the mid-sized firm's CEO must have the technical abilities that go into guaranteeing a high level of quality. Success in business depends on quality factors governed by the owner of a firm and his immediate assistants: quality production, quality service, quality management and quality human relations.

In practice, it is difficult for the head of a mid-sized business to display all of the above super-human characteristics. Nevertheless, he must succeed in meeting the special challenges of running companies of that size. The biggest challenges facing the manager of a mid-sized firm include:

- \* **Difficulties in recruiting high-level executives.** Smaller businesses find it difficult to recruit graduate-level executives who have high salary require-

ments. These companies often suffer intense competitive pressure on their margins, and their production volumes are not sufficient to make it profitable enough to compete for high-level executives.

- \* **The limits of family management.** One man or one family often owns all or the majority of shares in a small business. An employee who is not a member of the family has little chance of becoming directly involved in managing the business, which can discourage the best candidates from joining such firms.
- \* **The succession crisis.** It is often a traumatic experience when the head of a mid-sized business, who is frequently the founder, hands over control to his successor. If this event is not carefully prepared, the chances of finding a suitable successor within the business are low.
- \* **The lack of formal management skills.** In many small and mid-sized businesses, because making a profit requires all of top management's energies, little attention may be paid to the organization of the management system and the enhancement of human resources. While this intense concentration on the market and the customer is an undeniable advantage of small structures, it must be coupled with good management and organizational skills.
- \* **The lack of resources for developing new technologies.** The technology gap between large and small companies is widening as a result of extremely-rapid progress in recent years, especially in the fields of electronics and new materials. The scientific ability needed to develop, or even to use, new technologies is rarely achieved in small businesses. The smaller the business, the greater the risk that its technology will become obsolete.
- \* **Difficulties in handling subcontractor relationships.** Many mid-sized firms, particularly in Japan, are subcontractors. They are always under strong pressure from their customers. The uneven balance in resources between the mid-size supplier and the large-sized customer gives the smaller firm a disadvantage in negotiations.
- \* **Complex relationships with banks.** Contracts with bankers require a strong financial position to ensure that the company gets good deals. Many small businesses are treated just like individuals and are offered loans at high interest rates. At the same time, they find it harder to raise equity financing.

The obstacles on this list are real, but they are not presented as a reason for discouragement. New mid-sized businesses appear every day and develop into powerful competitors as a result of their management's abilities to meet these challenges. The warning must nevertheless be heeded: Lasting success is only possible when management skills are developed through training or experience.

*Koji Tajika, in World Link, No. 6 1991*

#### HRD IN JAPAN: TO DRINK FROM THE SAME CUP

Japanese labour markets are segmented by employment status. The recruitment norm is to hire inexperienced new graduates by level of education. The idea is to mould these fresh people to fit the corporate structure and work system. In some industries, due to rapid development, midcareer employment takes place. Private employment agencies (authorized by the Minister of Labour) do increase such changes among young people in all industries, but it is still far from common. For many years, more than one job has been available for new graduates and for the young; yet the unemployment rate for the young age group is relatively high. This implies that young high school graduates who first enter small industries tend to be mobile until they find a place to settle. In the midcareer market, or open labour market, mobility takes place between small companies; upward mobility from a small to large company does not normally take place. With some exceptions, most companies treat those hired midcareer somewhat inferior to the standard worker hired immediately after graduation. Nonregular employment markets are gradually expanding, due particularly to the continued shortage of workforce in many small enterprises, which provide jobs for an increasing number of married women who want to work part-time after their child-care years are over.

Regular recruitment is carefully planned by all those concerned (i.e., the school, company, and student) because the norm is long-term, stable employment. This is exemplified by a typical calendar of employment of university graduates. In the light of long-term corporate liability of hiring a university graduate, which amounts to Y200 to 300 million including all labour cost for about 35 years, the company must be careful. The student must also be selective; the choice more or less determines future career and family life. Since the performance of a school's graduates affects the future employment of its students, the school is sensitive in providing assistance to the senior students. Among all the measures for screening appli-

caris in this context, the most important is the introduction to employees from the same school, and personal interviews (recruitment of regular employees). For regular employment, no written individual contract is concluded. Instead, the employee submits a letter of promise of loyal fulfillment of duty, school records, and other documents; in return he or she receives an employee handbook (required documents for employment and rules of employment). The employment relationship is founded on mutual trust. For nonregular employment, a written contract is concluded for a legally permissible maximum period of one year with option for renewal. In the beginning of a career in the company, even a university graduate is assigned to a job at a low level, in later years such "hardship" experience becomes a solid qualification for a managerial position. Human resources development is a corporate responsibility in Japan. It is a long-term investment, mostly through unprogrammed on-the-job training (OJT) by internal trainers (methods of human resource development). Personnel appraisal is conducted in various ways. Evaluation items cover not only tangible performance but also intangible attitudes and, particularly, potentiality. Usually, the final corporate-level evaluation by the Personnel Department takes place after an initial evaluation has been conducted by the immediate superior, and the result is not evident in monetary terms except for a minor increase in the seasonal allowance. The result is applicable mostly toward future training and development. From the motivational point of view, negative evaluation (rating some employees inferior or below standard) is avoided as much as possible. The evaluation might designate the employees as "one who needs effort to improve." The supervisor and the workmates are expected to help these individuals improve.

*Hideo Inohara, Training Manual On Japanese Management & Human Resources Development, Asian Productivity Organisation, 1991.*

### INDIAN INDUSTRIES: INCREASING ENERGY INTENSITY?

Not only that the share of industries in the GNP is one of the lowest in India among the Asian Nations, its energy intensity seemed to have actually increased during the decade 1975-85. In 1975 itself the energy intensity of Indian industries was typically the highest among Asian nations; almost six times higher than in Korea. By 1985 while the energy intensity of Korean industries seemed to have declined, that of Indian industries increased. The energy intensity of Indian industries has been about seven

times higher when compared to the Korean counterparts in 1985. Interestingly, Chinese industry has an energy intensity ratio of 1700 TOE/ US \$ 1000 in 1985 against India's almost 5500 TOE/US \$ 1000.

	Share of Industry in GNP (%)		Energy intensity in industry (toe/USD 1000)	
	1975	1985	1975	1985
Bangladesh	14.2	15.7	1.187	1.830
China	—	49.7	—	1.700
India	19.7	20.8	4.882	5.477
Indonesia	27.8	29.7	1.149	2.034
Korea	31.4	42.1	0.883	0.785
Malaysia	26.8	31.8	2.083	2.628
Pakistan	22.8	28.2	3.201	3.114
Philippines	33.1	33.7	1.833	1.499
Sri Lanka	28.4	26.0	0.504	0.522
Thailand	25.0	29.4	1.678	1.381

*J. Girod: Energy Diagnosis of Energy Systems in Developing Countries, Commission of the European Communities, 1992*

### A NEW COAL AGE

Most of the technologies currently used to produce energy from coal were developed in the 1950s and 1960s and are approaching the limits of their effectiveness. The efficiency of coal-steam power plants has risen over the past 85 years from around 10 per cent to 35 per cent without addressing the associated generation of pollution which has become chronic in many coal-dependent communities.

A new generation of coal technologies has emerged in Europe and the United States since the 1980s, however, raising the prospect of a new coal age with efficiencies in the range of 40 to 45 per cent and emission reductions in the case of CO<sub>2</sub> by up to 30 per cent. Some of these clean coal technologies have the potential to make a coal-fired plant burn as cleanly as natural gas—the cleanest of all fossil fuels.

These "clean coal technologies" can be installed at various stages in the fuel chain or used to convert coal into other, more efficient and environmentally sound fuel forms as follows:

**Pre-combustion:** Sulphur, methane and other impurities can be removed before coal reaches the boiler. Research has traditionally focussed on two major approaches: physical cleaning and chemical cleaning. One chemical process which has shown promise is molten caustic leaching which removes sulphur and mineral matter. Biological cleaning, employing microbial and enzymatic techniques to liberate sulphur and ash, has also attracted recent interest.

**Combustion:** Two new advanced technologies remove pollutants as the coal is fired. They are fluidized bed combustion and advanced 'slagging' combustion.

**Post combustion:** Flue gases can be cleaned in the ducting which leads to the smokestack or in advanced versions of today's scrubbers.

**Conversion:** A fourth option outside of the fuel chain is the conversion of coal into other fuel forms. There are five categories of conversion:

- \* **Gasification:** Coal is broken into gaseous molecules by bringing it into contact with high temperature steam and oxygen (or air). The gases are purified and the clean gases are burned. The very hot exhaust is routed through a gas turbine to generate electricity and the residual heat in the exhaust is used to boil water for a conventional steam turbine generator to produce more electricity.
- \* **Mild gasification:** This modification produces gaseous, solid and liquid products by heating coal in an oxygen-free reactor.
- \* **Coal liquefaction:** Coal-oil co-processing is a recent development in liquefaction technology which could offer better economies. Rather than liquefy coal alone in a complex and expensive process, coal can be mixed with heavy residual oil waste from refineries. The slurry is processed in a cracking unit and sulphur and ash can be removed before the coal-based liquid is used as fuel.
- \* **Fuel cells:** The fuel cell is a coal-based technology which does not depend on combustion processes. Gasified coal is used as a source of hydrogen to supply the fuel cell for an electrochemical reaction. During this reaction, oxygen atoms and hydrogen from the hydrocarbon fuel are combined to form water, thus releasing chemical energy. Japan, the United States and Germany are leaders in the R&D of fuel cells.

- \* **Magnetohydrodynamics (MHD):** This process fires coal at close to, 5000 °F. The combustion gases are released as a hot stream of highly charged particles (plasma). The electrical conductivity of the gases is enhanced by 'seeding' them with special salts, and the plasma is channelled through an intense magnetic field at close to the speed of sound to generate electricity.

Clean coal technologies have primarily been geared towards the utility and industrial markets but most are capable of providing energy and/or fuel for all market sectors. There is a wide and expanding array of options at various stages of development, and while some involve the construction of new plants, others can be retrofitted to existing utilities.

*Update, N. 48/Winter 1991-92*

### CEMENT: ENERGY EFFICIENT PROCESS TECHNOLOGY.

A National Workshop on "Energy Management in Cement Industry" held at Hyderabad, India on August 29, 1991, was told in a paper that the energy intensive Indian cement industry, which had generally started moving towards energy efficient dry process plants and improved technologies, had the potential to save 17% of energy consumed in the dry process plants.

The Workshop was informed that a study of two large cement plants in 1989-90 by the Energy Management Centre of the Government of India suggested policy measures recommending that the existing wet process plants, which consumed more energy but produced less, should switch over to dry process. It also recommended that pre-heater technology should give place to pre-calciner technology which enhanced the plant's efficiency and capacity and also enabled it to utilise inferior grade high-ash coals. The study favoured setting up of comparatively large-sized 1000 TPD cement plants as specific energy consumption decreased with the increase in capacity of a plant.

The Workshop made several recommendations based on expert panel discussions. It called for designing strategies and programmes to enhance energy conservation awareness in the cement industry and recommended that the Cement Manufacturers Association should develop a few demonstration projects for energy conservation. The

Workshop also recommended that individual cement plants should develop their own manpower for efficient energy utilisation in operation and maintenance of plants.

*Energy Conservation News, Vol.1*

## RICE VERSUS METHANE

The impact of rice cultivation on global warming is the subject of a study currently under way at the International Rice Research Institute (IRRI) at Los Banos, Philippines.

The flooded fields in which 95 per cent of the world's rice is grown, emit 25 per cent of the methane which enters the atmosphere annually, according to Dr. H.U. Neue, coordinator of IRRI's methane research programme. "But farmers cannot quit growing rice to reduce methane emissions," he said. "Rice is the world's most important food crop. It provides more than half the daily food for one out of every three persons on earth."

### A Partnership

Soil and atmospheric researchers have joined forces at IRRI to measure methane emissions under varying fertilizer regimes as part of a five-year study of how climate change might affect the world's rice crop and vice versa.

Methane is produced by the bacterial decomposition of organic matter in flooded rice soils and enters the atmosphere by three routes. As much as 80 per cent passes from the roots through the plant which acts as a 'chimney'. Smaller amounts bubble up to the water surface or diffuse slowly from the soil through the water. Most of the diffused methane however is broken down in the soil and floodwater and never reaches the atmosphere.

### How and why

"We are interested in the how and why of methane emissions from flooded rice fields," says Mr. Hugo Denier van der Gon, a research fellow from the Wageningen Agricultural University of the Netherlands. "We don't want to change the system without first understanding it".

Methane has assumed a high profile in the global warming debate because of its heat trapping properties. Although the methane concentration in the upper atmosphere is only 1.7 ppm compared with carbon dioxide (CO<sub>2</sub>) at 350 ppm, a single methane molecule traps heat 30 times

more effectively than a CO<sub>2</sub> molecule and may cause about 15 per cent as much global warming as does CO<sub>2</sub>.

### Options

"Changing from irrigated lowland rice cultivation to dry upland farming won't solve the problem," says Dr. Neue. "Even without rice cultivation, much of the wetland areas would be naturally flooded and methane emission is a natural process in flooded soils. Any fertile submerged soil will produce methane. Our aim is not to decrease methane production, but to decrease methane emissions."

Dr. Neue said that increased methane oxidation in the fields would mean less escaping gas. "We need a plant with both high oxidation power and high yield potential. A plant that will help the environment without endangering farmers' income".

IRRI scientists have placed 16 plexiglass boxes each 1 cubic meter in size in small plots with rice exposed to different fertilizer treatments. The boxes open and close, trapping and continuously measuring the methane emitted. Methane emissions from different rice varieties and under different water management practices will also be measured.

*Update No. 48, Winter 1991-92*

## COMPARATIVE PRODUCTIVITY TRENDS, 1960-90

Over the three decades since 1960, U.S. manufacturing productivity has risen at an average annual rate of about 3 per cent per year. This long-term performance was exceeded by all the other countries studied except Canada whose average productivity growth rate matched that of the United States. Productivity growth in the nine European countries ranged from nearly 3-1/2 percent to 6 per cent per year over the period, while Japan experienced average productivity growth of 7 per cent.

U.S. output peaked in 1973, and the years since 1973 have been characterised by a slowdown in the productivity growth rate. The U.S. rate slowed from 3.3 per cent per year between 1960 and 1973 to 2.5 per cent per year between 1973 and 1990. All countries studied have experienced productivity growth rate slowdowns in the latter period. With the exception of the United Kingdom, the productivity slowdowns in these countries have been more substantial than in the United States, although from large pre-1973 rates of gain.

Between 1979 and 1990, British productivity rose about 4-1.2 per cent per year, greatly exceeding the average rate of gain between 1973 and 1979 and also exceeding the pre-1973 rate of increase. The United States is the only other country covered by this study whose average productivity growth rate between 1979 and 1990 was nearly equal to its pre-1973 rate of gain. In addition, the United States was the only other country to experience a substantial productivity growth rate increase in the 1979 to 1990 period, compared with the 1973 to 1979 period. Norway recorded a modest increase; the other countries studied experienced further slowdowns. Even so, U.S. productivity growth between 1979 and 1990 was matched by France and the Netherlands and exceeded by Japan, Belgium and Italy as well as the United Kingdom. However, the U.S. rate exceeded the average rates recorded by Canada, Denmark, Germany, Norway and Sweden of under 2-1/2 percent.

*Arther Neef & Christopher Kask, in Monthly Labour Review, Dec. 1991.*

#### ILO STUDIES: RESTRUCTURING STEEL INDUSTRY

Following a period of crisis, the iron and steel industry has undergone major restructuring which has in many countries resulted in a profound transformation of its strategies, products and personnel. New technologies and modernisation have had an important effect on employment, in particular on the level of training and qualification in a sector which is increasingly concerned with environmental protection.

Steel remains the basic industrial material, the foundation on which modern civilisation is built. Although the industry directly contributes fractionally to the creation of national wealth, its real contribution is much greater because of its close and diversified interrelations with upstream and downstream sectors of the economy. According to two ILO reports (Iron & Steel Committee 12th session, Report 1: Recent Developments in the Iron & Steel Industry, Report II, Training in the Iron & Steel Industry, Geneva 1992) an upswing in world steel production which occurred from 1987 to 1990 has been followed by signs of decline, although trends have varied in different groups of countries. In the industrialised market economies, following a long period of crisis, the industry has complemented major improvement in technology and efficiency. In countries of Eastern and Central Europe, growth

was disrupted by a deepening recession in 1990, a development associated with the profound restructuring taking place in these economies. The modernisation of the industry appears essential, by means of privatisation given the scarcity of hard currency. Joint ventures between Western and Eastern steelmakers as well as some new forms of co-operation can be expected.

It is in developing countries that the most dynamic development is taking place. Their share of world steel output climbed from 8 per cent in 1980 to 13 per cent in 1990. The State has played a very important part in this expansion, but in a number of countries there is a trend toward privatisation in an effort to modernise outdated works and raise their efficiency.

Employment has declined in the steel sector in all industrial market economy countries, and in a majority of those in Central and Eastern Europe, a trend which is likely to continue. Employment trends in developing countries are more diversified, but privatisation will, in all probability, result in a decline in jobs.

New technologies tend to reduce the manual content of skills and lessen the need for traditional practical knowledge, but they can expand the intellectual content of work and often demand higher levels of knowledge. Average hourly wastes in the industry tend to be higher than in manufacturing industries as a whole. Training of technically qualified personnel who can operate and maintain new machinery has in recent years become a top priority issue for steel companies, a number of which are directly involved in staff training. New strategies for vocational training and retraining adapted to the industry's development will be among the questions examined by the committee.

Another major preoccupation of the industry is protection of the environment. Virtually all its production processes are major consumers of natural resources and energy and can give rise to substantial air and water pollution, noise, heat and waste generation. The industry has given considerable attention to the introduction of cleaner technologies and pollution control measures.

The results have been impressive. In many countries the industry now occupies a leading position in the development and use of industrial emission monitoring and control system and energy and material recycling, but in others it remains among the most polluting branches of economic activity. Solutions exist, at a cost. Increasing importance rests on the cultivation of positive attitudes towards environmental management and of environmental

education of all those employed in iron and steel production.

*ILO News 20 March 1992.*

## WHO IS A CONSULTANT?

The term "consultant" is generic and can be applied to any person or organisation that provides advice to decision makers. This advice can take many different forms and concern any area of human activity and interests: there are consultants on pension plans, garden layout, buying antiques and raising funds for social organisations. Anyone who feels like it can call himself a consultant—if he finds clients.

The terms "management consultant" or "business consultant" point to the area of the consultant's intervention, which is assistance to entrepreneurs, managers and other decision makers in business and management, in both the private and public sectors. It is not an officially defined and protected title. Anyone who believes that he has something to offer to managers can position himself as a management consultant. Clients looking for management advice can choose from a wide range of service offerings by consultants who exhibit tremendous differences, in background, experience, competence, work styles, conditions of intervention, quality of service and professional standards. Therefore no client can escape from the time consuming, risky and sometimes painful task of selecting the right consultant. The consultant's profile must be matched to the nature of the problem at hand and the client's specific requirements. In addition, the wheat has to be separated from the chaff.

In our conception (which will be used consistently in this publication) the consultant is a person or organisation that meets the following four criteria.

Firstly, the consultant offers and provides something that the client is lacking but wishes to acquire in various areas of business and management knowledge, expertise, experience or know-how. It can be a special and narrow subject, such as job evaluation for clerical occupations, or a broad and multidisciplinary topic such as diagnosing companies in difficulties. It can be state-of-the-art expertise in information technology applications or international financial markets, or conventional down-to-earth know-how on improving the organisation of small maintenance shops.

Secondly, the consultant is someone who knows how to work with clients in helping to identify and solve their

problems. He realises that clients have varying needs and personalities, and are more or less experienced in using consultants. Therefore, the consultant uses various methodological tools for helping the client to define problems and analyse their causes, recognise the need for change, choose among alternatives, deal with psychological and other barriers to change and implement the right decisions. To a certain extent, every consultant must have psychosociological skills in addition to being an expert in production control, employee compensation or any other substantive area of management.

Thirdly, the consultant is an independent and objective advisory. He must be able and willing to tell his client the truth and give an absolutely independent and unbiased opinion without having to worry about any possible consequences to the consultant as a person and the consulting firm that employs him. He should be independent of the client himself, any supervising authority, organisations and people who have or would like to have a business stake in the client organisation, centres of political power in the community and so on. Most consulting firms are owned by the consultants themselves and are fully independent. Some firms are owned by banks, governments, other professional or business firms and agencies, etc. In these cases it is necessary to make sure that the firm's ownership pattern does not constrain independence and objectivity in any way.

Fourthly, the consultant is someone who has chosen to abide by a professional code of ethics and conduct. We shall see that it may be an official code of a consulting association where the consultant is a member, or a personal code defined by the consultant himself. It is important that there is no misunderstanding between the consultant and the client about the interpretation of this code and the consultant's behaviour. The client-consultant relationship is based on trust above all. In particular, the client must feel sure that the consultant is absolutely honest with him and that serving the client's interest is the guiding principle of the consultant's behaviour.

*Milan Kubr, How to Select & Use consultants: A Client's Guide, International Labour Office, Geneva, 1991.*

## TOMORROW'S FIRMS

### A. The new concept of the industrial firm: more service

Due to, among others, the changes in the scientific, technological and industrial basis, it does not make much

sense to look at the industrial firm in a traditional way with the focus of interest on the prime production process activities and the blue collar workers. Beside a tendency towards specialization, more focus on efficiency and not on labour productivity, the most dominant force in the organisation of production today, is the increasing importance of service functions embodied in manufacturing activities. We are talking about both design, maintenance, repair, financing and continuous need for training of manpower. The reason for this development can be seen as the growing complexity of production and society, the need for better management and more target marketing, and of course the need to adjust to the changing condition on the global market.

### **B. New tendencies in company strategy : 'The flexible firm'**

There is, no doubt, a tendency away from tayloristic production towards more skill-based production. This tendency is partially due to the increasing recognition of the need for consensus between management and labour on the questions of implementing new technologies. Training as part of a well designed personnel policy has to be seen as an integrated part of the overall company strategic priorities. This has turned out to be for the benefit of the core-workers of the companies. But at the same time there is an increasing tendency to use subcontractors as a way to rationalize production and reduce financial risks. Consequently this affects the use and composition of manpower, thereby reflecting the concept of the 'flexible firm' and increasing the number of workers outside the core of the company's manpower. The need for skills and formal qualification among these peripheral workers is rather limited compared to that of the core-workers. The overall effect of this strategy is a further balkanisation of the labour market.

### **C. Networking as development strategy**

In a period of great turbulence in politics and economics the uncertainties of the future make it necessary for the individual firms to reorganise, accept increasing transaction costs and form alliances with companies normally regarded as competitors, with authorities and unions as well in order to implement a given strategical development plan. For a country/region (e.g. Denmark) characterized by the dominance of SMEs such a total concept necessarily must lead to network strategies, because the individual SME cannot possibly cope with all functions or is the solution that SMEs have to become specialized subcon-

tractors of large multiregional national firms able to cover all the service functions needed?

Altogether, this calls for a better understanding of the way firms organize the necessary production functions. How do firms, for example, organize the innovation of services and integrate these innovations into the total production process? What are the consequences of investment in material capital, e.g. human capital, what changes may be expected in the industrial relations at both firm level and on the labour market as a whole? It might be useful to discuss the implications of the changes in Industrial Relations, the need for more service, the "Flexible firm" concept and the networking strategy on the need for innovation in training, if we are going to address the right kind of problems and make proper priorities between the proposed fields of action. The tendencies and questions like the ones mentioned are essential to face, if we want to have knowledge of the impact of today's rapid changes in Europe on working-life in general and needs for innovations in training in particular.

*Eurtcent, Innovation & Training, Report on European Workshops at Blenheim, Oxford, Nov. 1990.*

### **SATCOM FOR CONTINUING EDUCATION IN INDUSTRY**

For the first time the National Productivity Council (NPC) along with Indian Space Research Organisation (ISRO) imparted Industrial training through Satellite Communication Network in February 92. The programme was an experiment in Mass Communication through Distance Learning Process. Satellite Communication is best suited in situations where it has to reach large numbers spread in various remote and distant locations.

The Teaching-end Training Centre with a small studio facility and an up-linking earth station was set up at ISRO Telemetry Tracking and Command Network (ISTRAC), Bangalore. From this end the Training programme was transmitted live or through pre-recorded tapes. The TV Signal containing the Training programmes was transmitted from the Up-link Earth Station at ISTRAC to the INSAT-1B Satellite and was received at eight different training centres. It was also equipped with three exclusive and dedicated telephone lines exchange for receiving the telephone calls from different Training Centres during the duration of the training.

Eight centres were selected as receiving-end Training Centres:



BEML	:	KGF
HAL	:	Banglore, Nasik
HMT	:	Pinjore, Hyderabad
L & T	:	Kansbahal, Bombay
NPC	:	Madras
(TIPIE)		

Three of the Training Centres were equipped with satellite based Talk-back Terminals through which the participants at these centres can ask questions on an audio channel via the Satellite to the experts at the teaching end. The Satellite Talk Back Audio Signals from these training centres were received at ISTRAC and fed back to the audio of the TV. The questions asked from one centre can be heard on the TV at all other training centres. For Satellite Talk-Back Terminals, two centres were selected from remote areas. These were Kansbahal in Sundergarh District, Orissa and Pinjore in Ambala District of Haryana. The third one at Bangalore, was selected for demonstration purpose.

The remaining five centres (KGF, Hyderabad, Nasik, Bombay and Madras) were equipped with STD facilities to ask questions on the Public Switched Telephone Network (PSTN) to the experts at the teaching end.

A total of 210 participants from 11 companies participated in the programme. The participants included 29 overseas participants also.

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## THE ECONOMICS OF CLIMATE CHANGE

- \* Global climate change is an economic issue because any policy response we pursue will involve sacrifices. If we take measures to reduce our greenhouse gas emissions substantially or to adapt to climate change impacts, we will have to pay for these efforts by diverting resources away from other activities. If climate change impacts are still felt despite our efforts, then we will have to suffer the consequences of environmental damage. The economics of global climate change is primarily about how to balance these sacrifices.
- \* A balanced policy response must seek to reduce both greenhouse gas concentrations and the damage they cause. Atmospheric concentrations can be lowered by abating emissions and by creating new "sinks" for absorbing greenhouse gases

(by planting trees for example). Meanwhile, the damage from the remaining greenhouse gases can be lessened by constructing dikes and sea walls or by developing new seed varieties that are better suited to a changed climate. Because there is no feasible policy response in the short term for bringing greenhouse gas concentrations back to pre-industrial levels, some measures for adapting to the expected impacts of climate change will be essential. The optimal balance between abatement and adaptation will depend on each policy's costs and benefits. One economic study shows that, while some abatement of emissions is warranted, it would be less than the amount required to stabilize concentrations at their current levels.

- \* The cost of a climate change policy can be estimated by calculating the change that it produces in human well-being. One way to estimate this change is to determine the additional income that would be required to make society as well off with the policy as it would be without it. Economists generally agree that the per-ton cost of making the first modest reductions in greenhouse gas emissions would be small. However, after the cheapest solutions for reducing emissions have been exhausted, the per-ton cost would start rising steeply as further reductions are made via more expensive solutions. Estimates vary widely of just how much total abatement would actually cost, and of the point at which incremental costs would begin to rise steeply. There is even substantial disagreement over the cost of cutting emission by just one ton (the first "unit of abatement"). Some analysts argue that this cost would actually be negative because the first reductions could be achieved by reforming policies that currently discourage energy conservation. Others disagree. In any case, most economists believe that the total cost of reducing emissions by a significant amount would be high—more than one percent of gross domestic product (GDP).
- \* The benefits of a climate change policy can be estimated by calculating how much the policy reduces environmental damage. Calculating the benefits of a climate change policy is even more controversial among economists than is estimating the costs. An order-of-magnitude estimate can be obtained by asking how much of an economy would be seriously affected by climate change. For some industrialized countries, it seems that the answer is not more than 1-3% of GDP. However, for other

countries—including island nations and countries with very large agricultural sectors—the percentage could be much higher. One weakness of estimates based on GDP is that not all goods and services that would be affected by climate change appear in conventional national income statistics. A loss of biological diversity, of example, would not be captured in GDP figures. Finally, the benefits of a particular policy may not be realized for many years because the climate system responds slowly to changes in greenhouse gas concentrations. This lag raises the issue of whether the value of benefits should be discounted and, if so, at what rate (economists use discount rates to put a current value on a future benefit).

- \* Once policy-makers have determined what their objectives are, economists can offer insights into how to craft the most cost-effective policies. Economists generally prefer economic instruments to direct regulation. Two particular proposals for economic instruments have received the most serious attention. The first is to impose a tax on carbon dioxide emissions. Several countries—including Sweden, Finland, Norway, and the Netherlands—already levy a national carbon tax, and the European Community too may soon adopt a uniform but nationally-administered tax. The second proposal is to set a quantitative limit on the global emissions of a greenhouse gas and then to allow emissions

permits to be traded like ordinary goods and services. To date, no country has implemented a scheme of tradable permits for emitting greenhouse gases. However, a conceptually identical approach is being used in the US to limit the production of chlorofluorocarbons (CFCs) and the emission of gases that cause acid rain.

- \* Making a significant reduction in atmospheric concentrations of greenhouse gases will require international coordination and agreement. When one country reduces its emissions, all countries benefit. But the country reducing its emissions will incur a substantial cost and will receive only a fraction of the total benefit achieved by its actions. Clearly, the economic incentive for any nation to reduce emissions unilaterally is very small. At the same time, assuming that no country is a net gainer from climate change, all countries would benefit from a greater reduction in global emissions. Unfortunately, negotiating an agreement that achieves greater reductions will be extremely difficult. While a few similar agreements have been negotiated in the past—the best-known example being the Montreal Protocol for phasing out CFCs—climate change is a much more complex and challenging issue, particularly because of the difficulties over sharing costs and benefits.

*IUCC Fact Sheet-226*



## **NPC & Quality Circles**

NPC has assisted a number of organisations in successfully implementing quality circles. These include engineering industries, electronics, process industries, power stations, textiles and service industries.

NPC Offers the following training programmes for the benefit of those organisations who are intending to introduce Quality Circles or are in the process of implementation:

- Top Management Exposition (1 day)
- Quality Circle Facilitator Programme (2 days)
- Quality Circle Leader Programme (3 days)
- Quality Circle Member Programme (1 day)
- Workshops for Sustenance of QC activities.

For details, contact:-

**Director (TQM),  
National Productivity Council,  
Utpadakta Bhavan, Lodi Road,  
New Delhi 110 003**

## Book Review

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**Foreign Direct Investment in Asia** Edited by Edward K. Chen. Tokyo, Asian Productivity Organisation, 1990, 270p.

The phenomenon of MNCs from third world developing countries (LDC MNCs) has become increasingly prominent. The LDC MNCs mobilise small scale less-import-intensive technology. They extensively use local inputs and save on scarce foreign exchange. They increase domestic linkage effects and share ownership with local partners. Unfortunately, these aspects of LDC MNCs and the impact of Asian based foreign direct investment (FDI) on host countries have not been properly understood. This gap has been filled by the book under review which is a product of a two-year survey undertaken by the Asian Productivity Organisation.

Professor Edward K.Y. Chen, the editor of the book, in his Preface says that a common framework was used for the survey of six countries which included two newly industrialised economies (Hong Kong and Singapore), two ASEAN countries (Indonesia and Thailand) and two South Asian Countries (India and Sri Lanka). The main focus of the book is on the characteristics and behaviour of LDC MNCs and how they are different from the MNCs of developed countries (DCMNCs).

The survey points out that the LDC MNCs are smaller than DCMNCs but larger than local firms. They are less dependent on their parent firms in the use of technology and input procurement. They place emphasis on the diversification of economic and political risks as an objective of FDI. They give importance to flexibility and adaptability, appropriate technology and above all lower costs of managerial and technical staff. The LDC MNCs are more export-oriented than local firms. The study points out that Japanese MNCs are, however, increasingly like American MNCs.

An interesting find of the Survey is about the so-called *flying-geese pattern of development* in which the production of a single product is usually undertaken in different countries. To illustrate, the production of semi-conductor comprises of four different stages like designing and mask-making, wafer fabrication, assembly and testing

which require different resources and factor intensity. Designing is done in Hong Kong and Singapore, fabrication in South Korea and Taiwan, assembly in Thailand, Malaysia and the Philippines, and testing in Hong Kong and Singapore. FDI has facilitated this type of development. But this is possible only if national governments adopt a friendly approach to FDI.

Section II of the book contains Country Reports from Hong Kong, India, Indonesia, Singapore, Sri Lanka and Thailand. The Report on India is written by R.H. Patil of the IDBI. After an excellent review of India's foreign investment policy touching on FERA, NRIs, tariff incentive and export policy, Patil gives the results of a sample survey of 58 companies. It reveals that the behaviour pattern of LDC MNCs differ from DCMNCs and local firms. Their investment decisions are greatly influenced by ethnic ties and desire to diversify political and economic risks. Most of the LDCMNCs covered by the survey did not undertake R & D activities and market research.

The case of Singapore is however, unique because while it exports capital through its own MNCs, it also receives a large amount of foreign capital from other LDC MNCs which gave their subsidiaries in Singapore greater autonomy in capital expenditure, pricing of products, choice of technology and export markets. It may, however, be noted that the structural characteristics of the Singapore economy such as smallness and openness had strongly influenced and reshaped certain operational behaviour of LDC MNCs. As compared to the MNCs of developed countries, the LDC MNCs were weaker and less effective in promoting technological sophistication, managerial advancement, labour upgrading and economic expansion in Singapore.

FDI has no doubt successfully promoted the growth and development of many countries. Taiwan is a success case. It facilitated the inflow and effective utilisation of capital through a positive attitude and favourable policies. The foreign firm's market orientation is the most important factor in determining the appropriate technology used. Further the importation of used machinery by foreign investors has posed no problem at all for the users or the

economy. At least in Taiwan's case, FDI was high-tech oriented and it always abandoned those traditional industries which were losing comparative advantage. This indeed is a lesson for other developing countries which refuse to follow the fundamental principle of comparative advantage.

The book is well written and well documented. It carries a useful bibliography. As Nagao Yoshida, Secretary-General, Asian Productivity Organisation says in his Foreword, we have moved far away from the times of Vernon's *Sovereignty At Bay* which considered only the MNCs of developed countries. Now MNCs based in developing countries have been demonstrating very active foreign investment both as host and home countries. The book is a commendable reference volume.

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**Community Action For Social Justice: Grassroots Organisations in India** by Shashi Ranjan Pandey, New Delhi, Sage Publications, 1991, p 294, Rs. 225.00.

The book under review is the outcome of a long-run field research by Dr. Pandey covering the social significance, strategies, impact, and developmental roles of the non-government voluntary organisations, alternatively termed as community action groups (CAGs). It analyses the growth, achievements, roles and links of CAGs in India during the plan periods. To examine their achievements and failures in terms of a counter-model approach with focus on equity and social justice, the author has undertaken extensive field investigations, out of which 17 cases are presented in this book.

The book starts with an introductory note covering an overview of the issues, contents, and background of the emerging role of CAGs in India. The author initiates the discussions with the premise that in spite of various rural development strategies, and programmes, poverty remains embedded in our villages. The programmes have failed owing to the inability of the Government machinery to create local awareness as well as local institutions. After providing a background of the nature of economy and society and the indigenous roots of development processes, he has focused on Government sponsored programmes for rural development, and the problem of persistent poverty and inequality.

He has argued that the failure to create active and

responsive grassroots institutions is due to the adoption of dominant growth-oriented top-down models of rural development. This attribution is totally biased against the planned approaches and strategies. On the basis of our field studies in Uttar Pradesh and Orissa, we have observed that the root causes of failure are; lack of political-will, lack of education, caste and class conflicts, bureaucratic hurdles, and large-scale corruption prevalent at the grassroots. The study would have been more comprehensive with incorporation of these aspects into the analysis. Besides, there are some erroneous statements made in this chapter. For instance, he has mentioned that "IRDP is mostly confined to agricultural development. As a grain-producing strategy, it has carried the green revolution to limited areas and has barely been able to feed the country" (p38). This observation is misguided and not tenable with the basic objectives of IRDP. Since IRDP is aimed at improving economic conditions of the households below poverty-line, who have hardly any access to land, it focused on financing the tertiary and ancillary activities. Our post-evaluation study of IRDP in U.P. had established that nearly 85% of the IRDP finances went to allied-to-agriculture and service sectors.

The objectives of the study, hypotheses tested, methodologies adopted, precautions adhered in primary data collection, definitions of CAGs, a comprehensive review of literature on CAGs, and the criteria of selection of the case studies are discussed. The distinctive features of a CAG, as identified are: they are micro-based, mostly experimental, led by charismatic leaders, aimed at meeting the local needs, and also intensely supported by the local people. With these characteristics, he has selected 17 innovative CAGs including at least three from each group; viz. Service, Development, People-based action, Field-based action, and Social action. A detailed analysis of backgrounds, physical activities undertaken, people's participation, financing patterns, achievements and failures of these CAGs is presented.

But a critical analysis of these samples reveals a bias in selecting them because no standard statistical tools have been used. The regional variations are missing. More particularly, he should have attempted to make it more broad-based by covering proportionate number of units from each region of the country. While he has selected more than one-third units from Maharashtra, very few are covered from Eastern India. Specifically, the grassroots approaches of the Marxist Government in West Bengal and the role of some oldest CAGs in that State are missing conspicuously.

After focusing the individual profiles of CAGs, the

author has analysed the models and links of CAGs in terms of volunteerism as service, developmentism as economism and activism as empowerment. The ideological characteristics, collective strengths and weaknesses of CAGs and the hypotheses related to evolution of alternative models of development are well depicted in (pp 201-202).

The author traces the impact of CAGs on the mainstream development models and focusses on issues of an alternative model (which is well indicated in Table 7, p 238) of a counter-stream ideology based on a new paradigm. The author has rightly mentioned that the grassroots level micro-movements and local activities will take a long time before they translate into movements and concrete models. Apart from raising these new issues, the last section of the book deals with a future perspective for the CAGs in India. He has demonstrated that the contemporary scene of development processes and social activism in India today is characterised by several progressive trends and inner-contradictions (p 239).

In spite of a good scope for CAGs for revitalisation of the rural areas, the concluding observation of the author is disappointing. According to him the social action front in India presents a strange scene: while the rural poor suffer, action groups differ, the government co-opts, the middle class remains indifferent, the critique writes, continue to write to no avail. The approach used by the state is one of benign neglect—accept the criticism and do nothing about it. These failures and problems lead to action fatigue and disillusionment.

In spite of the weaknesses mentioned above, the contents and findings of the book are extremely informative and useful. Our policy makers, planners, economists, sociologists and statesmen would be immensely benefited by reading this lucidly presented study.

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**Productivity Management : Concepts and Techniques**  
by Sawhney S.C., Tata Mc Graw Hill Publishing Company  
Ltd. New Delhi. p.275

Productivity has become the key word in the present economic scenario as it has been recognised that productivity growth is of vital importance for accelerating the economic development process. In the context of increas-

ing competition and renewed emphasis on customer's satisfaction, productivity has acquired a new sense of urgency. The concepts relating to productivity and its improvement have also been subject to change. While an integrated and holistic approach to managing productivity has been found to be most successful, most of the literature (which is in abundance) does not deal with the subject in an integrated manner. This book is an attempt in this direction and starts promisingly but ends up dealing with tools and techniques. The required emphasis on process and dynamics of improving productivity is missing. However, the book has been written in a very readable style providing many practical examples. Methodological equations and models have been used in abundance to illustrate the basic areas. All the different concepts relating to productivity have been clearly presented, notable among them being the models used by American Productivity Centre, Gold, Steward including the one by Sardana and Premvert. The methods of measuring the performance indices in different departments such as marketing would assist in institutionalising and diagnosing productivity through regular monitoring. The tools and techniques for estimation of workload and manpower have been highlighted. A good attempt has been made at compilation and consolidation of the work done in the area of theories on human motivation. The process of developing layout machine plant design has been laid out highlighting the use of operations research to predict the future and improve present utility.

A welcome feature is the emphasis on Materials Productivity. Since materials account for more than 50 per cent of the cost in majority of our industries, the detailed analysis combined with case studies will be of use to industries. Time management has been dealt with emphasising the reduction of throughput time for a job. The criteria used by National Productivity Council for its awards have been indicated. When attention is paid to the process of improving productivity, the final results are automatically improved. However, there are notable omissions such as the role of top management, trade unions and employees in improving productivity and approaches for creating productive work culture. Notwithstanding all this, this book is a well deserved addition to any manager's library as it gives some practical ideas for achieving higher productivity levels.

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**Social Side of Tata Steel** by S.N. Pandey. New Delhi, Tata MC Graw-Hill, 1991, pp. 186 + XVII, Rs. 150/-.

This book describes the various social service activities of the Tata Iron and Steel Company in some detail. It is written by an Industrial Relations Executive of the company. As such, the book may appear to be a part of the company's usual image-building exercise. But such a characterization of this informative book would be rather unfair. Tata Steel has been a pioneering and premier firm not only in steel making, but also in initiation of important and wide ranging tasks and activities in the service of its neighbouring community and country. The company reflects the unique, farsighted, and enlightened vision of its founder, J.N. Tata, and steersman, J.R.D. Tata.

The book is divided into nine chapters. Various views concerning the social responsibilities of business, and the philosophy of J.R.D. Tata are presented in the outset. The community development and social welfare activities of the company include education, health, childcare, and sports. Special attention has been given to the slum dwellers, destitute women, and the deprived and handicapped children, individuals, and groups. Over the years, these activities have spread out from Jamshedpur to the neighbouring villages in the radius of 35 kms. of the factory, and its mines and collieries.

Family welfare and health care activities within and around Jamshedpur have been described. Activities related to rural development and Adivasi Welfare taken up by the company include provision of agricultural inputs like irrigation, seeds, and fertilizers, information towards improved agricultural practice, development of rural industries, implementation of income-generating programmes, and vocational training. The organization is also involved in the promotion of education, arts, culture, sports, and games. The company's environment management or ecological conservation programme deserves a special mention. The firm has created an Environment Management Division, charged with the responsibility of control of pollution from manufacturing processes. The company has also been engaged in programmes of social forestry in the neighbouring rural areas. The book describes the relief provided by the company in terms of money, men, and material, towards alleviating the distress of people caused by natural calamities like earth-quakes, floods, and droughts, as well as, man-made calamities like communal riots in different parts of the country. Chapter nine provides a summary. The book is interspersed with various line sketches. They enhance its readability. The book is well organized and written in a lucid style. A serious weakness of the book is however, its almost total lack of

any critical and/or reflective mode of inquiry in the presentation of its subject matter. For the author of the book, what Tata Steel has done or is doing, is best in every respect, and could not have been better. There is no discussion of any alternative way of doing things, or different courses of action. There is also no mention of the politico-cultural problems that must have been encountered by the company's management in their attempt to introduce planned socio-economic change in a backward area. Such problems are almost inevitable in the context of changing any existing socioeconomic and cultural system. An account of such problems and their effective resolution by the change agent is not only useful and instructive in its own right, but also adds to our knowledge of planned social change.

A more serious deficiency of this book is its obvious omission of the company's failure to discharge effectively its key national obligation towards providing world class technological leadership to the Indian steel industry. While social responsibilities of business like providing schools, houses, and hospitals, have been met in varying degrees by other industrial houses as well, the technological leadership based on innovation, could be provided only by a company like Tata Steel. Starting with comparatively unfavourable conditions, the steel plants in both Japan, and S. Korea have been able to achieve world leadership in terms of production, productivity, quality, price, and market share. Tatas who were more favourably placed to do so, did not pursue, or missed this crucial opportunity. Perhaps their vision has been flawed in this respect. Instead of 'We also make steel', their mission or motto could or should have been, 'we are a world leader in making steel'.

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**New Trends in Medical Technologies and Hospital Management**, Tokyo, Asian Productivity Organisation. 1991, 126p.

'New Trends in Medical Technologies and Hospital Management' is a compilation of the summary of country papers presented at a two-week study meeting on Medical Technologies and Hospital Management jointly organized by Asian Productivity Organization (APO) and Asian-French Cooperation Programme on Productivity, held in Paris, France from 21st May to 1st June, 1990.

The book provides some valuable introduction of French know-how in the following sectors;

- \* Welfare medical care system
- \* Hospital Management and Computerization
- \* Maintenance of equipment
- \* Budget management
- \* Staff training

One of the problems being increasingly faced is the high cost of health care. One way, as highlighted by France, is to divide beds based on intensity of service/severity of illness into acute-, intermediate-, and minimal care patients. Thus with the same cost a much higher number of patients can be served. Surplus acute beds, thus generated, could be converted into medium- or long-stay facilities or into facilities for geriatric patients. The use of Diagnosis Related Groups (DRGs) based on limited number of parameters used and the use of predetermined complications and comorbidities among the secondary diagnosis has been found inadequate by French management. They have constructed a new algorithm, the Normalised Complexity Index (NCI). The index is based on the clinical summary written by the doctor in clear language and on the direct care report assembled by the nurses.

To treat patients with therapeutic technology, thus avoiding invasive and traumatizing surgical procedures, new health care devices have been developed with the help of advanced technologies, such as acoustic waves (ESWL), laser and microwaves. Technomed International and Sopha Medical offer a wide range of such devices.

This summary of country papers would prove quite handy for health planners to identify areas which need immediate attention. The maldistribution of health care resources, particularly in India, is apparent from the papers. The rural population constitutes 77 per cent but 73 per cent of hospitals and 87 per cent of hospital beds are located in urban areas. The papers highlight that unless a comprehensive health care planning and financing is undertaken, 'health for all by 2000' would remain a distant dream.

Overall the book would be of immense value to those concerned with health planning.

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**The Productivity Manual: Methods and activities involving employees in productivity improvement** by Elizabeth A. Smith. Bangalore, Media International, 1990, 200P., Rs. 400.

Since mid 1980s, several books and articles on productivity measurement have appeared for reference. But most of these books are full of theories, models etc. which are quite heavy to read. Here is an exception where the author has tried his best to present the subject in a simple manner that can be sized up by a practitioner to measure productivity in real life situation.

The book under reference has 18 chapters—the first chapter defining productivity and the last two chapters concentrating on simple methods of productivity improvement. All the other chapters deal basically with productivity measurement. Unlike other books talking about models and their underlying assumptions, this book analyses productivity from basics—measuring outputs and inputs. Chapters explain all the relevant aspects in very lucid manner and there is clarity in presentation. Most of the chapters help the reader to recapitulate the matter through questions and answers at the end. Each question provokes the reader to think about the application of the concept in his personal context. A pre-determined format to fill up the answer also helps him to think about the answer in a proper manner. This style of presentation is quite effective for an adult learner.

Another noteworthy aspect of the book is that it explains inter-linkages between productivity and other measures reflecting efficiency, effectiveness, quality, innovation and quality of worklife. There is another striking feature. This book has dealt with what is known as the science of measurement. Any practitioner interested in develop an appropriate set of measures of productivity in a specific context needs to follow certain fundamental guidelines related to measurement. This book gives the methodology of both qualitative assessment and quantitative measurement proving that productivity measurement in future need not be thought of in terms of ratio scale.

In spite of the many good features this book has, there is difficulty in integrating many of the chapters in a common framework. Author could have added a section providing inter-relationships between the chapters.

This book is an excellent guide for a practitioner to measure productivity in different kinds of organizational contexts. The reviewer is quite confident that all the professionals concerned with productivity and quality

measurement and improvement will use this book extensively in their efforts to improve productivity.

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**How to listen better : A hand book for improving your listening skills** by *Pramila Ahuja & G.C. Ahuja*. New Delhi, Sterling Publishing, 1990, 96p. Rs. 90.00

As the Ahujas have defined "Listening is hearing plus attending plus understanding and processing information". It is indeed a very important behavioural aspect that affects the life of every individual. All of us hear everything spoken within our hearing range, but many of us many times do not *listen* to many things we hear and that mostly leads to failures, losses and disasters.

The disastrous air crash that occurred to a Canadian Aircraft in 1977 in Tenirife, Canary Island, killing 586 people, destroying an aircraft worth USD 100 million and giving rise to claims totalling over USD 500 million was the result of the carelessness of a crew member who heard the radio instruction from ground control without listening to it. Many such instances of disasters and colossal failure caused by 'hearing without listening' are there in this book.

The importance of listening in all spheres of human activity cannot be overemphasised. Realising this an International Listening Association (ILA) has been formed with its Headquarters in Minnesota and it is engaged in promoting effective listening through a network of professionals who have dedicated their time to promote listening and to exchange information and their experiences and teaching materials. ILA has members from the USA, Belgium, Canada, Denmark, Germany, the Netherlands, South Africa and many other developed countries of the world. ILA has already succeeded in creating an awareness in the business world to consider good listening behaviour as

an essential quality of executives and an aspect to be included in the syllabi of management education courses.

The Ahujas' handbook on 'How to Listen Better' is a good book dealing with all technical and behavioural aspect of the subject, written interestingly for the use of students, teachers, educationists, doctors, lawyers, business managers and people from all other walks of life to whom listening is important. The authors have skilfully approached the subject from the angles of defining the special importance of listening while hearing, the process of listening, listening skill, listener quality, communication barrier and the role of listening in conflict management. Their analysis with different situational references makes the book more useful. The extensive quotations from the published works of eminent researchers like Charles R. McConnel, Mark Steinberg, Gerald G Miller, Richard Nelson Jones, Ralph G. Nichols and C. Washburne show that the book has been written after sufficient research on the subject. This enhances the quality of the book.

The authors have adopted good mechanics of writing which enhances readability. Comprehensive summaries help the busy readers, the dialogue helps the students and teachers, and the bibliography the researchers. The authors have used simple style of language keeping even ordinary readers in mind.

Books are rarely found without omissions and/or deficiencies, which ofcourse, the authors can reduce in second and future editions. The Ahujas have left out the most important role of listening in occupational safety and risk management at work places. The book could have been made better by including a few diagrammatic illustrations. The thin size and writing style, however, make the book easily readable even without illustrative figures.

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