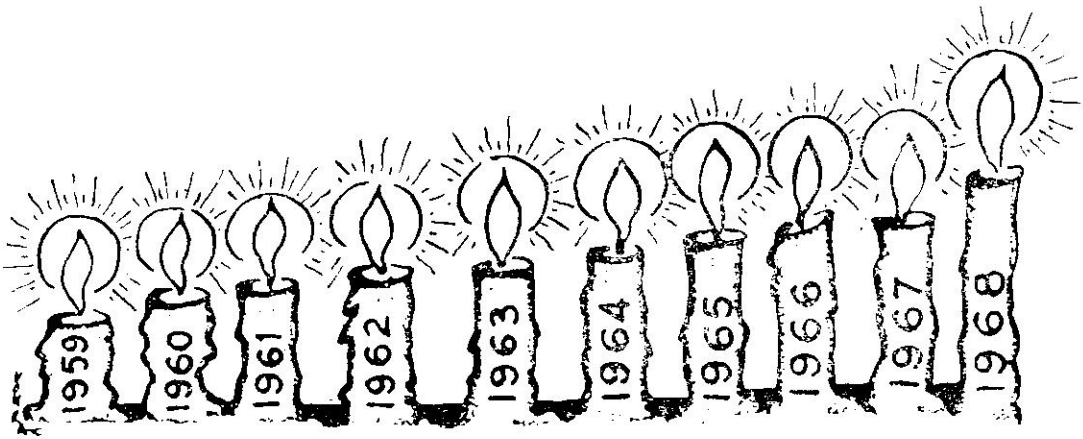

The Tenth Birthday of NPC

ABOUT THIS TIME, 10 YEARS AGO, THE GOVERNMENT OF INDIA launched the National Productivity Council, on the ILO tripartite pattern, with the active participation of Government, Labour and Employers as the three critical vertices of the Industrial Economy.

The assumption rightly was that unless the Economic Policies of Government, the basic attitudes of the Trade Union Movement and of entrepreneurial management were in harmony, very little could be done to push up the productivity of the social economy; and then we were launched at a time, when the rage of the age was not cost-consciousness, but cost-contempt. It is true that the Recession has given us our life's opportunity, but we can hardly call it a blessing, considering its impact on output and employment.

Thus we were launched under somewhat adverse circumstances; and hardly anybody had heard of productivity. However, two and a half years after the birth of NPC, the United Nations' representative in India, in a special article written for this Journal, said: "Throughout the ages there have been words which have had a magic quality in man's

Editor: **DH Butani**

mind—'Gold', 'Oil' and others. Nowadays in India such a word is 'productivity."*

This magic word has now become current coin. A decade ago, the mere mention of Productivity raised eyebrows as something alien to the ethos of the country. Now, alike in the valuations of Cabinet Ministers and Company Chairmen, Productivity has become the accepted yardstick of performance, as can be seen from their annual speeches when it is customary to evaluate and report on how a system or enterprise has fared.

In a special article (A Decade of Productivity) written at our request for this Souvenir Volume, Sri Wanchoo, the Chairman of NPC, has said: "...it is only too evident that at all decision-making points, there is a realisation that they will be judged by the measure of productivity that they are able to accomplish; and practically in all the forums of critical appraisal—the Parliament, the People and the Press—the question now invariably asked is: 'How productive are these investments?...How productive are the people we are employing in the public interest?...How productive are the various institutions and organisations that we have set up?...' In short, the capacity to deliver the goods and the proved determination to optimise output at the minimum cost in terms of real resources—these have now become the accepted criteria of social judgment"—should we say, thanks to NPC?

However that may be, we feel naturally happy at the NPC Chairman's what we believe to be a well-deserved pat on the back: "The specialists of NPC have contributed substantially to the development and propagation of Productivity Techniques. Practically every day, in one or the other part of the country—often at a number of places—we are conducting programmes: we have been doing this for years, running a number of training courses, assisting a large number of people from industry in the development of new skills." These are facts written on the walls of Indian Industry.

About the future, we are told that it is there for us to take: "...the coming decade is a period of opportunity for the NPC. The conjuncture of circumstances is therefore propitious for a New Deal".

In a highly critical article—we had invited our former Chairman Sri HVR Iengar—the great civilian and the former Governor of the Reserve Bank of India—to write for this Souvenir Volume—Sri Iengar comes to practically the same conclusion as Sri Wanchoo: "...the work of the Council is, if anything, even more important in today's conditions than it was a few years ago...it seems to be essential, if only for survival, that we should, in spite of all the difficulties that we are passing through, difficulties of raising capital, difficulties in getting raw materials, difficulties in marketing and particularly difficulties in labour relations, take all steps that we possibly can to increase productivity. In other words, I would say that it is precisely the difficulties through which we are passing that make it incumbent on us to increase rather than decrease our dependence on productivity techniques."

This, we must say, is an encouraging lead from a person who is now a great

* "A Word About Productivity" by James Keen, NPC Productivity Journal, Vol. 1, No. 6, Aug-Sept. 1960. p. 397

industrialist; and we are proud of him and of the courage with which he expresses himself in the public interest, though we may be permitted to add a rider—as we are a tripartite organisation, with a policy of established neutrality in matters of Labour-Management relations and Government Policies—that Sri Iengar's views on Labour Unrest and State Governments' labour policies, are his own personal views which, of course, deserve respect and attention, coming as they do from a man with a whole life dedicated to public service. The Official Labour Policy of NPC is reflected in the several extracts strung together from the Leading Articles published in this Journal, since its inception, on Labour and Productivity.

Nevertheless, the point made by Sri Iengar is of extraordinary importance, because unless we overcome the psychological barriers to Productivity, very little can be accomplished : "The barriers", as he says in the peroration to his article 'What Then Must We Do ?', "to taking up intensive work in the field of productivity techniques are today psychological and arise out of a feeling of frustration that things are going so wrong that the use of these techniques is of little consequence. We ought to pull ourselves out of such psychological barriers. I am convinced this is as necessary now as at any time in the past."

For this Souvenir Volume, we have a number of other distinguished contributors : the Minister for Industry, Sri Fakhruddin Ali Ahmed, has himself been good enough to write a Policy Article for us on this auspicious occasion, our tenth Birthday; Sri NJ Kamath,* Joint Secretary in charge of Productivity, has written on a burning problem of the day, viz., Productivity and Recession, a topic broached by us in the last issue of the Journal. Sri BN Bhattasali, with his specialisation in techno-managerial economics, has given us a wide perspective on the need of the hour on In-plant Training in Production Engineering. The Editor of this Journal has made his humble contribution in a signed article on The Indian Tradition: an analysis of the fundamental sociological factors that hold us up on the Productivity Front.

Really we have tried to pack this Souvenir Issue, as far as it lay in our power, with quality material. It is really several Issues in one: we have a number of highly readable and analytical articles on Coal, the base of our economy. We have again gone into Agriculture in a rather detailed way, with a number of research pieces on the subject : more or less a special supplement to our Special Issue on Agricultural Productivity (Vol. VI., Nos. 2 & 3, 1965).

Then we have a number of special articles on The Choice of Techniques, Value Analysis, the Continuum Theory of Management, Mathematics for Managers, Pedagogy, etc., etc., and we have processed a whole section on the New Literature in Management and Productivity.

And we have gone over a bit of the humble contribution over the years of this Productivity Journal in the formulation of Economic Policy, on Productivity as an element in Planning, and our thinking about the rightful position of Labour in the field of Productivity. Since this Journal came into being, we have written on

* Due to exigencies of service the author could not complete his analysis: it is now scheduled for the next Issue of the Journal.

these subjects from time and time : the three articles that follow are taken from the editorial pieces published in this Journal, since its inception in the autumn of 1959.

It is, however, the future that is inviting. Once again, the guidelines are clear, as stated in the NPC Chairman's article on 'A Decade of Productivity' : what, in fact, may be called The Second Decade of Productivity !

"There is need for an apex organisation to set standards for training, to evaluate trainees so that Industry and Government do not get flooded with sub-standard products; and at the other end, there is need to train on a mass scale the first line supervisors, the foremen, who are the real vanguard of industry, and the main conduit for the flow of productivity into the industrial system. I hope, NPC will, in the coming decade, do something substantial in both these directions.

"Now that industry is more ready for productivity, on account of recessionary tendencies and other difficulties, it is our duty to go forward and give them a helping hand in every possible way, to assist industrial firms develop a concrete productivity organisation, see through publicity and other ways that these efforts acquire a multiplier effect, push forward the status and standing of NPC as an honest broker, and as the apex organisation for a multi-dimensioned Productivity drive.

"For us in NPC, it is essential not only that we insist on that status but also that we deserve it...

"We, in the NPC, believe—this is our firm faith—that we are engaged, humbly of course, and according to what lights and talents we possess, in national service : for if industry becomes really productive, it will help to give the people of India the standard of living to which its citizens are entitled as human beings in the context of the new technologies.

"In this grand adventure we have to play the game; and we must know that it can no longer be played with slogans, for the targets are tough and the stakes high, indeed..."

Luck in Merely Staying Alive

In a world which proverbially does not give the race to the swift, nor the battle to the strong, nor bread to the wise, nor riches to men of understanding, final promotions must depend on luck. Luck in being born the son of a particular father (there is no harm in hereditary succession if only one could control the choice of the female line as well as the male as you can in race-horses—no one so far has started a Tycoon farm); the luck of being born a little bit earlier than somebody else, or the luck of having been pre-selected either by the modern method sometimes called "ordeal by house-party", or the older one of catching the manager's eye, or possibly even the eye of the manager's wife; luck possibly in merely staying alive.

However, carefully you frame your managerial succession or your organizational pyramid, fate can knock the top off it in an instant and presto! there at the head of affairs you find Old So-and-So who has been sitting peacefully in his corner for years waiting for his pension to fall due. And then you sometimes see the strange spectacle of Old-So-and-So, the despised and rejected, making quite a good list of it after all, thereby proving that there's not much in the pre-selection idea. Most confusing.

—Sir OWAIN JENKINS, *Balmer Lawrie, Calcutta*

6. Actually our plan was to publish a series of Special Issues dealing with each industry in the national economy and with the productivity of each country in the international economy; but circumstances became somewhat unfavourable, and with the IPY we were practically forced to publish only a general type of material, with such specialised stuff as we had taken pains to gather over a long period of time.

7. Now we propose reviving this feature of special sections, if not of Special Issues; and our programme over the year would cover Computerisation, Productivity of Capital, Methodology and Techniques of Industrial Consultancy, Techniques of Training with actual field applications, Production and Distribution of Food, Productivity and Recession, Productivity and the Foreman, the Impact of Economic Policy on Productivity etc., etc.

8. Now this obviously is too tall an order and wholly impracticable without the fullest cooperation of the readers of the Journal, who must contribute their experience in these areas or for the matter of that, in any area in which they feel competent to write.

9. The idea is to give the Journal a new orientation: to make it as far as possible research-based, particularly in the field of Industrial Productivity, through case studies, shopfloor applications, analysis of concrete techno-managerial experience, etc. etc.

10. To give an idea of the areas to be covered, we have published on the next page an announcement about a Special Issue on Computerisation. With large-scale industry resorting to Computerisation and Government itself having installed computers, and the public mind being naturally excited about the implications of automation on the volume of employment, we must rationally think about it and bring out the best we can of rational thinking in the matter.

11. May I end on the note that Productivity is founded on the belief and in the faith that the readers are potential writers, and that it is all a cooperative business in which a large number of knowledgeable people in the field of Productivity make available to each other their knowledge and experience; and that the Editor is only an honest broker of ideas and experiences.

Wishing you the very best for the New Year,

Truly yours

D H Butani

NPC *PRODUCTIVITY* Journal

Special Issue

on

Computerisation

IN view of the fact that both the Government and the Private Sector are resorting to increasing Computerisation, this subject needs a close study in the public interest from the point of view of its implications in respect of the levels of output, quality, efficiency, and above all, employment.

For quite some time, there has been an exciting discussion in the pages of this Journal about the pros and cons of Automation which in the modern context is co-extensive with Computerisation. In spite of the fact that we have declared the subject as closed, the interest does not appear to have waned ; and we have had to publish a few letters even in this issue of the Journal.

In view of the current interest and particularly because of the enormity of its implications *vis-a-vis* the social economy, we propose to devote a whole issue to Computerisation.

In this special Issue, there will be space only for first class material : experts in installing computer systems, experts in programming them, operators and interpreters of Computer Language, management experts with experience in the utilisation of data processing systems, academicians who have made a deep study of their economic implications, experts in the new science of Cybernetics, and other friends who feel they have something worthwhile to contribute, are invited to write for this Special Issue.

The invitation is extended with equal warmth to our friends abroad.

Productivity and Economic Policy

Since its establishment in 1959, the Productivity Journal has, on a number of occasions, examined the intimate relationship between Economic Policy and Productivity. Extracts from the leading (Editorial) articles published in the various issues of this Journal, are printed below:

...a grave danger exists : if the volume of employment increases with corresponding increases in spendable incomes and with no significant rise in the level of productivity, we face the risk of a rocketting inflation. *Rationally considered, the solution of the economic problem is simple enough: full employment with full productivity, supported by an intelligent and determined application of anti-inflationary techniques.*

Further, the fear of unemployment is a causative factor in the persistence of low levels of productivity. The working classes are somehow afraid that if they increase their productivity, there will be less of employment for them than before. With full employment, that fear will cease to exist. On the contrary, the bargaining power of the working class in a full employment economy is considerable and has, in fact, to be held in check because of the threat of inflation. Incidentally, all the economies with the highest levels of productivity are full employment economies—the USA, the UK, West Germany and the Soviet Union. It is there that the *People Produce more in less time.*

While all foreign experience is inviting and instructive, we have in this country to build up our own economics. We have a large and growing population, untrained largely in the habits and processes of intensive production. We are short of capital equipment and this shortage is likely to increase as we proceed faster on the road of economic development. We, therefore, have to devise our own techniques and policies for raising productivity. In this connection we need to clear our minds of the many fads and fancies that have grown up in the course of the Industrial Revolution. A big machine is not necessarily more productive than a small machine, nor, of course, is it the other way about. We need to take the utmost advantage of modern technology, but at the same time we cannot afford to disregard the basic factors in our social economy. It is these factors, more than modern engineering, that would determine the type of productivity techniques that need to be employed in the Indian Economy.

"There is now less flogging in our great schools than formerly,—but then less is learned there; so that what the boys get at one end, they lose at the other."

—Samuel Johnson

Productivity and Planning

As about economic policy, so about planning, this Journal has, since its inception, drawn attention to the vital role of Productivity in any planning system. The extracts printed below are, in fact, from the very first issues of the Journal.

THE FIVE YEAR PLAN FORMS THE CENTRAL fulcrum of the Indian polity. It is clear that the ultimate success of the Plan depends upon the overall productivity of the economy. None is more conscious of the correctness of this position than the planners themselves.

The programme of Economic Development upon which we are currently engaged is of crucial importance in the history of this country, as it will determine, both internally in terms of standards of living, and externally in the status of India as a nation, the level at which we shall live and function.

Our need of realising higher levels of productivity is greater than normal, because we are late-comers in the race of industrialisation. Our economic problem is really tough, for we need a simultaneous and substantial increase in consumer as well as capital goods. While the community urgently needs more and better equipment, we all desire an immediate increase in the good things of life and are not prepared to wait. Productivity then is the only answer, for such a simultaneous and massive advance on the economic front can only be achieved by a massive increase in productivity. There is no other answer, for in a poor country, people will not put in their best, unless we offer them the incentive of at least some increase in the standard of living. At the same time we want resources to invest in steel, coal, power, chemicals, heavy machinery and equipment of every kind.

So, too, on the agricultural front, for it is a matter of life and death with us that we grow two blades of grass where one grew before. The man-land ratio is probably the most unfavourable factor that this country faces in the course of its economic development. Probably other countries of Asia are as disadvantageously placed. China, with its more than 600 million, Japan and Indonesia with tragic overcrowding on small islands, face almost identical problems.

But it is significant that of all these countries, Japan is doing remarkably well because of the high efficiency of its men and machinery. What is known as the German Miracle by which a defeated country has risen to a position of economic superiority in the postwar period is a triumph of productivity.

Labour and Productivity

Since its inception, the NPC has taken a direct interest in the welfare and Productivity of Labour. This Journal, as the principal organ of NPC, has been forthright in asserting the right of labour to its due share in the gains of productivity. The following extracts from the various issues of the Journal show how the NPC has advocated, through the instrumentality of its Productivity Journal, a full employment, fair wage policy.

FOUNDED ON THE TRIPARTITE PATTERN, NPC, like the ILO, has a paramount interest in the productivity and welfare of Labour. The subject of Labour and Productivity has a marked significance, particularly in the context of the strategic role of labour in the industrial economy, not to mention the polity of the world's largest democracy. NPC has, therefore, on its Governing Body representation of labour of all shades of political opinion, and on par with Government and Management. And the welfare of labour is written, as it were, in the very Constitution of NPC.

While announcing the establishment of NPC, in its communique dated the 10th January 1958, the Goverment of India made it clear that apart from efficient utilisation of resources and general rise in the standard of living, the objective of the Productivity Movement, as embodied in the NPC, was to "improve the working conditions and welfare of labour, taking into account the social implications of these changes. The (Productivity) Movement does not seek the intensification of labour's burden through increasing work-loads and speed-up... Government, employers and labour should take specific measures to obviate the possibility of any unemployment...Benefits of increased productivity should be equitably distributed among capital, labour and consumers..."

Dr. PS Lokanathan, the Founder-Chairman of NPC, in fact, suggested a specific formula for sharing the gains.

	Percentage Share	
	Management	Labour
Where the wage is below the minimum wage	0	100
Where the wage is between the minimum and the fair wage	20	80
Where the wage is at or above the fair wage level	50	50

In support of this formula, Dr. Lokanathan added: "It appears inevitable that the economy will either develop along these lines or will be made to do so... In an economy such as ours, operating at such low levels of productivity, it should be immediately possible over a fairly wide front to link up increased productivity and higher remuneration for workers... a rise of wages to the minimum level would be rapidly paid for by

increased productivity itself and the management, for foregoing its share in the gains of productivity, would have made an investment in the goodwill and contentment of its workers. This is good business."

This "good business" idea needs to be rubbed in, in the interests of higher productivity, higher wages, higher profits and the like, for historically, high productivity, high wages, high profits, high rates of capital formation, high taxes: these all go together, as also low productivity, low wages, low profits, low investment, low taxes. Broadly, therefore, the government and people (including management and labour) have to make a fundamental choice as between a dynamic economy (whether socialist or capitalist) which raises all levels of effort, consciousness and remuneration or a stagnant economy where the factors of production cancel each other's productivity through mutual antagonism.

In all this, Labour has been the principal loser, for, for good reasons or bad, men have made profits both from abundance as also from scarcity, from inflation as also from deflation; but from a state of low productivity, whether in a purely communist or in a purely capitalist society, labour has never been able to get more than—to use a famous phrase of Ricardo—"dry bread in the one case and dry bread in the other." The stake of labour in the game of productivity is therefore a crucial one.

Labour has only to make the economy more productive: then the world is theirs, for they have the major voice in this sovereign, democratic State. In this context, one has to examine carefully the forces underlying the growth and prosperity of the great liberal democracy upon which our Constitution is very largely patterned. The success of British Democracy is traceable to the decision, to quote Benjamin Disraeli: "We must educate our masters." The radical efforts now being made to liquidate illiteracy and the good beginnings in the direction of Workers' Education are likely to pay rich dividends in terms of industrial relations, industrial productivity, industrial growth; for the *Platonic analysis is fundamental: what holds up human progress is not selfishness or cussedness as such, but ignorance.*

Those who have critically examined the high productivity of the Japanese system have often pin-pointed the universal literacy that prevails there. Apart from education being an enlightening and moderating force, it is only an illustration of what Alfred Marshall called "Personal Capital." In a passage of marked beauty and depth, Prof. Galbraith, former US Ambassador in India, refers to the radical change in economic thinking and policy: "We now get the larger part of our industrial growth not from more capital investment but from improvements in men... *We get from men pretty much what we invest in them.*" ('The Liberal Hour')

Labour productivity, about which there is so much controversy, also means that labour should be able to do in less time what it is doing at the moment or, what comes to the same thing, turn out a larger quantum of work in the same time. If this is achieved, as it must be, labour has to be assured that the gain in time would work to the advantage of the working class as a whole (in terms of employment and share of national income), to the immediate advantage of the labour force of which the individual worker is a part and directly to the individual worker himself. The anomaly by which labour is not interested in the enhancement of its own productivity lies in the lack of a straightforward analysis of the whole problem of productivity. Productivity essentially means the saving of time; and time cannot be saved unless the persons involved are psychologically interested in the saving of that time. They will not be so interested unless it works to their advantage and the advantage of their class. Socially speaking, therefore, *labour productivity has the best chance in a full employment, fair-wage economy.* ●●●

The Fundamentals of Productivity

Fakhruddin Ali Ahmed*

MAY I, ON THIS AUSPICIOUS OCCASION OF the 10th birthday of the National Productivity Council, send my personal greetings, as President of the NPC, to all persons who have during the last ten years given of their best to the promotion of productivity in all the sectors of the national economy; to all the workers of the 48 Local Productivity Councils, which now cover the entire area of our country. It is due to their devotion that we have now, in the National Productivity Council, a running concern of catalytic importance in the country's economy.

When we are celebrating the 10th birthday of NPC, we can do no better than recall the significant words of our great President, Dr. Zakir Hussain, in his Republic Day Broadcast on the evening of the 26th of January 1968. It is of great historic importance that the President himself felt—which is a reflex of the thinking of the whole machinery of Government—that productivity is the only answer to the country's complex difficulties and the dilemmas, that have so intractably dogged its economy for many long years.

The relevant passage deserves to be embossed on all the outgoing papers of the NPC. The President said, *inter alia :*

> "It is seemingly a paradox that, though our level of wages is lower than in the highly developed countries, the goods that we produce are not cheaper but sometimes even more expensive and consequently more difficult to sell. We cannot obviously lower wages. The only answer, therefore, is increased productivity by the best and most efficient utilization of our manpower and resources. I appeal to all workers in industry and in office establishments to make this possible, by hard, conscientious, efficient work and to fill the unforgiving minute with sixty seconds worth of distance run."

The President said all this in the overall context of the economic recession and the continuing Balance of Payments difficulties, with particular reference to the UNCTAD Conference, now going on in the City. This United Nations Conference is concerned with Trade, Aid and Development, to be so organised that developing countries, such as ours, should be able to accelerate the rate of national economic growth. It is obvious that the desired development of international trade, as the President himself pointed out in his reference to the UNCTAD, the most profitable utilisation of Foreign Aid, and the Development of Domestic Resources—none of these three factors of the UNCTAD can mean much, without better productivity.

*Union Minister of Industrial Development and Company Affairs, and President, NPC

The people working in the Productivity Movement can, in this context, now feel their crucial importance in the social economy, and correspondingly, it should not be necessary to emphasise their obligation in the national interest.

On our part—those of us who have the great opportunity of guiding the country's policy in the field of productivity—it is our obligation to make clear our basic policies, particularly in relation to labour. In this connection, I would like to endorse the policy statement made by my distinguished predecessor, Sri Manubhai Shah, the Founder-President of NPC, published in this Journal in the Summer of 1960: "...On one thing I should be unequivocally clear, both as Minister of Industry of the Central Government and the President of the National Productivity Council, that the first and prior claim of increased productivity must be higher remuneration for labour. We must write this in our industrial code and make it clear both by words and deeds that the gains of higher productivity must be primarily devoted to raising the remuneration of labour to a fair wage level. The consumer, by way of reduction in prices or holding on to a reasonable price line, must be close second in sharing the gains of productivity..."

To some extent, consumers are having a little relief as a result of the recession, but it cannot be called an unmixed blessing in view of its adverse impact on output and employment: factors with which we are now grappling in the Ministry of which I am incharge in the Government of India.

I am, therefore, particularly concerned that labour should not suffer in any way as a result of the productivity drive. In fact, I should emphasise that the most powerful productivity techniques are those which in the first instance grip the minds and hearts of the men and women who work the industrial system.

On the other hand, it is equally a fundamental of productivity that the management must have the right of decision-making, which of course goes alongside the Management bearing all the consequences of its decisions. In fact, what we need is a change in the basic social philosophy and the whole complex of attitudes that go along with it. What is really needed is a system based on mutuality of rights and obligations, of responsibility in proportion to authority, exercised in an atmosphere of general friendliness. Unless, for at least a decade or so, the people of this country, of whatever class or caste—be they top industrialists, Chief Ministers, janitors—act and feel as comrades in a common task, no amount of mere economic planning will improve the situation. A more productive orientation of the economy requires a positive, and, of course, an egalitarian philosophy.

In fact, the Fundamentals of Productivity are embedded in our Constitution itself—a document which I trust, will play, in the economic resurgence of Asia, a part as historically important as that of the American Declaration of Independence. I am not referring to the Fundamental Rights, which are enforceable in courts of law. Productivity or any other social end cannot be achieved by legal means. No code of Efficiency or Discipline or Welfare will work, unless the people involved mean business. Productivity cannot be achieved without a business-like attitude to the tasks of life.

A business-like attitude does not exclude the humanities. It does not negate a generous attitude to life. It is the universal experience of all bosses that the most generous of them gets the most generous response from the men associated with them. A business-like attitude is not born of sadism, authoritarianism and the like. It is born out of a conviction that the most effective humanism must be broad-based on the facts of life.

Even the Constitution, to which I have referred, makes several good things for labour

conditional on the productivity of the economy, which in fact is specifically stated as the limiting factor to the achievement of these good things. Article 41 of the Directive Principles of State Policy reads as under : "The State shall, within the limits of its economic capacity and development, make effective provision for securing the right to work, to education and to public assistance in case of unemployment, old age, sickness and disablement". Even the relief of "undeserved want" is made conditional on "economic capacity and development". It is the realisation of this truth that will help in the shaping of rational social policies.

It is precisely because of this that the founders of our Constitution made these Directive Principles of State Policy non-justiciable; for it is the general adoption of productivity techniques in the small affairs of life—and no court of law—that can bring us the full fruits of the Constitution.

Yet it must be said that these Directive Principles constitute the essential framework of social policy within which alone a really productive economy becomes a practical proposition. The Constitution directs the State to adopt policies with a view to secure the following ends : "that the citizens..... have the right to an adequate means of livelihood.....that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment...The State shall make provision for securing just and humane conditions of work and for material relief.....The State shall endeavour by suitable legislation or economic organisation or in any other way, to all workers, agricultural, industrial or otherwise, a living wage, conditions of work ensuring a decent standard of life and full enjoyment of leisure, and social and cultural opportunities..."

We have so far been discussing Fundamentals—the Fundamentals of Productivity. The most important Fundamental, however, lies in doing a multitude of small things, with grace and dignity. It was Alfred Marshall, the great economist, who said that he considered British Factory Legislation as a disgrace to British industry; in his opinion the employers themselves should have come forward to give their workers the small things that the law had to enforce. It is a historical fact that the very elementary precautions for ensuring safety of human life in mines and factories had to be enforced by law. India has just embarked on the road to economic development and social reconstruction. If we have also to enforce by law the many small things that human beings require for fairly tolerable standards of working and living—such as comfortable sitting and lighting arrangements, medical and housing facilities and the like—the sheer enforcement of such regulations over an area of continental size and a population of over 500 million—the very making and enforcement of regulations will mean an unproductive wastage of resources. The really major failure in the productivity drive has to be looked for in the doing of small things—the observance of small courtesies which give men a feeling that they are men. The big things—the big plants, the know-how of big machines—will come as a matter of course at the rate that we can absorb them; but we shall succeed in our productivity drive only to the extent that we make life tolerable, if not comfortable, for the small men.

What Then Must We Do?

HVR Iengar*

FROM TIME TO TIME, WHEN I THINK OF THE work of the National Productivity Council in India, I get a discouraging feeling that we are dealing with the fringe of our problem, a sophisticated segment of our problem, and not with the foundamentals. But some reflection takes me back to the view that the work of the Council is, if anything, even more important in today's conditions than it was a few years ago.

The reason for discouragement is pretty clear. We have undoubtedly had a bad setback in industrial development. The rate of capital formation in the industrial sector, the rate at which gross fixed assets are going up, has lost its momentum. Not only is this the case, but existing industries are unable to operate at anything like full capacity. In some industries unutilised capacity is as much as 50 or 60%. There has also been growing industrial unrest. This has been going on not merely in West Bengal whose affairs, quite naturally, have been highly publicised but also in certain other States. Growing labour indiscipline has been aggravated by the attitude of some of the new governments that have been formed since the recent elections. The impact of these new governments has been twofold; in some States their instability has led to the lack of a coherent policy and in some other States, where a firm policy has been adopted, that policy itself has been strongly in favour of support of labour indiscipline and, in some cases, of even harrassment and intimidation of management.

With an industrial recession in some sectors, the virtual collapse of the capital market, growing industrial unrest and unstable State governments, it is natural to lapse into the feeling that the sort of policies and programmes that the National Productivity Council has been talking about, such as work and methods study, cost control, inventory control, personnel management and the more sophisticated tools such as operational research and linear programming are somewhat unrealistic. This, however, is taking a purely defeatist view of the situation. If we assume that things are not only bad now but are going to continue to be bad and actually may become worse, then there is no hope for our country. I do not myself think that the situation is beyond repair and that a pessimistic conclusion is justified. On the contrary I have a feeling that while we are passing through a difficult enough phase, this phase is bound to pass and improvements in many directions will soon take place. In any case it is only if we have such a feeling of confidence that we can make any progress. On this view of the matter it seems to be essential, if only

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for survival, that we should, in spite of all the difficulties that we are passing through, difficulties of raising capital, difficulties in getting raw materials, difficulties in marketing and particularly difficulties in labour relations, take all steps that we possibly can to increase productivity. In other words, I would say that it is precisely the difficulties through which we are passing that make it incumbent on us to increase rather than decrease our dependence on productivity techniques.

Our immediate preoccupation, I suggest, is to see what we can do about the improvement of industrial relations. I know that this is not an easy matter and that a great deal depends on the attitude of State Governments. In fact this could be absolutely crucial if the Labour Minister of a State Government actively encourages indiscipline. There is really not much that management can do to bring about a harmony of relations with their working force in such conditions. Nevertheless, over most of India, it is possible for management and trade unions to get together and arrive at sensible compromises. Indeed I would go further and say that the recent spate of indiscipline and harrassment of management and of strikes and lock-outs have led to a certain degree of shock and of a feeling on both sides that something must be done in order to improve the situation. There is evidence that this is true even of the Calcutta Howrah region which has witnessed the most unseemly and, on occasions, inhuman acts of indiscipline and harrassment on the part of labour. They have begun to feel that such methods do not lead to an improvement of working conditions. I know of a number of cases even in disturbed areas in which, with patience, it has been possible for agreements to be reached on questions such as wages and dearness allowance and the like. Every possible effort should be made in this direction.

The second preoccupation, I suggest, should be in the field of cost control. Here again, I appreciate that the area within which management can effect reductions in cost is limited. There was a seminar last year in Delhi, organised jointly by the Ministry of Industry and the All-India Management Association, on the problem of effecting reductions in cost in industrial products. It was quite evident from the papers submitted to the conference that over a large area, sometimes over 90 per cent, there was little that management could do to bring down costs. Nevertheless, to the extent that possibilities of reduction do exist, every step should be taken, in the larger interests of the country's economy, to reduce costs.

The barriers to taking up intensive work in the field of productivity techniques are today psychological and arise out of a feeling of frustration that things are going so wrong that the use of these techniques is of little consequence. We ought to pull ourselves out of such psychological barriers. I am convinced this is as necessary now as at any time in the past.

The Boss

He should be a chairman and after that a consultant for his directors and key executives. His staff should be trained in the way a famous Viceroy of India was by his well-known Private Secretary, who wrote on a Report, he put up: "This, Sir, is a report which you need not read, but you should be aware of."

—**NDH HARRIS,** *Imperial Chemical Industries, Calcutta*

A Decade of Productivity

NN Wanchoo*

WHILE WE ARE CELEBRATING THE TENTH Anniversary of the NPC, I may as well take the opportunity of paying my meed of praise to my distinguished predecessors, Sri HVR Iengar and Dr. PS Lokanathan, who have really put the Productivity Movement on the rails. This is also an occasion when we may recall the pioneering services of the Presidents of NPC, who as successive Ministers of Industry, beginning with Sri Manubhai Shah who established the Movement, and last but not the least, Sri Fakhruddin Ali Ahmed, who is now piloting it through the difficult period of recession. And we may not forget the Executive Directors of the NPC, Sri HD Shourie, Sri N K Bhojwani, Brigadier K Pennathur and now Sri BN Bhattasali, who have throughout their tenures, with commendable energy and zeal, striven constantly to give new content and dimensions to our productivity programmes and also to devise means by which we can make available our experience of productivity techniques to the developing countries in Asia and Africa, while at the same time learning from them.

We have travelled a great deal during the last decade. Whether or not we have achieved significant increases in productivity, at least the concept of productivity has achieved recognition and this in itself is a great benefit, on the basis of which we have to build further. Not that massive increases in Productivity have occurred in all the sectors of the national economy, for if that had been so the battle had been nearly won; nevertheless, it is evident now that at all decision-making points, there is a realisation that they will be judged by the measure of productivity that they are able to accomplish; and practically in all the forums of critical appraisal—the Parliament, the People and the Press—the question now invariably asked is : "How productive are these investments? ...How productive are the people we are employing in the public interest ?...How productive are the various institutions and organisations that we have set up ?..." In short, the capacity to deliver the goods and the proved determination to optimise output

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at the minimum cost in terms of real resources: these have now become the accepted criteria of social judgment.

While as Chairman of NPC, I naturally take pride in what may be called a conceptual achievement—the triumph of the idea, as such—I must say that we have still a long way to go before we can claim that the idea has so successfully taken root that the plant must naturally grow and flourish into a tree, so as to lift the nation to a distinctly higher level of achievement.

We have tried to do our best, of course, with the resources we had and have demonstrated the feasibility and profitability of productivity techniques in practically all the metropolitan areas; but, by and large, over large areas of the country things have moved under their own momentum consequent upon massive investments through the Five Year Plans. We cannot claim that as Productivity.

In fact, the whole battle lies ahead; we have yet to put productivity into the Plan projects and investments; and therefore the coming decade is a period of opportunity and challenge for the NPC.

Not that substantial work has not been done during the last 10 years. The specialists of NPC have contributed substantially to the development and propagation of productivity techniques. Practically every day, in one or the other part of the country—often at a number of places—we are conducting programmes: we have been doing this for years, running a number of training courses, assisting a large number of people from industry in the development of new skills. NPC programmes, directly and indirectly, have led to the development of a new class of technicians, the productivity experts; and they are professionally and psychologically ready to prove their ground on the shop floor. This then is the direction in which we may now deploy our resources.

The men in charge of industry are now trying to make a serious draft on productivity techniques as a sort of new resource. It is now deeply felt that the gap between costs and prices, now that further increases in the latter are not so easy, can be maintained only by means of productivity. The conjuncture of circumstances is therefore propitious for a New Deal.

Circumstances also call for some rethinking on training, and that for quite a number of reasons: during the last 10-15 years, industry has developed its own training facilities and a number of institutions have come up all over the country to satisfy training needs in Management, Personnel Development, Industrial Engineering, Cost Accounting, and a vast variety of other related subjects. There is, of course, need for an apex organisation to set standards for training, to evaluate trainees so that Industry and Government do not get flooded with sub-standard products; and on the other end, there is need to train on a mass scale the first line supervisors, the foremen, who are the real vanguard of industry, and the main conduit for the flow of productivity into the industrial system. I hope NPC will, in the coming decade, do something substantial in both these directions.

Thus, training in one form or another will still consume a large part of the resources of NPC, but we have to realise that training itself has to undergo reorientation in the context of new circumstances and needs. No longer is it sufficient to teach the principles of Work Study and Personnel Management. The country not only demands that these principles be practised but that they also yield results in terms of the Nation's demand upon industrial capacity.

It should also be clear to us by now taht the purpose of training is not only the development of productivity experts but also of working individuals who operate alongside other individuals in an environment which is necessarily Indian. While the improvement of individuals is certainly god in itoself, it is not sufficient. We have to take steps to see that the degree of implementation of pro-

ductivity concepts imparted through training and project studies, becomes really more substantial than what it has been so far.

From a Productivity Organisation like the NPC, something more substantial than general training in productivity techniques is now to be expected. A committee of the Governing Body was set up some years back to study and work out a new orientation of NPC activities. It went over past experience, appraised future needs and assessed NPC's potential for greater accomplishment in the national interest. This committee examined carefully whether the resources of NPC could be so deployed as to provide greater depth and a more positive demostration of the value of productivity techniques; whether it was possible to establish a firmer meeting ground for the offer and acceptance of productivity techniques.

Thus was born the Productivity Survey and Implementation Service (PSIS) and later the Fuel Efficiency Service (FES) which, I am glad to find has become extremely popular with industry. Thus we have over the years gained substantial practical experience. In fact, we have done Productivity Surveys of a number of enterprises both in the public and the private sectors. We have covered the Hindustan Cables, the Hindustan Antibiotics, the Bharat Electronics, the Andhra Pradesh State Road Transport Corporation, and done a number of Surveys for the Indian Railways. The Ministry of Defence has recorded its appreciation of the painstaking survey, done by the NPC, of its Naval Dockyard at Bombay.

For quite a number of years, we have been training our own industrial engineers at Madras. Thus, besides experienced personnel, we have our own technicians whom we have trained; and we have also gained experience in working with public and private enterprises.

Now if we were to deploy our resources so that we could actually show industrial managements how to apply improved methods on the shop floor, and in consultation with the Management, work out an organisation to sustain the improvements, this would go a long way towards promoting the practical application of productivity techniques, enhance the recognition of the value of training and assist in the discovery of productivity models and the satisfaction of the felt-needs of industry.

We in NPC are now conscious that we have to keep our feet on the ground, walk alongside industry and assist it in the adoption of the techniques of higher management and operational efficiency consistent with the economic and social aspirations of the community. We have to concentrate our resources on the investigation of management and operational practices and problems, the actual demonstration of proved techniques in concrete situations, and working out with due consultation with men of knowledge and experience an organisational set up that would sustain higher levels of performance. We have not only to stimulate the internal efforts of management but also help it to develop investigation and implementation skills among their own personnel.

No longer should we expect men of industry to sit as students at the feet of the productivity experts, but rather we should go hand in hand with them for a close look into the problems of industry and the evolution of workable and lasting solutions.

Now that industry is more ready for productivity on account of recessionary tendencies and other difficulties, it is our duty and opportunity to go forward and give them a helping hand in every possible way, to assist industrial firms develop a concrete productivity organisation, ensure through publicity and otherwise that these efforts acquire a multiplier effect, push forward the status and standing of NPC as an honest broker, and as the apex organisation for a multi-dimensioned productivity drive.

For us in NPC, it is essential not only that we insist on that status but also that we

deserve it. Our task must not be to supplant any institution or body of technicians or consultants, but to supplement their work. To begin with, there was genuine fear that NPC would compete and take away the field from those who were running training courses or those who were working as consultants to industry. These fears soon proved unfounded, for as the situation developed, aggregate demand for training courses from industry and government combined, far exceeded the supply of facilities of all training institutions; and it is likely to be so (for good training courses) as long as we can foresee.

The market for industrial consultants is richer than ever before. A decade ago, when NPC was established, the demand for the services of industrial consultants had to be stimulated, and their complaint was that it was sagging and that the field was poor; that there was neither full nor continuous utilisation of industrial consultants. Now industry is calling upon industrial consultants on a far larger scale than ever before. We in NPC can reasonably claim to have contributed to the growth of this market; and also what is a good deal more significant, the productivity atmosphere created through the efforts of NPC has significantly improved the chances of implementation of the positive recommendations of industrial consultants. It was a complaint both in industry as well as among the industrial consultants that the patient labours of the latter did not bear fruit, that their reports had to be shelved either because management was ignorant or unwilling or that labour was uncooperative. Again we in NPC may legitimately claim that the substantial improvement in the situation in this regard is due to our persistent efforts.

We in the NPC believe—this is our firm faith—that we are engaged, humbly of course, and according to what lights and talents we possess, in national service; for if industry becomes really productive, it will help to give the people of India the standard of living to which its citizens are entitled as human beings in the context of the new technologies. Further, it is the only means of beating the Malthusian menace, and building up an impregnable defence base for meeting any possible aggression.

In this grand adventure we have to play our role; and we must know that it can no longer be played with slogans, for the targets are difficult and the stakes high, indeed. Further, while money and organisation and techniques are resources, the knowledge and the devotion with which they are applied are what make the resources fruitful. ● ● ●

I am on the side of the Prigs

"Every democratically-elected government cheats the electorate... The worst form of cheating is to abolish democracy (dictatorship); the next worse is to do, what the voters want you to do, no matter what the cost in honour, humanity and the future (demagogy), and the least bad is to do what you think right and wise even at the cost of losing the next elections (priggery). I am on the side of the prigs."

—Philip Toynbee in *the New Statesman*

Short-Term In-Plant Training in Production Engineering†

BN Bhattasali*

PRODUCTION ENGINEERING, AS A SUBJECT, has a distinct place of its own in industrial activities and this shows up rather prominently in the field of in-plant training. A production engineer may pick up his ideas for developing and manufacturing a product from any of the technologies and engineering disciplines, i.e. mechanical, electrical, chemical, ceramic, or metallurgical etc. He may blend or substitute these, without any avowed attachment to any, so long as his objectives are achieved. In designing a product—laying down the fits, tolerances, material specifications and process control particulars, in production planning and control, in inspection and in packaging—in all these, he is guided entirely by consideratoins of technical practicabilities: consideratoins of cost, quality and business opportunities, involved in the process. In the ultimate analysis, production engineering is essentially product-oriented, seeking optimum benefits through the combination of different production technologies—cost, quality and business opportunities. A trainee in the field of production engineering is interested in all these diverse activities in the plant, following heterogeneous disciplines which make the manufacture of the product a feasible proposition in a given industrial siotuatin.

In India every year thirty-five thousand engineering graduates and diploma holders are passing out from colleges and technical schools. Most of them are joining various industrial undertakings as graduate apprentices and supervisory trainees, running through a period of in-plant training in production engineering to make themselves

† The United Nations Industrial Development Corporation (UNIDO) held a Seminar of Training Directors in November 1967, at Vienna (Austria to discuss In-Plant Training Programmes. At this Meeting, a number of knowledgeable papers were read: the author presented the paper printed here, which is being published for the first time for the benefit of the Readers of the *Productivity* Journal, through the good offices of Mr. Hans Fahlstrom, Chief of the Management and Training Section of the UNIDO.

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familiar with the practical and operational aspects in the related fields. In a number of undertakings—either due to changes in product policies, or adoption of more advanced production techniques, or as a part of simple job rotations—technical executives and supervisors are also exposed to a brief spell of in-plant training in the requisite areas. Various foreign governments and international agencies often extend their generosities by providing short-term in-plant training opportunities to the production engineers from the developing countries in learning the manufacturing processes of a wide variety of industrial products. The volume of such training facilities that could be made available to the production engineers of the developing countries, for disseminating the required technical knowledge through in-plant training, are rather meagre as compared to the actual physical needs. Generation of maximum possible multiplier effects in such short-term training, therefore, is an issue of some importance as also of urgency—if more effective use of such facilities is to be made for serving the objectives for which these are given. This would mean that each person who receives the training should not merely be able to learn and multiply the techniques he had assimilated—but, what is even more important—that such a process of learning must be constantly modified and tempered by the physical realities and limitations of his own plant or country, so that in terms of technical practicability, cost and quality, these activities become feasible industrial propositions there.

In this research paper, I have tried to locate the critical areas in the process of implementation of such in-plant training, offering suggestions primarily to those who are sponsoring and supervising the programmes in the large and medium-scale industries where, by and large, systematic training in production engineering is mostly organised. The suggestions made in this paper though relevant for all in-plant training in production engineering in general, special attention has been paid to draw out the major needs of the production engineering trainees from the developing countries.

AIM OF THE TRAINING

The aim of the short-term in-plant training in production engineering is to impart applied knowledge concerning the manufacture of selected product or products in all relevant aspects, to technical personnel already having the basic qualifications and experience in their professions, with a view to promote maximum possible industrial development, both in quality and in quantity, through the generation of requisite multiplier effects. These are to be achieved, through the reproduction of such knowledge in the practical field, by the production engineers on completion of the training, with such modifications and adjustments that might be necessary to conform to their own respective technical and business situations.

CRITICAL AREAS OF TRAINING

The deficiencies and weaknesses of in-plant training in production engineering are manifested in a variety of ways—though by and large, most of these owe their origins to lack of a clear definition of purpose and lack of proper organisation and methods in implementing these. The following significant and major weaknesses, however, stand out among others, as the common critical areas in a large number of such in-plant training courses :

(a) Sponsors as well as trainees often look up to in-plant training as something of general orientation value—without proper plans to make sure that the knowledge thus gained would have to be translated into physical realities of production, later on. Many go through the training programme in a perfunctory manner, without the requisite degree of interest or seriousness.

(b) In several cases, the position is even worse, when the trainees as well as the sponsors treat training as a sort of

respite, if not holiday from the monotony of daily work routines.

(c) Such training could, no doubt, be an interesting and enjoyable period of respite from monotony, but this must necessarily be along and not against the training objectives, by making the trainees inquisitive and self-motivated in the process of assimilation. This calls for certain amount of planning and organisation, which are not always properly attended to by the executives and senior supervisors busy with their day-to-day functions of production in the factory. It is not infrequently that one sees the ugly sight of in-plant trainees watching the factory operations with philosophical detachment or even sleepy eyes without any serious interest—or treading along the shop floors in groups, following the supervisors busy in explaining things to them, like a "tourist guide". Such mockeries in the name of training are by no means rare. It is worthwhile to recall here the almost classic words of Dr. Lawrence Lowell, President, Harvard University :

> "There is only one thing that will train the human mind and that is the voluntary use of the mind by the man himself. You may aid him, you may guide him, you may suggest to him, and above all you may inspire him, but the only thing worth having is that which he gets by his own exertion—and what he gets is in direct proportion to what he puts into it."

(d) There is a gulf of difference between understanding a production process on a conceptual plan, and assimilating and digesting it thoroughly, particularly the practical aspects on a physical plane requiring considerable amount of personal involvement and critical examination of each element on the part of the trainees. Insufficient appreciation of this difference often leads to inability to set up the production processes on the shopfloor in a systematic manner later on—even by otherwise intelligent trainees with excellent academic qualifications, who had grasped well the broader ideas of the issues involved.

(e) In many cases, even when the trainee had fully assimilated the production process on a physical plane, he was unable to cater to the design variables or production variables involved, in order to conform to the facilities that could be made available in his own plant or for meeting the consumer preferences of his own country. This resulted in the trainee asking for similar facilities as seen during the period of training, to be provided in his plant before work could commence. Such demands are often made without adequate exploration or attempt at improvisation of alternative methods for making the most of the opportunities that were available or could be made available without incurring any undue extra expenditure. For example, a production engineering trainee saw in a foreign country milling cuts like slotting, slitting, parting or grooving being imparted by very fine abrasive wheels, using a wet cutting machine in a particular production process. On return, he wanted the same facilities to be provided before he could commence work, which was just not practicable in India then—due to the non-availability of such wheels, and the machine in sufficient number from indigenous sources, and the rather tight foreign currency situation—thereby reaching a deadlock.

(f) Most developing countries depend on imported materials for production work to a much greater degree as compared to the developed ones. Apart from this, the disadvantages of the economics of scale and the time lag in imparting and distributing these, caused serious bottlenecks. Material substitution, therefore, is an issue of considerable importance for such countries.

(g) All production engineering trainees, irrespective of the technologies involved, should have a reasonably satisfactory background in engineering drawing and designs. Mere ability to read drawings and designs passively is not good enough—and what is needed is ability to critically examine, modify, substitute and supplement the existing patterns by better ones, no doubt seeking specialised assistance on *ad hoc* basis, if necessary. In the case of chemical engineering and similar plants, the emphasis naturally is on design and fabrication work concerning plants and equipments, which often have to be improvised, modified and replaced.

(h) Other major weaknesses of the trainees are in the field of production tooling, process control devices and plant layout—inclusive of ability to modify methods, balance, adjust and supplement the flow lines, requiring some reasonable understanding of the principles and practices of work study.

(i) There have been instances when production engineers, after training, had displayed initiative and imagination in reproducing the production techniques seen elsewhere, duly modifying the same to conform to the facilities available. Difficulties had, however, arisen in selling the products, because of high costs or inappropriate qualities which would sell through a given market. Some analytical understanding of costing and value analysis, cost reduction and integration of the same in technical activities, would go a long way in removing such weaknesses.

RECOMMENDATIONS

(a) Recommendations for Consideration by the Promoters of In-Plant Training

Promoters of such in-plant training may be an international or a national organisation or an industrial undertaking interested in serving its aims. Depending upon the circumstances, they have to bear a part or the whole of the expenses involved in the process. Naturally their primary concern would be to seek maximum possible value for the resources invested. In order to facilitate this, it might be worthwhile to consider the following suggestions :

(i) *Advance Determination of the Specific Areas of Training, in Terms of Development and Modernisation Plans :* Arranging training programme on broad notions, in isolation from the specific plans for developing and modernising industrial activities, often leads to tragic results. For example, providing a highly specialised type of in-plant training in a steel foundry, or providing training, in the manufacture of calcium cyanamide from calcium-carbide, to the production engineers of a country which does not possess such industries (nor likely to develop these in the near future either due to the lack of the requisite infra-structure or any other reason) is rather wasteful and should be avoided. It is a good thing to start the whole process of organising the training by obtaining data from the sponsoring agencies—as to their actual needs, in terms of various items of such plans. The next step would be to organise specific programmes covering such of the common areas of actual needs, earlier intimated, for which sufficient number of trainees could be fruitfully mobilised and trained in this manner. In short, in-plant training should be field-oriented and not imposed from above on the basis of a hunch or some general appreciation of the requirements, which might not be appropriate.

(ii) *Prior Notification of the Basic Qualifications and Experience the Trainees Should Possess, by the Sponsors :* Little is achieved by providing such training to persons who—because of inappropriate educational qualifications, experience, and age, or any other physical or mental disabilities—are unable to assimilate and reproduce the production engineering techniques on a physical plane.

It is, therefore, essential that the promoters announce in advance the minimum essential and desirable qualifications for participation in the courses and ask for the recommendation of at least two, if not more, persons for each seat offered (along with their *curriculum vitae*) so that some selection could be made, if necessary, in consultation with the training establishments. Notwithstanding the special and peculiar nuances of production engineering, involved in the manufacture of different products, all short-term in-plant trainees should have a minium basic qualification in the relevant technology. They must understand designs including material substitution problems, and production tooling work and also should have a minimum of practical experience in production work. Some basic knowledge of work study, cost analysis and quality control would be very desirable, if not essential. Side by side, due weightage should be given to the candidates, who are likely to generate multiplier effects (by propagating their knowledge to a number of firms) rather than contributing the same to only one—i.e. trainers, consultants, nominees of institutions engaged in the advancement of technologies, etc. If best possible use is to be made of the rather short period that is available for such training—from which again multiplier effects are sought to be generated—then these seem to be basic prerequisites for a successful execution of the in-plant training in production engineering.

(iii) *Choice of Training Establishments :* Training establishments should not be chosen merely on account of the business reputation of the firm or of their products, but on their training capabilities. The point which is being emphasised here is that mere largeness of the firm's business or their technological sophistications are not synonymous with training capabilities. The firm must have a properly organised training cell, capable of arranging in-plant training in production engineering with facilities for design analysis, analysis of production processes and their variables, tooling, production planning control, cost and value analysis. Highly and automated industries are not generally suitable for training of the production engineers from the developing countries, because apart from wide disparities in technologies, many of the elements of production involved in transforming the inputs into output, are not readily discernible for analysis and assimilation by the trainees. To a lesser extent this is equally applicable to the production engineers from the developed countries, particularly those who are still in their formative stages. It is desirable for a competent technical officer on behalf of the promoters to visit the training establishment, to make sure that requisite facilities—organisational and technical—are available, unless of course such capabilities are beyond doubt on the basis of reliable information from other sources.

(iv) *Payment to the Training Establishments :* It is true that a number of large industrial undertakings very generously agree to provide in-plant training facilities to the overseas production engineers free of cost. There is no reason why these should not be availed of, so long as the basic organisational and technical facilities are available there for this purpose. But it so happens that quite a number of such generous offers, as praiseworthy as these are, often do not have the appropriate facilities. It would be better to pay fees to an industrial undertaking with proper facilities, than to avail of a free offer from an undertaking without these—however well reputed they might otherwise be.

(v) *Motivation and Certification :* A certificate of satisfactory completion of training provides a useful and effective element of motivation, particularly to the trainees from the overseas countries. Any commendable performance or useful suggestions made by trainees in the course of analytical work—on any topic—right from product design up to packaging, could be suitably endorsed in the certificate. A small cash reward or a gift could be a valuable adjunct in such a process of motivation.

On the other hand, it should be an ex-

plicit and binding part of the terms for the training that a participant could be sent back home in the event of persistent neglect, inattention or misconduct, at the discretion of the training establishment or the promoters of the training, without assigning any formal reason. No doubt, it would seldom be necessary to take such a harsh step—still it is better to incorporate such a provision in the terms of training to meet such remote cases.

Normally certification of the trainees or disciplinary actions on them should be the prerogative of the training institutions, but the in-plant training promoters have overall administrative responsibilities. It so happens that the programmes are often split amongst several esiablishments for covering different areas, thereby necessitating discharge of such responsibilities by the promoters. In any case, promoters should always be approached by the training establishment for a final decision to terminate the training, even when the entire training is confined to one establishment only.

(vi) *Follow-up :* It is essential that the promoters of the training programme not merely screen the trainees before admission, but also verify the subsequent activities of the trainees—say for a period of three years—to find out to what extent the knowledge picked up during the training periods is put to actual use. This aspect apart, such follow up often-provides information which might be of value in adding, modifying and shifting emphasis amidst various topics in the training programmes. It often happens that some of the ex-trainees, never bother to reply to such follow-up queries. Apart from making a gentleman's agreement with the trainees—to furnish the promoter with the necessary information—perhaps their co-operation could be better secured by making them the associates of the technical club of ex-trainees with a half-yearly or annual Journal. The training establishments naturally are also interested in the follow-up reports. Rather than expecting the ex-trainees to send another set, perhaps important extracts could be sent to them by the promoters.

(b) Recommendations for the Training Establishment

(i) *Scrutiny of the Proposal:* The management of an industrial undertaking, in consultation with their training cell, must scrutinise all training proposals received from the promoters—in the context of the background of the trainees, the area and the depth of training, and its duration. They should suggest such alterations and adjustments as might be considered necessary so as to conform to the requirements and the facilities available for making the proposal more realistic and fruitful as joint partners in the process, rather than treating the promoters as customers, believing that they "could do no wrong." It is often more time-saving and fruitful for the training establishments to prepare an outline of the training scheme in conformity with the broad requirements given by the promoters and the qualifications and background of the trainees, duration, area of coverage etc., particularly by those industrial undertakings where regular training cells with professional trainers are in position—rather than asking the promoters for too many details.

(ii) *The Training Programme* : It so happens, in practice, that the details of background and other particulars of the trainees are available to the training establishments only a few days before training is scheduled to commence. It is, therefore, not practicable to cater for the special requirements of individual trainees at the planning stage—though this aspect also should be covered later on, by making necessary modifications to the programme.

At this broad planning stage each trainee should be identified by an alphabet, e.g. if there are twelve trainees, the letters A to L could be used for this purpose. Trainees are not to be kept bunched up in groups but scattered in different work centres to the maximum extent possible. Even in

in-plant training, a few group sessions for general topics, film shows etc., more particularly during the initial stages, are necessary. Except for this, trainees are to be dispersed and distributed to the different work centres and placed under the care of the supervisor in charge for allocating and supervising the discharge of the specific tasks given them. After setting apart the periods for the general group sessions—the in-plant work should be organised by rotating the training through the pre-determined work centres—allocating sufficient time to each will ensure satisfactory coverage of the training programme both in area as well as in depth.

In the in-plant work it is neither necessary nor practicable that all trainees should start their training from the commencing stages, so long as trainees are familiarised with the whole picture of production in a general sort of way at the outset. After this, little is lost if one goes to the machine shop, the other to the foundry and the third one to the packaging room to do their in-plant work. At this broad planning stage, it is easy to sequence and queue the alphabets representing the trainee for desired periods in various centres in a systematic manner—making allowance for marginal adjustment later. Some extra periods should be set apart for special coverage of those areas in which trainees are specially interested.

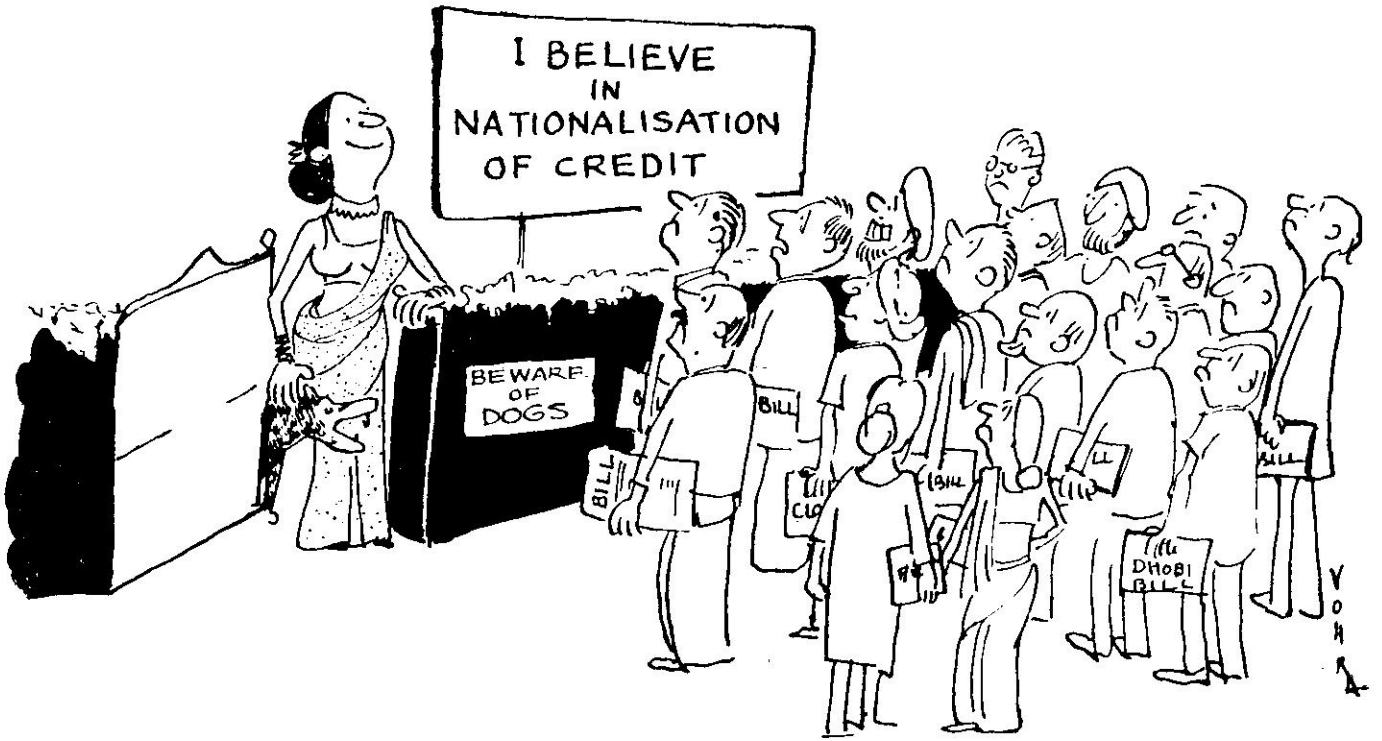
(iii) *Trainees to be Treated as Participants in Factory Work and Not as Visitors* : This is an issue, which is often treated rather lightly and yet it exerts powerful psychological impetus in in-plant training. In an effective in-plant training, one cannot afford to be just an "on-looker." One has to plunge and identify himself in the stream of factory activities: in observing, analysing, verifying and, wherever practicable, even in handling and operating the products and the processes. The trainees should always be made to feel that they are a part of the factory and subject to the same facilities, and disciplines as its employees. In many factories, where the supervisory staff wear distinguishing overalls—or identification marks—it is desirable that the trainees should be given similar insignia.

(iv) *Basic Structure of In-plant Training in Production Engineering* : The differences in the technological contents of product or process-oriented inplant training, and differences in training requirements with variations in the areas of emphasis, do not allow the preparation of any standard syllabus which would be applicable to all. Even when repeating a course—after a period of time—it is desirable to have a fresh look at the old plan, modify the same in the light of experience gained, the technical advances made during the intervening period, and the background of the fresh batch of trainees.

Notwithstanding the above facts, it is possible to construct a broad structure —as a sort of basis for the syllabuses of all such product-oriented in-plant training courses—so as to provide a starting point, upon which additions, modifications and shifts in emphasis that are considered necessary to meet the individual peculiarities could be made. It is in this context that the following broad and brief structure is being indicated :

1. Study of the performance requirement of the product from the users' point of view with some indications of the trends of the consumer preferences in the market, wherever practicable.
2. Design Analysis, Value Analysis, Material Specifications and Variables, Fits and Tolerances, Finish and Aesthetics.
3. Production Analysis, together with the Variables and Tool Engineering.
4. Production layout—flow lines—balancing and work simplification in general.
5. Production Planning and Control, and Critical Path Studies.
6. Packaging.
7. Inspection, Quality Control Trials.
8. Cost Analysis and Reduction.

The weak areas experienced in such a training had been indicated earlier. It is desired to re-emphasise here the great importance of design and production analysis, including tool engineering for such training, without a thorough grasp of which the main benefits of the training are lost.


I BELIEVE
IN
NATIONALISATION
OF CREDIT
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OF
DOGS
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BILL
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The Great Tradition*

DH Butani

It has been said that the Indian Tradition constitutes an almost impassable obstacle to the growth of a productive environment. Many years ago, when Indian thought in the field of social sciences had hardly developed, the famous Vera Anstey of the London School of Economics referred to a typical Indian as being the very antipodes of an economic man and she went on to say in almost Shakespearian language that it would be easier for the sun to cool down, etc., before an Indian could think and act in purely economic terms. It is futile to repudiate the thesis of Vera Anstey, for it is possible to bring forward overwhelming historical evidence of the large mass of Indians having been hard working during periods not altogether unfavourable to activity ; and even at the time Vera Anstey wrote, the peasantry which has always constituted the large mass of the Indian people was found to be extremely hard working under the most difficult circumstances, particularly in areas where there was some reasonable chance of winning a crop from the soil.

IT WOULD BE DIFFICULT TO DENY THE existence of a rather formidable tradition, which contains elements antithetic to productivity. Whether this view is right or wrong, or whether there is a sort of a permanent element in the Indian cultural tradition inhibiting economic growth in terms of the Rostow model, it is really difficult to say; but that the tradition exists, which could work powerfully either way, has to be admitted. In the Preface to the Third Five-Year Plan, with which, it is apparent from the style, the late Prime Minister Jawaharlal Nehru was personally associated, this tradition is referred to as a major causal factor in socio-economic growth : "Each major culture and civilisation has certain distinctive features, rooted in the past, which bear the impress of that culture. India, with thousands of years of history, bears even now the powerful impress of her own distinctive features. They are today covered up by widespread and appalling poverty, the result of a traditional society and a static economy in the past, petrified to some extent by colonial rule. But these essential features, though apparently associated with the traditional structure of society, are in no sense an integral part of it. They are in fact a set of moral and ethical values which have governed Indian life for ages past, even though people may not have lived up to them. These values are a part of India's thinking, even as, more and more, that thinking is directed to the impact of the scientific and technological civilisation of the modern world . . . Even in this ancient land, for so long governed by tradition, the winds of change are blowing."

*This is really the opening chapter of a Book on Essays in Productivity, which the author intended to publish after his retirement from the NPC, having gathered plenty of ideas (but little money) from having spent nearly a decade in the Productivity Business ! For the Souvenir Volume, however, the author, as Editor of the Journal, felt bound to contribute something entirely personal; hence this signed article. —*Editor.*

This view of the Indian tradition emphasises its essential moral and ethical values and considers their retention as an integral part of the new industrial culture not only possible but certainly very desirable. The general body of sociologists, however, hold a rather different view, that these moral and spiritual values of a folk society will certainly go under, with the impact of a secular society : "a rapidly expanding and technologically progressive economy", as the Planning Commission calls it.

The future alone can show which view is right. At the moment we are concerned with the analysis of the Indian Tradition. By and large there has persisted, for as long as we can recall it, a philosophical attitude among the people, which regards human life as an infinite continuum in which the paramount objective is the liberation of the soul from the thraldom of the body, which in the process is regarded as an unnecessary and inconvenient drag through the orbit of spiritual experience. Since the process of life is infinite and the body has in any case to be jettisoned at some point in the journey to infinity, it gives rise to either or both of two attitudes : (a) within an infinite expanse ahead of the individual, one can take it easy ; (b) since the body at best is a nuisance and at worst a liability, an anti-materialistic attitude develops. In any case each individual is for himself, for liberation is essentially an individual phenomenon. At the other end is God or divinity. In this rather bland version of the Indian Philosophy there is apparently no scope for the good life either in the material or in a moral sense ; and Western Philosophers have not failed to point to the absence of an element of positivism or ethics in the Indian tradition. There is, according to this theory, no intermediate, workable social level at which the Indian operates purposively and creatively. In this philosophy there is a sort of fatalistic resignation, at least to the affairs of the material world. There is an absence of a feeling of liberty in its Anglo-Saxon connotation. There is no aggressiveness, no will to action in the material sphere; no desire for advancement as such; there is absence of a forward-looking philosophy in the sense of building up a career, to take care of the future. There is acceptance of life as it comes and the will to alter it purposively does not exist. There is a laziness of mind and body, which is the major cause of the society working at a particularly low level of productivity.

It is true that this view of the Indian Tradition, as darkly painted above, will be acceptable only to a few of the cynics among Indian thinkers and the large mass of foreigners who have been brought up in certain generalities related to them through persons insufficiently acquainted with the basic facts of Indian life.

It was Van Loon who, in his famous *Geography*, warned the European races against the acceptance of any generalisations with regard to the people of India. In Chapter XXV, significantly entitled "India, where nature and men are engaged in mass production" (page 322), Van Loon wrote:

> "Please remember, everything connected with India is on a scale which dwarfs the geographical proportions of Europe... Whenever you touch upon a subject of India, whether you approach it as a historian, a chemist, a geographer, an engineer or a mere traveller, you find yourself right in the heart of profound moral and spiritual problems. And we people of the West should proceed carefully when we enter into this labyrinth in which we are both strangers and new comers.
>
> Two thousand years before the learned Council of holy men in Nicea and Constantinople tried to formulate the Creed which afterwards was to conquer the Western world, the ancestors of these people, about whom I am writing in so familiar a fashion, had already settled obscure points of doctrine and faith which to this very day disturb the minds of my own neighbours and will probably continue to disturb them for another dozen centuries or so. It is easy, far too easy, to condemn things that are strange to us. Most of what I know about India is strange to me and gives me a feeling of discomfort, a bewildered

> sense of uneasy irritation . . . But then I remember that I used to feel the same way towards my grandfather and grandmother . . . And now at last I am beginning to realize that they were right. Or at least, that, if they we not always entirely right, neither were they always so absolutely wrong as I used to think them to be . . . "

This, of course, is a healthy warning both to the foreigners as also to ourselves, for this is by all standards a very large country of continental size. Its people have come together through massive racial and cultural migrations, and have passed through what must be considered as a very tremendous course in history. In fact, throughout the length and breadth of the country there are large material differences in the social culture of the people, in their literature, in their outlook on life, their language and philosophy. There are again very significant and substantial differences as between the rural culture and the new urban culture; and it is very obvious from time to time that the behaviour patterns of the people have been changing under the stress of social and economic circumstances.

The Hindus with all their philosophy of resignation and fatalism have been in historical times very adventurous, as can be seen from the evidence still present in practically the whole of south east Asia. Very intimate experience can still be had of the impact of Hindu philosophy and culture in the heart of Indonesia, Cambodia, Thailand and Vietnam. Today even in the interior recesses of the African continent, Indians are found plying their trades under extremely shocking circumstances. Orthodox communities like the *Marwaris* have come up as pretty sharp entrepreneurs in the new industrial communities that have been emerging during the last twenty or thirty years.

It is true that, by and large and taking a long period, there has been lack of mobility among the general population; but it is equally matched by lack of opportunity. Wherever opportunities present themselves, as in Malaya, there has been a sort of mass migration. Sikh businessmen are to be found on the western coast of the United States and Canada. Poor workers from Orissa and Bihar treck their way to Calcutta for the pittance of a wage; and they are perpared to work, provided there is work that offers itself. There is, of course, the factor of climate. But with all the enervating climate, the poor masses of people work pretty hard. The general inference, therefore, that Indians are lazy both in mind and body does not appear to be based on any concrete evidence.

Laziness there certainly is; but it is not inherent in the social environment. It is a defect in organisation. Wherever there is good organisation, or wherever there are opportunities for working hard, people do work hard in this country There is make-work and there is also go-slow. But these are features of a non-incentive society to which a reference has been made elsewhere in this Book*. Myrdal's reference to an average Swede earning 20 to 25 times more than the average Indian because he works more hours a year, works harder and more efficiently is probably not all the truth. The truth can better be understood in terms of Myrdal's theory of a cumulative circular causation, according to which people who are compelled to become idle and those who earn low wages go on becoming idler because there is hardly an incentive to be active.

The following extracts from Myrdal's speech to the Indian Parliament have to be properly interpreted in the socio-economic context of the countries under reference: "I believe the people in India work perhaps not much more than half the number of hours a year compared with what people do in a developed country and what the Indian people must come to do if this country shall become developed. And when they work, their efficiency is low. This is true even among the professors, the students, the officials and the engineers and, I would assume, the politicians also. It is, of course, still more true of the large masses of labourers

* Essays in Productivity (to be published)

and peasants whose low levels of living, malutrition and ill-health often prevent them from working at all, or working the whole time and, when they are working, prevent them from working so hard and so efficiently. Around every piece of work to be done, there are too many workers hanging around. If I want a lamp fixed in my house, there comes a man who does the work, one who holds the tools, one who carries the ladder, and perhaps a few more who are just standing by. You are, of course, well aware of the fact that a regular situation in some of the most modern factories in India is that a machine which in Sweden or Germany, the Soviet Union or the United States is serviced by one man or woman, will need two, three, four or even five men here. In spite of low wages, the actual labour costs to the industry then often come up towards, or above the levels in the richer countries with their higher wages but also higher labour efficiency. Your industry is then not competitive and lacks the strength for expansion..." The latter part of Myrdal's analysis is correct. Probably the emergence of competitive conditions is improving the situation to some extent, in certain areas. But here we have a mix-up of issues. The question is whether these defects are basic and inherent or just a part of a changing economic situation.

While we have criticised Myrdal, there are quite a number of Indian intellectuals who hold the view that normally the Indian is by nature a shirker. He avoids work; he sees to it that he has not to work hard; that is believed to be a national characteristic. This view was rather strongly aired by an anonymous writer in his obituary of Dr. B.C. Roy, for long the Chief Minister of West Bengal. Writing under the quixotic pseudonym of Flibbertigibbet in the *Economic Weekly* of 7 July 1962, the obituary writer put forward the theory that hard workers like Nehru and BC Roy were really non-Indian except by birth, and that the Indian Tradition stood out pre-eminently for laziness of mind and body:

> "...in spite of the dams and factories going up here, there and everywhere, it is still far from certain that the Indian people will not again reject modernism, the machine and the scientific outlook. It is no use lamenting deaths like Dr. Roy's without recognising that these people were ardent subverters of the Indian tradition, worshippers of things totally alien to the native ethos. Hard work such as Dr. Roy did to the last of his days, is almost an un-Indian activity; and it is an unflattering commentary on what is called the Indian heritage that the great Indians of our time—Nehru, Roy—are, in a very real sense, 'non-Indians' except by birth."

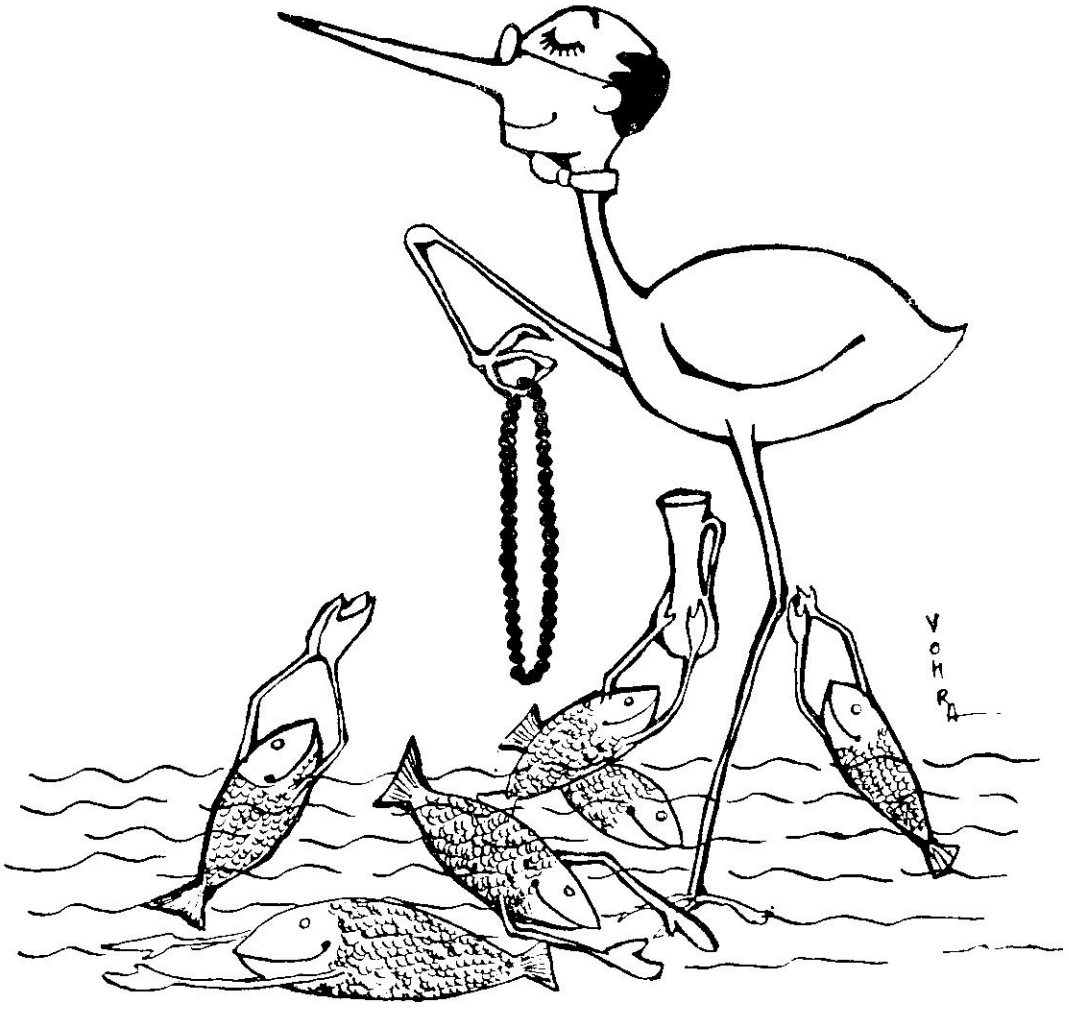
This, of course, is cynicism with a vengeance. Nehru, BC Roy and, above all, Gandhiji do represent—very patently and with all their qualities and defects—the Indian Tradition. In fact, they represent nothing else. Even their receptivity of foreign ideas and absorption of foreign influences were peculiarly Indian. They occupied a large place on the canvas of the Indian Scene, precisely because their personalities clicked with the basic ethos of the country. They are the makers of India as we find it today: free, democratic and modern.

How much of the ancient Indian culture will remain, after the changes generated by them have exhausted their course, it would be difficult to say. This much is obvious that we are right at the moment in a flood of change; and it will take a decade, or even two, for the New Society to attain a position of equilibrium. In this period of change, Tradition appears to count for little in the actions or thoughts of men and women. How far the bedrock of Indian culture gets eroded by continually accelerated change, it would be possible to appraise only in some what calmer weather: say about the mid-1970s. Till then, Change rather than Tradition would be the watchward of the Times.

The one thing common among all the languages of the world is that it is possible to talk nonsense in all of them. A good deal of nonsense is being talked right now.

—The *Capital*, Calcutta.

Fish productivity



Improving Productivity in Coal Mines

GS Marwaha*

This is an outstanding piece, not only from the research point of view, but also as a basis for international comparisons of productivity; an insight into the very nature of productivity, its economic and sociological implications; the impact of mechanisation on the Coal Economy, Wage and Welfare policies; the practices abroad; the real key to effective cost reduction; new techniques in mining: this piece is a mine of information and knowledge; and we commend it to everyone genuinely interested in raising productivity in any sphere of the social economy.

TABLE I SHOWS THAT OUR OUTPUT PER manshift (OMS) of 0.58 tonnes in coal mines compares[1] with 1.3 tonnes of Belgium and France, 1.6 tonnes of Poland, 1.9 tonnes of the UK, 2.1 tonnes of West Germany and 9 tonnes of Australia. The OMS in the USA is over 16 tonnes and, as a result, the price of coal there is not much higher than that in this country despite the fact that an American miner earns in one day what his Indian counterpart earns over a month. Some large opencast mines in the USSR are being planned to give an OMS of 60—70 tonnes and a production cost of only Rs. 5—8 per tonne of coal, compared to the present Indian coal price of about Rs. 25—40 per tonne. Japan, which had an OMS less than ours only 20 years ago (0.37—0.38 tonnes), has left us far behind in this race by achieving an OMS of over 1.5 tonnes last year, (*Fig. I*) to a mere 0.58 tonnes in India. It may thus be seen that we are not only at the bottom of this large table but that *the increases being achieved by us appear trivial compared to those obtaining in other countries.*

Measures necessary to effect improvement cover a multitude of factors including more and more mechanisation, with particular stress, however, on (1) *rationalisation of labour force and removal of job restrictions*, (2) *greater use of simple labour-saving devices*, (3) *concentration of work and improving of layouts*, (4) *better and more intensive utilisation of the machinery already in use.*

Rationalisation of Labour Force

From the view-point of productivity in coal mines, Table II tells a particularly depressing story. Despite all the mechanisation that has taken place in our mines and the large increase in use of explosives, the annual production of coal for every person employed in the industry is only slightly above that of 35 years ago: 165 tonnes compared to 136 tonnes, i.e. an improvement of only 21%. In fact the comparative

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1. The comparability would be conditioned by relative degrees of mechanisation, working and living conditions etc., etc.—**Editor**

TABLE I

Output per Manshift in Coal Mines in Different Countries

Year	Belgium	France	Holland	India	Japan*	New South Wales Australia		Poland	UK	USA (Bituminous)	West Germany
						Underground Mines	Opencast Mines				
1953	0.77	0.93	0.99	0.36	0.43	2.84	6.92	...	1.24	7.41	1.10
1954	0.78	0.99	0.97	0.37	0.49	3.00	7.31	...	1.25	8.59	1.13
1955	0.83	1.04	0.95	0.38	0.52	3.14	8.11	...	1.24	8.93	1.16
1956	0.84	1.08	0.96	0.40	0.57	3.28	9.19	...	1.25	9.33	1.19
1957	0.84	1.12	0.97	0.42	0.59	3.69	10.2	...	1.25	9.61	1.22
1958	0.84	1.13	0.97	0.42	0.56	3.95	11.5	1.31	1.29	10.3	1.27
1959	0.91	1.16	1.02	0.43	0.59	4.37	11.1	1.35	1.35	11.1	1.43
1960	1.02	1.22	1.14	0.45	0.72	4.81	13.8	1.40	1.42	11.6	1.61**
1961	1.09	1.26	1.31	0.46	0.87	5.55	14.6	1.45	1.58@	12.6	1.73**
1962	1.15	1.33	1.29	0.48	1.00	5.84	15.0	1.49	1.68@	13.4	1.85**
1963	1.16	1.33	1.31	0.50	1.25	6.26	18.2	1.53	1.79@	14.4	1.98**
1964	1.25	1.41	1.35	0.50	...	...	...	1.58	1.87@	15.3	2.06**
1965	1.21	1.30	1.38	0.56	...	...	...	1.63	1.95@	15.9	2.13**
1966+	1.27	...	...	0.58	...	...	...	...	...	16.2	...

* Approximate ** Including Saar Coalfield † Provisional

@ New Series—Not taking into account shifts worked by under-officials

figure for 1961 was only 135, that is, less than that 33 years ago (*Fig. 2*). A closer look into these figures is quite revealing. During the past one-third of a century, the increasing use of machines and other production-aids has resulted in an improvement of 49% in the face productivity: the productivity of the miners and loaders. This improvement works out to less than 1.5% per year and is niggardly indeed; but even this hard-earned increase has been practically nullified by a proportionate increase in non-productive labour (Table III).

Thus, in 1930, for every 100 persons employed at the production point in coal mines, 47 more persons were employed below ground and another 66 on the surface. The comparative figures for 1966 are 85 non-productive men underground and 84 on the surface. For the sake of its own health, the mining industry must shed off this extra

TABLE III

Number of persons other than Miners and Loaders employed in Coal Mines as % of Miners and Loaders

Year	Below ground	Overall
1925	...	121
1930	47	113
1935	60	114
1940	60	132
1945	141	283
1950	92	216
1955	87	194
1960	100	182
1965	84	169
1966	85	169

TABLE IV

Output per man-year in Coal Mines

Year	Opencast Mines (Overall)	Underground Mines (underground workers only)	
		Non-Gassy	Gassy
1955	138	184	156
1960	163	190	203
1965	272	221	230
1966	279	222	228

The workers have to gain equally from easing off the practice of job restrictions. *We must get away from the concept of one man doing only one job.* The face group must work as a team. For example, it should not be necessary to have different groups of men for dressing roof and sides, for loading, for timbering, for extending track and ventilation devices, etc. By properly training every face-worker to do each of these jobs, considerable reduction can be effected in the labour requirements. This should result in not only better productivity but also improved safety. The work-cycles could be so planned and adjusted that every worker remains reasonably busy throughout the shift. Time studies show that some of the workers employed on jobs like drilling perform useful work for only small periods : in some cases, even less than 2 hours.

In comparison, it might be mentioned that in the USA it is usually the foreman (overman) himself who does the stone-dusting, attends to all the pumping, and checks and puts right old timber and ventilation devices, etc. The qualified electrician/mechanic, though drawing the higher wages of this category, normally operates one of the loading or transport machines. Though some successful attempts in this direction have been made in India, the cases are still too few. A major change in our outlook in this field thus appears to be vitally necessary.

There need be no fear of redundancy from such rationalisation of work-force as any pruning is likely to be gradual and of only such magnitude as can easily be absorbed by the natural wastage. Any odd surpluses at the mine level can be easily absorbed by the expanding industry.

Simple Labour-saving Devices

Many manual jobs in the mine can be made easier by the use of simple devices like wheel-barrows, etc. Properly designed trolleys and trailers could be put to good use for shifting timber and other material. In the workshop, greater use could be made of welding in preference to riveting, etc. Many items of equipment could be standardised with allround advantages. Haulage arrangements in many mines are much below standard, and not a few mines could do with a few more tubs. More attention to the turnround of tubs could also prove fruitful. Pit-bottom layouts with capacity of 500 tonnes per shift, requiring only 2-3 attendants, are already in operation in the country. A little thought to the matter could reveal many more such areas where simple labour-saving devices could be employed profitably, or the productivity

otherwise improved without recourse to costly equipment.

Concentration of Work and Improving Layouts

At present the production points in many of our mines are widely scattered, only a few tonnes of mineral being obtained from each district. Each such district, however, must have proper haulage facilities. There must also be separate travelling roads and additional airways. The maintenance of these approach roads, with respect to safety of roof and sides and dust etc., requires employing many men. These 'overhead' charges could be reduced by concentrating the work areas. Thus mines which are working three districts on two shifts each could work two districts on three shifts each. Old areas developed, but awaiting extraction, could be sealed off. New districts could be developed on such layouts as require the upkeep of the minimum possible supporting roadways.

It is also worthwhile devoting attention to ensure that safe and proper working faces are always made available for the work-force on roll in the mine.

On the surface, attention could be paid to the rationalisation of wagon loading so as to reduce double handling of the output. For this purpose, of course, co-operation of the railway authorities is indispensable.

Better and Fuller Utilisation of Machinery

Better utilisation of machinery requires proper planning of machine use, adoption of adequate preventive maintenance programmes, and thorough training of the machine-operators and maintenance men for giving them the necessary know-how as well as to upgrade their skills. *With good preventive maintenance, there is no reason why 3-shift production cannot be achieved,* except under special circumstances. In many of the new mines, one hour at the beginning of each shift is spent on checking and oiling machines, and the machines are usefully employed on all the three shifts.

NONE OF THE IDEAS MENTIONED ABOVE REQUIRES COSTLY MACHINERY OR FOREIGN EXCHANGE BUT I FEEL SURE THAT IF EVERY MANAGEMENT ANALYSES THE PROBLEM CRITICALLY, AND CAN GET THE COOPERATION OF ITS WORKERS' REPRESENTATIVES, IMPRESSIVE IMPROVEMENTS IN PRODUCTIVITY CAN BE OBTAINED EVEN OTHERWISE.

It can perhaps bear repetition that *only about 37% of the employees in a mine are at present engaged on direct productive work.* Any effort made for improving the productivity of this category of employees can be rendered comparatively insigificant or can even be nullified, unless the productivity of the remaining 63% of the workers is also improved. Thus while mechanisation of face operations is no doubt necessary, mechanisation of other operations in the mine and rationalisation of the remaining labour force is equally, if not more, essential.

Other Cost Reduction Areas

Any increase in productivity resulting from the suggestions mentioned above would result in a reduction in the cost of production. Further cost reductions can be achieved by the streamlining of other aspects, such as reduction in the completion time of projects, scientific stocking of spare parts (as far as is possible under the existing conditions) and pruning of overheads. There is scope in many cases for reducing the cost of administration also. Use of operational research methods, O & M studies and other modern management tools is already made in some undertakings and can prove to be of immense value in this respect.

Developing New Mining Methods

While outputs from the exising units can be increased—to a smaller or greater extent,

depending upon conditions—by effecting the improvements mentioned above, the large outputs envisaged from the new units can be obtained efficiently only through greater concentration and allround mechanisation of work. This would involve basic changes in mining methods and layouts. We must also learn to make the most of our natural conditions. THUS THE GREAT THICKNESS OF OUR COAL SEAMS IS AT PRESENT PROVING A HANDICAP. WE MUST TRY TO CONVERT THIS HANDICAP INTO AN ADVANTAGE BY INTENSIFYING PRODUCTION AND BY PUTTING THE FORCE OF GRAVITY TO USE IN THE SELF-LOADING OF COAL. The present shortage of stowing material can prove to be a good thing after all, if it results in successful adoption of the caving methods on a greater scale. These changes would, of course, require considerable experimentation, and many problems that are likely to crop up, will have to be overcome, but such obstacles are common to every road leading to success.

Many notable advances in the working methods, particularly for the extraction of thick coal seams, have been made and many more are being attempted in foreign countries, particularly those of Continental Europe We could learn a lot from these attempts and practices. Till lately, most of our mining engineers obtained their foreign training in the UK—no doubt due to historical reasons; the increasing opportunities now being made available for the study of the experiments being conducted and new methods being adopted in European countries are, therefore, to be welcomed.

ACQUISITION OF KNOWLEDGE ALONE IS, HOWEVER, OF LITTLE USE. EQUALLY NECESSARY IS THE PUTTING OF THIS KNOWLEDGE INTO PRACTICE AND EXPERIMENTATION, WITHIN THE COUNTRY, WITH THE NEW METHODS AND THE NEW MACHINES. It is good to note in this connection that some experimentation of this type has already started.

This is not to say that all mining methods developed in other countries, possibly under different conditions—both technical and economical—could be successfully adopted in this country. *What is necessary, however, is a spirit of enquiry and a spirit of adventure amongst all concerned.* Experimentation with new methods should be welcomed and encouraged—even financially, if necessary—with the object of developing and evolving methods suitable to the conditions existing in this country.

It is also highly desirable that the trials with new methods and new machines are carried out in a scientific manner and that all the relevant factors and the results obtained are fully documented. Any failure must be investigated in relation to all the existing conditions, and all successes related to the relevant factors. If this is done, it should be possible to develop standard methods for application under different natural conditions. Greater adoption of these standard methods would be facilitated if the characteristics of all our coal seams and of their roof and floors are known. The Central Mining Research Station has made some studies in this field. Our mining and geological schools and colleges could also make a useful contribution in this regard.

Flexible Mine Safety Law Needed

Mention might also be made here of the mine safety law, which governs all work in mines. This law which too was designed mainly for the board and pillar method of work, is under revision to meet the changing situation of the industry. Under the present provisions of the statute, however, any amendment of regulations is a long drawn-out affair. It appears desirable, therefore, to devote some attention to the simplifying of procedures required for effecting changes in the safety regulations. This could perhaps be done by laying down only the broad fundamentals and the basic requirements in the regulations and by empowering the safety directorate, with suitable safeguards, to prepare and alter, when necessary, the statutory codes for ensuring safety of

work-places and workers under the different methods being tried out. The American Federal Coal Mine Safety Law is developed somewhat on these grounds.

Organisation Pattern

In 1953, there were only eight coal mines in India, each producing 0.3 million tonnes or more of coal in the year. The corresponding number in 1958 was 22, and the present number is 48. Five mines now have each an annual production of more than 0.6 million tonnes of coal. Such a mine under present conditions employs about 3000 workmen. MOST OF THE NEW MINES ARE LIKELY TO BE OF THIS SIZE, AND SOME OF THEM WOULD EVEN HAVE AN ANNUAL PRODUCTION OF OVER A MILLION TONNES OF COAL. Such large mines are quite complex industrial undertakings. The Mines Act at present requires 'every mine (to) be under one manager who shall be responsible for the control, management, supervision and direction of the mine'. Considerable debate is at present going on as to whether this concept of 'one-man control and responsibility' is feasible in the larger units now under development, and a proposal has already been made for the statutory responsibility in such mines to be delegated to properly qualified Sectional Managers.

While making any changes in this respect however, it is necessary to keep in view the need for ensuring that every person employed in the project who is in a position to give effective direction or suggestion relating to the operation in the mine, including senior personnel and specialists does shoulder the responsibility for his directions and suggestions. The problem is rather a complex but an important one, having an important bearing on the vital subject of safety in mines. It is expected, however, that the proposed changes in the statutory management pattern would go some way in solving it.

Improving Communication

There also appears to be considerable need for improvement in the communication between the managements and the workers, both at the mine level and at the industrial level. Such an improvement is indispensable if the labour force in mines is to be rationalised as suggested earlier. The nature of the problems facing the industry is changing fast and, if these problems are to be faced successfully, everyone connected with the industry should be made aware of them. The managements could take steps to see that the workers and the lower supervisory staff are taken into confidence whenever any major changes are envisaged, and *such an atmosphere created wherein these employees consider themselves a part of the greater mining family.*

On the workers' side the need is for enlightened criticism and for accepting the basic fact that mine labour can prosper only if the mining industry in general is prosperous. For its successful economical development the country must be assured of adequate supplies of raw materials at economical prices. *The present concept of increasing the coal price for every increase in the workers' wage is going against this very fundamental requirement.* The workers must recognise that wage-increases have to be earned by greater productivity, and should base their industrial relations policies and attitudes on this cardinal fact of life.

In this connection it might be of interest to note that, to meet an expected 4% annual increase in wages, the British National Coal Board considers it necessary to improve the productivity by 6% every year. In actual fact, however, the NCB mines have been able to achieve even higher increases in productivity over the past five years and thereby to meet the rising costs of production without putting up the price of coal except marginally.

An important means of improving communication is joint consultation, and it is good that efforts in this direction are already being made in the coal mines. All concerned, however, must realise at all times that the mining industry is only a part of a bigger

community and has a multiple responsibility, to the owners, to the workers as well as to the nation. The benefits likely to accrue from increased productivity have got to be shared between them : the owners should get a fair return from the money and effort invested and something extra for re-investment; the workers should get better wages and amenities, and the nation should get its mineral requirements at reasonable prices.

It is only when such a realisation has become general that this important industry can hope to make the quick advances that are necessary if it is to develop and play the role expected of it.

Conclusion

Before concluding, I would like to reproduce here the *Ten Recommendations* drawn up by a Director of the General Electric Company (during a visit of the French Heavy Electrical Equipment Mission to the United States in 1950), and referred to in an I.L.O. publication :—

1. Convince your staff of the need for close collaboration between the main branches of the firm.
2. Have modern, good quality equipment.
3. Standardise, standardise, standardise, all along the line.
4. Use the most uptodate equipment for handling your goods.
5. Use plant manufactured as a complete unit, wherever possible.
6. Simplify your designs.
7. Study and analyse your methods, and do not hesitate to change them if necessary.
8. Train every member of your staff.
9. Have a system of promotion based on efficiency and results, by which anyone can reach the top on his merits.
10. Pay particular attention to the training of supervisory staff.

The recommendations have equal application in the mining industry and could be followed with advantage.

The mining industry today faces a challenge of quickly rising costs but a relatively stalled productivity—a challenge which was never as grave as it is today. *This observation is in fact true for the whole wide field of human effort in this country*, but has particular relevance to the industrial effort, of which mining forms a basic part. During the past 35 years since 1930, productivity in coal mines has gone up by a total of less than 21% but costs have increased several-fold so that the price of coal has gone up over 11 times. The pressure on costs (including wages) is still at a high level, but the current rate of improvement in productivity is less than 2% per year.

In a nutshell, the need of the day is for reducing costs and increasing wages; and these can be attained only through higher productivity. In particular, it appears necessary to curb the tendency of increasing the price of coal every time there is any increase in costs; it should not be too much to expect that the industry meets most of such cost increases by improving productivity and that wage increases are coupled with at least corresponding increases in productivity.

The current situation demands also that the required increases in productivity are obtained through our own effort and with minimum dependency on foreign expertise, in respect of both machinery and know-how. In other words, we must pull ourselves up by our own boot-straps.

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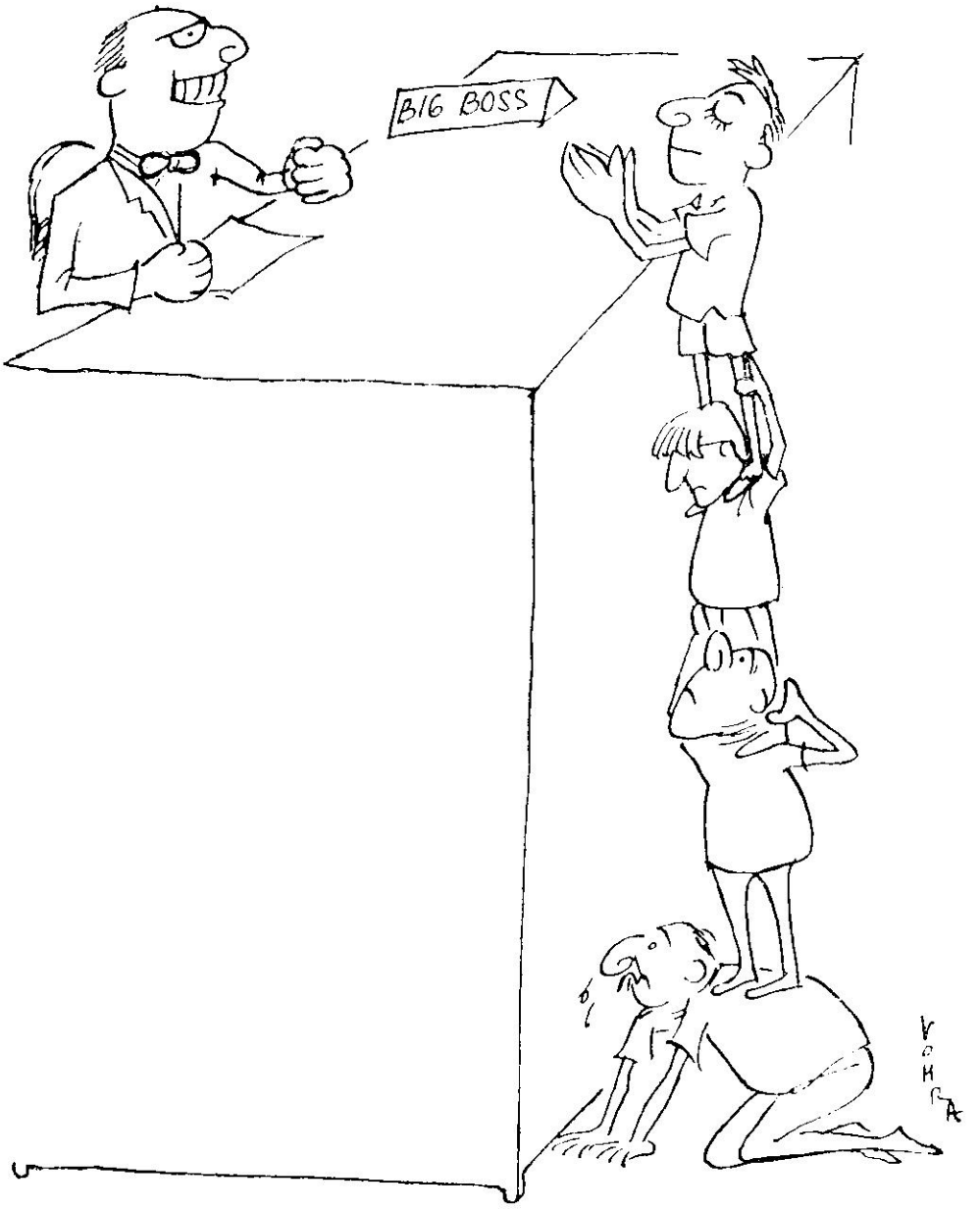
BIG BOSS

Import Substitution in Mechanized Mines

LN Misra*

The problem of individual equipments needed in big mechanized mines now being developed is a big one. In many cases import substitution is possible, but there are difficulties, some of which are psychological, as our engineers and operators are used to imported equipment. Slowly, Indian equipments are coming up, but there is a natural faltering in initial stages of manufacture: nothing unusual, but it creates an impression that a machine made in India may not be good to hold production. Equipment users are willing to risk using even unknown but imported equipment with no after-sale service, and a permanent problem of spare parts import problem, yet unwilling to risk using equipment of Indian manufacture even though under strong collaboration. Sometimes even Government rules are too strict for indigenous make but liberal if the item were imported. With our inherited habits of caution more than action, the management itself sometimes fights shy of Indian equipment.

IN THE FIELD OF MINING, THE PROBLEM CAN be solved by organising a large number of small mines, for which indigenous equipment is or can be easily manufactured. We have been putting up some of the biggest mining projects, for which we have necessarily to import equipment, for indigenous manufacturers of smaller equipments, not finding a market for such big sizes, are not ready to manufacture a few big ones. The solution lies in larger numbers of smaller size equipments made in India or those that could be made in India, than using a few heavy size equipments.

It is true that small size equipment will not suit all conditions, but they would prove satisfactory with appropriate adjustment of specifications in 90 per cent of the situations, and in the remaining 10 per cent it should be possible to have a mix up of indigenous with imported equipment.

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In fact, the sophistication of foreign equipment is itself a handicap in view of the background of our operators. Such equipments create problems of operation and maintenance. In the past, and even today, they suffer reputedly from low utilisation because of operation and maintenance troubles, lack of spares, frequent downtime, all leading to higher cost of production, making our products uncompetitive. Unless the whole economy of India is geared to heavy sophistication and operators get accustomed, sophistication at one place only will give poor results. It will be better, therefore, that while drawing the Project Reports we should keep in mind not only the mathematical calculations giving the best conditions, but also the availability of equipment in India and the

proved performance of indigenous equipment. It is interesting to note that unless this allround vigil is kept on specifications at the time of the Project Report, even the Technical Development Wing may clear for imports equipments which could be substituted in many cases by useful equipments manufactured in India,

We may now discuss the problem of Mining Equipment with reference to specific requirements, as for example, drilling. So far, we have largely been doing our drilling operations manually. We do not manufacture what are called drill jumbos. They are imported by Mining Departments, which want to mechanize their drilling operations. A Drill Jumbo is nothing but a group of drills so that one man can operate more than one drill simultaneously without much fatigue. In a country accustomed to very heavy equipments, the drill jumbos may mean completely automatic and mechanized drilling operations, including forward, backward, upward, downward and sideways, precise and easy movements by hydraulic or compressed air arrangement of heavy booms, each carrying large size drills. In another country accustomed to lighter equipment, this drill jumbo may mean one or more heavy or even hand-operated drills mounted on suitable pneumatic air legs or autofeeds kept on platform, the whole thing made mobile on wheels to do drilling, and some of the movements can be manual. Surely the productivity of one cannot be compared with the productivity of the other. But in a situation like ours where the entire system is not geared to the use of sophisticated equipment and the availability of skilled workers is a problem, highly automatic drill jumbos are likely to produce derated results and work inefficiently. Our men accustomed to do hand drilling feel more in tune with hand-operated drills, and using standard equipment in the transition stage, are likely to produce over an extended period, the same tonnage as with the heavier jumbos unless special conditions exist. Further in a complete cycle of excavation, drilling time may be only 20% to 25% of the whole cycle time. Only when one can achieve 3 cycles of 8 hours a day can drilling time mean some difference. At present, at most of the places, even two cycles a day are difficult to get through. Most of the East European countries are doing their mining work with light rigs, actually called jumbos. If Indian Mines improvise such rigs, quite a bit of foreign exchange could be saved on import of jumbos. The Beas Project seems to be using something like this for their large tunnel. Also for parallel horizonal holes, Atlas Copco have introduced channel drilling which should help.

In certain cases, we do not appear to be sufficiently cognizant of the existing facilities. For example, 25 and 50 ton trailors have been made in Delhi for long and have done good work with Government Departments. Towing arrangements have so far been imported, but it is possible that 30 ton trailors made in India can now be towed with Leyland Hippo tractors made in Madras and therefore these need not be imported. The Leyland Hippo tipper can do the dual work of 16 ton tipper and alternatively also of 30 ton towing arrangement. 50 ton trailors are already available. Occasional requirements for 50 ton towing can be improvised by two 30-ton towing arrangement in tandem. Very soon the country could make 50 ton tractors also.

Materials handling is the toughest problem in modern mines. Mobile cranes are needed everywhere to save manpower. But mobile cranes are made only upto 12½ tonnes capacity in India. 25 tonners are not made. 50 tonners are made, but only crawler mounted which means less mobility and work only in a limited area. Keeping in mind that except in case of very heavy industries, heavy lifts are few and needed only mostly during construction, a good deal of improvisation is possible, and in fact not at all difficult. In fact, it is in the public interest to stop import of 25 tonne and heavier mobile cranes. Two 12½ tonnes

of indigenous make can very well replace one of 25 tonnes. The bulk of the project work in mines generally falls within 12½ tonnes and can, therefore, be tackled without diffiiculty with indigenous equipment. 25 tonne loads can be handled by two 12½ tonne mobile cranes or 50 tonne crawler cranes. 50-tonns lifts within plant jurisdiction can be handled by crawler cranes. Distant railhead problems can be solved by cranes already imported in the projects or in the Railways. Indigenous 2½ cu. yd. shovels which are slowly getting standard are basically the same as 50 tonne crawler cranes. A large number of such shovels are already working in many mines. In that case, only a crane conversion kit (a crane boom and hook attachment) is all that is needed to get a 50 tonne crawler crane ; for shovel can be converted into a crane and *vice-versa*.

Also, heavy truck-mounted cranes need not be imported, as mobile cranes can be transported by tractor trailor arrangement. In the meanwhile Kumardhubi Engineering Works are offering a 10 ton truck-hauled-mobile crane with its own independent Dodge tractor for towing to long distances. This has been designed and developed for Bokaro Steel Plant. On our request they are examining the feasibility to develop a similar 25 ton truck-hauled mobile crane. In such cases only one towing arrangement may be sufficient for a few cranes in one project; and the tractor will be available for use, when cranes work within the project. This arrangement, with its ingenuity, is not less versatile than most imported mobile or truck cranes.

The question of using Indian equipments of smaller capacity and large in number, seems to fit the case of locos. Indian Railways have standardised shunting locos of 650 HP, 18000 kg. draw bar pull and 60 ton tare weight. An indigenous manufacturer (M/s. Dynacraft, Bombay) offers 320 HP, 10,000 kg. draw bar pull and 30 ton tare weight locos: two of these locos can replace one shunting loco standardised by Railways : a good substitute if the manufacturer can deliver the locos and they pass the teething troubles. Small 3 ton and 6 ton locomotives are also being developed by M/s. Grumina Equipment Corporation, Calcutta.

Similarly EMC, Calcutta, now offers 2½ cu. yd. completely indigenous front-end loaders in place of Eimco type loaders (for open cast mines) that have been imported so far. The Horse Power of the engine used is higher than necessary. Exact Horse Power engines are not made indigenously. Hence engines with a reserve capacity are used. The firm has proven experience of manufacturing smaller shovels. Sooner or later this front-and-loader can solve the problem for open cast mines.

At the moment dumpers up to 15 tonnes capacity are being manufactured indigenously. 35 tonnes are going to be made shortly. Even if at some inconvenience we stick to these sizes, foreign exchange can be saved.

Equipments for earth-moving cover a wide range like bulldozer, ripper, pusher, grader, etc. In these cases the basic unit is a tractor, crawler or pneumatic, with attachment say for dozing, ripping, pushing or grading. Normally complete equipments are being ordered from foreign countries, e.g. bull-dozer, pusher, grader, etc. If a close study is made of interchangeability during the ordering stage, it should be enough to order some tractor as the basic equipment. The other attachments e.g. dozer, ripper, pusher, grader. etc. could be locally purchased to mount these on the same tractor. If we are serious about import substitution, we must break-up the equipment into the basic component and the attachments and import only the minimum components, not locally manufactured rather than import complete equipments and even different basic equipments every time. On a similar basis Kamani Engineering Company now manufacture Tractamount Road Rollers which are only attachments to and

are worked by indigenous tractors and are cheap in capital and operation costs.

Slusher hoists are needed to develop adits, drifts and cross cuts. Double drum slusher hoists are not yet made and there is a difficulty in making them but we do make single drum slushers and we should first examine, if they are not sufficient for the work in hand.

Raise climber, representing a new trend for raising, is not yet made in India. In the absence of a raise climber, it should be examined if the height between levels can be decreased. Work by conventional methods is, of course, slow; but in this connection, a parallel feed raising method introduced by Atlas Copco may be of help. Khetri not only uses it, but it has even improved it and has solved the immediate problem. Raise climber, however, is an item which can be used by most mines and efforts should be made to persuade manufacturers to produce the same indigenously.

Ropes are needed for hoisting. The Chief Inspector of Mines has already allowed the use of indigenous winding ropes up to 600′ depth. Such winding ropes should be encouraged. For greater depths, ropes may have to be imported till CIM allows use to further depths. Locked coil ropes are going to be made indigenously, but not for winding. Rope Capples, Safety Hooks, etc. are easier to manufacture and steel fabricators and foundries should be able to take up this work.

The MAMC and even some private firms have already started making equipments for Mining Industry. Many other big engineering firms in India are in a position to tackle the problem of concentrators, smelters and refinery. If knowhow is made available, sooner or later all requirements of capital goods could be met from indigenous sources. It would be advisable to establish an 'indigenous' cell at the Headquarters of every Corporation for clearance of all imports : this will go a long way in helping Import Substitution.

When a whole range of built-in equipments are being imported, it should be borne in mind that quite a number of items used in the manufacture of the main units, are now made in India, such as ball-bearings, valves, belts, bolts and nuts, tubes, and lubrication fittings, etc. Foreign manufacturers of these plants cannot economically import such Indian components for their assembly lines, but Indian designers should be advised to keep an eye on sizes and dimensions of these items for Indianisation, and, with a judicious eye kept on units functioning within the country, many future maintenance problems could be reduced and eventual cost of production brought down. During maintenance, one by one, easily and steadily, such imported components can be replaced by indigenous make. One of the terms and conditions of any foreign order should be that for components which are available in India, maximum use should be made of indigenous equipment and where this is not possible, Indian standard dimensions and sizes should be kept in mind.

Also the market should be kept informed of our requirements from time to time that the market itself keeps track and develops newer and newer equipments to our requirements. This will have to be done on forward planning basis so that there is enough time available to the manufacturers to develop, design and manufacture what they can. Many firms requiring large number of spares have put exhibitions in industrial areas and this can come handy.

For a growing industry, research facilities and design centres are a *must*. This becomes the source of greatest self-reliance. How much we are lagging behind in design can be seen by an example. Mining engineers prefer to use only a certain make of 35 c.ft. tipping trolley for hand tramming. A new requirement for 65 c.ft. trolley came up. A big concern which had for long earned a

reputation for manufacturing the standard 35 c. ft. tipping trolley, refused to undertake this work, for want of design! Only after we decided to sound others in the line, at a later stage, designs were developed and the firm came forward to make 65 c. ft. trolleys. The nation is paying heavily for not spending a reasonable portion of its resources on design and development.

Even if it costs more, it should be arranged that designs according to which materials have to be fabricated in India should be made by our own design engineers, if necessary, first under the charge and supervision of collaborators. There should be Indians at all levels so that in course of time when experts return, the know-how is available in India. Such design work should be organised as near the site as possible so that designers can check and see things for themselves and correct their mistakes on the basis of on-the-spot study.

To achieve that, even as a first step, we should only take trained men and women with suitable qualifications. At times it is argued that men, who have no qualifications but have experience, also fit, and are at times treated at par with qualified engineers. For jobs of routine nature and set operation, they are equals, but for improvements and adjustments which is a continuous process for a growing industry, men with suitable qualifications are better. In general, the point has to be recognised that education plays its part in life and is to be given its proper position. It appears even the Diploma course should be considered as the continuation of the craftsman course in a more intensified and enlarged form than as a condensed or simplified version of the first degree course in Engineering.

The Weather

". . . Everybody complains about the weather, observed Mark Twain, but nobody does anything about it. This is not strictly true. The London fog and the Los Angeles smog are both created by man. Draining swamps, clearing forests, flooding valleys, irrigating deserts—all alter the climate so far as the people who have to live nearby are concerned. It is not beyond the bounds of possibility that Soviet scientists might discover how to divert the Gulf Stream or American scientists to flatten the Rockies. Like almost everyone else, except the meteorologists, I suspect that any unusual weather can be blamed on H-bomb tests. To a Congolese nudist, San Tropez probably feels chilly. To a well-dressed Eskimo, Edinburgh probably seems sultry. We change the weather for ourselves simply by putting on waterproof boots or fur-lined gloves. The rich have a different idea of winter from the poor, the young from the old, the townee from the countryman, even a man from a woman.

". . . We are creatures of the weather as the tides are slaves of the moon. For one thing, it is a universal, all-purpose excuse for not doing what we do not want to do, and a checkable, impenetrable cover for doing what we do want. We pass it from one to another like a bad cheque which will not be cashed until it is out of date. It can be produced as a reason for staying in or staying out, for arriving late at work or late back home, for the extra drink, the missed appointment, the dirty laundry, the new coat, the low turnover, the high absenteeism . . ."

—Allan Brien in the *New Statesman*

4 per cent in semi-mechanised and manually worked mines.

In regard to coal won by open-cast methods, or quarrying, it is found that only 18% of our total coal output is raised through such methods, whereas 82 per cent is done through conventional underground methods. The author has, therefore, reason to question the 16 per cent rise in OMS between 1957 and 1965, as indicated in CIM statistics.

There is of course no doubt that productivity in Indian coalmines, in terms of the OMS, is low, very low indeed, compared to the standards of other coal producing countries: in the USA, it is 14 tonnes, in Australia 6 tonnes, etc., etc. Such comparisons are, however, not pertinent, in view of basic economic differences : radical differences in technologies, conditions of work and living, motivations involved, the levels of general and technical education, in fact the whole milieu. Underlying the record of achievement with regard to increase in the OMS and contributing significantly to it, are important operating and management factors : significant trends in mechanisation and mining operations, all of which are not feasible at the present stage of our economy.

It is, of course, not necessary to say that the most obvious method of increasing productivity in a coalmine is the adoption of intense and accelerated mechanisation. This is seen from a recent survey of productivity, made of nearly two dozen collieries in West Bengal/Bihar fields : it was found that the OMS varied between 0.40 to 0.75 tonnes, colliery to colliery, in accordance with the degree of mechanisation. *In one particular colliery (fully mechanised) the OMS was as high as 2 tonnes.*

We may, therefore, look into the background of mechanisation in Indian coalmines. Over the last fifteen years, the number of coal cutting machines used in Indian coalmines has increased from 374 to 779, the number of mechanical loaders from 7 to 22, and the number of mechanical conveyors from 23 to 155. Out of the total coal won from underground mines, the quality of coal cut underground with machines forms about 15 per cent, and coal loaded underground with machinery about 12 per cent. The figure is not at all impressive, compared for example to American standards, but the figure reflects a measure of progress which, considering our general record, is fair enough.

In the United States, the high OMS has been made possible because of general and significant improvements in practically all the aspects of coalmining : the design of cutter-loaders for longwall and shortwall faces, self-advancing hydraulic supports, flexible artificial roofs, continuous miners for driving gallery, side by side with intense electrification.

It may not, of course, be possible for us to adopt similar methods of mechanisation due to shortage of power, foreign exchange, coalmining equipment etc. Despite these deterrents, however, we can push through modernisation and rationalisation, for conceptually, everywhere, such processes begin with improvisations on existing equipments and facilities. It should be possible, for example, to replace the traditional "board and pillar" methods of mining by longwall ; and we may increasingly adopt opencast methods, as in the USSR. The transport of coal and of materials, can be centralised, and coal operators may be motivated and educated into greater mechanisation consiousness.

The present rate of productivity in Indian coal mines has to increase appreciably, and progressively, if this basic industry has to lift itself from the present slough of despond. *And productivity would mean mechanisation.* While mechanisation cannot, of course, be had on tap, sincere and determined efforts should be made to *revamp the present set up of the coalmining industry*, and to get it out of the age-old rut. Unless this is done, it will be idle to hope for better days for "King Cole".●

Work Study in Mines

NL Chatterji*

Mining industry ranks foremost in the industrialisation of any country, as it furnishes the food for all industry and the raw materials for heavy industry. Increased output depends on mechanisation which unfolds its own problems. To increase productivity, we have not only to effect economy in manpower but also to organise the proper utilisation of costly machines and the elimination of unnecessary work. The logical development of work study methods thus comes in the forefront. Its importance is in fact greater in the mining industry due to its various peculiarities, its problems being rather uncommon. In fact, conditions differ from mine to mine, from unit to unit. Many variants like geology of the mineral deposits, working conditions, local hazards, climatic conditions, peculiarities of the available labour force are problems which a mine manager must face and tackle.

TO MAKE THE BEST USE OF MEN AND materials under the prevailing conditions, standard operational procedures for each and every operation in a mine should be developed by the application of work study methods for effective managerial control, cost control and evaluation of performance. A standard operating plan must be evolved with a balanced, practical and low cost method, designed to produce a predetermined volume of products and services.

For preparing such an operating plan, Time data is very essential. Below are given the details of a study conducted for box-hole mucking with 12B Eimco Loader. In Time Study Table I the job has been divided into small parts, the start and finish of which are easily recognised.

Table II has been compiled from the details of Table I showing the job analysis. The final compilation of a number of studies conducted for the same operation in Sheet No. 2 has been shown in Sheet No. 3 to get an idea of the average results under the existing conditions.

From the Time Study Table III, the following results are obtained :

In & Out	— 6%	
Preparation	— 5.4%	
Main Operation	— 68.7%	including 28.1% covered for actual mucking only.
Job allowance	— 19.9%	mainly constituting time loss in waiting for empty tubs.

The results shown above clearly indicate that for actual mucking, a loader costing about Rs. 15,000/-could be utilised only for 28.1% of the total time in one shift. This leaves a very considerable margin for increasing productivity. Further, the job allowance

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TIME STUDY TABLE I

Working Face.....

Date.....

Subject :—Loader Mucking (Eimco 12 B) in Box hole.

Kind of Work	*Starting Time*	*Finishing Time*	*Period*	*Remarks*
Issuing of cap lamp	8—0	8—7	7 mins	
Reaching the Working Place	8—7	8—22	15 mins	Walking on level
Non-supply of Compressed air	8—22	8—49	27 ,,	
Lubrication & other adjustments	8—49	9—16	27 ,,	
No work due to low air pressure	9—16	9—43	27 ,,	
Bringing the loader to the working face	9—43	9—48	5 ,,	
Bringing the Ist empty tub	9—48	9—49.5	1.5 mins	
Attaching the tub	9—49.5	9—50	0.5 ,,	
Loading the tub	9—50	9—53.5	3.5 ,,	
Detaching the loaded tub	9—53.5	9—54	0.5 ,,	(Air pressure available at the time of loading was 65 p.s.i.
Derailment of the 4th empty tub	10—29	10—31	2 mins	
Pop drilling & Secondary Blasting (before 9th tub. loading)	11—32	11—45	12 ,,	Necessary because big lumps of stone rolled down the box hole
Operators sat down for smoking & rest (after filling 17th tub.)	1—17	1—30	13 ,,	
Loading of 27th tub	3—39	3—41	2 ,,	
Detaching of loaded tub	3—41	3—42	1 ,,	
Removing of hose pipe, etc.	3—42	3—46	4 ,,	
Cleaning of the loader	3—46	3—50	4 ,,	
Coming out to the office for depositing cap lamp	3—50	4—00	10 ,,	

TIME STUDY TABLE II

(To be compiled from Table I)

Working Place.....

Subject :—**Loader Mucking** (Eimco 12 B) in Box-hole

Elements of Operation		Time	% of total time	Remarks
IN	Walking in	10 mins.	2.1	
OUT	Walking out	10 ,,	2.1	
	Total	20	4.2	
Preparation work before & after	Hose connection	7 mins.	1.5	
	Blowing of compressed air	2 ,,	0.4	
	Transferring the machine to face	15 ,,	3.15	
	Arranging tools	2 ,,	0.4	
	Lubrication	4 ,,	0.8	
	Taking out machine to safe place	15 ,,	3.15	
	Cleaning the machine	7 ,,	1.5	
	Hose disconnection	4 ,,	0.8	
	Washing hands	12 ,,	2.5	
	Total	68	14.2	
Main Operation	Mucking	130 mins.	27.1	
	Tub connection, disconnection & pushing	68 ,,	14.2	
	Opening up jams	45 ,,	9.4	
	Derailment & other troubles			
	Pop drilling	18 ,,	3.7	Necessary to reduce the size of rock to fit the crusher size
	Blasting	14 ,,	3.0	

(Contd.)

(*Time Study Table Contd.*)

Elements of Operation		Time	% of total time	Remarks
	Blowing of Compressed Air for fume clearance	5 ,,	1.0	
	Cleaning	3 ,,	0.6	After a blast, the track line requires cleaning
	Hammering of lumpy rock pieces for easy handling by bucket	18 ,,	3.7	
	Total	301	62.7	
Operation & Allowance	Checking the machine	3 mins.	0.6	
	To receive instructions regarding job	2 ,,	0.4	
	Total	5 ,,	1%	
Job Allowance	Repairing	—	—	
	Waiting for empty tubs	48 mins.	10%	
	Bringing explosives	—	—	When separate blaster is not there
	Waiting in	7 ,,	1.5	For proper compressed air pressure
	Waiting out	15 ,,	3.1	To receive instructions from supervisors
	Total	70	14.6	
Rest Allowance	Sitting rest Standing rest	10 mins. ,,	2.1 ,,	for smoking
	Total	10 mins.	2.1	
Physiological allowance	To drink water	5	1%	
Lunch Time allowance	—	—	—	
	Total	5	1%	

STEP OPERATIONS

Operation :—Mucking operation with a Shovel Loader (Eimco 12B)

Tools & Material :—A can containing air motor drain oil, grease gun full of grease, 18" pipe wrench, 9" slide wrench, loose bar for barring down loose, waste cotton, 50' length 1" rubber hose with connections.

Steps	Essential points
1. Connection of one end of the rubber hose to the compressed air line.	1. Open the valve and blow air for a minute or two 2. Close the valve
2. Connection of other end of hose with loader-swivel	1. Open valve and blow air through the swivel after opening the stop-cock provided for a minute or two. 2. Close the cock and examine connection points to detect any air-leakage.
3. Preparation before flitting the loader inside the face	1. Clean and lubricate the machine and adjust loose nuts and other minor things. 2. Check whether loader controls are working allright or not after taking out the passing bar and the lock pin. 3. Examine the face and bar down loose, if any. 4. While bringing down loose, be careful not to go under the loose. Use loose bar standing away from the striking point.
4. Flitting.	1. Be sure that the travelling road has proper height for the passing of the loader when the bucket is fully elevated. If not take out the passing bar and lower the bucket to a suitable position. 2. When the bucket is in the lowered position, the lock pin should be in its position to prevent any swinging of upper deck. The bucket must rest on the track. 3. While flitting towards the face, never forget to operate the control standing on the platform provided on one side. Body should remain parallel to the loader. 4. Take care of air hose. Avoid any sharp bending of hose and see that it does not come under the loader wheels. The hose should be at least 1' away. 5. When approachine near the muck pile, stop the loader.
5. Coupling the tube with the loader	1. Set the coupling pin properly in its seat. 2. On a bend, there should not be any movement of the loader with the coupled tub. A straight tract of at least 25' is preferrable. Coupling of tub is also not to be done on a bend.
6. Actual Mucking	1. If the bucket is at the elevated position, take off passing bar and lock pin. 2. Move towards muck pile. While moving forward, lower the bucket. Attach muck. 3. When bucket is full, move back a little, stop traction, raise the bucket and discharge contents into the tub. 4. Be prompt to move back if muck pile slides. While discharging the bucket content, nobody should be close to the tub or machine. 5. Avoid jerky operation to increase the bucket elevating chain life. 6. Repeat (2) & (3) till the tub is full.
7. Disconnection of loaded tub and connection to next empty tub	1. Lower the bucket to rest on the track. 2. Uncouple the loaded tub and take it off by one of the two men engaged on each loader. 3. The other man will bring in empty tub. Couple it with the loader ; restart mucking.
8. Completion of Mucking Cycle.	1. Flit out the loader to a safe place. 2. Disconnect the air hose and give the machine a thorough cleaning by blowing compressed air. Keep the machine as clean as possible.

TIME STUDY TABLE III

(Compilation of time studies conducted for a number of shifts)

(Working Face.....)

Subject :– **Loader Mucking** (Eimco 12 B) in Box hole

Serial No.	Kind of Work	1	2	3	4	5	6	7	8	9	10	Total Time	% Time	Remarks
1	Distribution	20	45	15	30	30	30	20	15	20	15	240	3%	
2	Going in	15	15	11	15	10	10	25	10	10	15	136	2.8	
3	Preparation	30	20	14	15	20	31	25	67	15	20	257	5.4	
4	Loss in time for empty supply	50	35	138	26	67	122	49	10	72	148	717	14.9	Total Tonnage mucked— 382 Tons Average tonnage mucked/shift— 38 Tons
5	Tub connecting, disconnecting and pushing	78	83	102	98	107	96	72	96	75	81	886	18.5	
6	Opening of jams in box hole	27	5	10	30	20	15	25	111	62	60	365	7.6	
7	Derailment and other troubles	62	114	—	69	55	36	61	15	—	10	424	8 8	
8	Mucking	157	124	137	142	156	125	110	141	135	121	1348	28.1	
9	Drilling	—	—	—	—	—	—	28	—	27	—	52	1.1	
10	Blasting	—	—	—	—	—	—	21	—	24	—	45	0.9	
11	Blowing	—	—	—	—	—	—	17	—	17	—	34	0.7	
12	Cleaning	26	24	33	30	—	—	20	—	10	—	143	3.0	
13	Coming out	15	15	20	25	15	15	10	15	15	10	155	3.2	
	Total	480	480	480	480	480	480	480	480	480	480	4800	100%	

of nearly 20% can be reduced by arranging timely supply of a sufficient number of well maintained tubs at the working face. This means standardizing the operational procedure for trammers or loco drivers when locomotives are used for main level transportation. The main operation time can be further increased if the loss of time in derailments of tubs and loaders (8.8%) is eliminated by having well maintained tracks and tubs. A further step forward can be taken to provide automatic attaching and detaching of tubs in order to bring down the percentage time of 18.8% to a minimum. Thus, it is seen that constant vigilance is necessary for finding out ways and means of improving the standard.

All operations in a mine should be scrutinized, as suggested above and finaly, the jobs themselves should be standardized to reach target production. The standard

operational procedures should be so laid out that safety for men and machines is given the highest consideration. Its success depends mainly on i) proper training of the personnel responsible for each job; ii) a well-knit organisation; and iii) good labour relations.

A long-term training programme under competent persons should be organised to train workers to take charge of specific jobs. Trouble-free operations are only possible when the workers are aware of the fundamentals of the job they have to undertake. The operators must be trained to look after proper lubrication, minor machine adjustments, cleaning up, etc. Before an operator is sent up for giving a regular evaluated performance as per the standards laid down, he must be given enough practice on the job, step by step, in proper sequence so that a habit is so formed, becoming the operator's second nature. Safety to men and machines, at all stages, should be the prime consideration while building up the 'steps'. The operators should be provided with lubrication charts prepared as per the manufactures' recommendations and the existing working conditions. On page 559, we have given the example of Step Operations. Lubrication Chart for a 128 EIMCO Loader is as under:

LUBRICATION CHART FOR 128 EIMCO LOADER

1. **Chain roller** : Grease weekly, chassis grease.
2. **Bucket chain** : Oil weekly, use air motor drain oil.
3. **Controls** : Grease daily, chassis grease.
4. **Centering drum** : Grease weekly, chassis grease.
5. **Lower deck fill plug** : Check monthly—keep filled with SAE 80 gear lubricant, 11 pints capacity.
6. **Lower deck drain plug** : Drain, flush, refill every 6 months.
7. **Upper deck fill plug** : Keep filled with SAE 80 gear lubricant 2¼ pints capacity.
8. **Upper deck drain plug** : Drain, flush, refill every 6 months.
9. **Linkage** : Grease daily, chassis grease.
10. **Air Strainer drain cock** : Open daily, clean sediment trap monthly.
11. **Coupler** : Grease weekly, chasis grease.
12. **Air motor test cock** : Check level daily, keep filled with SAE 20 engine oil, 1½ pints capacity.
13. **Air motor drain plugs** : Drain water frequently.
14. **Air motor filter cap** : Drain, flush, refill with SAE 20 engine oil weekly.
15. **Ball race** : Remove plug & pour 1 pint of SAE 20 engine oil weekly.
16. **Centering Roller** : Remove cover and repack with fibre grease every six months.
17. **Cable & Springs** : Oil weekly, use air motor drain oil.

Maintenance Control Programme

A maintenance control programme should be chalked out in order to establish a systematic method for effectively planning, organizing and utilizing men, materials and equipment to keep the plant in good operating condition at all times and under all conditions as economically as possible*. It should be divided into two parts: i) an established programme by virtue of which unpredictable breakdowns can be attended to as and when necessary, without loss of working time; and ii) a preventive maintenance programme defined as "the proper adjustment and timely replacement of necessary integral parts prior to their failure".**

Preventive maintenance is the key to the success or failure of any operation and maintenance programme. It prevents break-downs and shut downs through systematic inspection of equipment, making adjustments and scheduled repairs to eliminate as far as possible any interruptions to plant operations. Availability of the machines for giving target production is possible if spare machines are made available for preventive maintenance without affecting the regular production programme. The success of preventive maintenance with the

* "Principles of Method Study", by Dr. T.J.R. Sales in 'Minutes of Proceedings of National Association of Colliery Managers', 1955-56.

** 'Increasing Equipment Availability through Maintenance' by THOMAS P. BRADFORD in *Mining Congress* Journal, Dec. '61.

most economical expenditure depends upon proper delegation of responsibility, the extent to which it is accepted and assignments carried out.

Maintenance control programme should consist of 6 major phases† :

1. Develop and instal administrative control, listing of routine jobs and work order system.
2. Develop and instal procedures for controlling and scheduling manpower, equipment and materials.
3. Develop a system of record keeping for plant use for filling, compiling and tabulating information to be used in analysing and improving the maintenance function as it relates to (a) cost control (b) improved maintenance (c) manpower and equipment requirements (d) budget details (e) improved maintenance methods and techniques.
4. Develop standards to evaluate staff performance as it relates to maintenance.
5. Develop a system of materials controls.
6. Develop a system of reports to various levels of management to portray the status of the maintenance activity.

Cost Control

No concern can continue unless it makes profit. Cost control is, therefore, a major item for creating conditions for higher productivity. Effective cost control is one of the best tools to effective managerial control. Work methods and techniques which are tools for cost control should be continously improved for ultimate reductions in cost. Cost reduction can further be possible by the existence of a well-knit organisation, effective planning, choice of equipments of proper size, flexibility of work force and work scheduling to maintain a steady flow of work to workmen.

Cost consciousness among all should be infused from top to bottom. Supervisory staff directly concerned with production should be provided with periodic cost statistics prepared on the basis of standard cost system : they will thus get a measure of their performances. The basic standard of cost accounting reflects specific working conditions and practices. It specifies the equipment, material and personnel to be used to maintain certain levels of productivity within given cost levels.

Organisation

No standards can be maintained unless a good organisation exists. Effective organisation requires active demonstration of leadership: a leadership capable of mastering other people to work enthusiastically with team spirit. An atmosphere must be created wherein each and every employee should feel secure : his importance and contribution in the organisation must be understood and appreciated. By observing the general attitude of the employees, the relative productivity of any organisation is not difficult to be determined. After all, men are not machines, devoid of feelings. They are individuals and respond favourably, when treated as such.

A mining organisation is essentially made up of two parts : one which is directly concerned with production (production departments such as mining and milling) and the other for rendering services to the production departments (service departments, such as power house, workshop, personnel. store, hospital etc.). There is no question of the importance of the one over the other : such a feeling leads to faulty organisation

† 'A Maintenance Control Programme', *Coal Age*, Dec. 1961.

exposing weakness in the co-ordination machinery. The production departments can go ahead with their scheduled production without interruption only when well supported by the service departments. The very existence of service counterparts loses its value if production fails. So an organisation rests on these two pillars. The two parts can be interwoven into a well-knit pattern when co-ordination is maintained at all stages.

Management—Labour Relations

The successful adherence to the standard procedures requires good labour relations. Incompetent, tactless and secret management on either side (labour & management) leads to bad relations which should be avoided by having well defind contracts of employment. The confidence in the labour force can only be created when the unions are staffed with competent, responsible and qualified persons to cooperate with the management, with the common interests in view. The demand for more and more money by labour is necessarily limited by the OMS: the very essence of higher productivity is based on the fact that OMS (output per man-shift) should increase by a greater percentage than the percentage increase in EMS (earning per man-shift); otherwise the management would lose interest in investing more amount of capital for purchasing costly machines or adopting costly means and engineering techniques to attain greater production and to minimize the hazards and exertions of the workers. That means, the 'norms' set up for different jobs should be flexible enough for subsequent alteration with the active co-operation of the labour unions as and when better working conditions are created by the application of engineering skill and machines involving extra capital investment. The engineering implications of different operations can be propagated within the union level if the management does not look down with contempt on the active participation of junior engineers as members of the labour unions as long as they are below management level. This will further train up future members of the management to understand the labour problems judiciously.

Conclusion

In the foregoing paragraphs, attempts have been made to emphasise the importance of standard operational procedures for higher productivity by giving specific examples of the multifarious jobs in mining and a general outline of the problems associated with its working. All operations right from the working face to the despatch of wagons can be standardized with the judicious application of work study methods and a proper appraisal of the conditions prevalent in order to attain target production.

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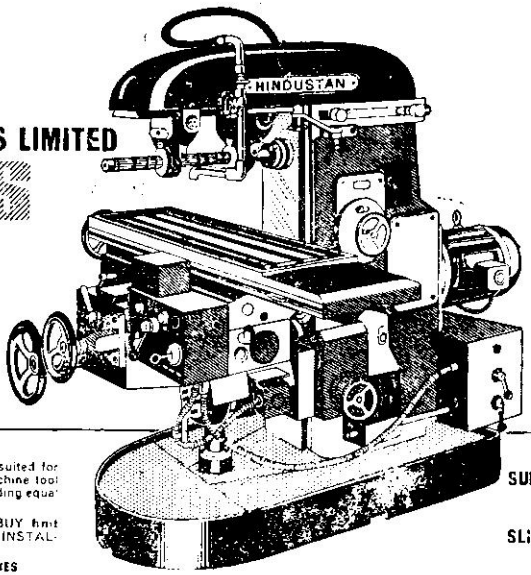

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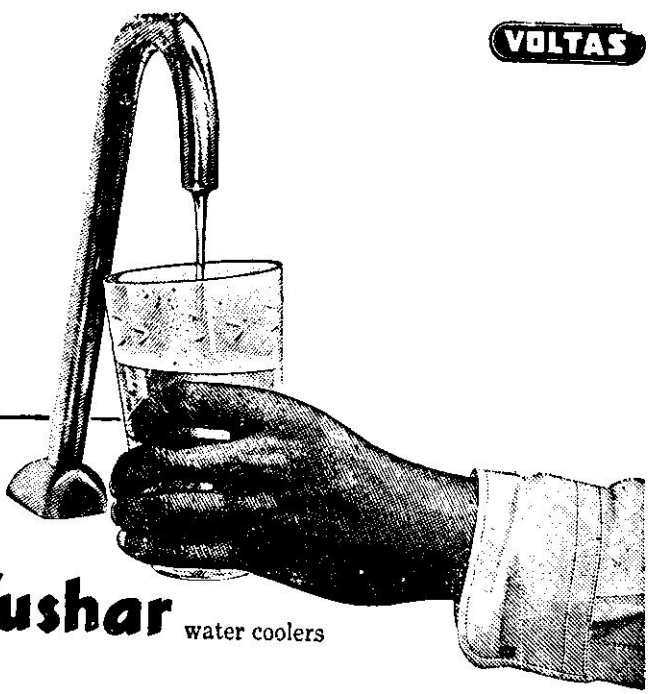

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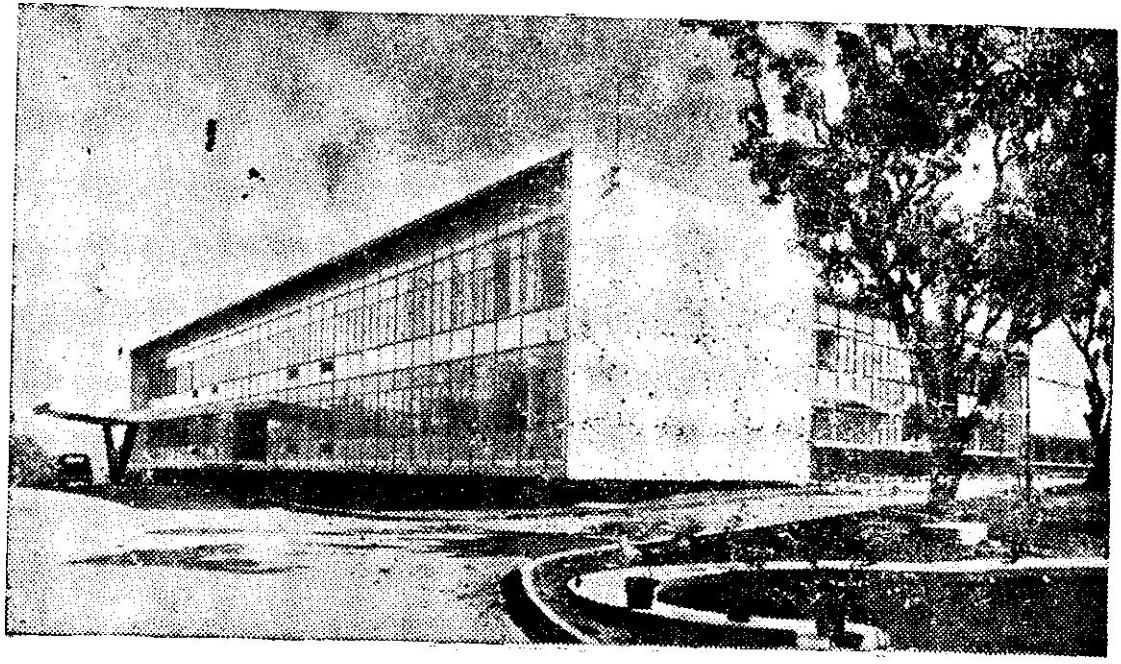

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The Boatman of Padma

River Padma lay wrapped in darkness. Oar in hand, the boatman looked around. Nothing was visible, not even the sprawling trees nearby. It was a long way to that village where he hoped to sell his goods at the fair the next morning. So he untied his boat, and pushed off. He rowed and rowed—how long he did not know. So engrossed was he in planning his transactions and counting his profits that he did not even feel the weariness of rowing.

At last the dawn peered through the distant trees. "Now the fair must be in sight," he thought. And looked around. What! The same place! He rubbed his eyes and looked again. The boat had not gone far from the place he started. And then he found out what had happened. He had been rowing against strong currents which almost neutralised his speed.

Our country today is in a similar situation. After 20 years of hard and earnest efforts to improve the standard of living of our people, we have not gone far from where we started, though, of course, in certain areas we have moved a long way. Take food production, for instance. It has gone up by 17 million tons during the 14 years from 1951 to 1965 but the amount of food available for each person decreased by 0·4 oz. What about employment opportunities? Educational facilities? In these and several other development areas, our efforts have been nullified by the rapid rate of the growth of population. We add to our population more than 13 million people every year. Isn't it a formidable problem for any country to tackle?

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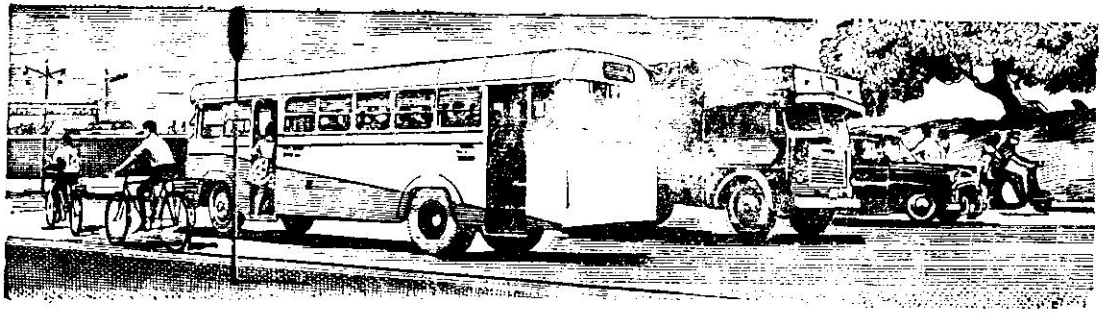

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Agricultural Growth in Kashmir

NS Gupta*

This article is published here as a purely academic exercise : for once, a young economist has taken the pains to apply the elements of modern economic theory (capital-output ratio, etc.) to the agriculture of an important State of the Indian Union. We have taken the liberty of a substantial transformation of this piece, for it is obvious even from the author's statistics that the state has done remarkably well : we do not know of any other State of the Indian Union, which has, like Jammu and Kashmir, doubled its foodgrains output since 1951-52. Its dependence on imports from outside the state – about 10% of its requirements, is no more than normal ; and what is significant, almost the entire deficit has been covered this year by increased output, as against the author's expectation that it would take some years. On the whole, therefore, despite the shortcomings referred to in the course of this article, the State seems to have done much better than is generally believed; and much better than other States in the field of agriculture; and the prospects are pleasing under the new dispensation in the State of Jammu and Kashmir. Recent developments indicate that the Government is very much alive to the economic possibilities of the State; and a future is likely to open out, with the prospect of a better standard of living for the mass of the people.

AGRICULTURE IS THE BACKBONE OF THE economy of the State of Jammu and Kashmir. It provides employment to more than 78 per cent of the total population and contributes more than 45 per cent to the total income of the State. Its rate of growth has however not been stable; in fact, it has gone down from 5.2 per cent in 1955-56 to 4.5 per cent in 1965-66.[1] The contribution of agriculture to the State's income has also been falling gradually : from 49.44 per cent in 1955-56 to 45.16 per cent in 1964-65.[2] What is more significant is that the output-input ratio** has been continuously falling from Plan to Plan.[3] Whereas every input resulted in as much as 2.5 units of output at the end of the First Plan, it could not fetch more than 0.97 unit by the Second Plan. At the end of the Third Plan, output was only 0.21[4] for every unit of input. A complete picture of the output ratio is given in Table I.

* Lecturer, Postgraduate Department of Economics and Commerce, University of Jammu & Kashmir, Jammu

1. Statistics Bureau, J & K Govt. : "Some Basic Statistics, 1963-64", published in July 1966, p. 2
2. Planning Department, J & K Govt,: "Estimates of State Income 1950-51 and 1955-56 to 1958-59", p.4
3. Calculated on the basis of the Estimates of State Income by Planning Department.

** The author's output/input ratio needs to be clearly differentiated from the capital-output

TABLE I
OUTPUT-INPUT RATIO IN AGRICULTRE

	Input Lakhs (Rs.) 2	Output Lakhs (Rs.) 3	Ratio (Col. 3 ÷ Col. 2 4
First Plan	304.26	768.50	2.50
Second Plan	725.02	710.21	0.97
Third Plan	1181.74	247.09	0.21

Note: In spite of all the limitations in the Output-Input mechanism the main purpose of the above table is to present a picture of the comparative performance of agriculture from Plan to Plan.

The table printed above shows a phenomenal increase in Government expenditure, alongside an equally phenomenal decline in output, particularly in the Third Plan Period. The question naturally arises : why is the output failing to keep pace with the input? Why is a predominantly agricultural State feeding her population by imports from other parts of the country?[5]

Table II shows that the State of Jammu & Kashmir requires more than 13 lakh maunds of imported foodgrains every year to feed her growing population. These imports form more than 9 per cent on an average of the total food requirements of the State. On the other hand, production has also doubled as between 1951-52 and 1964-65 ;† and if the rate of agricultural growth is stabilised for sometime, the entire deficit will be wiped out.

Despite the operation of certain favourable factors, it is obvious that the State's agricultural economy has been under strain for quite some time. It is, therefore, essential to make a detailed study of the trend of agricultural growth, the pattern of land use, the programme of irrigation and the behaviour of other variables to get a suitable answer to the triangular problem of diminishing agricultural growth, the falling output-input ratio and the increasing food imports in the State.

Agricultural income is derived from four sources : (1) agricultural production (2) animal husbandry (3) forestry (4) fishing and hunting. Table III shows the income from agriculture : that the relative contribution of agriculture to the total income of the State has been broadly static, except for two early years, when it shot up, presumably due to good harvests. The more significant statistical fact is the increase of 62 per cent in the Income from Agriculture during the 11 years since 1950-51, whereas the corresponding increase during the following five years to 1966-67 has been less than 4 per cent ! The relative position of the various cereal and non-cereal crops in

ratio of recent economic theory. Apparently, the author treats Government expenditure on agriculture as the input orcapital. This isreally a very strange and unusual way of computing the input, for the input in any understandable economic sense consists of all the current investments made by agriculturists to produce a given crop. The response of total agricultural output to expenditure of Government on agriculture may have its own limited significance but to take it as an integral part of the ratio with any causal or consequential significance would strike any reasonable economist as a rather unjustified use of the technology, which has its own distinct association—**Editor**

4. Calculated on the basis of the total income from agriculture as given in the "Estimates of State Income" and the actual expenditure under this head leaving flood control,—taken from Digest of Statistics of J & K Govt. 1960-61 pp. 396-401 and the unpublished Statement showing yearwise Budget Estimates, Expenditure and Shortfalls during III Five Year Plan (State Plan).

5. This is a countrywide phenomenon. Recent reports indicate that the dependence of the State of Jammu and Kashmir upon supplies from the Central Government will be negligible during the corrent year—**Editor**

† This shows that the situation does not warrant the degree of pessimism, indicated in the earlier part of this article. Current year's statistics show a far larger increase in output and consequent decline in import supplies.
—**Editor**

TABLE II

BEHAVIOUR OF IMPORTS

Year	Imports in Lakh maunds	Production in Lakh maunds	Total Cols. 2+3	% of Col. 2 to Col. 4	Index No. of Col. 2
1	2	3	4	5	6
1951-52	3.47	82.57	86.04	4.0	100
1952-53	2.59	101.60	104.19	2.5	75
1953-54	12.35	118.07	130.42	9.4	366
1954-55	12.02	110.26	112.28	10.7	346
1955-56	10.84	125.50	136.34	7.9	313
1956-57	15.62	123.53	139.15	11.2	450
1957-58	31.75	103.21	134.96	23.5	811
1958-59	18.36	146.75	165.11	11.1	529
1959-60	18.40	143.17	161.57	11.3	530
1960-61	10.93	155.93	166.86	6.5	315
1961-62	8.36	160.30	168.66	4.9	241
1962-63	14.68	171.22	185.90	7.9	423
1963-64	20.62	161.34	182.16	11.4	600
1964-65	22.68	166.10			
Annual Average	13.38	130.27		9.4	

the agricultural economy of the State is shown in Table IV.

Information regarding cereal production has been given in earlier tables. Table V reveals a not very progressive state of affairs in the sphere of non-cereal production.

In Table VI we have indexed the output of the principal crops with 1951-52 as ase. It shows that the State has done very well in cereal production, particularly maize, which is the staple food of the mass of the people in the State. The pulses position has been unsatisfactory as probably it is throughout the country. Similarly, the oilseeds are erratic, as practically throughout India. As against agricultural crops, the other sectors of agriculture—animal husbandry etc.—have done relatively very well.

The study of land use reveals substantial scope for expanding cultivation. According to recent statistics, out of the total geographical area of 24.17 lakh hectares, 11.99 lakh hectares (about 50%) constitute the cultivable area, of which 6.97 lakh hectares (about 28.86%) is the net area sown. Thus as much as 5.02 lakh hectares or 21.14% of the

TABLE III

State Income from Agriculture

Year	Income in Lakhs (Rs)	Index	Percentage to total State Income
1950–51	2605.56	100	46.92
1955–56	3374.06	126	49.49
1956–57	3508.53	135	48.74
1957–58	3123.02	119	44.00
1958–59	3687.03	141	44.37
1959–60	3875.13	149	46.92
1960–61	4084.27	152	47.48
1961–62	4228.49	162	47.50
1962–63	4250.59	163	46.67
1963–64	4205.24	161	45.37
1964–65	4281.94	164	45.16
1965–66	4331.36	167	
1966–67	4380.78	168	

TABLE IV

	Cereals		*Non-Cereals*	
	Description	Percentage to total cereals	Description	Percentage
1.	Rice	39.75	Pulses	51
2.	Maize	35.54	Oilseeds	42
3.	Wheat	18.06	Sugarcane	5
4.	Bajra	2.40	Cotton & Tobacco	2
5.	Barley	1.81		
6.	Grim	1.20		
7.	Goji	.60		
8.	China	.25		
9.	Trumba	.24		
10.	Mandal & Kudroo	.06		
11.	Kangni	.04		
12.	Jowar	.04		
	Total	100.00		

TABLE V

Value and Index of Non-Cereal Crops

Value Lakhs Rs.	Index Number	Year
680.30	100	1955–56
637.80	94	1956–57
504.37	74	1957–58
629.02	93	1958–59
679.03	100	1959–60
684.94	101	1960–61
690.09	101	1961–62
668.06	98	1962–63
704.12	104	1963–64
669.08	98	1964–65

total land area can be brought under fresh cultivation. It is, therefore, wrong to say "that the land available for cultivation in the State is very small...because of its mountainous character". In fact, if only 25% of the available cultivable land is brought under cultivation the entire food deficit of about 9-10% may be made good without much difficulty. Table VIII shows the broad break up of land use.

In recent years, the net sown area has shown a tendency to increase, partly at the expense of current fallows, and partly by way of extension to new cultivable areas. It is a good sign that as far as statistics are available, the area under forests has also grown substantially. As between the various crops, the area under

TABLE VI

GROWTH OF AGRICULTURAL PRODUCTION

Year	Cereals			Non-Cereals	
	Rice	Wheat	Maize	Pulses	Oilseeds
1951—52	100	100	100	100	100
1955 - 56	138	190	183	82	137
1960—61	156	232	267	105	118
1961—62	156	229	287	73	118
1962—63	163	247	321	100	113
1963—64	169	250	250	n.a.	n.a,
1964—65	173	246	291	n.a.	n.a.

TABLE VII

Growth in other sectors of Agriculture Income in Lakhs (Index in brackets)

Year	Animal Husbandry		Forestry		Fishing & Hunting	
1950—51	881.95	(100)	195.32	(100)	5.38	(100)
1955—56	1052.83	(119)	379.61	(193)	6.32	(117)
1956—57	1091.72	(124)	538.33	(276)	5.38	(100)
1957—58	1120.50	(127)	459.77	(236)	6.28	(116)
1958—59	1153.40	(130)	431.03	(221)	6.08	(113)
1959—60	1292.88	(147)	465.75	(239)	5.77	(107)
1960—61	1331.79	(151)	500.27	(256)	7.97	(165)
1961—62	1371.07	(155)	536.52	(275)	27.81	(519)
1962—63	1410.17	(160)	445.28	(228)	14.88	(275)
1963—64	1449.27	(163)	415.97	(213)	22.48	(420)
1964—65	1488.37	(169)	436.89	(224)	26.60	(492)
1965—66	1429.87	(162)	459.09	(235)	23.23	(460)

maize and wheat has increased substantially, also to some extent under rice, whereas the area under pulses has actually declined. The area under oilseeds has remained broadly static within narrow limits. The small area under other non-food crops has gone down substantially.

Among the major variables affecting crop production, irrigation is the most important. During the first Three Plans, the total investment in irrigation amounts to nearly Rs. 7 crores: Rs. 2.2 crores during the First Plan, Rs. 1.9 crores during the Second Plan and Rs. 2.8 crores during the Third Plan. Table IX shows the investment in irrigation since 1951-52 and the variations in the irrigated area :

On the average, it works out to an investment of Rs. 883 per acre of irrigated area; and it may be added that in the State irrigation is largely (over 95%) through canals and negligibly by wells or tanks. On account of the extension of cultivation, however, the irrigated portion of the gross cropped area has, in recent years, declined from 40 to 37 per cent. Thus a large part of the cultivated area—over 60 per cent—is still at the mercy of the rains. Of the various crops, benefiting from irrigation, Table X gives the significant statistics. Irrigation facilities for maize which is the staple food of the masses are rather poor.

Regarding finance, it is difficult to say anything definite for want of statistics. An attempt has been made to put in money through cooperatives. In a period of 13 years, over Rs. 7 crores have been invested in agriculture through cooperatives by way of loans for fertilisers, improved seeds, improved tools, etc., etc. It is, however, the considered opinion of the author that this finance has not improved the state of agriculture either because the finance has been diverted to non-production uses, or not properly matched with other necessary inputs.

TABLE VIII

	% of Total Land Area
Net sown area	29
Current Fallow	3
Forests	28
Cultivable but not cultivated area	17
Uncultivable area	23
	100

TABLE IX

Year	Cost in Lakh Rs.	Changes in irrigated area in thousand acres
1951—52	20	+ 7
1952—53	26	+320
1953—54	18	— 34
1954—55	67	+ 65
1955—56	85	+ 2
1956—57	30	+ 27
1957—58	20	— 7
1958—59	32	— 2
1959—60	42	+ 11
1960—61	60	— 68
1961—62	68	+ 33
1962—63	66	— 39
1963—64	48	n.a.
1964—65	40	n.a.
1965—66	60	+ 51

TABLE X

Crop	Area as % of total area under cultivation	Irrigated area as % of total area under the crop
Rice	27	93
Maize	26	12
Wheat	21	19
Other Food crops and pulses	9	36
Oilseeds	5	37
Total	88	

It is also the considered opinion of the author that the large investments of the Government have not yielded adequate results due to poor planning; and that it should be possible through good management to wipe out the 10 per cent deficit in the foodgrains requirement of the State, in a short period of 2 to 3 years.

While planning in the form of laying down targets is easily done, the real job—how it is to be done—has been rather poorly performed. Further, the system of planning in the State has no mechanism of controls; and whatever there are, are ineffective; and there is no coordination either. The State Government has hardly any effective agencies for the efficient execution of its programmes. The primary reliance of Government has been on the Block Development machinery, and on the network of Cooperatives; and these are reputedly unsatisfactory organisations. In the sphere of agriculture, particularly, the various departments dealing with irrigation, fertilisers, seeds, pesticides, tools and technology need to be welded into a highly coordinated mechanism for adequate results. From the long-term point of view it would be only proper to stress the imperative need for the creation of an atmosphere of maximum participation by the people in the process of economic growth; and radical efforts should be made to check the leakages of inputs designed for agriculture.*

* This again is a general phenomenon in the whole of the country, affecting agriculture throughout its length and breadth. There is really no radical cure for such leakags, except a slow, general improvement in national character and administrative efficiency—**Editor**

It's not only in India

This Language Problem

From the 1st January 1968 the Welsh language will recover a little more of the legal standing in its native land that it lost over the centuries of English rule. The birth of children in Wales may from now on be registered in both the Welsh and English languages, if the parents so wish. English will remain compulsory. ..Gittins' Report on Primary Education in Wales was completed in English, last summer. But why has it not been published ? Because documents of this sort have to be done into Welsh as well : and either the translators are doing the job terribly slowly, or the big-wigs cannot agree on the appropriate Welsh neologisms for the technicalities of modern educational practice. The Irish, of course, have simply given up trying to do the more modern bits of their governing through the medium of the Irish language. It's safer, they feel, to stick to English nomenclature.—*The Economist* (London)

Application of Comparative Cost Advantage to Land Utilisation

Laxmi Narain Gupta*

The Theory of Comparative Cost Advantage has been so far applied, by and large, to international trade and, in the domestic economy, to the industrial sector. There has hardly been any significant application of this principle to land utilisation in agriculture. The author rightly holds that if the principle is valid, it ought to be applicable to every sphere of the economy, to agriculture, as to industry and commerce. In this context, the author has worked out a paper : the first section deals with the theoretical aspect of land use as integrally related to the law of comparative cost advantage. The second part is of an applied nature, wherein an attempt is made to work out the theory in case of land utilisation in agriculture. An attempt has also been made to demonstrate how various factors like natural advantages, socio-economic elements and institutional agencies, influence land use in agriculture *via* Comparative Cost Advantage.

ECONOMISTS USUALLY TALK ABOUT THE doctrine of Comparative Cost Advantage in connection with international trade : in fact it is international trade which gave birth to this concept. It was Edgeworth who held that even if the theory of international trade is distinct from the theory of home trade the former will apply to 'parties to distribution' when we try to explain their relative shares in the national product.[1] Mr. JR Hicks also pleads in favour of the idea. To quote his words, "Once we assume that some people are better suited for some occupations (relatively to other occupations) than other people are, then we can no longer assume labour to be homogeneous, but must conceive that there is a number of different sorts of labour each of which may be homogeneous within itself but between which there is no homogeneity".[2] International trade or production has, of course, got some special characteristics, but the fundamental issues[3] involved are the same : the concept of Comparative Cost Advantage has a significant role to play in every sphere of the economy; but it is only recently that some agricultural economists have attempted to apply the theory to land use.[4]

Some confusion has been caused by the introduction of the concept of opportunity cost, but the latter is a part of Comparative Cost Advantage.[5] Undoubtedly, opportunity cost plays an important part in the 'choice'

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of a production project. Hence, it is one of the major constituents of Comparative Cost Advantage.

Actually, there is no fundamental difference between one kind of trade and another. All trade, whether between persons, towns, regions,or countries, originates in specialisation and whatever form specialisation assumes the principles governing it are the same.[6] From this statement it is evident that both types of trades, internal and international with their reflex actions on all types of activity, whether industrial or agricultural, need be on equal footing, as far as the theory is concerned. The Comparative Cost Advantage concept works in the field of international trade. This understanding, no doubt, is convenient and illuminating. If the matter is viewed on a logical basis, its restriction to international trade is unrealistic and leaves us in ambiguity. Here an attempt has been made to examine the application of the theory of Comparative Cost Advantage to land utilisation, particularly in the sphere of agriculture [7]

Land Utilisation

Since the dawn of civilization, land has played a significant role in man's economy. In fact, it is impossible to think of any production without the use of land. Hence a study of land utilisation is of vital importance to the national economy, in order to determine for what and how the available land may be most economically employed to maximize the national welfare. At any point of time, under the influence of geographical, economic and cultural factors, land is utilised for a variety of objectives : cropping, pasture-forest, mining, transportation, housing, factories etc.. etc.[8] Now the idea of land use planning has come in, and we have at least in theory the formulation and administration of land policies aimed at the employment of the land resources in the uses for which they are economically and socially best suited.[9]

The law of Comparative Cost Advantage is a very important doctrine in economic theory. It was David Ricardo who in 1817 furnished the first simple proof that international specialisation was for any nation paying proposition.[10] If every region could produce all goods equally cheaply, there might be no advantage in exchange between two different areas; but in reality different regions have significant and substantial differences in their efficiencies and working capacities in producing different goods. These variations arise due to climatic and geographical conditions, variations in human capacities, uneven distribution of resources, existence of different political and social climate etc. A country, therefore, gains by specialising in the production of those commodities in which its comparative cost advantage is greater, exporting these commodities in exchange for commodities in which its Comparative Cost Advantage is less.[11] It, therefore, follows that all countries gain if each concentrates on the production of those things it is best suited to produce. Therefore, the region which can produce a commodity more cheaply than another region, will in fact be producing the thing, under the free play of economic forces. Assuming that it can produce all commodities cheaper, does it mean that it will meet all its requirements through its own home production? Apart from the fact that such a situation is unrealistic or at least rare, in which a country can produce all its requirements more cheaply than every other country, the answer to this question depends upon a number of considerations : the relative importance of the thing in the economy, the nature of the product, its capacity of yielding profits etc., etc. It seems necessary to stress here that we are concerned not with the **absolute** cost advantage, but only with **comparative** cost advantage, as the determining factor in production. A State may be able to satisfy all its needs through its own efforts, but even if it were possible and feasible, it would be expensive and wasteful; therefore, in the sphere of agriculture, for example, it is in the national interest that various land areas be permitted and encouraged to specialise in those types of products for which they have

high Comparative Cost Advantage. Even under the free play of economic forces, each area would tend to produce those products for which it has the greatest ratio of advantage or least cost combination or the least ratio of disadvantage as compared with other areas. This concept helps to explain why some areas tend to concentrate on the production of a limited number of products while they look forward to other areas for supply of many products they use. The operation of the principle of Comparative Cost Advantage may now be illustrated, taking a few examples.

Assuming two areas P and Q each producing all the wheat and sugarcane, required within the area, we have Case I, in which each produces 80 units of wheat and 120 of sugarcane.

CASE I

Land Use	Area P	Area Q
Wheat	80	80
Sugarcane	120	120

In this way neither area receives any benefit from the production advantage of the other. Consequently, both the areas would not specialise. If, however, the authorities of Q realising that their area is more suited to wheat than to sugarcane, change their production pattern as in Case II, a basis is set up for trade, for Q has now more wheat and less sugarcane than it requires.

CASE II

Land Use	Area P	Area Q
Wheat	80	100
Sugarcane	120	80

P can get the benefit of the higher output of wheat in Q, only by diverting part of its area to sugarcane, which it can do with advantage, for each area has really an absolute advantage over the other, P in sugarcane and Q in wheat.

The above, however, is a comparatively simple case. In real life we observe that some areas do enjoy absolute advantage even if they produce more than two crops each, while other areas find it quite difficult to enjoy this benefit. Even then, these 'disadvantaged' areas do not go out of use, but carry on the production function. We have in Case III, an area B, which has an absolute advantage over A, in respect of both crops.

CASE III

Land Use	Area A	Area B
Wheat	80	140
Sugarcane	120	130

In spite of its absolute advantage, B cannot produce all the requirements of A + B. B, therefore, specialises in the production of wheat on account of its higher comparative advantage. While A is comparatively disadvantaged in respect of both crops, its comparative disadvantage is less in respect of sugarcane than in wheat. So a trading base is established.

Working the same example in a different way, we have, say two areas, C & D, with two units of input, capable of producing wheat and sugarcane. With a given amount of labour and time, C can produce either 18w (wheat) or 9s (sugarcane) and D with the same amount of inputs can produce 18w or 18s, as shown below :

Area	Produce
C	18w or 9s
D	18w or 18s

Assuming self-sufficiency in both areas, each may devote half of its resources to the

production of each of the two commodities. Thus, we have :

Area		Produce
C		9w+4.5s
D	Total	9w+ 9.0s 18w+13.5s

With trade and resources distributed on the basis of comparative advantage, we can have :

Area		Produce
C		18 w
D	Total	18s 18w + 18 s

Now that the elements of the theory are clear, we may proceed with the analysis : explain comparative cost in terms of natural advantages, e. g., soil, climate, rainfall, topography, etc. This, however, is somewhat narrow ; and it is static in its application for there is always a margin for the play of human forces, governmental policies, institutional arrangements etc., etc. While natural advantages predominate in the area of agriculture, other factors have also to be considered. We may now analyse each of the factors.

Natural Advantages

It is obvious that a mineral-rich area would specialise in mining industries. The arid or semi-arid climate of western Rajasthan favours the production of bajra crop.[13] If we change the order of usage of land as stated above, each area will have to bear losses : it would be from the national standpoint a disadvantageous planning of land use. The law of comparative cost will only work when each area is used for whatever it is best suited. Similarly, big rolling areas have a distinct advantage for the promotion of mechanised farming. Mountain valleys provide excellent sites for constructing dams and power plants.

Socio-Economic Factors

These natural advantages however may come to nought in the absence of adverse socio-economic factors such as lack of working capital, skilled personnel or marketing facilities etc., etc. Hence, sufficient availability of these factors is all the more necessary to maximise output out of given inputs at minimum cost. It is even possible in cases of natural deficiencies to make up through the creation of an infrastructure of facilities in terms of electric power, irrigation water, banking and marketing arrangements and thus create a nett balance of advantages.

In this context, it is important to stress, among these facilities, the crucial significance of proper transportation, for comparative cost may be vitally affected either way by the presence or absence of adequate transportation facilities. Areas enjoying the benefits of low transportation cost can successfully compete with other areas ; even the comparative material advantage may be in favour of the latter.

It has also to be taken into consideration that there is what may be called the cost of producing economic land : cost of reclamation, cost of creating productive capacity into the land ; for there are all manner of difficulties in the way of converting raw nature into a factor of production.[14]

Institutional Factors

Comparative Cost Advantage is also influenced by the operation of institutional factors.[15] Government can influence comparative cost by fixing a special schedule of prices, through tax concessions, cheap credit and marketing facilities for particular crops etc., etc. With the coming in of new capital, new entrepreneurs, Comparative Costs will certainly be affected.

Summary

The whole subject of Comparative Cost

Advantage particularly in relation to land use in underdeveloped areas is still in the formative stage. As we have seen, it is not only the natural factor considerations, but quite a number of social and institutional factors, which have a multiplier effect and finally determine the relative cost structure. It is, therefore, difficult at the present stage, to assess with any degree of exactness the elements which should enter into the concept of Comparative Cost Advantage, leading to land utilisation in keeping with the changing demographic, social, economic and institutional set up in a region and over the whole country. To sum up, there are three main factors, aiding and abetting each other : natural resources, effectiveness of labour, Governmental policies and investments.[16]

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Government by Jeep

Once I thought, unfairly of course, that the jeep was the undoing of the post-war administration in India. Pre-jeep horses obliged officials to stay in a camp overnight and get a feel of the place; jeeps made it too easy to get back quick to the town. If Government by jeep seemed a step backward, Government by gimmickry such as "the maximum is the minimum we can do" or that "we need more science in planning and more planning in science" (I still don't know which Madison Marg produces these wisecracks or Government by helicopter seems no improvement. . .

Mr. J.B. Priestly once suggested that the world might be a more peaceful place if statesmen travelled by train, at ground level, rather than by air, from where men look like ants; but even he must make concessions to modern forms of travel. Tagore once wrote that between our schools and homes the trams run; the mind does not.

Capital, 11 January 1968.


SUPREME CLASS
FIRST CLASS
SECOND CLASS
THIRD CLASS
FOURTH CLASS
FIFTH CLASS
SIXTH CLASS
?

Resource Productivity in Selected Chewing Tobacco Farms†

R Santhanakrishnan*

The present paper is an attempt to study Resource Productivity in randomly selected 'mhote' irrigated (chewing) tobacco farms in Coimbatore district. The author's calculations are based on a Production Function of the Cobb-Douglas type. Resource ratios, marginal and residual productivity estimates have been worked out so that reorganisation of resources can be attempted to ensure maximum returns with less unit cost.

ONE HUNDRED 'MHOTE' IRRIGATED (chewing) tobacco farms were selected at random from two taluks (sub-divisions) of Avanashi and Gobichettipalayam of Coimbatore district, Madras State. Ten villages were at random selected from the two taluks, with probability proportional to the area; and from each of the villages, ten farms were selected at randum. Data was collected in respect of the most recent year in regard to the inputs used and the yield obtained, with net returns. The average area for the 100 farms worked out to 250 acres. With a view to comparing the efficiency of (chewing) tobacco farming, the farms were classified into two groups : Group I consisting of Farms up to 2.49 acres; and Group II, farms of 2.50 acres and above. The yields of these two groups were tabulated and analysis of Variance was worked out to determine the differences between size groups and villages.

ANALYSIS OF VARIANCE

Source	DF	SS	MS	'F' ratio calculated	F for 0.05
Total	19	169740.29	—	1	5.12
Villages	9	130979.75	14553.35	3.43*	3.18
Acres	1	605.01	605.01		
Error	9	38155.53	4239.50		

There was no significant difference between the two size groups ; between villages, however, there existed significant difference at 5% level. The entire range of

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farms was, therefore, treated as one unit for working out a Production Function.

Taking into consideration all the resource inputs of the sample farms studied, a production function of the Cobb-Douglas type was fitted to the data of inputs and outputs:

$$Y = a\, x_1^{b_1}\, x_2^{b_2}\, x_3^{b_3}\, x_4^{b_x} \ldots\ldots x_n^{b_n}$$

where Y is the field of cured (chewing) tobacco in kilograms, x1 land area in cents, x2 human labour in man-days, x3 bullock labour in bullock labour days, x4 value of manures, fertilizers and plant protection charges, 'a' a constant, and b1 to b4, the partial regression coefficients or elasticities of production.

As a first step in fitting the function, logarithms of the above data were computed. Secondly, simple correlations between individual factors among themselves and with the yield were determined. High correlations existed especially between human labour and input factors, except land. The correlation matrix is given in Table I.

TABLE I

CORRELATION MATRIX

	Y (yield)	x1 (land)	x2 (Human Labour)	x3 (Bullock Labour)	x4 (Manures, Fertilizers and Plant Protection Charges)
Y	1.00000	0.764664	0.902944	0.857832	0.870461
x1		1.00000	0.846797	0.848286	0.882498
x2			1.00000	0.948879	0.962160
x3				1.00000	0.973030
x4					1.00000

Multiple partial regression coefficients, multiple regression and multiple correlation coefficients were estimated by solving the normal equations using the Gauss multiplier.

Results and Discussions

The final multiple regression function worked out as

$$Y = 0.908715\, x1^{-0.007051}\, x2^{0.882185}\, x3^{-0.007562}\, x4^{0.035239}$$

S.E=	0.00435	0.00400	0.00700	0.00831
t =	1.6	2205.4	0.95	4.2

bi = 0.902811

Among the exponents of the equation which are the partial regression coefficients, those of x2 and x4 indicate diminishing returns while those of x1 and x3 show apparently negative returns. The exponents indicate the percentage increase of output for every one per cent increase in the resource input. When the value of the exponent of a factor is less than one, it indicates diminishing returns to this factor, and when it is equal to one it indicates constant returns and if more than one, increasing returns are indicated. The multiple correlation coefficient (R) was statistically significant and the coefficient of multiple determination (R^2) indicated that 82 per cent of the variations in the output was accounted for by the included input factors. The partial regression coefficients along with other related particulars are given in Table II.

In the function, all the elasticities are less than one, indicating diminishing marginal returns to each input factor. The partial regression coefficient values b2 and b4 corresponding to the two factors x2 and x4 were significant, while b1 and b3 were not significant. The sum of all the partial regression coefficients was 0.902811, indicating diminishing returns to scale. This kind of decreasing returns operate within agriculture and correspond with the nature of returns, assumed in farming **(Clark, 1940).**

TABLE II

REGRESSION COEFFICIENTS AND RELATED STATISTICS

Particulars	Factors	Symbols	Value of Factors
Log Value of Constant		Log a	0.908715
Real Value of Constant		a	8.104
Value of Elasticities of Regression Coefficients	Land x1	b1	—0.007051
	Human Labour x2	b2	0.882185
	Bullock Labour x3	b3	—0.007562
	Manures, fertilizers and plant protection charges x4	b4	0.035239
Values of 't' for the elasticities	Land	b1	1.6
	Human Labour	b2	2205.46*
	Bullock Labour	b3	0.95
	Manures, Fertilizers and plant protection Charges	b4	4.2**
Multiple Coefficient of determination		R2	0.82

Since labour charges (x2), and manures, fertilisers and plant protection charges (x4) are important components in the cost of production of chewing tobacco, they may be considered as major factors in tobacco production. For an increment by one per cent in respect of any one of the above factors, keeping the other factors at their mean levels, there would be an increase or decrease in tobacco production by an amount equal to the partial regression coefficient which is also the elasticity of the particular factor.

For example, one per cent increase in labour would result in an increase of tobacco by 0.88 per cent, that is, at a diminishing rate, when all the other factors are held constant at their mean levels. Similarly, manures and other charges would operate at a diminishing rate and these two factors together contribute about 0.91 per cent to the total production. The scarcity of labour†, felt in some of the areas studied, resulted in inadequate and inefficient utilisation of labour services. There is thus much scope for efficient employment of labour to increase returns. With regard to land, the partial regression coefficient showed negative returns, but not statistically significant. There has been a decline in the land coefficient and increase in fertilizer coefficient in the United States under the conditions of Federal Acreage Controls **(Hartman & Tolley, 1961).** The non-significance of land and bullock labour coefficients suggest that they have little influence on tobacco production. Negative returns of this kind are known to have existed in Telengana Farms **(Suryanarayana, 1958).**

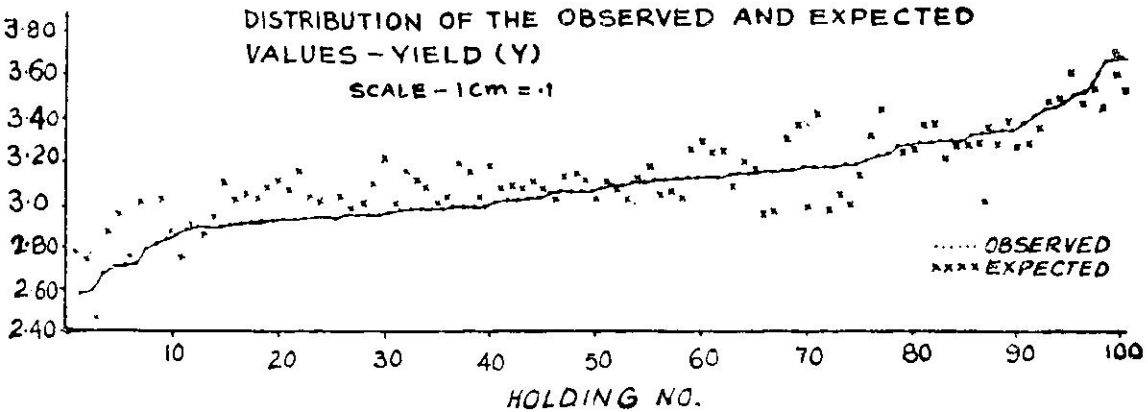
The relative contribution of human labour (x2) and values of manures, fertilizers and plant protection charges in the study are somewhat exaggerated owing to high wages for human labour and cost of fertilizers purchased at black-market rates. Such high wages and prices arise due to keen competition of other cash crops, chiefly cotton.

Distribution of Observed and Expected Values and Closeness of Fit

The observed values of tobacco production (in log scale) were arranged in ascending order and the corresponding calculated values were computed for each farm. These points were plotted against the farms and

† If there are diminishing returns to the employment of labour, as indicated in the first sentence of this paragraph, scarcity of labour would be a blessing in disguise from the productivity stand-point—Editor

FIG. 1.



the points of observed and estimated values joined separately by a smooth curve (Fig. 1). A graph was also drawn showing the closeness of fit of the observed and expected values (Fig. 2).

Resource Productivity in Tobacco Production

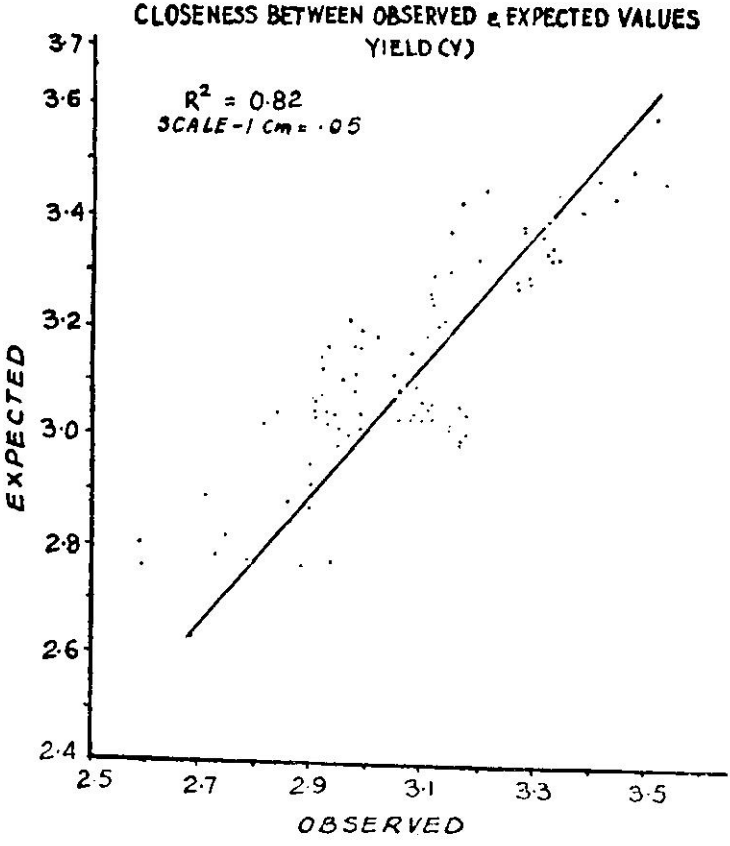
Resources efficiency studies are important in guiding the farmers in the efficient utilisation of resources for maximising returns. Two methods of estimating resource productivities are considered here, viz., (1) Average Productivity and (2) Marginal Productivity.

Average Productivity of Resources

Several studies have been made to measure resource productivity, viz., **Heady and Shaw (1955), Heady and Strand (1955) and Clark (1940).** Estimation of average productivity involves either (a) Gross Average Productivity or (b) Residual Average Productivity.

The Gross Average Productivity of a particular resource was computed by dividing the sample average product by the sample average input of the resources, ignoring the share thereto of other resources. The Gross productivity of land, for example, was computed by dividing the sample average product, viz. Rs. 1830.46 by the sample average input of the resource, namely 2.5 acres. Similarly for other input factors also, gross average productivity was determined. Gross average value productivity for various inputs was obtained by dividing the average value of the product by the particular input.

The estimate of Gross Average Productivity is of limited value **((Heady 1952),** as no share was imputed to other resources. Hence the method of residual average productivity has been employed to serve as a fairly accurate measure. In this method an amount equal to the share of the total value of the product at market price was imputed to other resources like labour. Residual average productivity for the land was obtained by subtracting from the total value of the product Rs. 1830.46, the amount of capital services Rs. 1376.85, and the residual value of Rs. 453.61 was divided by the sample average input of the resource, namely 250 cents. The resultant value 1.81



denotes the average residual productivity of land. This would mean that one unit of land would be able to produce Rs. 1.81 worth of tobacco in the farms studied. This figure is more precise and valuable because it takes into consideration the share of other resources. With respect to labour, average gross productivity was estimated at Rs. 6.02. Residual average productivity of labour worked out to Rs. 2.07 worth of tobacco per man-day. The details of the estimates are given in Table III. It can be seen that the gross average productivity for bullock labour was estimated at Rs. 18.30 and this could not have much relevance. When, however, expressed as residual average productivity, it is seen that a unit of bullock labour would result in an increase in output of Rs. 4.88 worth of tobacco. With respect to manures and fertilizer charges, gross average productivity was estimated at Rs. 3.30; the residual average productivity indicated that a rupee worth of manures, fertilizers and plant protection charges would result in an output worth Rs. 1.30. Hence it can be seen that residual average productivity has greater relevance, and resources can be increased based on these estimates.

TABLE III

RESOURCE RATIOS, GROSS AND RESIDUAL PRODUCTIVITY OF RESOURCES ARITHMETIC MEANS OF SAMPLE IN TOBACCO CULTIVATION

Serial No.	Particulars		
1.	Number of farms studied	Rs.	100
2.	Average area of the farm in acres	,,	2.50
3.	Total value of the product	,,	1830.46
4.	Value of land as resource input	,,	285.18
5.	Value of human labour as resource input	,,	451.36
6.	Value of bullock labour as resource input.	,,	320.00
7.	Value of manures, fertilizers and plant protection charges	,,	553.96
8.	Value of total capital services including labour cost	,,	1662.03
9.	Value of non-labour capital services	,,	1210.67
10.	Total labour units contributed including unpaid family labour	,,	304.24

GROSS AVERAGE PRODUCTIVITY AT ARITHMETIC MEAN INPUT LEVELS

S. No.	Resource Input	Average Physical Productivity	Average Value Productivity
1.	Land	5.439	7.310
2.	Human Labour	4.476	6.016
3.	Bullock Labour	13.622	18.305
4.	Manures, Fertilizers and Plant Protection Charges	2.459	3.304

RESIDUAL PRODUCTIVITY

1.	**Land**	Product value per cent of land	1.81
2.	**Human labour**	Product value per man-day unit	2.07
3.	**Bullock labour**	Product value per bullock-day unit	4.88
4.	**Manures, fertilizers and plant protection charges**	Product value per Re. worth of manures, fertilizers and plant protection charges	1.30

Input—output ratio . . . 0.52

Marginal Productivities of Resources

Brekke (1954) observed that the concept of marginal product has great relevance in policy and research in economics. Various sizes of farms have been considered, to measure the marginal products as an indication of resource efficiency. **(Reder, 1946).** Marginal productivity of each factor was estimated on the basis of factor and product prices prevailing in the area studied. These values would give an indication of the use of resources on a marginal basis. Maximisation of returns could be effected on the farms by suitable resource reorganisation, based on marginal productivity. The estimates are given in Table IV.

TABLE IV

MARGINAL PRODUCTIVITY AT ARITHMETIC MEAN INPUT LEVELS

S. No.	Resource Input	Marginal Physical Productivity	Marginal Value Productivity
1.	Land	0.038350	—0.051389
2.	Human Labour	3.949998	5.292997
3.	Bullock Labour	0.098883	—0.132503
4.	Manures, Fertilizers and Plant Protection Charges	0.086659	0.116123

We see from Table IV that an investment of Rs. 1.50 in human labour would cause an increase of output by Rs. 5.29. It could, therefore, be inferred that labour can be increased beyond the present mean level for maximizing returns. In respect of other factors a decreasing trend is noticed and hence it is not profitable to increase these resource inputs. In general, it can be said that **the productivity of factors included in the analysis shows a decreasing trend except for human labour.** Suitable reorganisation of resources based on the estimates is, therefore, necessary to increase the returns from the crop.

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The Dusty Minds of Economists

. . . Certainly we British should try hard now to pay our way. But the chief reason is never mentioned. It is not so that everybody can go to Spain to eat fish-and-chips and drink bottled beer, so that Bingo can be played at a pound a game, hippies be dressed in gold lace, and the City man who spent £10,000 last season on his daughter's coming-out party be able soon to spend £25,000 on his next daughter. No, the chief reason why we should pull ourselves out of debt is that then we shall no longer be compelled to pass so much time exploring the dusty minds of economists. We can wrench ourselves out of the grip of exports, imports, the balance of trade. We can think and talk about other things—for example, Atlantis...

J.B. Priestley

Our Food Problem

Haridas Chakrabarti

INDIA, being a poor country, the first problem for Indian Leaders, after Independence, should have been to regenerate the ransacked agriculture to achieve quick results, to provide two square meals for the people, raw materials for industry and also to generate surpluses to earn foreign exchange, and **then only to aspire for further development.** And these would have been the easier means to see a better India, also to lay a sound foundation for building upon it a heavy structure of industrialisation. As it was, India went in for sudden industrialisation. At that time, the position in the external world was :

(a) some of the developed countries were facing serious problems, with over-production of foodgrains;

(b) some were facing the problem of excess capacities developed to meet war time exigencies.

(c) Quite a few were looking out for markets for exporting capital goods to help them stabilize their economy during the post-war reconstruction phase.

It was a happy coincidence for them that India, by her policy of rapid industrialisation, went out of its way to meet their needs.

In the retrospect, we may recall that *before independence :*

(i) the industrial potential of the country was uprooted by the ruling country to meet its needs;

(ii) while the country was made purely agrarian, hardly any sizeable attempt was made for the improvement of agriculture on a commensurate scale;

(iii) the condition of Indian agriculture and the agriculturists as also the condition of the Indian people at large, was made precarious by gradual exploitation.

After Independence the Indian policy of rapid industrialisation without a domestic base in heavy industry, and an undeveloped agriculture, meant simply that the country became a market for surplus capital goods and surplus agricultural produce of developed countries.

Due to the above process, the country's debt accumulated day by day, foreign exchange dwindled, and the food problem rose to its peak, causing an imbalance in our economy. What happened after Independence seems to be the outcome of our want of self-reliance and over-dependence on the ideas as diffused by interested parties.

DEATH
COMMUNITY DINNER
MARRIAGE

Whatever we did for all these years, has now turned to benefit for others and peril for us. In melancholy strain we have to record that we have made large dams to provide us with no water in time of drought or in winter when we need it most, but to cause flood in rainy season and cause devastation. We have made gigantic plants to produce goods that cannot compete in foreign markets and cannot earn foreign exchange for us, but have been a source of perenial drain on our limited resources (we have to import about Rs. 250 crores worth maintenance goods every year to keep our various industrial units running at the current level of production) and accumulate a debt burden of Himalayan height..In the midst of such frustration, the consolation is this, that our industrial and agricultural potentials are still immense and with proper attention we may have still ways for salvation.

Agricultural Potential

As remarked by various economists, Indian agriculture is quite sufficient at least to feed the present population. Our land supply both as regards quantity and quality is abundant. Our per-capita land supply is more than that of many of the countries of the world; we have an abundant supply of land labour, who would be able to bring about a dynamic change, with two square meals in their belly and improved methods in their hands, and with a little education. According to NPC, our yield per acre is about one-fourth of what is obtaining in advanced countries and that we have a potential to multiply it four-fold; while we can increase our productivity by 400 per cent, our short-fall is only 10 per cent. It is a story of non-utilisation, mal-utilisation and non-attention that we could not raise our production to such a level. Apart from the question of imports of fertilisers, mechanisation of agriculture or large-scale farming, we failed to provide the agriculturists with proper supply of water, bring fallow lands under cultivation and to achieve waste reduction by establishing warehouses and other means, which would have made our course easier to fill up the gap. As we know "business is people" so also "agriculture is agriculturist". To ameliorate the conditions of agriculturists, to boost their morale and to spread education to remove their illiteracy, we have done very little. An agriculturist—skeleton in figure, illiterate, half-fed, half-clad—is the correct replica to represent the state of Indian agriculture to anybody.

Governmental Effort

Governmental effort has not been direct. Though according to official estimation there has been about a 12% reduction in waste land, more area totalling about 12% has been brought under irrigation and many development programmes as regards soil conservation, dry-farming and land reclamation, supply of manures and fertilisers, seed multiplication and distribution, plant protection through community development projects have been undertaken, the same have proved to be very scanty in relation to requirements. Even co-operative farming and the development of co-operatives in the field of agriculture, which was so much spoken of, failed to keep pace. Though even as early as 1955 we had more than 2,20,000 farmers' credit co-operatives they supplied only a small fraction of the agriculturists' needs : and a mass of them are failures as credit institutions.

Government, it seems, became more keen on distribution rather than going in for production. Had the governmental effort been diverted to production more rigorously from the very beginning, rather than to distribution, the present galaxy of administrative set up employed in food department would have been able to make the shape of the food position vastly different. We lecture about agricultural productivity in air-conditioned lecture halls, but do not jump to the fields, to be with the agriculturists, to guide and advise them about better ways and means of production, and to create large government-owned agricultural farms

all over the country to set examples for higher productivity.

The Solution

Following, *in toto*, the principles as prevailing in advanced countries may not help us considerably or may not be feasible due to limited resources and also due to differences in other conditions such as environment, social heritage, etc. We have to orient our own ways and pursue them with zeal. Commensurate with the country's financial resources, the following steps are suggested :

1. The primary factor that needs immediate attention on an emergency basis is to spread teams of workers through the length and breadth of the country. The teams may be volunteers from political parties, students, villagers, or may be government officials (the present set up under community development is very scanty).
2. The Government of West Bengal has recently got the assent of the President to acquire waste lands in the State and to distribute them to the landless agricultural workers. While such steps are encouraging, Government may go a bit further in organising farming on such acquired lands, if necessary, with further acquisition of land, to demonstrate the results of better methods and improved techniques.
3. Encourage well-irrigation system.
4. Setting up of government warehouses to check waste and compelling the agriculturists to keep their produce in such protected places.
5. Agricultural colleges should make it compulsory for their students to spend certain periods with the cultivators, and before getting their final degree or diploma they should make a practical demonstration of their knowledge to raise production.
6. Food zones should be abolished. We have a most democratic shape of our Constitution : we should not encourage provincialism or districtism in our food policy, allowing somebody to get a full meal, and others to go without.
7. Above all, development of co-operation in the field of agriculture is the first and foremost need; and to raise it to the required level, more government assistance is essential. If co-operatives are raised to the desired level, the other developments in the field of agriculture, such as mechanisation of agriculture may become easier. Recently, we have witnessed how under government encouragement, a large number of Consumers Co-operatives have been established and they are rendering good service. During the early thirties, when the USA faced severe agricultural depression, the US Government advanced substantial loans to help people to start co-operatives. During this period the major regional co-operatives were founded. It was also during the Depression period that the US Congress and Government began to do something to help the farmers and their co-operatives : that is why they are able not only to provide substantially for their citizens and for their animals, but also for us ! Cannot the national government play at least the same role as the US Government did for their agriculture in times of depression, and revive our agriculture and save crores of rupees spent every year by way of food imports ? Can our National Congress and other political parties not combine to launch a productivity campaign and stand by government to help India come out of the present turmoil ? ●

Where's The Milk ?

Pat Wiley*

IN MARCH 1967, THE PARTICIPANT JOURNAL** featured an article "Where's the Milk ?" This article helped give myself and my Indian friends the final push to start our own dairy. I had grown exceedingly aware of the definite milk shortage in my village, and of the pollution of milk. My friend Miss Lalitha Kumari and I started trying to get money together so that we could organise an association. This we were able to do—now known as the Nandyal Dairy Association. The members are Miss Lalitha Kumari, Mr. P.B. Royalu and Mrs. T. Ambamma.

Of course we contacted many people, but all were sceptical and said they would watch and see if our scheme would work. First we built a *pucca* farm for eight buffaloes. We bought four '*Murrah*' buffaloes from the Punjab. They are the only ones in the district. So, of course, they are quite impressive. We feed a balanced diet, which we mix ourselves. We also practice taking the calf off the mother and teaching it to lap like a dog. This method was thought impossible by local vets and the villagers.

Besides the dairy, we started a 12-acre Fodder Programme specialising in hybrids. We received a CARE self help pump, the only one ever given to a private business in India. We are distributing 5 litres of milk freely to local Harijan orphans in repayment of the CARE pump. In our Fodder Programme we raise hybrid napier, hybrid jowar, cow-pea and hybrid maize. As soon as the next season begins we will plant *Lucern* grass and *Pai* grass. We are making the Fodder Programme and the dairy a demonstration scheme. We have many visitors for both sections of the project. In the Dairy section we show efficiency, cleanliness and the best possible techniques to run a small-scale dairy. In the Fodder section we use the best cultivating methods, fertilisers and pesticides. Jointly then we can produce more fodder, which helps produce more milk so that our people can have a better diet.

We are striving to raise the dignity of labour as well as supplying pure milk. Never before has Miss Lalitha done any kind of manual labour. Now she is very instrumental, being the joint manager along with myself. She sees that the milk is distributed, plants in the fields and most importantly tells and explains our operation to our visitors in the local language of Telugu. ●

* Peace Corps Volunteer, Nandyal, Andhra Pradesh

** For this and the following article, the Editor has drawn on the *Participant* Journal, dated November 1967

My Small Farm

MB Singh*

MY VILLAGE IS 21 MILES FROM THE NEAREST Railway Station and 100 miles from Lucknow. Radio is the only contact with the outside world, because a single newspaper received is three days old.

After return from the States I served the Government of India and then Ford Foundation in Indonesia. On retirement from service I decided to live the life of a small farmer in my native village. I have ten acres of land scattered over one square mile in small pieces and therefore have concentrated my work on a three-acre piece of land for which I have got a shallow tube well with 5 H.P. diesel engine. Planting an orchard and trial of new varieties of grain crops is the work that I am doing these days.

While on active service it was difficult for me to understand as to why small farmers do not adopt the recommended methods. Now I feel that difficulties of small farmers are so great that it is not easy for them to adopt new recommendations for improved farming. Tradition, lack of capital, inefficient Government machinery and vagaries of weather make the small farmers fatalists. Unless educated young men with enough capital and capable of taking advantage of all the Government machinery establish themselves in the villages, adoption of improved agriculture will be a very slow process.

Facts and figures given out by the Government agencies are not easily believed by the average small farmer whose number is more than seventy-five per cent of the total number of cultivators in the country. Very young Extension Workers are not capable of advising the experienced farmers. Red tape also scares the real farmers.

It will therefore be a good idea for you to give the economic conditions of the successful farmers, when a success story is being printed.

Cost chart of cultivation figures for the dwarf variety of wheat known as "Larma Rojo" is being given, on page 599. Such figures of other crops will be supplied in future, if found useful to you.

* Retired Principal, Bersinghpur, Sultanpur

Cost of production per acre of Larma RoJo Wheat

in

Village BERSINGHPUR Block, Jaisinghpur Dist., Sultanpur U.P.

1. Soil : Light loam
2. Previous crop : 1/3 fallow, 1/3 Lobia for fodder, 1/3 Moong Type 1 for grain
3. Source of irrigation : Small tube well with three inch delivery and 5 B.H.P. kerosine Engine

	Date	Operation	Quantity or No.	Cost in Rupees
1.	July-October	Seed bed preparation	4 ploughings	8.00
2.	27th to 30th October	Irrigation before sowing	4 hours of tube well	8.00
		or	6 man days	6.00
3.	7th to 12th November	Pelewa Sowing	44 seers seed	50.00
4.	-do-	Basal manuring	5 maunds 20 seers cake 31 seers Dia AM Phosphate 36 seers Maurate of Potash	
		Top dressing	56 Seers Urea	143.00
5.	26-11, 25-12, 15-1, 16-2, 28-3	Five irrigations	22 hours tube well	44.00
6.	28-11 to 1-12-66	Hoeing only one	4 man days	4.00
7.	27-3-67 to 31-3-67	Harvesting	12 man days plus 56 seers grains as share	12.00 56.00
8.	1-4-67 to 14-4 67	Threshing and winnowing	10 man days plus 14 seers grain	10.00 14.00
9.	14-4-67	Transporting	10 seers of grain	10.00
10.	14-4-67	Charity from threshing floor	8 seers of grain	8.00

Total expenses Rs. 379.00

Total yield of grain 38 maunds at Rs. 40 each
= Rs. 1,520

Profit = Rs. 1,141

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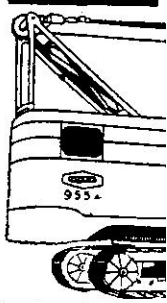

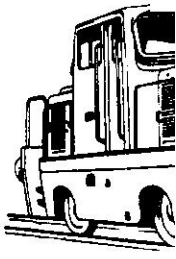

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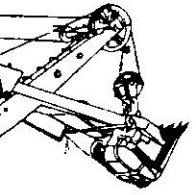

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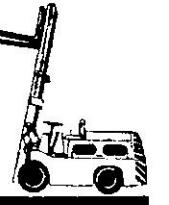

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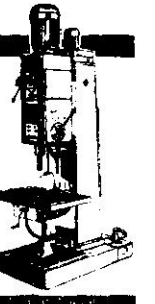

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7/394

CAN WE AFFORD TO WASTE FOOD?

Over 450 million mouths to feed... yet almost 25% of India's fruits and vegetables go to waste due to spoilage between field and kitchen. The reason? A cabbage or a carrot has miles to go before it's eaten. By that time, the blazing heat has done its damage.

HINDUSTAN LEVER studied the problem... consulted Unilever food experts... then made a beginning by setting up a modern dehydration plant at Ghaziabad.

Why dehydration? Because it's practical, easy to handle, inexpensive. Dehydration takes the water out, seals the freshness in. In fact, dehydrated foods stay fresh whatever the season. They take so little space that transportation is easy. And they need no refrigeration, no special storage facilities.

Dehydration is HINDUSTAN LEVER's contribution to the national effort to produce more food and make the most of what is available. The farmer will grow more now that he can count on steady prices and an assured market. And less will be wasted, because more will be processed and preserved. From all this will flow new products and therefore new opportunities.

The housewife is already familiar with our dehydrated vegetables. Plans are afoot for offering her a greater range of such foods. The day will break brighter tomorrow... with a little less of care, a little more of joy.

TODAY AND TOMORROW...
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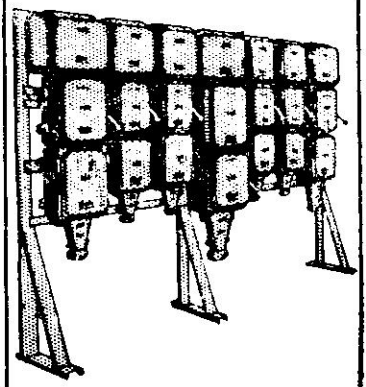

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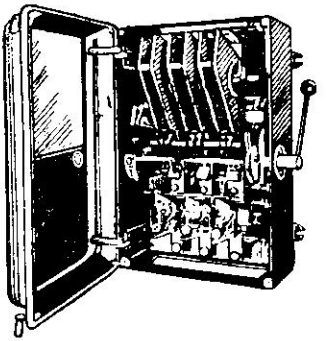

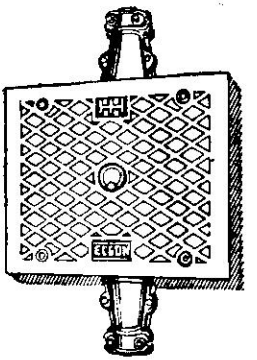

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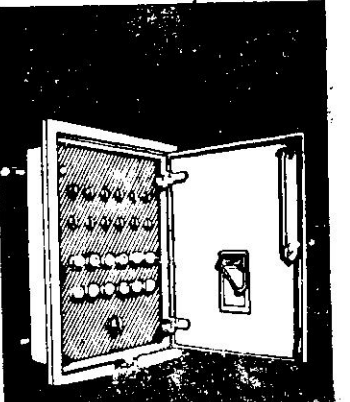

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Value Analysis

Asoke Gupta

Lawrence D. Miles, Manager of Value Services at the General Electric Company is the founder of modern value analysis. During World War II when some critical materials were difficult to obtain, Mr Harry Ferlicher, Vice-President of Purchasing for GEC., with the help of LD Miles searched for substitutions for critical materials. The ultimate findings not only resulted in lower costs but in many cases resulted in an improvement in the final product. Since 1947, Value Analysis technique, under the leadership of LD Miles, has gathered considerable momentum and today Value Analysis is being applied in design engineering, mannfacturing, purchasing, etc. It is claimed by the US Navy that they have applied this technique to more than 2300 projects within the last 12 years and realised a saving at the rate of about Rs 16 crores per year.

WHAT IS VALUE ANALYSIS ? IT IS AN organised creative approach to ensure that the essential functions of a product or process or the services of procurement and marketing etc., are provided at a minimum overall cost without sacrificing quality or reliability.

What is Value ?

Value means a great many things to a great many people : It could be classified into four :

(a) *Use Value* : Properties and qualities which fulfil a use, work or service
(b) *Esteem Value* : Properties, features or attractiveness which cause us to want to own it
(c) *Cost Value* : Aggregate of labour, material & various other costs to produce it
(d) *Exchange Value* : Properties or qualities which enable us to exchange it for something else we want

In our Value Analysis technique, we are concerned with

(i) Use Value, as the lowest cost of providing for reliable performance of a function ; and with
(ii) Esteem Value, as the lowest cost of providing the appearance, attractiveness and features which the customer wants.

Understanding the designed function of a product or item or the expected performance of a service is the basis for determining the value concept.

BASIC STEPS

For Value Analysis, as defined above, three basic steps are used :

A. Identify the function
B. Evaluate the function by comparison
C. Cause value alternative to be developed

Identify the Function

Any product or service has a primary function, which can be described by short, simple words. Then again, there is a function known as the secondary function. Let us consider a source of light, a water pump, a clock. Here the primary function

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is to provide light, to pump water, to indicate time. Each of these things may also have a secondary function : a light source may be required to resist shock, a pump for domestic use to operate at low noise level, a clock or watch to have attractiveness.

We may take another example : an electric refrigerator has the prime function of preserving food by electrical means. The added features of revolving shelves, a butter conditioner, storage space in the door, etc., are secondary functions.

Once the functions have been determined and evaluated in terms of their primary and secondary nature, we can go ahead and examine the cost of each part in order to accomplish that particular function at a lower cost. In this functional approach, it will be helpful to separate the parts and their costs into functional areas. If we consider a large electric switch, for instance, we can break it down into functions :—

Electrical parts
Mechanical parts
Case
Cover
Finish

From this breakdown, a definite picture is derived of the cost of the

Electrical function
Mechanical function
Encasement
Assembly

The relative cost figures indicate what areas hold the best promise for profitable value analysis.

Evaluate the Function by Comparison

Value being a relative rather than an absolute measure, the comparison approach must be used in evaluating functions. This means breaking the basic functions into subunits, components and parts and comparing the use of one material with that of another, the style of one part with that of an equivalent. It may be a matter of comparing metal with plastic, screwed machine parts with lathe machined equivalent or stamping with spinning to determine how the needed function could be achieved reliably at the lowest cost.

Develop Value Alternatives

There is a whole series of techniques, which identify unnecessary cost, remove obstacles and provide alternatives at minimum cost. Good results are usually obtained even by using one of the techniques but there is no hard and fast rule in the way of applying more than one technique to get desired results.

Blast, Create, Refine : In this technique, the function or functions are brought into a clear focus. The possible means of satisfying the function are then expressed in simple terms. Afterwards, the necessary complexity is added.

BLAST : At this stage, (keeping in mind the basic function to be accomplished—but not expecting necessarily to accomplish it entirely) alternative products, materials, processes. ideas are generated. These alternatives should, first of all, at least fulfil some important part of the function in a very economical way : at the same time the specific cost involved must be brought into clear focus.

CREATE : Using intense creativity this step should serve to generate alternative means by which the concept revealed by blasting can be modified to fulfil a large part. The increased cost which is associated with the increased function should be cleared and brought out to notice.

REFINE : In this final step, the necessary created alternatives are added to the functions including whatever is necessary, and the full cost figure worked out for the idea is that the resultant newly constructed product concept fulfils the total function with the same reliability and at reduced cost. The following examples show how to follow the three basic steps.

Let us consider two common fasteners : (i) Nail (ii) Bolt. To blast a steel nail, let us compare its costs with that of

steel wire of nail diameter which is capable of doing the important function of a nail.

CREATE—Our next step must be to create, for review, the best of alternatives which will serve the function of the head, such as :

(i) bend wire at one end

(ii flatten one end

(iii) weld a small piece at one end

REFINE—In refining, we must look critically at the total functions of the nail. Secondly we should review the basic cost of the material from which the nail is made, as found in blasting. Also, we must calculate the amount of function which the wire alternatives fail to accomplish. Then we should develop ideas, with their cost, for doing the function of a nail. Having selected the low-cost practical solution, if we find that the required function is not totally accomplished with complete reliability, we must further refine by adding increments of function and cost so that the new product becomes totally usable at reduced rate

Formerly, the US Navy was using 1000 landing craft tanks each with a 200 gallon gasoline capacity, life expectation of 8 years, costing 520 dollars.

BLAST—Use four 50 gallon standard drums.

CREATE

(i) A standard tank similar to 250 gallon oil tanks

(ii) Tanks of rubber like material, often used in aircraft

(iii) Special, but simply made, welded tanks

(iv) If iron for drums or tanks is not suitable, add appropriate coating.

REFINE—The use of 4 basic 50 gallon drums to contain fuel at a cost of 25 dollars was refined by applying alternative (iv), the use of appropriate coating to provide the required reliability and life, at a cost of 80 dollars each. As 4000 such drums were needed to replace the original 1000 tanks, the total cost at 80 dollars each, worked out to 3,20,000 dollars, as against 5,20,000 dollars for the thousand tanks: a saving through value engineering of 200,000 dollars on one item alone.

ii. *Avoid Generalities* : Don't aceept any statement unless you critically examine the reasons. "This field won't grow potato—this land is bad—it has hollow centres—don't waste time or money trying to grow potato on it". But by specifically enquiring why it won't grow potatoes, we might find that Rs. 10/- worth of magnesium sulphate will make it top grade potato land.

iii. *Get All Available Costs* : Emphasis is placed on getting meaningful costs and not necessarily those provided by inadequate (for this purpose) accounting systems.

iv. *Use Information from the Best Available Source* : The source from which the information comes must constantly be weighed to ensure the utmost reliability.

v. *Use Real Creativity* : Using real creativity through individual and group brainstorming and practising the principle of deferred evaluation, quite a number of realistic and economical alternatives can be developed.

vi. *Identify & Overcome Road Blocks* : It involves the identification and evaluation of precedents, established practices, prejudices.

vii. *Use Industry Specialists to Extend Specialised Knowledge* : This means that a

good Value Analyst should be diligent in consulting with others who have better specialist knowledge.

viii. *Get a Rupee Sign on Key Tolerance.*

ix. *Use Vendors' Available Functional Product.*

x. *Utilise & Pay for Vendors, Skills & Knowledge* : It is necessary and profitable to consult with vendors to involve them in development work.

xi *Utilise Speciality Processes* : A Value analyst should be aware of and seek out new processes. A significant consideration is that many suppliers provide service rather than products and a knowledge of their special skills may not be known and must therefore be sought out : For instance a non-founder may not be aware of the advantages of, say, investment in frozen mercury casting, but a founder could advise on these.

xii. *Ask Yourself the Question* : *"Should I Spend My Money This Way?"*

Procedure and the Job Plan

The broad procedure is given below :

(a) *Orientation Phase* in which objective and restraints are determined.

(b) *Information Phase* where all the relevant information on cost and function is gathered.

(c) *Creation Phase* the stage when alternative ways of performing all the sub-functions are worked out, possibly by use of group 'brain-storming'. At this stage, no evaluation is permitted.

(d) *Evaluation Phase* is a preliminary selection of the exposed alternatives, calling for some evaluation and leading to the rejection of some ideas and the selection of others for further development.

(e) *Investigation Phase* involves the preparation of programmes for obtaining development information consulting with suppliers and with persons (within and without the parent Company) with specialist knowledge.

(f) *Recommendation Phase* is the phase when fully evaluated proposals (possible one or two for each component) are submitted to management for decision and action.

Normally, the value analysts neither 'police' their suggestions nor do they take part in 'Instal & Maintain' nevertheless they keep themselves informed of the progress of their suggestions. A chart has been appended to this article, showing the Job Plan and how the key and supporting techniques are related to each other. The last column deals with Value Engineering questions which are aimed at finding the best answers to these questions. Another chart, giving a Typical Questionnaire for Value Analysis has also been given as Appendix. It may be mentioned here that recently ICI (India) has been making use of this technique; and its associate factories like ACCI & specially Indian Explosives (where the author is employed) have applied Value Analysis in the fields of

(a) Packing Materials

(b) Raw Materials

(c) Engineering standards & Store holdings

By the application of Value Engineering an appreciable saving has been achieved. Day by day this technique is gathering momentum in its application at the ICI (India) and within a short time, a wider application of this technique will be noticed in the various fields of Design Engineering, Manufacturing, Purchasing, etc., etc.

CHART I

VALUE ENGINEERING TECHNIQUES AND RELATIONSHIPS

Basic Step	Job Plan	Key Techniques	V.E. Questions
1. Identify Function	Orientation & Information phases	Get all the facts Define function Determine cost functionwise	What is it ? What does it do ? What does it cost ?
2. Evaluate the function by comparison	Information Creation Evaluation phase	Breaking Basic Function into sub-units Blast, Create & Refine	What else will do job ? What is the value of the function ?
3. Develop Alternatives	Investigation phase	Consult Vendors Use Co. & Industrial Specialist	What else will do job ?
		Use Co. & Industrial standards	What will that cost ?
		Use Special Product, Process & Material Determine cost	
	Recommendation phase	Motivate Positive Action	

CHART II

Typical Questionnaire for Value Analysis

At this stage the function of the component (i.e. what does it do ?), the use value (i e. what use is it ?), and the esteem value (i.e. does it have any sales attraction to the customer), are questioned. The investigation is broken down to ten headings or subjects; basic question or questions are asked and an analysis performed. This again is formalised and a list of standard questions is used.

I. 1. **Subject :—Function**
Basic Question :—
Analysis

What functions are performed by the component ?

i) Are all the functions essential ?
ii) What other ways are there of achieving the same functions ?
iii) Can any or all the functions be incorporated in another component ?

I. 2. **Subject :—Material Specification**
Basic Question :—
Analysis

What is the full Material Specification ?

i) Can any other specification of the same material be used ?
ii) Can any other material be used ?

I. 3. **Subject :—Material Content**
Basic Question :—
Analysis

What dimensions control the amount of material used ?

i) Can any dimension be reduced ?
ii) Is the part oversize ? By calculation, comparison, physical test, competitors, component.
iii) Can any dimension be increased and a less costly material be used and vice versa ?

I. 4. **Subject :—Material Waste**
Basic Question :—
Analysis

What percentage of material is wasted ?

i) Can waste be reduced by making a blank smaller ?
ii) Can waste be reduced by a minor design modification ?
iii) Can waste be reduced by changing the method of manufacture ?

I. 5. **Subject :—Limits**
Basic Question :—
Analysis

What limits are critical ?

i) Can any limit be relaxed to ease manufacture ?
ii) Can any limit be relaxed to allow alternative method of manufacture.

I. 6. **Subject :—Process of Manufacture**
Basic Question :—
Analysis

How is component manufactured ?

i) Can raw material of component be produced by a different method of manufacture ?
ii) Can finished component be produced by a different method of manufacture ?
iii) Can component be made to advantage in more than one piece ?
iv) Can a different process of manufacture be used to reduce or eliminate labour ?

I. 7. **Subject :—Surface Finish**
Basic Question :—
Analysis

What are surface finish requirements ?

i) Are the surface finish requirements essential ?
ii) Can an alternative surface finish be used ?
iii) Can an alternative method of applying the surface finish be used ?

I. 8. **Subject :—Standardisation**
Basic Question :—
Analysis

Is finished product standardised ?
Is raw material standardised ?

i) Can finished product be replaced by a standard item ?
ii) Can raw materials be standardised ?
iii) Can a component in common use be substituted ?

I. 9. **Subject :—Direct Labour Costs**
Basic Question :—
Analysis

What labour operations are involved ?

i) What labour operations can be removed and how ?
ii) Can any assembly operation be reduced ?

I. 10. **Subject :—Direct Material Costs**
Basic Question :—
Analysis

What is 'bought-out' content of cost of component ?

i) Is 'bought-out' content of cost of component reasonable when compared with similar purchasable components ?
ii) Is 'bought-out' content of cost of component reasonable when compared with estimated cost of similar component ?
iii) Can the costs of packing, handling and transporation be reduced ?
iv) Is the ordering quantity optimum ?
v) Can supplier reduce costs ?
vi) Can alternative supplier reduce costs ?
vii) Is it cheaper to buy outside ?
viii) Is it cheaper to make internally ? ●●●

DEINKED NEWSPRINT

RS Sawhney*

India with its teeming millions needs a daily supply of more than 420 tons of newsprint : this figure is likely to go up rapidly, not only on account of population increase, but also due to increasing literacy/readership, rapid industrialisation etc. etc. On the other hand, most of the projects to set up newspaper manufacture plants have been shelved ; therefore there is likely to be a growing disparity between supply and demand. The author suggests that we should adopt the new American technique of deinking newsprint, which will set up an inexhaustible source of supply.

THERE HAVE BEEN MANY PLANS, ALL THESE years, for the putting up of newsprint manufacturing units; but most of the plans have been shelved; only the following projects remain on the cards :

1) Newsprint mill in Himachal Pradesh (200 tpd, softwood-based, M/s Karam Chand Thapar & Brothers, Calcutta).
2) Two newsprint mills in Maharashtra (36,000 tpy and 99,000 tpy).
3) Newsprint mill in Madras (Bagasse-based, M/s Seshasayee Paper Board, Madras)
4) Three newsprint mills (100 tpd) one each in U.P., Assam (Gauhati) and Madhya Pradesh (Dandakaranaya).

The last three newsprint plants would be put up in the public sector ; their management will be in the hands of the Paper Corporation which the Government has set up to look after the interests of the newsprint industry. It will have at its disposal a sum of Rs. 40-45 crores. Recently, a team of experts visited the UK, and some other countries with a view to exploring the possibilities of setting up these newsprint units. Apart from these proposals, the expansion of the Nepa Mills from 30,000 tpy to 75000 tpy (based on bamboo hardwood) will lead to an enlargement of supplies during the next 2-3 years. The required machinery has already been imported from Finland.

The post-Devaluation annual cost of newsprint import is about Rs. 14-15 crores. It is in the national interest that we should economise on this rather large drain on the foreign exchange. At present, NEPA can meet about 20-21% of the total requirements, the rest being met with by imports ; but demand is likely to go up, according to a survey done by the National Council of Applied Economic Research, from the present level of around 150,000 tons to 200,000 tons by 1975-1976. It is, therefore, necessary to increase supplies, not only by setting up new plants, but also through deinking. It fact Deinking Newsprint Mills (100 tpd capacity) are quite an economic proposition; even the existing mills can go in for small units deinking 30-40 tons of printed newspapers per day. It started in the USA as early as 1943; and that country is at present the leading manufacturer in the line,

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The author would like to express his thanks to Mr. P.S. Kothari, Managing Director, The National Newsprint/Paper Mills Ltd., for permission to publish this paper.

contributing as much as 1.6 million tons of deinked newsprint to a total supply of 10.4 million tons. In Germany, the deinking process furnishes 20-25 per cent of newsprint supplies. Japan has also entered the line.

The deinking process was first experimented at the plant of Garden State Paper Company, Garfield, New Jersey, USA in 1943. Since then there has been a considerable refinement of the process. From 1962, what is known as the Scudder Process has been adopted. The Company has now two machines, of which the engineering details are given below, producing 408 tons per day.

	No. 1 Machine (Rice Barton Corpn.)	No. 2 Machine (Rice Barton Corpn.)
Wire Width	228-in	262-in
Trim	210-in	240-in
Wire length	128.5 ft.	130.0 ft.
Speed (Operating)	1450-1500 fpm.	1900 fpm (designed speed 2500 fpm.)

Early 1967, the USA entered the third phase of expansion, with the establishment of a new deinked newsprint mill with 80,000 tpy capacity at Pomona, California : it has a fourdrinier paper machine 256-in, with 1900 fpm speed (Rice Barton Corporation).

The quality of Deinked Newsprint matches very well with the American and Canadian newsprint supplies. About 10-15% of the deinked newsprint is being consumed by Newark News and the rest is being shipped to more than 40 customers. Research tests on deinked newsprint show that it compares favourably with the normal wood-pulp newsprint; and the customers' remarks are also favourable. The price of the deinked newsprint is $ 120 as compared to $ 134-135, the price of standard normal wood-pulp newsprint.

Encouraged by this success, another plant has been set up at Alsip (Illinois, USA) with an annual capacity of 80,000 tons. By the time this is printed, the plant may have been commissioned for production.

Field Enterprises, publishers of the Chicago Sun-Times, the Chicago Daily News and World Book Encyclopaedia are expected to consume about 70% of the output of the Alsip mill: their decision is based on a fairly long period study of paper processes in order to assure a supply of quality newsprint for their papers. A Field Enterprises committee which examined the Garden State process, came to the conclusion that under the circumstances, it was the best method to be adopted. However, no information is at present available regarding the deinking chemical used in the deinking process.†

The advantages of a deinked newsprint mill are :

* Lower costs on account of building and equipment as compared to a vrigin pulp mill (saving may be around 40-45%).
* Less equipment because of fewer process steps
* Less time for erection and subsequent operation

† The Brains behind these deinked newsprint mills are :—

1. Mr. R.B. Scudder, President, Garden State Paper Co., and Publisher-Newark News (pioneer of the Deinking Process).
2. Mr. R.H. Illingworth, Chemical Engineer, Newwark Times, and collaborator in developing the deinking chemical along with Mr. Scudder.
3. Mr. R O. Donoghue, Designer of the Deinked Mill and Consulting Engineer, New York (USA).
4. Mr. E. Mahannah, Project Engineer of the Deinked Mill and Manager (Pulp/Paper), Lockwood Greene & Engineer, Inc., N.Y. (U.S.A.)

* Less stream pollution and absence of atmospheric pollution, both being undesirable as health hazards
* Less operating costs
* Recirculation of white water through the deinking mills, an extra source of good valuable fibre recovery
* 'Soiled broke' can be easily processed with minimum of loss in the deinking system
* Significant saving on refining power, as deinked fibres require very light refining
* Conservation of fast dwindling forests and fibrous raw materials. (net saving of 200-230 tons of fibrous materials per day, compared to the normal demand of a conventional wood pulp newsprint mill
* Absence of softwood or hardwood would present no problem in putting up a deinked newsprint mill
* No adverse impact on existing newsprint mill installations
* Release of white printing and other kinds of paper for better uses
* Saving of foreign exchange to the extent of more than Rs. 3 crores per year with the setting up of a 100 tpd deinked newsprint mill

In a symposium on Wood Handling, Paper and Pulp, held sometime ago in the USA, attention was drawn to the mounting costs of handling wood and the serious shortages of raw material likely to develop by 1975; hence the immediate importance of deinking printed newsprint, as an economical proposition.

Human Limits to Productivity

Cost-effectiveness could never have predicted that mankind would collectively decide that somewhere between 70 and 80 mph was about as fast as the average passenger car needed to go. There is no difficulty about building family cars that travel safely at double these speeds, and the actual technical limit seems to be around 600 mph. Nor are fast cars necessarily expensive; prices might have been really low had there been anything approaching a mass market for them. There never has been. So even the 100 mph car remains the exception and is gradually becoming an outlaw.

Chemical food formulas have been perfected that provide everything needed for health in a few, appropriately flavoured spoonful. But however great its hurry, the majority of urban mankind clings still to the old-fashioned, expensive and time-consuming diet that requires land to grow it, transport to carry it, cooks to cook it, servers to serve it and someone to do the washing up. The amount of natural fibres used in clothing continues to be double the yardage of synthetics. Commonsense is creeping into the debate about how far computers and automation can turn this into a world without hands, and some young and otherwise utterly callous biologists are refusing to carry out research on living brains preserved outside the body because they are not prepared to risk the unnamable agony that a living brain might be capable of feeling.

From *The Economist* (London) 6 Jan. '68

Choice of Production Techniques in India

J L Dholakia*

Economic development has been historically associated with improved technology; hence it is important to discuss the problem of choice of appropriate production techniques in India. Adoption of capital intensive techniques of production is often advocated on the ground that such techniques would secure maximization of the rate of economic growth. India is, however, confronted with a substantial unemployment problem, aggravated by a very rapid increase in labour supply. Many knowledgeable persons have, therefore, an understandable fear that unfettered adoption of capital intensive techniques of production in all industries might further aggravate the unemployment problem. India is thus faced with an exceedingly difficult problem of choosing right production techniques for different kinds of industries.[1]

THE DILEMMA OF CHOICE AMONG alternative techniques of production is a real one. If capital intensive techniques are chosen, the rate of investible surplus over wages and other expenses of production would be higher than in the case of labour intensive techniques. A higher rate of investible surplus would in itself create conditions favourable to economic growth. The adoption, however, of capital intensive or more mechanized techniques of production is not an unmixed blessing as it would displace labour and aggravate the unemployment problem. Thus there would be a conflict** between the need to maximize the rate of economic growth and the need to provide employment to workers displaced by the adoption of more mechanized techniques of production.

Is it possible to reconcile the conflict between the need for desirable technological change and the need for providing jobs to retrenched labour force ? An answer to this question is extremely difficult but it is worthwhile trying to find out an approach towards a rational solution of this rather intricate problem.

In the first instance, the choice of production techniques is in itself largely governed by the choice of the national objectives of economic development. If the objective is to maximize the rate of surplus per worker and thereby to maximize the rate of growth of output, the choice of capital intensive techniques would be an appropriate one. We have however another objective, namely, maximization of employment, alongside maximization of output. In this connection, it may be said that maximization of employment opportunities has never been seriously thought of as the primary objective of planning in India.[2] Employment creation has always been regarded as a by-product

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**There would be no such conflict in the case of new industries; and in a developing economy new investments would offer substantial scope for automation, if otherwise considered desirable in the national interest—Editor

1. 'Choice of Techniques' by A.K. SEN

2. 'Industrialisation and Trade' by A.J. BROWN

of economic development. If the employment objective is accorded a very high priority in the preference scales of Indian Planning then a different set of techniques of production will have to be adopted for a large number of industries. Even here, it is not necessary to take a rigid or doctrinaire position. The Indian economy can be treated as a multi-sector, multi-product and multi-factor economy in which there is room for diversity in techniques of production.[3]

For providing an operationally meaningful solution to the problem of choice of techniques, it may be necessary to divide the economy into different categories according to the degree of capital intensity and skill of labour force. The following division is suggestive :

(1) Industries with low capital intensity and low skill, e.g. footwear.

(2) Industries with high capital intensity and high skill, e.g. petroleum refining.

(3) Industries requiring more capital but low skill, e.g. cement,

(4) Industries requiring high skill but less capital, e.g. metal working.

This list is only illustrative and does not exhaust different combinations of labour and capital in producing a given product mix. There are certain industries whose production function is technologically so fixed that there would not be any scope for substituting labour for capital. But there are a number of other industries where the given output can be produced by adopting highly capital intensive techniques or by labour using techniques. Degrees of mechanization may differ as in the case of automatic-loom, power-loom and handloom.

The importance of varying import content in relation to different production techniques has so far been not discussed here. It is necessary to examine the foreign exchange implications of different techniques of production. If we have a choice between technique 'A' and technique 'B' and the following details correspond to reality, it would be pertinent to inquire, whether the capital equipment would be domestically produced or imported.

TABLE I

	Technique 'A'	Technique 'B'
	Rs.	Rs.
Capital Cost per Worker	80	150
Surplus per Worker	80	250
Rate of Surplus per Unit of Capital	1	1.6

Here one is likely to prefer technique 'B', following the 'rate of surplus' criterion. If capital goods required for technique 'A' can be produced in India but those for technique 'B' have to be imported from abroad, the problem of choice becomes altogether different. For getting capital goods required for technique 'B', we may have to expand our exports to pay for this extra amount of imports. If the elasticity of foreign demand for our exports is such that for Rs. 150 worth of foreign machinery, we have to export an extra Rs. 300 at home prices, the rate of real surplus for technique 'B' becomes 0.83 (i.e. 250÷300) and because of this, technique 'A' turns out to be really more economical. On analysing the foreign exchange implications of techniques we find that high foreign exchange costs of machinery tend to go against the more mechanized techniques of production. For mechanized techniques of production, capital goods have to be imported from abroad: this may not be possible because the economy must not only undertake the necessary volume of saving but that saving must take the form of an increase in exports large enough to cover the cost of imported capital goods. In this way, techniques of production which have foreign exchange content may have to be chosen.

We had discussed earlier the criterion of maximum employment and output. It is necessary to find an additional criterion to ensure that the final combination of different

3. 'Measures for the Economic Development of Underdeveloped Countries', U.N. Dept. of Economic Affairs

production techniques in a multi-sector economy will result in the increment to production and employment compatible with the saving of foreign exchange. Since foreign exchange is a scarce item in India, techniques which economize foreign exchange have to be regarded as the right production techniques.

Over-investment[4] in heavy industry and infra structure of basic services such as power and transport might well aggravate a situation of over-all capital scarcity; hence the use of capital may have to be rationally organised. In this context, labour intensive techniques of production may prove useful. For using available labour productively, innovational activity in the case of different production techniques may have to be slanted in the labour-using direction. Factor endowment in India is such that there is an abundant supply of labour whereas capital is scarce in relation to various types of demand. Innovations in the matter of production techniques have, therefore, to be as labour-using as possible from the employment-creation as well as income-generation points of view. Research has, therefore, to be directed into making labour intensive techniques as productive as possible. We do not suggest here the adoption of primitive, outdated and inefficient techniques of production. Efficiency-based, productive techniques using abundant labour should supplant the inefficient techniques of production in India. Traditional technology as displayed in village industries in India does not result into the productive use of the labour force. Modern technology involving use of highly mechanized techniques of production is unsuitable to the factor endowment of the Indian economy. Efforts have, therefore, to be made to seek a solution through the development of efficient labour intensive techniques of production by evolving what is known as the "new technology" for labour surplus economies. The functions of identifying and developing the "new technology" through investigations carried out at research centres on the basis of comparative cost and performance will have to be planned and organized by those in charge of scientific research and industrial development: the elite in the field of science, industry and technology. By a series of experiments and innovations we have to develop efficient, labour intensive techniques of production. Ultimately, we have to ensure that the production techniques selected by us for adoption are those which minimize the average cost of production.

Techniques which save foreign exchange also indicate a bias against more mechanized techniques requiring imports of costly foreign equipment. At the same time, techniques, which enhance productivity of labour and reduce cost per unit of output need to be developed by scientific research. Unfortunately, industrialisation in India has not taken place through indigenous research and scientific development, but largely through borrowed technology. There is no harm in borrowing technology where such borrowing could be shown to result in maximum output and employment. Borrowing technology, however, can never be a substitute for developing a technology suited to domestic labour and capital requirements. There is thus a clear case for developing a "new technology" slanted in the direction of efficient utilisation of labour forces in the country. Capital-labour ratios and capital-output ratios of various industries will change considerably once the innovational activities gather sufficient momentum. By a series of trials and experimentations, we would be evolving appropriate production techniques for different industries in India. Technologists, scientists and research workers will have to strive for those optimum techniques which enhance labour productivity and reduce over-all cost of production. Only then would we be having a real break-through in the field of technology.●●●

4. "Investment Criteria, Productivity and Economic Development," Quarterly Journal of Economics (August 1955), an article by GALENSON & LEIBENSTEIN.

5. 'Planning for Steady Growth' by G. MATHUR

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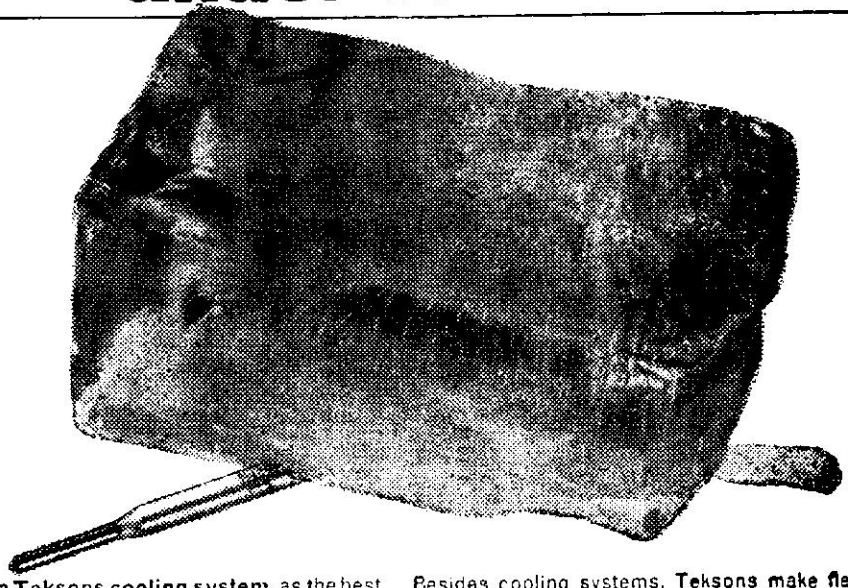

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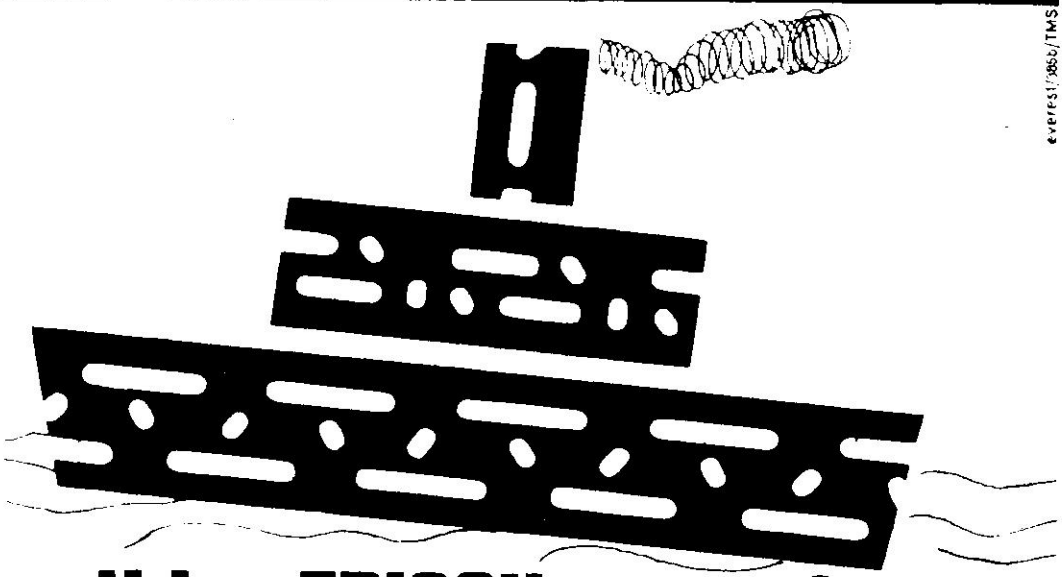

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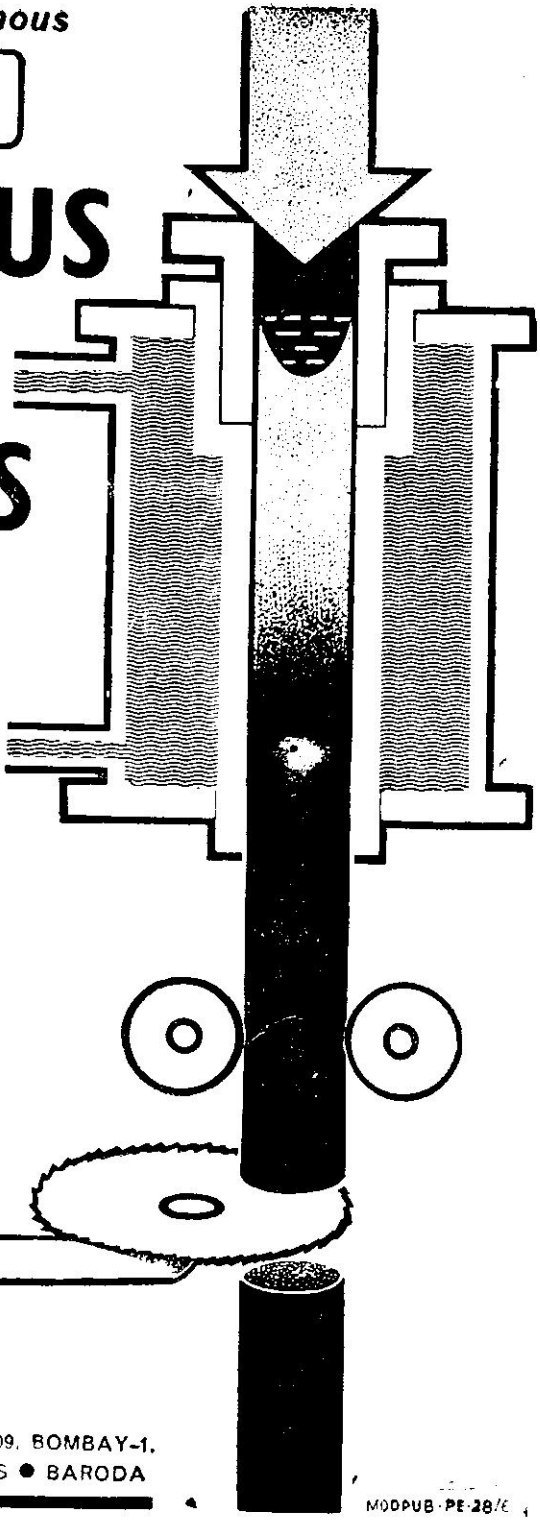

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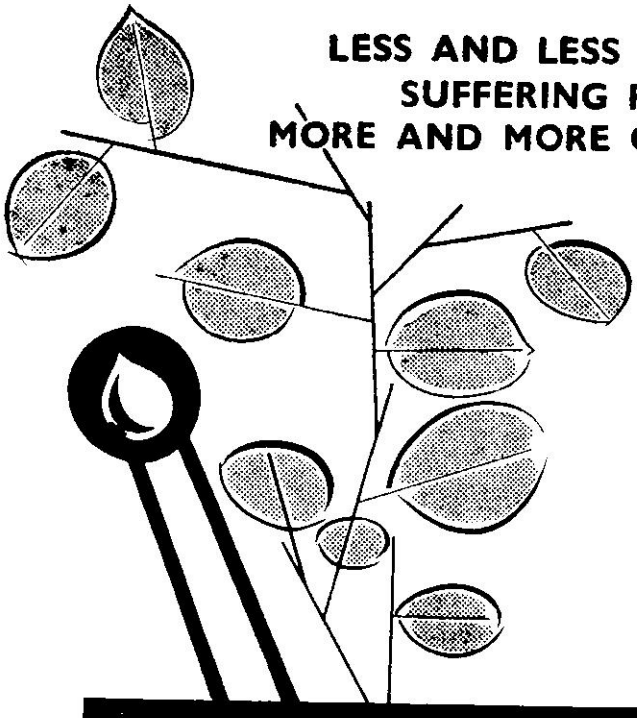

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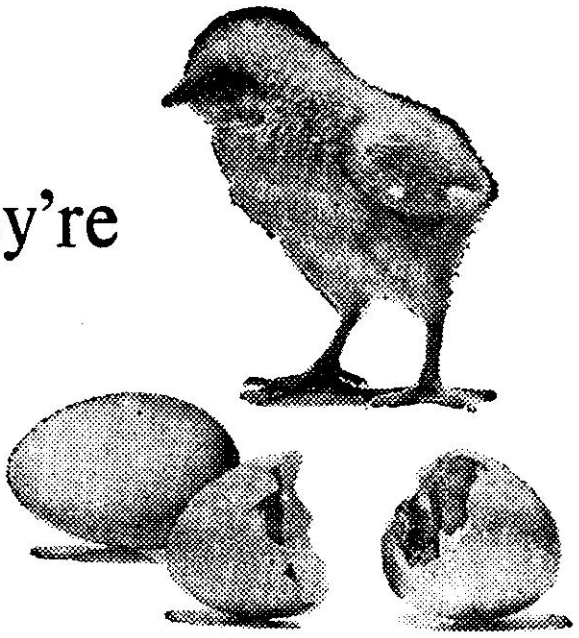

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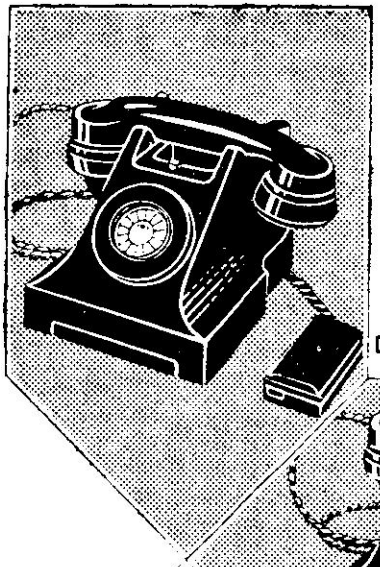

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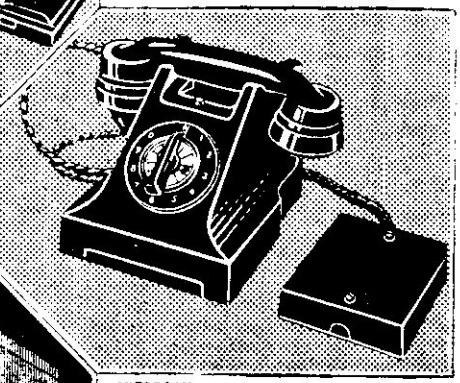

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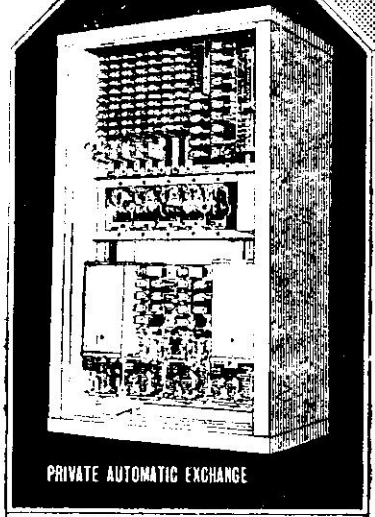

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The Automatic Machine Tool

RS Bir*

SATKE SIPPED THE LAST REMNANTS OF coffee and pushed his chair closer to the table. Topiwalla turned to the next page of his file. Both of these men had been sitting for the past four hours, finalising the list of machine tools required for the expansion of an engineering unit at Bombay, of which Topiwalla was the production-cum-project Chief. He had come down to Bangalore at the request of Satke, the Sales Manager of the machine tool factory, since both felt that the task was best performed in a machine tool manufacturer's unit.

"Let us move to the next item of our requirement. We need a cylindrical grinding machine with 150 mm centre height and 800 mm between centres", *Topiwalla* said, and yawned.

"No problem. We have a suitable machine to offer you", *Satke* said, with casual assurance.

"But let me tell you, we want this machine to be automatic;" *Topiwalla* continued. "It must be able to do automatic grinding to correct dimensions on a wide variety of jobs of different diameters and lengths. The machine must automatically adjust itself to compensate for the wear of the wheel. The speeds and feeds for grinding different materials should automatically get selected for best results."

"The type and size of grinding wheel needed for a job should get automatically selected and fitted on the spindle. The dressing of the wheel should happen by itself and at correct intervals depending on wheel wear and wheel loading. The wheel in feed for grinding should have three different rates—rapid, medium and slow, with spark-out cycle time automatically set for each category of job."

"The machine should have automatic loading and unloading device for the work pieces. There should be also the work-sizing feature coupled with sorting of work pieces into different categories of tolerances."

Satke was listening attentively.

"It should switch itself off when the batch to be ground is over, and restart again when the next series is loaded", *Topiwalla* added further.

This was the most complicated automatic grinding machine *Satke* had ever known: he had been conscious for quite some time of the growing demand for all manner of

*Manager, Designs and Development Department, Hindustan Machine Tools, Bangalore

sophisticated, automatic equipment, but Topiwalla's was really too tall an order.

"Let me get our Design Chief to look into your requirements. This is indeed a special machine" said *Satke*, and dialled for *Vasan*, the Design Chief, who appeared on the scene almost immediately.

Topiwalla explained to him in detail his requirements of this automatically automatic machine.

"What will be your production ?" *Vasan* asked.

"90 pieces per month in the beginning, but likely to increase to 1000 in three years' time. The average time for grinding is about 10 minutes per piece. The machine would work single shift", *Topiwalla* explained.

"Hoon !", *Vasan* nodded appraisingly, "The machine must have Numerical Control and be coupled to a computer. Besides, we must have a magazine for the grinding wheels..."

All the three were now assessing the magnitude of work involved for making such a machine. *Satke* had his head thrown back

and eyes fixed at the ceiling. His fingers were playing with each other. *Topiwalla* was looking at *Vasan* vaguely through the smoke rings of his cigarette. *Vasan* had pulled the data file from the front of *Topiwalla* and was reading between the lines once again.

Vasan broke the silence: "When do you want this machine?"

"One year and a half from today... what would this machine cost like, *Satke*?" asked *Topiwalla.*

Satke—"Our standard machine is forty thousand rupees. For all what you desire, you can add three lakh rupees to that. The development costs are extra, which we may cover on a number of machines and not charge you completely. You happen to be our preferred customer!"

Vasan—"We would need minimum 3 years to develop this machine."

Topiwalla—"Is there no method of making it cheaper and faster ?"

Vasan smiled and said, "Yes, of course—very much cheaper and quicker."

Topiwalla became eager : "How ?"

Vasan—**"Just put a man on the machine instead. He would perform precisely all these functions that the hoard of automatic devices would do ; A top grinding machine operator would cost no more than Rs. 400/- per month."**

Satke greatly relieved, added, "And the grinding machine would come to you ex-stock."

Topiwalla was surprised out of his wits, but he was "never, say, die, Sir" type. Regaining his composure, he looked at *Satke* and then at *Vasan*—"You are kidding. **Damn it—we want to be modern."**

Satke—"The choice is yours. Take your time to think it over... next item ?"

Topiwalla turned the next leaf on his file and started, "We need also four..."

Family Planning for Rats ?

Apparently the idea is by no means as far-fetched as it sounds. Some time ago, New York launched a rat extermination campaign, one feature of which was to be the use of birth control methods as a supplementary technique to poisoning. I have heard of this kind of thing before. It has even been suggested in some studies that sterilisation through drugs might eventually prove to be the answer to most of the pests this world suffers from. If this is so, the sooner we in India take an interest in such techniques the better. I have never quite credited those startling reports that rats eat about 10 per cent of our food supply each year—of the amount that is left when other pests have had their share. But the proportion must be considerable, and if it could be reduced, there would certainly be a handsome bonus in it. I suppose any campaign to sterilise our rats would require more than just the necessary chemicals; it would call for considerable organisation, and that is why I cannot see much future for the idea. But it might be worth a try. Personally, I have wondered ever since the success of the myxomatosis in controlling the rabbit menace in Australia why more work has not been done on this technique of pest elimination. Surely, all living organisms are subject to some form of disease which they can conveniently catch from one another. Of course, there are limits to what can be done by these means: eventually a rabbit immune to myxomatosis has emerged, I believe, and is now multiplying immoderately in much the same way the old-style rabbit did. But a combination of disease, sterilisation and poisoning could, I am sure, eliminate most of the pests which are such a nuisance to mankind. After all, look what was done with the malarial mosquito when man set his mind to dealing with it. New York's experiment is likely to be watched with considerable interest. Rats are an affliction almost everywhere, and as far as I know they perform not a single useful function.

The Ditcher

PS Ahluwalia

Assistant Superintendent,
HEL, Bhopal

Managers: For What ?

IN THIS ARTICLE, A MIDDLE LEVEL MANAGER VIEWS THE CONTEMPORARY INDUSTRIAL SCENE, naturally from his own angle, kicked as between two forces. The owner of the industry is his bread-giver, who clearly gives him to understand : "If you do not act according to my profit-making policies, you better search another job..." On the other hand, the worker tells him, "My dear Sir, you've got to live and work with us ; and remember ! the sovereign authority has resolved upon a socialistic pattern of society. Beware ! if you're on our side, we shall see that you pass the day happily, go cheerfully to your wife and have a good night's rest ; otherwise..." So the dazed manager has to choose between the Devil and the Deep Sea, between conforming to the capitalist, or putting his arm round the socialist proletarian ; or be content to be kicked like a football !

Poor Manager's Plight

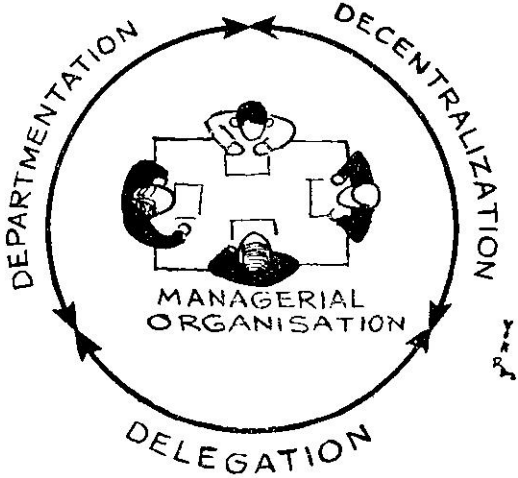
Under these circumstances, an owner of industry naturally asks himself: "Should I entrust my industry to a technocrat who knows the machines, or a manager who can manage the men?"

In this context, it is clear that an underdeveloped country like ours needs competent, resourceful, innovatory managers; and as time goes on this need is likely to grow. Even at present we face a growing challenge of finding good managers, owing to the rapidly increasing complexity of technology in this fast changing world. We are, in fact, in the midst of an Industrial Revolution; and we passionately desire to effect continuous improvements in productivity to provide our people a reasonable standard of living, and higher wages, stable employment and work to every able-bodied person. These dreams are healthy and serve a great social purpose, for today's dreams represent tomorrow's realities. And how can we convert today's dreams of shaping the destiny of every Indian into tomorrow's reality, so that we can live like a respectable nation? For this the managers of industry are going to be our best agents and we shall do well to recognize their role in modern society; and it may be added that if we fail to accomplish the aforesaid task, the blame will be squarely on the owners of industry.

A manager is the activating element who organises and coordinates the disordered activities and resources of men, machines, money, materials. In many industrial organisations, work is broadly classified as Operations and Management, the former including all the productive activities like manufacturing, engineering, accounting that must be done to get the work out, whereas the latter covers directing the work of others. The common term 'employees' in industry refers to operators (misnomered as 'workers', implying as if executives do not work) and managers, who supervise the work of others.

Once the work of an enterprise grows beyond what a single craftsman can do, the application of managerial organisation becomes inevitable. When applied to big enterprises, the operation of organization becomes still more complex and far more difficult to accomplish.

The structure of managerial organisation (where the manager's role is cognizable) is like a nucleus surrounded by three protons (better called the 3 D's of management). They are: *a.* Departmentation, *b.* Decentralization, *c.* Delegation.



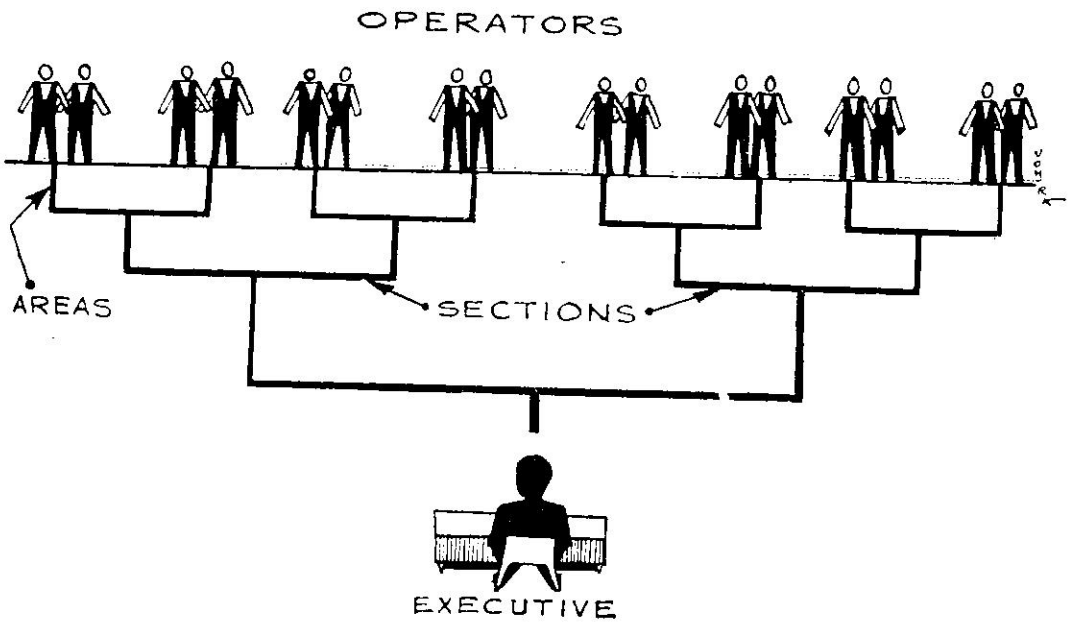
Managers, whether executive, line or functional, must break-up the operational work into smaller units: this continues until all the operations have been split up to one man's performance at the operator's level. This may be called departmentation. To elucidate it further, the Chairman or Managing Director of an industry divides the work into major departments; each departmental head reassigns some of his particular duties to managers; these, in turn, delegate operating duties to Superintendents, and the operational work is split further, till the last category of the operator is covered. The designations and titles may vary from Company to Company but the process remains similar.

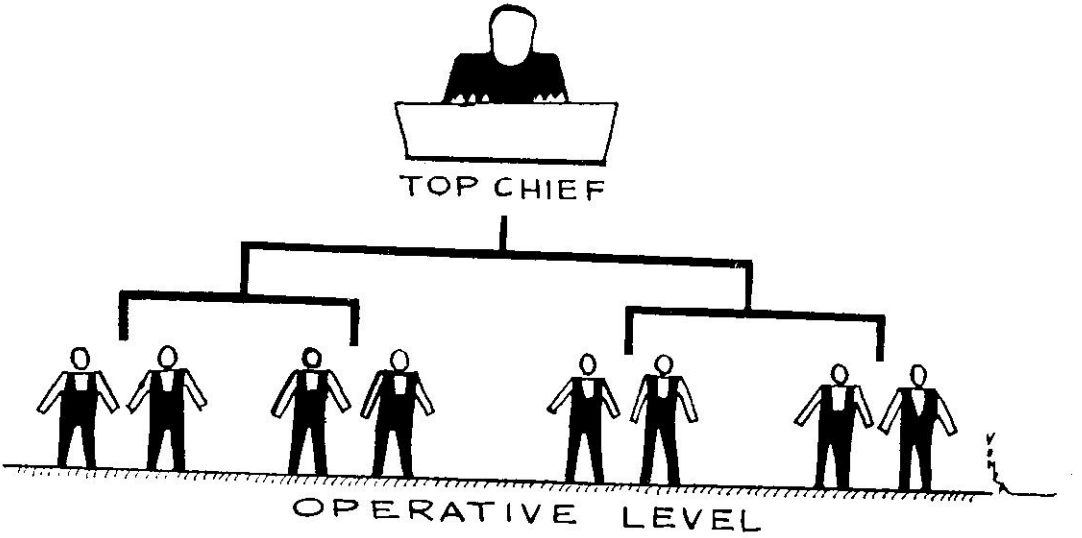
Departmentation can be traditional, functional, operational, customary, or just geographical. The term traditional normally is applicable to smaller firms where the manager has grown up with the company and both the scope of his duties and the methods employed are traditional.

Departmentation can proceed in two ways : One way, known as 'Top up', is the process of dividing and redividing the total work of an enterprise, starting with the duties of the highest manager and working downward to the operating level. The other way, called as 'Bottom up' is the process of combining the actual work operations into individual jobs, then combining operations into sections ; next putting up sections together into divisions and finally combining all work under a single co-ordinate executive.

The set-up of an administrative structure in an enterprise can be on centralised or decentralised basis : centralized administrative build up encourages a totalitarian regime, and is a theme of the past. To put it straight, it is a show of one or few executives, where there are no if's and but's, no team work, and only the law of jungle prevails. In a set up of this type, the brain of the chief works on simple arithmetic : money spent and profit earned. Profits are the only test of efficiency of a manager in such a regime, no matter how or what way the profits are made. This is the prime duty and function of the management.

In a decentralized set up, the manager's work induces collective thinking and team spirit. For a manager, it is impracticable to make all decisions, organise minute details and control every branch of operation. Policies must, therefore, be broad-based ; and an executive must reassign managerial tasks and allocate specific duties to the various heads, down to the line level. *Workers are the chief source and primary raw*





material to a manager. The welfare of the workers should be the chief aim. Enough pay commensurate with the amount of labour they put in, constant improvements in working conditions, a deep regard for the welfare of every worker in his charge : this is the prime content of a good manager's mind ; these constitute the bases of his recommendations for policy formation, in the hope and belief that this is the only way of getting the best out of the workers, and, in turn, the best for the organisation.

Let it not be deduced from the above, that the purpose of a business firm is not to earn a profit. Obviously, a Company, to continue in existence, must run on a profit basis. Earnings are essential to attract additional capital. For survival, it is also essential that the Company produces goods of quality and to the customers' needs and likings. But it is also an imperative that the conditions of employment must be such as to attract competent employees. Remove any of these essentials, and the Company will collapse. In this context, it is necessary that the Company's administrative set-up functions on a decentralization basis.

The ultimate aim of an administrative organization is to provide a mechanism for integrated co-operative action. This can best be achieved by the process of Delegation. Effective and clear-cut delegated authority can, in fact, lead to improved work staff-boss relations. 'Delegated to whom and what' should, of course, be well defined; and the chain of command should be so built up that it is respected by everyone. In delegation, it is wise to avoid dual subordination because, with a single boss, the likelihood of a consistent pattern of supervision is greatly increased.

Powers, arising out of delegation, can be either negatively or positively exercised : granting awards is the positive aspect ; inflicting penalties is the negative aspect. It is essential for success that the dual role of delegation be recognised.

An administrator, who is more akin to the blind use of power may land in trouble. An essential feature of power being the fear of punishment, we have to beware particularly of an administrator, inclined to the blind use of power, for he can easily land himself and his organisation into trouble.

Let this simple rule be not forgotten that each consistent action reinforces existing belief about how management will use its powers. But if an executive is capricious in using his power first one way and then another, he will excite fear, and not respect; and fear is the godmother of all evils.

This is the space age and we are racing against time. The crux of today's efforts of technologists and scientists is to land a man on the moon. We are thus being continuously outdated; we have, therefore, to be on constant watch for new innovations ; and yesterday's solutions may not be adequate for today's problems and the search must continue.

It is worthwhile recollecting the period prior to the Independence era when the executives and engineers in the front offices were supposed to have all the good ideas and a monopoly on the 'know how' : those days are over and, no doubt, we are free from the clutches of foreign rulers, yet I am constrained to write that the outlook of the executives has not materially changed.

We, young managers, want to see the new and free India growing under a socialistic pattern. The need of today is the assistance and co-operation of every person in the organisation. There is every reason why the men and women close to the jobs should be consulted on matters that affect their work. Indeed the ingenuity, ability and ideas of foremen, supervisors and workers are among the greatest unitapped resources of this country.

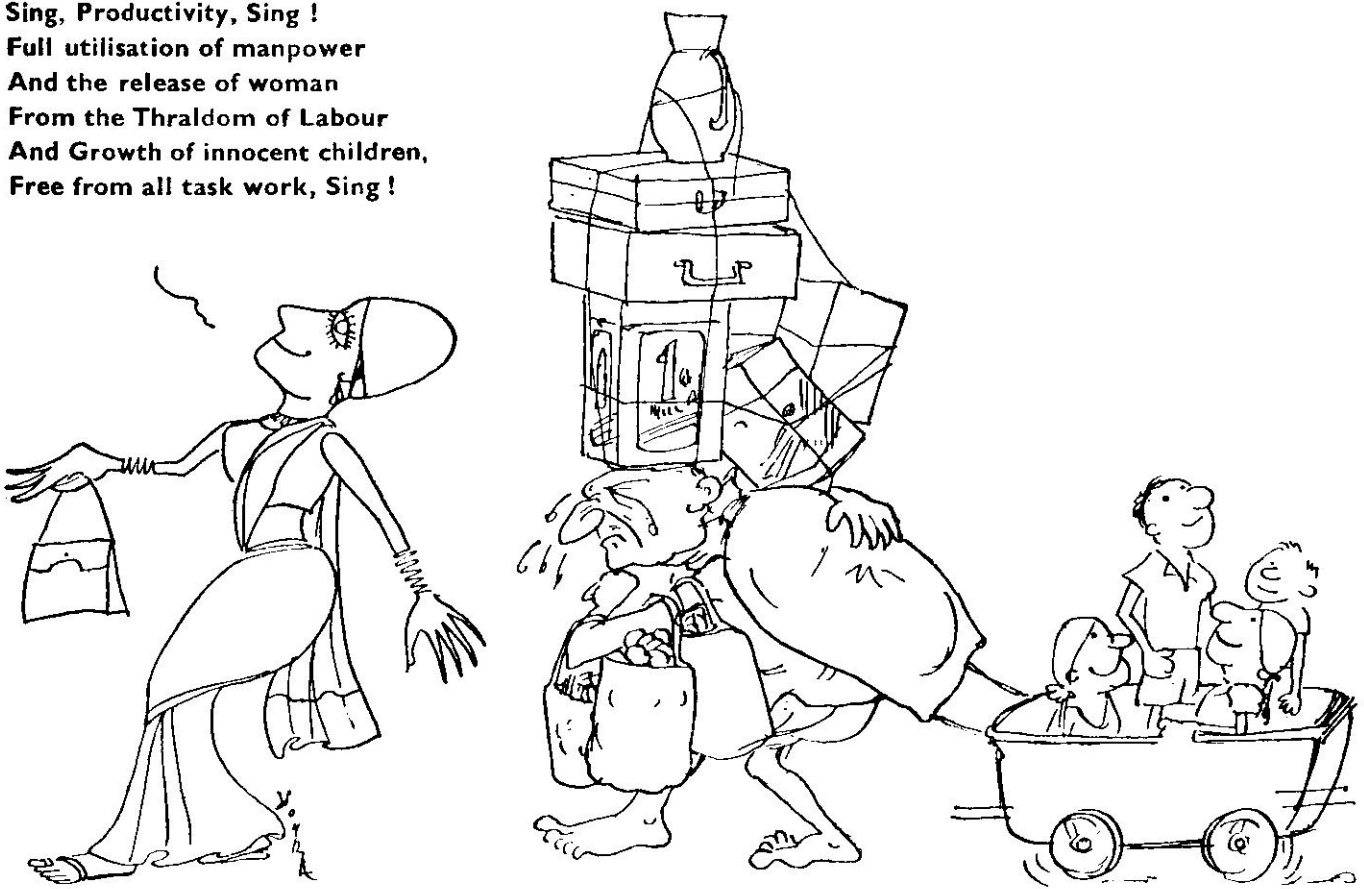
Recent aggression by our two close neighbouring countries reaffirms that we have to increase the production at a much faster rate than envisaged before and have to attain self sufficiency in a shorter period to reduce our dependence on the largesse of foreign countries. The nations of the world are watching our Indian experiments in democratic industrialisation. It is in the hands of Managers to make a mockery of it or create a legend.

Before I conclude, I request the readers to give a little thought on the cartoonic depiction. The poor Manager is being squeezed between two powerful blocks : Owner and Labour. The former is bread giver or employment retainer : "If you do not act according to my profit making policies, you better search another job" and the latter is the one, on whose welfare the future of sociaiistic pattern depends. He has to choose either of the two. Which side will you choose if you are confronted with this type of situation ? In fact, dazed Managers have been left with no other choice but to live and act in connivance with the former block and let the country's socialistic pattern take its own course !

A lot of nonsense is talked about making decisions, that the man at the top should always be making decisions, always quickly and always right. Being quick and right don't by any means go together. My advice is don't make a quick decision when speed is not necessary. I keep a card under the glass on my desk which reads "My mind is made up ; don't confuse me with facts".

—N.D. HARIS, *ICI Calcutta*

Sing, Productivity, Sing !
Full utilisation of manpower
And the release of woman
From the Thraldom of Labour
And Growth of innocent children,
Free from all task work, Sing !



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HOW TO KEEP THINGS

Change in Attitude of Society Can Help Productivity Movement

H C Pande*

Productivity. . . Increase Productivity. . . Increase Productivity by any means: that's the slogan today. Yes, we have to increase productivity, if we want to survive in a country where people are still not family-planning-minded.

WHAT SHOULD WE DO TO INCREASE PRODUCTIVITY? You may say: "We should instal automatic machines." Another man may say: "We should change our design." Still another may argue for change in the process of manufacture. Someone will ask for elimination of waste. Indeed all of them are right.

What is this elimination of waste? You can eliminate waste by innumerable methods. Have you ever thought of how many men we engage for controls and checks? How many men are we having whose job is only inspection of the work done by others? How many watchmen or security men do we have in our country? How many auditors do we have in the country? How many sweepers do we have in our country? What is the need for all these departments? Have you thought of it?

I can only think of two basic reasons for which these departments were created:

i) Regularity, and
ii) Propriety

How many of the total population do irregular, dishonest, shoddy work? How many cases of impropriety are caught per year? How much are we going to lose in case these cases were not traced? How much are we paying to the total staff kept for tracing these cases? Is the cost of irregularity brought to notice less than what we are paying to the staff engaged for finding out these irregular and improper cases?

We may argue that cases of irregularity are less because the departments are there. No, Sir. Because they are there, the real culprits know their procedure and find out the means to escape their eyes.

Because of the watchdog fellows, people doing the actual job do not put all their mind in their work and leave half their work for these departments to correct.

How many people are real culprits? Few. Is it not? And these real culprits can

*Assistant Superintendent of Training, Central Training Institute, Heavy Engineering Corporation, Ranchi

manage to escape even though we have these departments. Then what is the use of these departments ? They are not productive departments. They are in fact examining the work of other people.

Why is it necessary ? It is necessary because we doubt people. It is also necessary because we have no confidence in them. We doubt their sincerity and ability.

Because we doubt their sincerity and ability, we have provided watchmen. How much are we spending on these watchmen ? How much would we lose in case we did not have watchmen ?

It may be said that it would depend upon the type of men, or say, the society. If our society has a fairly high average level of reliability and competence, proportionately we shall need to spend less on watchmen. Then what should we do ? Should we try to change the social outlook or should we increase watchmen ? Anybody can make an answer. I will say, better try for a change in social outlook so that only productive people are employed, and not non-productive watchmen.

Let us take the case of sweepers. How many sweepers do we need in our town, and in our factory ? The answer may be : it depends on the floor area. Why will it depend on floor area ? A sweeper removes the dust from the floor area and also the things thrown on the floor area. Dust is natural, but what about other things thrown on the floor area ? Who has thrown them ? Naturally, you and I, and our children. Some people may say : "We know we should throw it in the waste bin. Don't tell us about it." But how often do we really throw it in the bin ? Also how many of us really throw waste in bins? Very few indeed! How much do we pay our sweeper ? We pay as much as our budget provides ! That means if we have less sweepers, we can pay them more. When we have less sweepers whom we can pay more and still save a part of our original budget for cleaning, we have eliminated waste and thus have increased productivity. Do we know that in certain countries we can be fined up to £10 for throwing used cigarette boxes on the street instead of depositing in waste bins attached to lamp posts ? That is why those countries can afford to look clean even with very few sweepers.

Now we must face the most important objection. Where will the surplus sweepers go ? How many clerks did we have before Independence ? How many do we have now ? What I mean is, that each productive department will need more and more people every day and these people of non-productive departments can definitely be absorbed in ever-increasing, money-producing, productive departments.

These things are possible only when we are prepared to change our habits. A few people changing their habits will help only to a little extent. What is necessary is that the whole society changes its habits.

How to reduce the expenditure on security departments ? Security works on rules and regulations. Those who violate rules are held by security. What is the percentage that violates rules ? Very small. Can the society take care of these few delinquents ? How can society do it ? Frame codes.

What will these codes do ? When codes for conduct have been made by society, it is the society that is responsible for seeing that the members of the society observe these codes. Whenever people do not observe these codes, what can society do? They can create moral pressure. What is moral pressure ? They can boycott the violator by asking him to vacate the area, not allowing him to come to their club, social gatherings, etc. The measures adopted for this moral pressure will vary according to different types of offenders.

But when will these codes produce effect? These will become effective if there are less offenders. If most of them are breakers

of law, not many people are left to exert moral pressure. So we can look after the trouble makers even without the help of security people. But only when the society is prepared for it !

I have a feeling that in a country where productivity is high, there are less people employed in the departments for checks and controls. This brings down cost of production and leaves more people for doing productive jobs. So, when we are thinking about elimination of waste for increasing productivity, why not look into these aspects also ? They are difficult. But once done, they will remain there. But it needs social consciousness : it is not a matter of indvidual conscience. How to create this social consciousness is, of course, what you, I and everybody have to think of if we want to enjoy the fruits of increased productivity.

The elimination of these wastes will not necessitate additional expenditure of money, and we all know we are short of money.

We can increase productivity even without additional expenditure !

Nawab Walter Reinhard Sumru

Some time in the 18th century, a German carpenter, Walter Balthazar Reinhard, came over to India. First he fought in the service of the French. His loyalties then shifted to the English and later to Indian rulers. With each change of allegiance, he rose in rank and power, till he became a General under Shah Alam II. In the Third Battle of Panipat, General Walter Balthazar Reinhard helped the Emperor Shah Alam to throw back the Maharattas who were besieging the capital. Shah Alam thereupon bestowed on him the principality of Sardhana, East of Delhi ; and he assumed the impressive name of Nawab Walter Reinhard Sumru.

From the *Yojana*, 26 Nov. 1967


WE BELIEVE IN WORK
Vohra

Preventive Maintenance As Applied to Personnel

MT Abraham*

We have heard it said 'Prevention is better than Cure' and 'A Stitch in time saves Nine.' Maintenance means keeping things in repair : it is "the labour of keeping something (such as buildings or machinery) in a state of repair or efficiency." Preventive maintenance eliminates costly shutdowns by constant checking and care of things. This thoughtful action prolongs the life of the equipment. In case of machinery it involves lubrication of all moving parts, periodic checking to detect any cracks, loose bolts and nuts and listening if there are any irregular sounds. Keeping a stock of spare parts and training operators to run machinery at the proper speed are also vital. One can only imagine the time, money and precious lives that could be lost if an aircraft does not undergo preflight inspection before each take-off!

WHILE VOLUMES HAVE BEEN RIGHTLY written on this philosophy of Preventive Maintenance as applied to machines, it is surprising that Human Relations Experts, of whom we now have plenty, have not taken the trouble of just transferring the idea of preventive maintenance to Personnel. How much more fruitful would it, in fact, be, if so applied !—for the underlying philosophy is identical: men go wrong for really much the same reasons—want of proper maintenance! The fundamentals are the same; it is only an acute mind that can grasp these fundamentals. Preventive maintenance is a thing often neglected by managers of factories and establishments in their dealings with personnel. That is why they have too many problems these days in managing labour. Many a strike, lockout, assault on supervisors, etc. bespeak the lack of lubrication at the point of contact between employees and supervisors or managers, and a failure to detect irregular sounds in the human machinery in time.

Many small things erode into the smooth relations between employees and managers or between workers and supervisors. Habitual late-attendance or frequent absence from work, which may not always be wilful, can be one thing that can bring a worker in the disfavour of his boss. Working the wrong way, misinterpretation of instructions, undue delay and slow pace of working are other reasons for crossing of wills, occasioning shouting and scolding. Often these may not be deliberate,

*The Editor considers it a matter of great pleasure to find space for the Productivity ideas developed by the author while working on the proofs of the mass of Productivity material published in this journal. Sri Abraham has been solely in-charge of the production of this Journal for some years; and the Editor has published this piece in grateful acknowledgement of Sri Abraham's services, apart from the basic fact that this piece is a really good and delightful one.

but could be because we are imperfect or due to the vicissitudes of life. The question of difference in temperament or incompatibility may also be there.

Little things that might be misunderstood or that might work hardship to the other man can be avoided: that means putting oneself in another's position and then viewing his problem as though it were one's own.

Employers who engage physicians for periodic check-up of their employees not only help the employees physically, but in return save for themselves the loss of manhours and production that would have resulted through absenteeism of labour. Providing living accommodation to workers, either free or on rent, also has similar value.

Workplace should not be one of boredom, bereft of all laughter and exchange of thoughts. The regretful look on the face of the worker could be touched up, if recreation facilities, canteens, libraries, etc., become a normal part of the workplace. It is heartening to note that many factories have now connected their workshops with radio music. Human machinery needs such healing touches.

Just as operators have to get used to new machines, and often make appropriate adjustments before a new machine settles to what may be called its normal functioning, managers should also make a study of the new human machines they hire, and make such adjustments for the human machine to work harmoniously, that they do not get out of gear; they do not make noise (grumble) and they do not break down! We are told that such a science of preventive maintenance, as applied to workers, is ergonomics; but whatever it is called, it is much neglected; that is why we have so much disharmony, lay off, *gherao*, recession, etc., etc. The boss should be at least as attentive and regardful of the operative as the latter is about the machine. Just as machines have their speed and their feed, so have human beings; and it is known that even identical machines vary in their speeds; and the same machine has not the same speed and feed, all through. Machines also suddenly develop trouble ; they creak; they grow old; and they need appropriate attention, summed up as *preventive maintenance*. If it is not done, the owner loses his investment. But who loses, if Preventive Maintenance theory is not applied to human beings ? Workers become frustrated, prematurely old and unemployable. Their families are the losers and, in a fundamental sense, the community is!

Mathematicians and the Devil

I'm tempted to think that St. Augustine, who lived sixteen centuries ago, must have been the first policy-maker approached by a mathematician turned management scientist. He wrote : "The good Christian should beware of the mathematicians and all those who make empty prophecies. The danger already exists that the mathematicians have made covenant with the devil to darken the spirit and to confine man in the bonds of hell."

A Live Pig at the Other End

There is a real advantage of simulation techniques that mathematicians call Invertibility. In this respect, mathematical models are strange sausage meat machines. We can put the sausage at one end, run the machine backwards and take the live pig out the other end.

Thomas Jensen, IBM World Trade Corpn., Bombay

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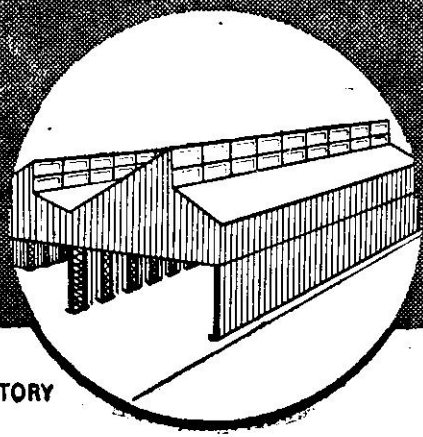

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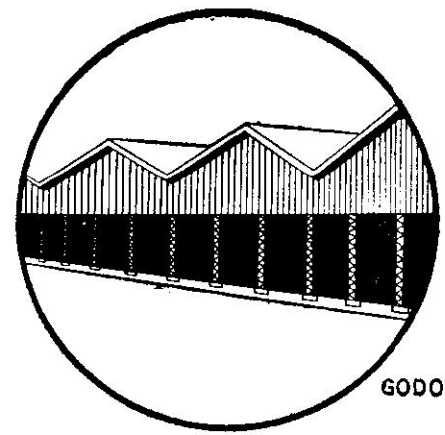

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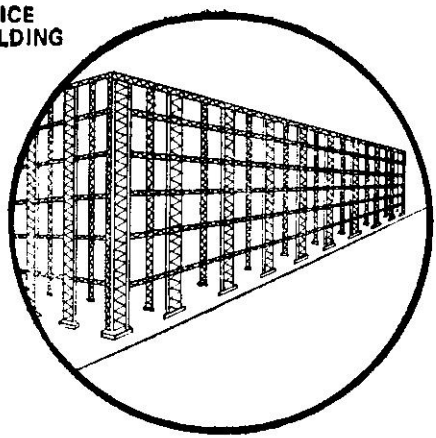

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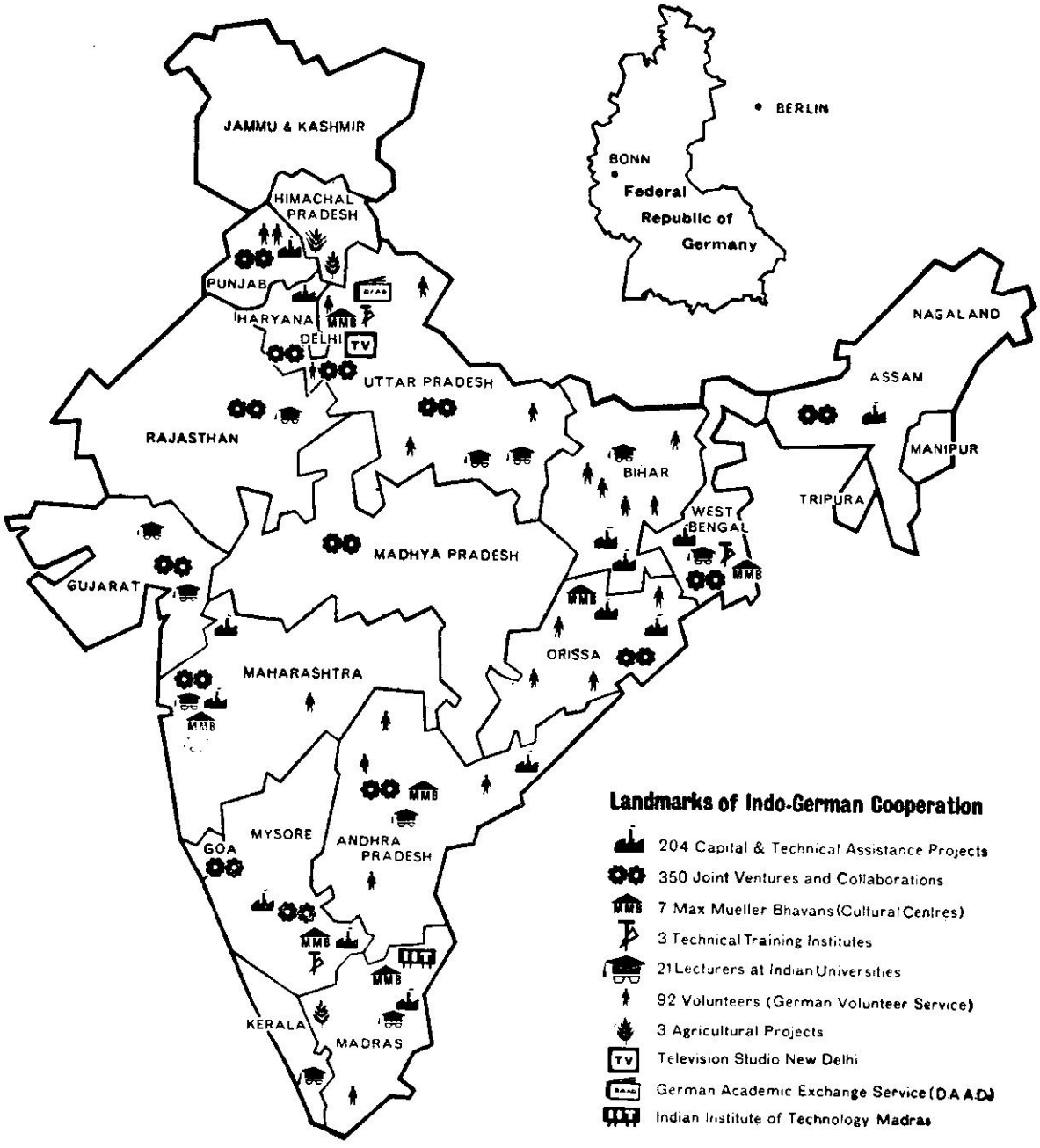

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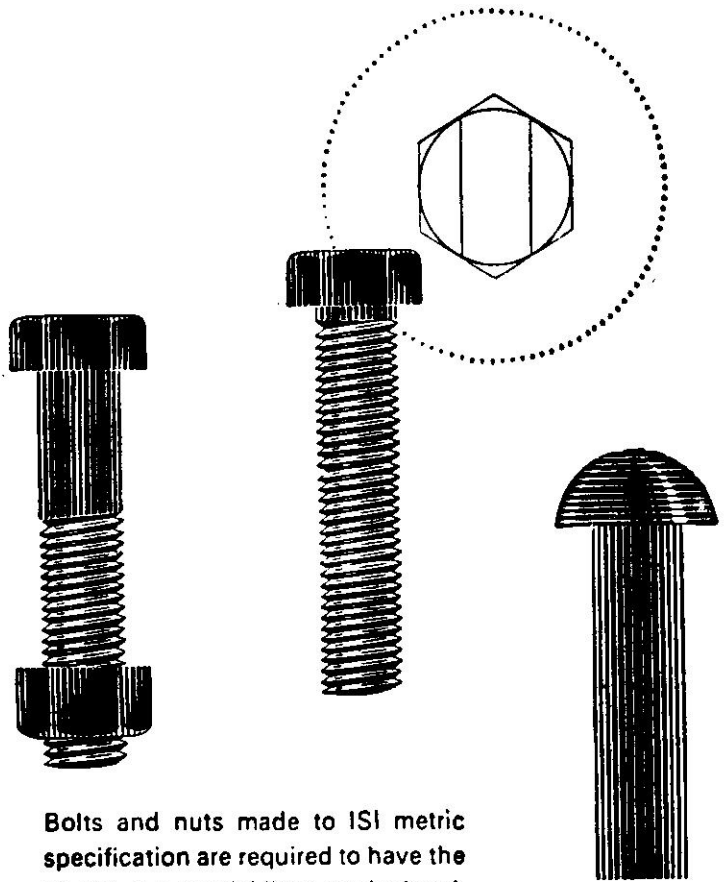

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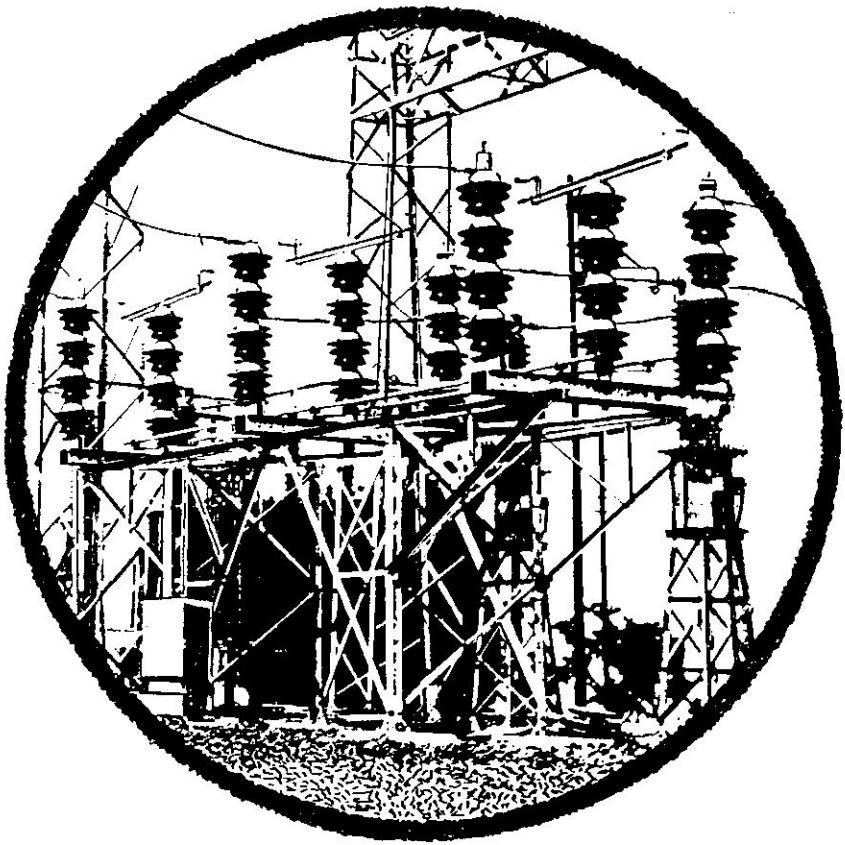

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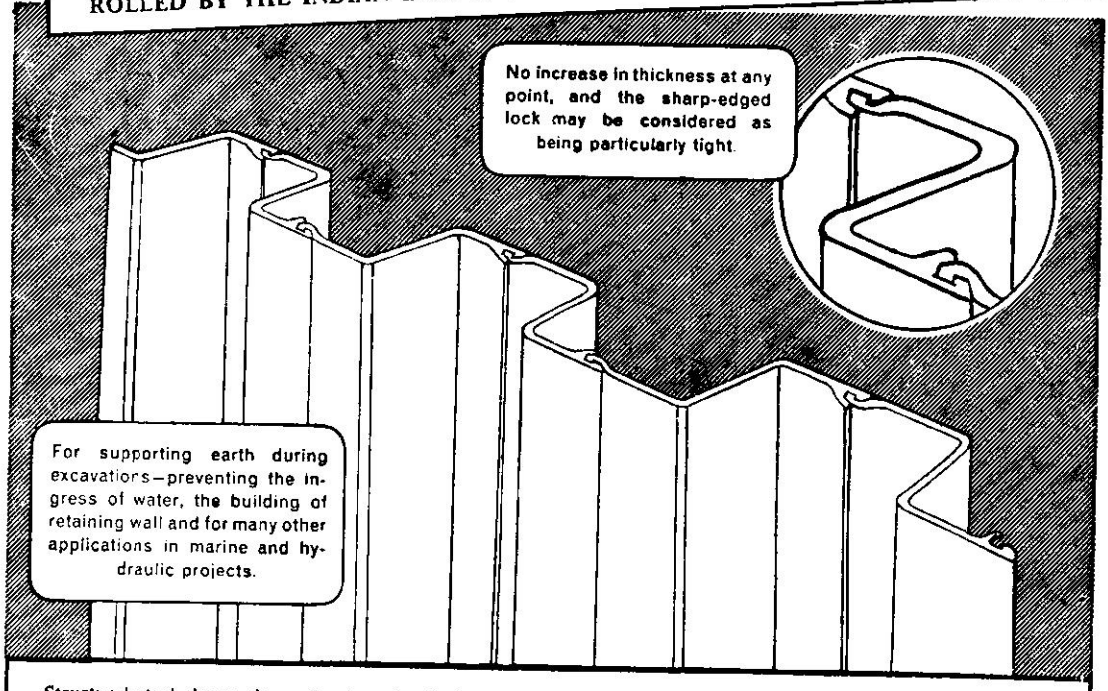

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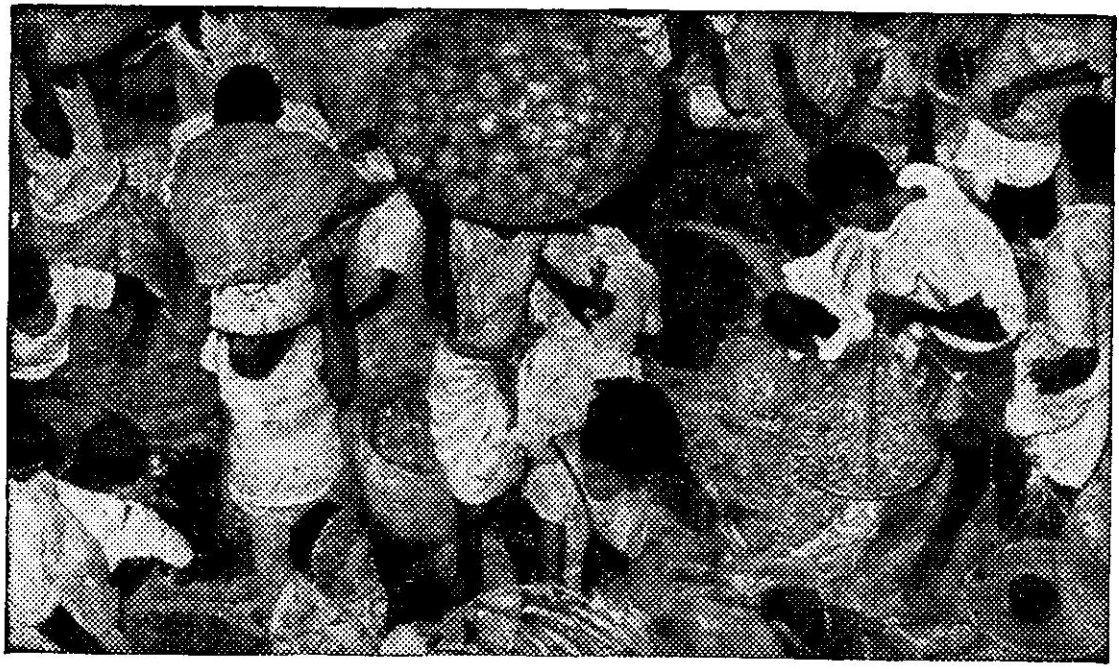

**It's in the nature of perishables to rot—
that's how one-third of our food goes waste.**

The consumer packaging industry can help prevent this waste.

Much of the food that goes waste consists of vegetables, fruits, fish, meat and milk products.. perishables that spoil before they can be consumed. The reasons for this are many.

They have to travel long distances, because markets are only rarely adjacent to the growing areas. On the way, they suffer different climates and wild fluctuations in temperature and humidity.

Yet when they arrive, there's no saying they will survive. Because storage facilities are usually inadequate.

This is where the consumer packaging industry could make a small, but significant, contribution towards saving the food that is now going waste. .By making available scientific preservation facilities...wherever they are needed.

But the industry must be equipped for the task. With adequate supplies of raw materials at a reasonable price. With imports of certain essential starting materials and the necessary machinery. With access to international packaging know-how...facilities for research and development.

Most important, those units within the industry that are competent to serve on a national scale must be given the materials to function at full capacity

Metal Box are making available to food packers, big and small, the kind of packaging and packaging service they require.

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MB

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protective packaging

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IFC Centre at ATIRA

NK JAIN

Ahmedabad Textile Industry's Research Association (ATIRA) was set up as a co-operative research association in 1947 under the joint sponsorship of the Cotton Textile Industry and the Government of India. The industry supports the research association through voluntary membership whereas the Government of India supports it through the Council of Scientific and Industrial Research (CSIR). ATIRA has at present a membership of 119 mills, of which 62 are from and around Ahmedabad and the remaining 57 are scattered all over India. This membership constitutes the base of the ATIRA scheme of IFC.

ATIRA INTRODUCED INTER-FIRM COMPARISON studies in the textile industry as early as 1952. Since then it has been undertaking such studies on a regular basis. The industry has shown considerable interest in such studies and today the Centre for Inter-Firm Comparison operating at ATIRA covers a wide range of activities in the textile industry. Presently these comparisons cover the following areas :

1) Spinning Productivity
2) Weaving Productivity
3) Consumption of Stores & Accessories
4) Productivity and Materials Consumption in Sizing Department
5) Balance Sheet Analysis and Inter-Firm Comparison of Costs
6) Quality Surveys for Yarns and Fabrics

The idea really is to enable the participating mills to use IFC as a tool for self-appraisal and as a mechanism providing opportunities to learn from each other's experiences. The studies are therefore designed to stabilise :

1) Inter-mill comparisons of machine and labour productivity, costs, technological parameters, production patterns, etc.
2) Norms with respect to productivity, cost, processing parameters, etc.
3) Assessment over a time of industry's progress in productivity, cost redncton and modernisation in different manufacturing processes.
4) Causes and sources of waste, with suggestions for remedial action whereever possible.

The existence of IFC activity in a research organisation, manned by specialists in different branches of textile science, technology and management, provides certain unique advantages. The participating mills have an advantage in the opportunities available to them to refer their problems in productivity, cost or quality for consultation or technical services to ATIRA itself.

Thus ATIRA is in a position to furnish adequate replies to the Textile Industry's Bill of Requirements : identification of the problem, detailed diagnostic study of its causes and recommendations for remedial actions. Over the last few years, ATIRA has attended to 330 technical enquiries, 62 *ad hoc* investigations and 32 departmental surveys per year, as a sequel to the variations revealed in our IFC studies. Participation in IFC studies is necessarily voluntary and open to all members of the ATIRA. Participation, though voluntary, is large

and covers generally about 70% of our membership. A nominal fee is charged from each participant for each study to partly meet the expenses of undertaking such studies.

The participants in the activities of this Centre accept certain obligations :

1) Each participating organisation nominates a suitable officer, who is responsible for collection of data from his mills in the required form.
2) The participant must ensure that the information in questionnaire is complete and accurate. Incomplete questionnaires are not included in the study. However, we find that such questionnaires do not form more than 2 to 5% of total participation.
3) A top executive is also nominated, by each mill, who can be contacted for deciding policy matters and for the follow-up at the top level. The results of the studies are sent to these executives.
4) Local participants are expected to regularly attend all meetings and discussions to ensure an active participation by them.
5) It is understood that reports of such studies are meant only for private circulation amongst the participants.

A new study is initiated only after intensive discussion and planning. Consultations are held amongst the specialists in the various disciplines available within the ATIRA. These are supplemented by frequent discussions with the group of specialists drawn from the industry, on the utility of the study and its feasibility in terms of availability of data. Except for quality surveys, the collection of data is essentially done by mail questionnaires. The following paragraphs give an idea of ATIRA's IFC studies.

Suitable indices have been developed for making valid comparisons between different units. Special attention has been given to inter-mill differences, in the nature of machinery employed, processing methods, sequence of operations, production patterns, etc. Data on productivity are supplemented by detailed information on quality of raw materials, processing particulars, production rates at every important stage of manufacture, etc.

In most cases these details help to understand and identify the reasons for variations in productivity between different units. Detailed technical information also enables the establishment of norms of productivity under the variety of conditions existing in the industry.

Comparison of Internal Costs has been started recently in collaboration with the Ahmedabad Management Association. The study is for the present restricted to the spinning stage of manufacture. Textile Industry is a multi-product industry; hence ATIRA's IFC studies take into consideration the variations in product, type of machinery, production rates, methods and rates of wage payments, work assignment, quality and rate of raw materials and other relative factors. Terminology etc., has been well defined and production processes have also been divided into well defined cost centres.

Since no uniform system of cost-accounting exists in the industry, only the basic data has been collected from the industry. It is being analysed and computed at the Centre under a uniform costing procedure.

In addition to the comparison of internal costs, the ratio analysis of published accounts of the mills has also been undertaken. Two such studies have already been conducted by ATIRA.

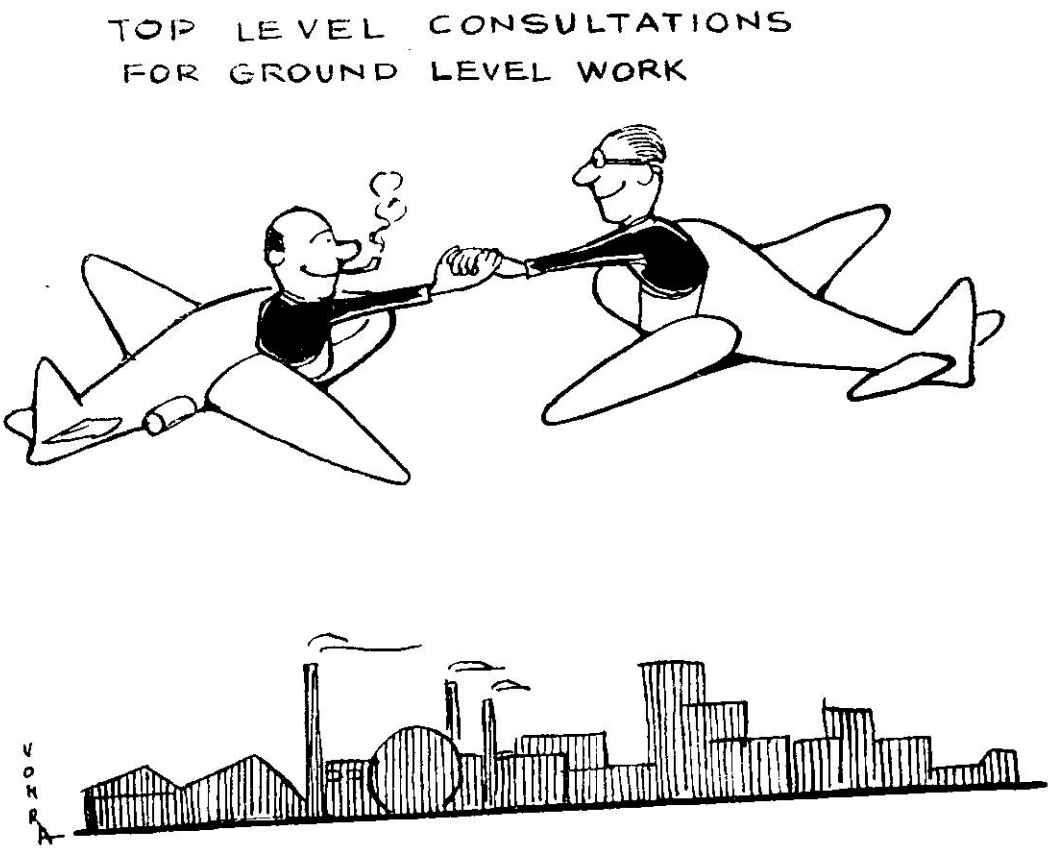
In addition to the usual report, it is intended to send individual reports etc., to each mill to focus the management's attention in individual mill performance in comparison to others, suggesting specific remedial measures, wherever possible.

Quality Comparisons in respect of Yarn and Fabrics, while essentially similar to productivity comparison, employ a different methodology. In addition to basic information regarding raw materials, machinery and

manufacturing processes collected through questionnaires, samples of the products are also collected from the mills. These samples are tested for a variety of important properties in ATIRA Laboratories. The data are suitably analysed and attempts are made to relate sub-normal performance to the quality of raw materials and technological efficiency of the mills.

ATIRA has been gradually expanding its activities in Inter-Firm Comparisons and the Industry's response has been encouraging. ATIRA has been lucky to enjoy the confidence of the textile industry, amply justified by ATIRA's performance in the service of the industry.

It would be worthwhile to undertake such comparisons in productivity and costs etc., on an international level. It will enable us to identify our own problem areas in comparison to other countries and help us to take corrective action the improve our performance and competitive position in the international markets. ●●●



Productivity Centres: The French Experience

PM Nityanandan

This is an interesting paper. The author's idea of a Productivity Centre, elaborated in the context of French Experience, is somewhat similar to an earlier idea, promulgated by the NPC, viz., Industry Productivity Councils, with their Interfirm Comparisons, Common Training and Research Facilities, etc., etc.

IN THE CONSTANT ATTEMPT FOR A BETTER industrial turn-over with the same facilities, technically called productivity, the establishment of productivity centres plays a key role.

What, in effect, is a productivity centre ? It is a coming together, a guild of various companies of the same specialisation, in such a way that all of them, big or small, are benefitted by the intimacy. For instance, a small member company wants to do research along certain lines, but cannot afford : it the centre provides the laboratory. A senior member wants some precision grinding operators : the training department of the centre can supply them in the shortest time possible, tailored to suit the needs of his shop. The activities of a productivity centre can, by common consent, be extended to include anything that is relevant to the operation of the industry as a whole.

In this article, a short review will be made of the impact of the productivity centre idea in French Industry.

The productivity centres were first initiated by the Commissariat-General of Productivity of the French Government. They vary in structure from one industry to another. Sometimes, they are groups of a Chamber of Commerce or of the interested specialists. This is the case, for instance, in the iron and steel industry, where the centre of productivity, though registered legally, is in practice a specialised department of the Chamber of Commerce. Very often, only a fraction of all the companies in a specialised industry may come together for this purpose, the companies being either a few large ones, or many smaller ones. An example is the structural engineering industry, whose productivity centre comprises of about 20 companies, five of which are among the largest in France. Where companies with a less complex organisational structure are concerned, productivity centres were formed as a result of agitation independent of the Chamber of Commerce. These centres are constantly being enlarged by the addition of new groups, as for instance in the footwear industry.

A productivity centre has three Chief aims. These are to provide specialised training for its member participants, to collect data and distribute them, and to establish a common research centre for the industry.

The training imparted by the productivity centre covers a wide range, according to the specific needs of the industry, and extends right from shop-floor level up to works managers. In particular, it has succeeded in instilling a new outlook

on productivity at the managerial level. Reliance on consulting engineers was discouraged, and the benefits of reorganising from within were widely realised. The centre thus filled an existing gap in French Universities which gave no curriculum at that time for training in industrial management and business administration.

Dissemination of information pertaining to the industry is another responsibility of the centre. Statistical data are made available, while seminars, lectures articles, films and radio talks all play a part. Actually, the centre is often a direct link between a particular industry and the consumers in matters of common interest.

The productivity centre puts at the disposal of its members the results of research of common interest, which would normally have been achieved only by a few large companies with adequate research facilities. It also provides specialised consultants to whom a member could turn for advice in the event of any specific problem. Incidentally, consultants are generally a rare and expensive commodity, and sharing their expenses is one of the prime advantages of the centre. Very often, a complete reorganisational study is made, and the results communicated to the other members for comparison with their existing methods. The productivity centre helps in standardisation within a particular industry, and enables yardsticks to be established in measuring teehnical capacity between various companies belonging to the group. Cost studies are made and the best costing method peculiar to the technical needs of the industry is determined. Each company is then in a position to select variations of the method to suit itself, never losing the capacity to assess itself with reference to its competitors. Standardisation studies are carried out on raw material and semi-finished products in common use in the industry, as well as on the finished article, to reduce multiplicity of models.

Market research is treated as equally important. And this is a basic requirement, because it will ultimately determine the optimum size of industry, and the direction of specialisation of its products.

The year 1955 saw a substantial expansion of productivity centres in France. This expansion was in three ways. Firstly, new industries started their own productivity centres and, in liaison with representatives of the concerned Ministry, launched a programme at work. Secondly, new companies, in rapidly increasing numbers, joined the productivity centres already established in their industry, and utilised their services. Finally, the productivity centres, which were originally created to meet certain practical needs, and whose scope was limited to studies of some aspects only, expanded their field of activity enormously. By 1955, there were 34 centres of productivity on industries ranging from optics to marine fishing.

The activities of these centres were directed, at the outset, towards solving the most urgent problems of the industry, and their programme of work indicated the importance attached to the study of certain problems whose solution would have a long-term effect on their future production. An example is available in the productivity centre for the structural fabrication industry. Here it was estimated that no move towards more productivity would be effective unless preliminary market study had been made. This was particularly difficult and complex in the case of this industry. The final results showed the urgent necessity for a major overhaul of the organisation of the companies involved, especially with regard to more specialised equipment as well as a common approach to both sales and design problems for all the companies engaged in this type of work. This gave an entirely new orientation to the progress of the structural industry.

In 1955, some of the vast possibilities of the productivity centre technique were observed for the first time. Apart from their decided effect in the fields of training for productivity, work simplification and standardisation, the studies made in that year led to the following : (a) A better knowledge

of the market for each industry (b) Establishment of a uniform system of costing, and (c) Establishment of measurement norms for performance, from various aspects, which enabled the industries to make comparisons among themselves, and define the ideal to the extent possible.

Let us now examine in detail the actions initiated by productivity centres in some industries, and their effects.

In the iron and steel industry, the centre established criteria for the ideal plant, after examination and analysis of fifty plants by specialists. About 70% of the steel production, the non-special steels, were manufactured by five groups, and three others had common standards for special steels. The centre established standards for carbon and alloy steels, and the plants engaged in these were reorganised on a common basis. The production of rolled sections in France reached an average monthly figure of 930,000 tons, which was 20% more than in the previous year 1954. A start was made in drawing up uniform contract specifications for public works, and a "selection of preferred steels" was published and publicised. Standardisation work was carried out even in maintenance items and spare parts for blast furnaces, such as tuyere nozzles, blast gates, refractories, cranes, etc.

Five groups worked on the following problems : (1) *Maintenance costs* which often formed 6% of the manufacturing cost (2) *Stock Control* (3) *Budgetary Control and Standard Costs* (4) *Internal transport and handling* and (5) *Statistical Quality Control.* Smaller specialised groups studied overhead cranes, lubricants, gates, hauling locos and rotation of rolling stock. Consulting engineers, each a specialist in his line, made diagnostic studies in many plants.

Finally, the data collected over a period of three years, during the visit of 18 technical missions to foreign countries, mainly USA, was compiled and circulated to all the member companies attached to the centre.

For Hand Tools manufacturing industry, a centre was organised in April 1955, and the first step taken was a massive programme of training of personnel at all levels. Thirty one companies were attached to the centre, and they all started reorganisation on specific lines in order to achieve a common basis of structure and working. Four pilot-plants, geographically distributed, were made the object of a detailed analysis that gave very interesting results.

Output clearly increased in many companies. The general improvement effected an increase in returns in one factory of 50%. Increase of 30% was reported in packing work, 15 to 20% in installation of measuring instruments, and 50 to 65% in other fabrication processes. The re-organisation of stocks and accounting on more efficient lines gave 20 to 30% of surplus personnel who were more usefully absobed elsewhere, apart from giving vital information more quickly to the works managers.

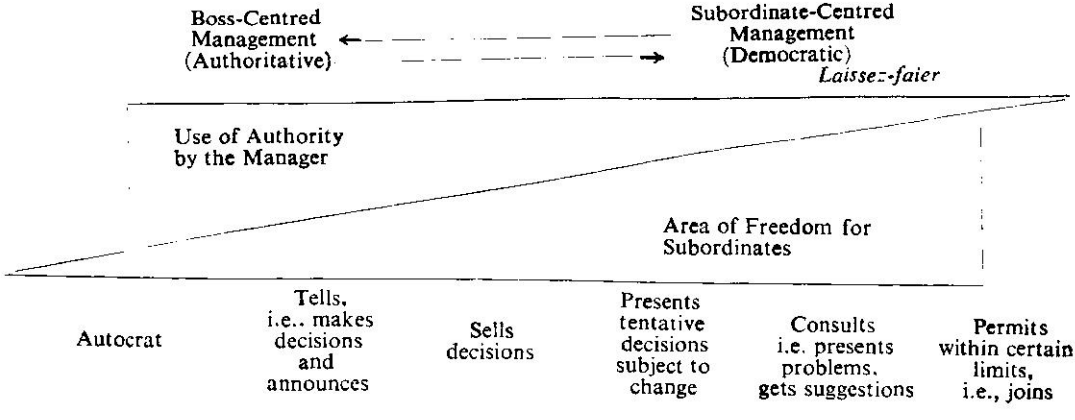
Apart from this, standardisation of new material and semi-finished articles was commenced. The principle of group purchase in bulk of raw materials was also agreed upon.

From these random examples, we can see that a productivity centre can play a very large part in the energising of companies engaged in similar work at a higher level of performance and well-being. It brings into being a common pool of knowledge and experience, to which the lowliest is welcome to help himself. Moreover, it creates skilled artisans who can benefit from the training methods perfected independently in a dozen companies of the same specialisation. For a developing industrial economy as we have in India today, this mutual self-help is of paramount importance. Otherwise our industries, after some time, will find themselves sitting in ivory towers, wrestling with problems of productivity which have already been solved by other countries, years before, but kept jealously guarded. Industrial isolation today spells decadence, and the most effective and logical way of coming together is the organisation of a Productivity centre. ●●●

The Continuum Theory of Management†

Col. Arthur W Shah*

AT THE NINETEENTH ANNUAL SUMMER LABORATORIES CONFERENCE IN HUMAN RELATIONS Training (Bethel)[1] a 'modified' *contiuuum*[2] theory of Human Relations in Management was presented. It may be graphically represented as follows :



†This was originally developed by Robert Tannebaum and Warren H Schmidt

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1. *Reading Book in Human Relations Training*, Nineteenth Annual Summer Laboratories, Bethel, Maine (1965)
2. **Tannebaum R & Warren H Schmidt :** *Leadership and Organisation* (1961)

At the extreme left of the range, the emphasis is on the manager—what he is interested in; how he does things; how he feels about them. As we move towards the subordinate-centred end of the continuum, the emphasis is on the subordinates—what they are interested in; how they look at things ; how they feel about them. If we extend the continuum at either extreme, we get the Autocrat System at the one end or the *laissez-faire* system at the other. The Autocrat system violates our traditional values and our self-image. The *laissez-faire* system means little control : it contradicts the modern concept of management and direction. It is, however, difficult to think of situations that are entirely authority-controlled, or entirely subordinate-controlled. Some situations call for the use of authority at one time, and freedom for subordinates at another. It is mostly like the optimal authority and optimal area of freedom, which can best be viewed as an amount or degree existing along a continuum in keeping with the demands of the situation.

The continuum theory has been applied by Henry Harris to another aspect of management : "Leadership—as the ability to exercise influence on the group—is not a dichotomy but a continuous series".[3] The relationship between the manager and the subordinates is not based on the division of people into two groups, namely, the managers and the workers, but on the basis of a continuum. In workaday situations, no manager acts as the boss all the time, nor do the workers remain subordinates all the time. These levels of leadership are not based on the assumption that it emerges at a certain specific point in the series, but in the belief that it emerges on a range of functions on a continuum. Sometimes the workers have to depend upon managers, while at other times, the managers have to depend upon workers. 'Managership' and 'Subordinateship' is a working relationship which concerns all. It is a matter of 'the need satisfaction' of the manager and the workers. In this context, both the manager and the subordinates know when to direct and when to follow, and whom to follow—when to influence and when to be influenced.

In considering various positions on the continuum, three sets of factors or forces are of particular importance in deciding one's management style.

Firstly, there are forces in operation within the manager himself. The Manager's behaviour in any situation is influenced by the forces operating within his own personality. He perceives problems in a way which conforms to his own ideas, attitudes, emotional balance, knowledge and experiences. Some of the important internal forces affecting him are : *His Own Value System*—how strongly he feels that the subordinate should have a share in decision-making, or that he should make the decisions himself. His own convictions about the organisational efficiency, the personal development of workers and the profits of industry play a major role in his decisions. *His Confidence in Subordinates*—he would consider their knowledge and competence, who is best qualified to deal with the problem, someone else or he himself ? *His Own Management Inclination*—some feel confident when highly directive, others feel so when they work in a team, where many functions can be shared with subordinates. *His Feeling of Security*—some may feel secure in wielding control, others in releasing it. Some have greater need for personal security in their environment. For instance, tolerance for situations creating uncertainty, suspense and frustration in an organisation constitute an important factor in one's manner of dealing with problems. One's own motive in self improvement, in relation to status, pay, recognition and so on, influence the manager's role to a great extent.

Similarly, there are forces working from within the subordinates. Before deciding his action, the manager would (or should) like to consider the forces that influence the

3. **Harris H :** *Group Approach to Leadership Testing* (1949)

behaviour of his subordinates. Each one of them has in him an image of the manager, in which he expects him to act in relation to him. An understanding of these forces would give the manager greater insight and determine more precisely the kind of behaviour that would enable his subordinates to act most effectively. Some of these forces are : *Subordinates' Need for Independence or Dependence*, that is, their readiness to assume responsibility for decision-making—some may see it as an honour, others may view it as 'passing the buck'. *Their Tolerance for Uncertainty and Suspense-Creating Situations* —some like clear-cut directions, others prefer a wide area of freedom. Their real interest in the problem and their feeling that it is important; their understanding and identification with the objectives of the organisation; their knowledge and skill in the particular task that confronts them; and their learning to expect to share in decision-making. Persons working under strong leadership when suddenly faced with a request to share in decision-making often get upset, while persons who have experienced participation with the management in decision-making do not like a manager who takes all the decisions himself.

Thirdly, there are forces in the situation which influence the behaviour both of the manager and of the workers. There are the people who hold the view that the behaviour of a person is the product of the forces emanating from the situation. Some situations facilitate one's behaviour, others inhibit it. Among the critical situational factors that influence both the manager and the workers are :

The Type Organisation: i. e., the values, the traditions of the organisation, and the expected pattern of work communicated by top management through job descriptions, policy pronouncements, enforcement of rules and regulations and public statements. Some organisations like forceful, imaginative, decisive and persuasive managers, others like more docile, obedient and influential ones.

The Mode of Manager's Group Effectiveness : This includes the manager's experiences of the groups working together, permissiveness allowed and experienced by workers, mutual acceptance of each other's views and commonness of purpose between the manager and the workers. These have subtle but powerful influence on the group's functioning. The manager needs to consider how effectively the workers function in handling daily situations together.

The Nature of the Problem : Should it be delegated, as being within the ability of the subordinate or should the boss give his own decision as, in his opinion, it is beyond the subordinate's ability ?

The Stress of Time : The stress of time is an important factor in all spheres of human activity. Less the time the more difficult it is to involve the people in planning, organising and decision-making. The organisations which are in a constant state of 'tempo' to produce things against time, are likely to use a high degree of authority with relatively less delegation to subordinates.

These are the important factors or forces which influence the manager's mind and determine his day-to-day behaviour towards his subordinates. Of course, the ideal behaviour in each situation would be that which would make it possible for him to get the spontaneous cooperation of the workers in coordinating their 'will to work' in the attainment of accepted goals.

The manager is, of course, responsible for achieving the objectives of the organisation as a whole, within the limitations imposed by the influence of forces referred to in the preceding paragraphs. He is primarily responsible for running the day-to-day short-range operations of the organisation by planning, organising, provisioning, coordinating, directing and controlling the immediate situations. A good manager, however, is required to look ahead, and raise his thinking from short-range objectives to long-range strategy. He can do so by gaining new

insights and skills for himself, arranging training in role-playing activities for his line and supervisory staff, keeping the channels of communication open between the management at the top and the workers at the bottom of the organisation, creating harmonious relationships between the management and the labour, arranging effective financial incentives that may help the social solidarity of the people, and providing participative experience in sharing organisational improvement.

As a broad guideline, these can be summed up as objectives for training in :

Developing Self-Awareness : Increasing understanding of one's strong and weak points, one's attitudes, beliefs and convictions, and awareness of one's blind spots in observing situations. Improving one's quality in the speciality and raising analytical ability within that speciality, knowledge of the specific discipline and decision-making.

Developing Awareness of Others : Understanding and appreciating the needs, feelings, attitudes, skills and expectations of others; improving inter-personal relationships between the management and the workers towards more productive and satisfying goals; facilitating the communication process, increasing readiness of workers to accept change, giving reward, raising motivation, reinforcing morale and furthering individual development of the worker.

Developing Role Awareness : Thinking and finding out a practical way of behaving in an organisation and analysing one's own acting and those of others in concrete social situations, and framing for oneself a guide for action, that is, behaviour like a "useful walking-stick to help on the way." In the light of these principles, increase one's technical proficiency and awareness of one's responsibility in specific organisational problems.

Developing Organisational Awareness : Increasing the 'manager's conceptual skill'[4] to see the situations in the organisation as a whole. It requires recognising the interdependence of various functions, and how changes in any one part affect all the others. It means visualising the relationship of the individual business to the industry, the community it is serving, and the political, social and economic forces of the nation as a whole. Recognising these relationships and perceiving the significant elements in a situation, the manager should be able to act in a way which may enhance the over-all welfare of the total organisation, including the growth of business, employees' interests, company objectives and policies and stockholders' expectations.

Guidelines for Action

A good deal of experience and research of recent years give a strong support to the theory that a fairly high degree of employee-centred rather than boss-centred behaviour is associated with the attainment of the above objectives. This does not mean that a manager should leave all important decisions to his assistants. A serious drawback of this practice would be that giving the workers greater freedom and responsibility than they are ready to accept and discharge at any given time may tend to increase their feelings of insecurity. This may inhibit rather than facilitate the attainment of the desired objectives, or may involve them to take wrong or one-sided decisions.

There are, however, some people who believe that the authoritative mode is better than the cooperative mode. It avoids delays in production and allows everyone to concentrate all his energies with the singleness of purpose to accomplish a given job. Once again the continuum theory comes to our help, There are no absolute situations calling for one or the other mode of conduct in an absolute sense : some management

4. **Katz, Robert L** : *Skills of an Effective Manager*, (Selected Readings in Management), edited by Fremont A Schull, Jr., School of Business, Indiana University, USA.

situations call authority as management style, while others call for a cooperative democratic approach as management style. From the point of view of the manager, it is important to know, how to analyse and determine the nature of various situations. This would need the understanding of the various forces influencing the situation at the time, and their correct identification into those requiring a cooperative or an authoritative mode of dealing. This could only be achieved by training the management and the workers. If situations could be identified correctly, we would progress towards a scientific management that would give benefit to the proprietors, the management, the workers and to the community as a whole.

Since there is hardly any situation that is totally cooperative or totally authoritarian, optimum authority can best be understood as a range extending towards permissiveness along the scale. Similarly optimum permissiveness can best be understood as a range extending towards authority along the scale. It, therefore, follows that an ideal executive style for any given situation would be some degree of authority and some degree of permissiveness. "Juvenile delinquents, and perhaps some troublesome employees, sometimes need the full force of the law to bring them into line with others. Most of them do well by permissive or cooperative treatment. The law, and the authorities are always available when needed."[5] It is not possible to offer a standardised yardstick for deciding how much authority or permissiveness to use. This should be determined according to the nature of the situation. As a guide, a rule that was stated at the conclusion of a seminar on authority is : "Use as little authority as possible, and as much as necessary".[5]

5. **Bellows R, Thomas G Gilson & George S Odiorne :** Executive Skills—Their Dynamics and Development (1962)

Conclusion

To sum up, there are three implications in the basic management concept discussed in this paper. The first is that the successful manager is one who is fully aware of the forces that are most relevant to his behaviour at any given time. And under the influence of these forces, he correctly understands himself, the individuals and the group he is dealing with, the company and the broader social environment in which he operates. This sensitivity of understanding alone is not enough for effective management. This leads us to the second implication, that is, a successful manager is one who is able to recognise and perceive the strength of these forces and behave appropriately in the light of these perceptions. If direction is in order, he is able to direct with authority ; if, however, participative freedom is called for, he is able to provide such a freedom in his permissive cooperative behaviour. Thirdly, he should keep his short-range objectives of running day-to-day operations well under control and have his long-range strategy constantly in view by providing effective incentive and new insights and skills for himself and the workers by training and participative experience in organizational activities.

Thus, a successful manager of men is one who is neither authoritative nor permissive. In fact, he is one, who understands the influence of the various forces on his management style and can decide on what his most appropriate role and behaviour at any given time should be, and is actually able to put on that role and behave in that manner. With this insight and role playing skill, he will be able to guide both the short-range and long-range objectives of management with more maturity, control and farsight, and will be able to arouse the intelligent interest of the worker in the organisation, heighten job satisfaction, reduce misunderstandings and raise the level of his morale and achieve increase in output. ●●●

Mathematics for Managers

YG Chouksey*

For a long time, management was considered a 'non-quantitative branch of knowledge : mathematical (or statistical) approaches to management problems were somewhat of an anathema. In recent years, however, mathematics, the "queen and servant of mankind", as Newton called it, has made welcome inroads into this field also, particularly after the introduction of Operations Research during World War II; and the resuts, as was only to be expected, are as rewarding as they are full of potentialities. No manager need get scared of this development, due to any mathematics phobia[1]. Even a general appreciation of the role mathematical tools are presently playing in decision-making may induce him to learn[1] much more of this much dreadeds but highly interestings activity, to solve problems that defy intuition or past experience.[1]

MATHEMATICAL TECHNIQUES ARE GAINING popularity, for they offer certain advantages in problem solving. They help a problem to be stated with precision rather than beating about the bush, tackle it even when there are so many variable factors influencing the decision and formulate the goal to be achieved clearly rather than

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1. While the author is basically right, we are afraid, this is not the way of curing the anti-maths fellows of their fright or phobia. The more exciting, in fact, the more attractive approach is to point out the enormous possibilities of the computer, and at the lower level, of the calculating machine. Most of us, who are even good at Mathematics, are sick of the mental fatigue involved in enormous arithmetical calculations that Business naturally involves. The availability of the calculating machine has offset the reluctance we all felt, when masses of calculations had to be done... Now comes the computer, which stores and sorts out vast varieties of information, presents them whenever needed, and works out the costs and prices and levels of output and inventories and production schedules of all the alternative possibilities: so that, in fact, the manager needs know no mathematics, whatever. People are not afraid of mathematics, as such; they are afraid of the enormous fatigue or sometimes the sheer impossibility of getting and processing masses of mathematical data. This is what the computer does; it presents all the alternative possibilities in cut-and-dried form. This is what the managers loved to have: what they hated was the processing. So managers, completely ignorant of mathematics, and even incapable of adding two and two—if such there be—can now get the benefits of the most advanced techniques of mathematics. In fact, *now the pure entrepreneur comes into his own.* In a computerised hospital, a doctor rightly said that with the computer on his side, he could now concentrate on the real job of curing the patient !—**Editor**

vaguely or 'broadly'. In short, *the mathematical approach directs the thinking to strike at the root of the problem.*

Linear Programming

Linear programming is one such tool which is now largely utilised in decision-making. It aims at finding out the best possible or optimum solution—such as maximisation of profits or minimisation of cost—from among a number of available possibilities under certain conditions or constraints. Of course, as its name implies, the technique is of use only when the problem can be reduced to linear equations or inequalities.

Linear programming is a recent discovery : it became known only in 1950, as a result of the researches of mathematicians, like Tjalling Koopmans and George Dantzi. It has gained much ground because it saves a good deal of time in reaching a positive solution, and furnishes a highly flexible instrument : "The flexibility of the technique is demonstrated by the fact that the problems in Mathematical Programming can be solved to obtain least cost, highest profit, best utilization, improved relations, increased output or for almost any other type of amelioration".

It is, for example, possible to determine with the help of Linear Programming, how to best allocate work as between various machines so as to minimise either the total time or total cost to meet the entire workload on the machines. A company, with a number of warehouses at different places can, with the help of Linear Programming, decide which warehouse should ship how much quantity of product to which locations, so that the total distribution costs are reduced to the minimum. Similarly it can help in devising a production plan involving minimum costs by taking into consideration the sales forecast, available plant capacity and the tangible cost factors. It also can assist in developing a most profitable product-mix such as in the refineries. For instance where two varieties of coal are available—one with more and the other with less coking qualities, this method can work out the most economical blend.

The other areas where linear programming has been used with advantage are the analysis of sales policy, setting up of a salary evaluation programme (for executive posts), analysis of investment procedures, marketing research, hand or non-automated materials handling, allocation of advertising budget, deciding whether to make or buy certain components, determining the best inventory strategy, etc.

Quadratic & Dynamic Programming

As already mentioned, Linear Programming can cope with problems involving linear relationships only. Moreover, it cannot handle more than one set of conditions at a time. Real life problems, however, involve simultaneous changes in several variables. As such they are sometimes required to be simplified at the cost of acccuracy. Under these circumstances, quadratic & dynamic Programming techniques can be employed to overcome these difficulties.

Dynamic Programming is used in solving sequential problems : problems which are set up in such a manner that the solution or decision arrived at one stage becomes the constraint governing the next stage. Each decision is quantified and the objective is to maximise or minimise the overall function of the whole process.

Areas where dynamic programming can be profitably used are "long range capital budgeting, timing of equipment replacement, machine loading in job shops, transportation scheduling to meet variable demands, smoothening of production levels to meet variable demands and for allocation of limited resources between current consumption and reinvestment to increase future output". Thus Dynamic Programming has a very wide field of application, where large computations are involved; and the equations

set up to solve problems are so diverse in nature that no general computer programme can be chalked out.

Input-Output Analysis

Where the inter-relationships are large and complex, Prof. Leontif's input-output analysis can prove rather useful. It is an approach that can cover an entire economy, exploiting the interdependence of production activities of various industries and sectors. This interdependence arises from the basic fact that each industry employs the outputs of other industries as its raw materials or inputs. It is a variation of linear Programming based on the assumption that in any productive process inputs are employed in certain fixed ratios, and as output goes up, the consumption of inputs would rise proportionately. For producing, for example, pig iron of a specified grade, we must have coal, iron ore, limestone, electric power, etc. in certain proportions. So if the ratios of input per unit of output together with the total volume of end products (targets) of the economy are known for all production processes, input-output analysis can help to calculate the exact production levels required to be attained by all intermediate inputs to supply the total sum of end products. Also if any change is to be made in the amount of end product-mix, consequent changes in the intermediate processes can be assessed.

Thus it can be applied to forecast future production requirements of various constituent units of the economy, provided demands can be estimated. Input-output analysis has obvious uses in economic and military planning. The mathematics of input-output analysis involves, of course, the solution of a set of simultaneous linear equations with variables: the process becomes rapidly complicated as the number of industries in the economy under consideration increases.

Network Methods

Problems such as the movement of commodities, construction of civil engineering projects and planning of shut-down maintenance are capable of diagrammatic representation in the form of a network, which with the help of relevant data, can be subject to mathematical treatment, through PERT* or CPC.† It is applicable in almost any situation calling for scheduling or requiring exact timing and performance to be followed, including the installation programme for an electronic data processing system.

The method consists of representing the project which may involve thousands of separate jobs, in the form of a diagram using arrows to show specific jobs. This line diagram, or network, shows which tasks follow other tasks, thus depicting their mutual relationships. Apart from sequencing, time and costs for each element are also given. And the analysis simply explores the network to discover which of the jobs can affect the completion time of the project. These are called critical jobs. The total project time can then be computed by adding the time for all critical jobs. For greater accuracy, a probability curve is helpful All plans for scheduling the project will have to be subject to the restrictions (as regards cost or time) imposed by the critical jobs.

In the PERT network, firstly, all the activities necessary to accomplish the project are listed, then projected as a network showing the sequential relationships among the activities. All such activities begin and end with an *event*, the latter signifying the completion of a distinct portion of a programme and giving clearance for beginning the succeeding dependent activities. The sequencing of events and activities is either determined by technological necessity** or the preferred plan of action. After this, the time required for completion of each of the activities is estimated in three

* Programme Evaluation & Review Technique

† Critical Path Scheduling.

Why only technological necessity? Any physical constraint would equally well affect the sequencing—Editor**

different ways, taking into account the *optimistic*, *most likely* and *pessimistic* conditions of work. Thus, the earliest and the latest 'event' times of the activities of the project are calculated.

Rhochrematics

Rhochrematics is concerned with managing materials flow from the raw materials stage to the ultimate consumer, *via* all production processes. Thus it involves the entire company operation and looks upon materials-flow as an integrated system, covering production, processing, storage, transportation and marketing rather than treating them as 'autonomous' units. To illustrate, before introducing new packaging which minimises cost due to the use of cheaper materials, a company would also measure its impact on transportation, handling and advertising. The final conclusion may be to change or to eliminate the packaging function.

Rhochrematics aims at securing better customer service at lower cost by reducing the materials-flow cycle time (the time necessary for production and distribution of the output), and minimising total costs associated with that flow. The reduction in materials-flow cycle time improves the competitive position of a business, for if it takes a long time for a product to reach its customers, the competitors may come up with something new and attractive to claim a bigger share of the market. It also fosters the better integration of the production processes and neater utilization of working capital.

Application of Rhochrematics requires refined accounting data and ingenious mathematical tools-simulation, mathematical programming, queuing theory, Monte Carlo etc., suited for large-scale electronic computers.

Problems Involving Uncertainty

Many a time, business situations require a manager to forecast on the basis of available data, anticipated reaction of rivals, customers and suppliers. The inevitable uncertainties were in the good old days resolved as best as possible through intuition, aided by experience : now managers seek the help of mathematical and statistical tools and techniques, based on the theory of probability. Probability theory helps in forecasting on the basis of past records, alongside making provision for corrective action at appropriate time. Sampling techniques have come into vogue to test the market-worthiness of products and control the quality of the whole lot by observing the performance of a few samples within a certain prescribed tolerance and control limits.

Queuing Problems

Almost every industry faces the problem of providing service to meet irregular demands: such as automobiles waiting to be serviced at a petrol pump, or telephone callers waiting for the line to be clear. These are the queuing problems, problems where an "aggregate of items"—not necessarily human beings—awaits a servicing function. Such problems are solved by the application of QUEUING THEORY which helps to find out the best feasible solution relating to intermittent demands for service facilities and to minimise costs by reducing waiting and idle time. It helps in solving problems relating to the landing of aircraft, parking of cars, running appropriate mumber of toll booths and bank tellers, timing of traffic lights, the processing of films etc, etc.

Use can also be made of SIMULATION methods which consist in formulating an empirical model and subjecting it to real life influences, translated into quantitative terms. Simulation thus imitates or duplicates the behaviour of the system under observation. The queuing problems can also be solved by setting up mathematical models which approximate the actual case and which can be solved in their 'steady state'.

A special variation of simulation and random sampling is known as MONTE CARLO technique, also employed to solve queuing problems: e.g., to determine the amount of inventory necessary to meet repeated customer demands commensurate with satisfactory product runs. It can also find out "the optimum manpower level that will balance overtime costs with excess manning costs". Monte Carlo techniques can be used for assessing the optimum period that must pass between two or several maintenance inspections for certain kinds of equipment. They may also tell in what sequence the orders should be handled to minimise process-time, or estimate how many clerks would be required to man a store room where the flow of requests for store items is irregular.

In recent times, the Games Theory has come into fashion for planning military or business strategy. It was originally used in the military field to simulate battles as also to evaluate weapon systems and tactics. In the field of social sciences it can be used for studying group behaviour. It is being used as a management training device, though with what results, it would be difficult to say.

Thus the mathematical tools at the service of managers offer a great variety. Some of them—queuing problems, for example—involve complex calculations and so cost more to find a solution, while some problem areas in business are still intransigient to the mathematical approach; yet the search goes on, even for the "Travelling Salesman Problem" (also called the Hamiltonian game). The problem is: "A Salesman sets out to visit a set of customers, travelling from one to the next. What is the shortest route in order to visit all customers and finish back at his starting point?"*

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*If he is a dud, no mathematics can help him: even when given a printed chart, he will muddle with the transport or with the customers, or the way. Really, there is no substitute either for character or for intelligence in any field of life: given these, mathematics is a reliable and intelligible instrument that can push up the level of efficient utilisation in any field. Without intelligence to use them, mathematical models and instruments add to the cost, without adding to the facilities. A computer without adequate programming arrangements is a white elephant—Editor

It's Now Time to Eat Them

When Jamshedji Tata was trying hard to establish a steel plant in India, the British refused to believe that it could be done. "...a British railway administrator wagered he would eat every pound of rails produced in India. By 1915 Tata was supplying an indigestible 20,000 tons..."

—The Economist (*London*), *Jan. 6, 1968*

Management Education and Pedagogy

GK Suri*

In an earlier article published in this Journal,[1] the author had discussed the case method of instruction, in relation to the objectives of management education, particularly its limitations in meeting the practical requirements of training a prospective or an in-service manager. Here, the author has written a sequel to his first contribution, as new pedagogic techniques have been developed to offset some of the inadequacies of the case method and to meet more effectively the requirements of potential managers.

THE INCIDENT PROCESS, DEVELOPED BY Professor Paul Pigors, has since 1950 been used at MIT, mostly in seminars. During the last few years, it has evoked great interest and has found applications, on a continuously increasing scale, in business and industrial organisations.

On the face of it, the incident process does not appear very different from the case method. Instead of a long case, a bare incident, with an assignment appended to it, is handed out to the members of the group : they gather relevant facts from the leader by asking specific questions. An attempt is then made to identify the basic issue. At the next step, individual members write down their decisions with supporting arguments and pass them on to the leader who sorts out the papers and helps form sub-groups of 'like-minded' people. These sub-groups go into brief sessions and elect their respective spokesmen. The elected spokesmen have a brief debate with the leader serving as a moderator, who may wind up by giving out the actual decision with supporting reasons. As a final step, 'the past is analysed to build towards the future' and some basic generalizations are drawn.

It is evident that unlike the case method, the incident process induces the students to get at the root of the problem and collect relevant information themselves. Also, it ensures a wider and more effective distribution of leadership functions among students and provides ample opportunity for practising a wide range of leadership skills. The incident process, thus adds two important elements, namely, 'information gathering' and 'organisation', to the case method. The incident process is good, however, only for specific purposes, particularly, in Prof Pigors' own words, for 'promoting an understanding of social relations'. It is by far less effective in teaching principles of management. Besides, like the case method, it is unable to provide feed-back on decisions taken by individual students and ignores the element of timing.

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From the foregoing discussion, it will readily appear that the incident process is at best a variant of the case method and complements it under specific circumstances. It is by no means an alternative to the case method.

Syndicate and Conference Method

Syndicate is the main pedagogic tool at the Administrative Staff College (Henley) and parallel staff colleges in Australia, India and Pakistan. A syndicate is defined as a group set to carry out a specific task through co-operative effort. Each syndicate consists of roughly 10 members and is so formed as to represent a variety of organisations, as well as a balanced proportion of different functional areas. Prospective participants are nominated by their organisations.

The method at Henley is somewhat like this : for each syndicate, a chairman and a secretary are appointed. They receive subject papers earlier than their syndicate colleagues. They then go into private conference with the staff director who satisfies himself about the arrangements for treament. They prepare their own scheme and examine printed material and books on the subject. The Chairman explains the task to the syndicate and puts forward its proposals for carrying it out. The time period is also fixed. The knowledge and experience of the syndicate in relation to the task assigned are mobilised and supplemented by visits to outside organisations, and by discussion with visitors. Syndicate reports are completed, duplicated and distributed to other syndicates. The Chairman meets the staff observer in the subject, and together they select the issues. These preliminaries over, a general conference is held where each Chairman gives an account of the deliberations of the syndicate to the satisfaction of his colleagues. The issues framed previously are discussed by the College as a whole.

It may be noted here that the task assignments to the syndicates are so arranged as to cover a well-conceived and well-planned course. The emphasis obviously is not on teaching. It emphasises the process of learning, sharing of experience and training in leadership. The case method also emphasises the same qualities, with the difference that the training in leadership in the syndicate method is of a more intensive nature. Some people seem to draw a contrast between the case method and the syndicate method. This contrast seems to be mistaken, because the syndicate method is a form of organisation, and as such does not preclude the possibility of using case studies as task assignments to syndicates or, for that matter, the use of lectures and other audio-visual aids including the use of film strips. The Administrative Staff College (Hyderabad) does use cases as task assignments to syndicates. It should, however, be noted that cases here are used as an aid rather than as a complete and self-sufficient method of imparting managerial training, as it is done at Harvard Business School. It must also be noted here that the syndicate method may be good for sponsored in-service senior executives whose employers pay substantially for their 3-month training. Its use for training prospective young managers on a much larger scale appears doubtful owing primarily to the tremendous cost and elaborate planning that it entails.

From this brief discussion, it can be safely concluded that the syndicate method and the case method are not alternatives : they can go hand in hand, with relative emphasis on the two, depending on the nature of the training programme.

Role-Playing

Role-playing is widely used as one of the training methods in both Europe and America. The mechanics of the method is simple. The students are given roles from actual and live business situations and they play these out in the class under the direction and observance of the instructor. This technique or, rather, teaching aid is mainly

used in courses that involve the 'human factor'. It is sometimes used as an aid to case discussion. A possible weakness of role-playing is that quite often the participants forget the subject or the problem areas and take it as 'just another game'.

Thus it is obvious that role-playing is at best an aid and can be used to supplement case-discussion class, especially in the subject areas which involve human factor. Its weakness in teaching principles of management needs hardly any articulation.

The 'In-Basket' Method

It is a special type of case-study method. In a simulated operation, the student participants put themselves in the position of an executive and then within a specified time period make decisions on each item of correspondence in an in-basket received by the executive. The contents of the correspondence are very realistic and usually cover a wide variety of job problems. In order to enable the students to competently execute their assignments, background material is distributed beforehand. The in-basket material is distributed only in the class and the time pressure is maintained all through just as in a live business situation.

Apparently, such a device can be used only for a limited purpose in a training programme. It is at best an aid rather than a method of teaching principles of management.

Management Games

Management games are the newest and the most advanced among the pedagogic tools, discovered so far, to train, develop and nurture the prospective and in-service managerial talent and are becoming increasingly popular with educational institutions and management centres. They are simulated business situations with simulated time periods in a 'laboratory situation', susceptible to experimentation and analysis. Mathematical relationships are built in the game model. Based on these relationships, computations are made either by computers or by desk-calculators, to convert the decisions made by the players into performance reports which are returned to them. The participant has thus for the first time a chance to evaluate the effectiveness of his decision-making with objective data. Time dimension is also introduced. Just as in a live situation, time pressure is maintained all through for effectively organising incompete information for the purpose of decision-making. Management games thus add two very important elements to the case-study approach—the objectivity of the feedback and the new use of the time dimension.

Management games, like other pedagogic tools, have their own limitations. They cost more, both in money and personnel. They require more planning and time. Moreover, decision-making in a simulated operation will be devoid a of compelling sense of responsibility which an executive will have in an actual business situation. Game experience seems fun to most participants. All said and done, its utility as a training method is beyond doubt.*

Conclusion

A wide variety of pedagogic tools is now available. Each serves its own purpose and makes its own contribution; each has its advantages and disadvantages depending on the specific circumstances. Together they form a family, which can be effectively utilized to train and develop managerial talent Full advantage should be taken of these pedagogic tools to assure the country of an adequate supply of competent managers, for not only managerial performance is the key factor in raising productivity but also their lack will be a brake on the tempo of economic development.

*Rather a too categorical statement! —Editor

recent literature on productivity

Aspects of Top Management*

QUITE some time back, we received a small book—*Aspects of Top Management*—published by the Industrial Team Service, St. Marks Cathedral, Bangalore. The Rev. A.H. Batchelor deserves real congratulations for having edited this book, for it would be difficult to recall a book of comparable size (this has only 128 pages) containing so much material of such sheer excellence. That the Church should be involved and that it should bring in women to inspire the men to attain heights of intellectual analysis in respect of managerial functions, makes it a rather awkward business to review the book as part of current management literature; but that is modern life.

Two distinguished persons who figure very much in the Book may be mentioned: Prof. R. Natarajan, who was long associated with the Productivity Movement. He appears to be the prime mover of the whole business, furnishing ideas, experiences and even the theory; also Sri K. Sreenivasan of SITRA. A number of political dignitaries, Sri V.V. Giri, now the Vice President of India and the Chief Minister of Mysore were also associated with the Symposia of which this publication is a record. The Church dignitaries not only participated, but they also by their presence, particularly the Reverend Batchelor appeared to have acted as catalytic agents. The NPC was happily associated through contributions of the late Sri Gopal Rao and Dr. Yoga, then NPC Regional Director at Bangalore. The manner in which the idea emerged is interestingly religious. A lady member of the Industrial Team Service appears to have read an article by a British Management Consultant, suggesting that managers were often not aware of the human and ethical values involved in their daily decisions. She found that the matter had received attention in the USA through organisation of a two or three-day Conference of Senior Managers and their wives, wherein special aspects of management and the interdependence of homes, communities and workplaces, were considered. She talked it over with a number of friends and colleagues; and a small group consisting of Prof. Natarajan, the Rev. A.H. Batchelor, Mr. W Edgley and Mr. MM Thomas (Director of the Christian Institute for the Study of Religion and Society) met over dinner and discussed the idea. It was here that 'Industrial Relations' was selected as the topic for men and 'Child Psychology' for women, and the case study method chosen. The Mysore State

* Available from St. Mark's Cathedral Industrial Team Service, Bangalore, Price Rs. 3/-

Productivity Council became the co-sponsor of the Seminar. Encouraged by its success, another seminar on 'Aspects of Top management' was organised, including lectures on 'PERT', 'Human Development in Industry and Top Management Controls', alongside practical exercises and case studies.

In the first seminar on Applied Industrial Relations, Prof. Natarajan delivered an opening talk on 'Management Around the World'. He expressed his own considered judgment that the major contribution to industry was made by management; and he had seen the truth of this in the many countries he had visited including Russia, the USA, Japan, Europe, etc., etc. He said that modern management did not conform to the Oxford Dictionary meaning of trickery and deceitful contrivance; and that the industrial miracles achieved in the postwar period in Germany, Japan and Italy were due to good management. Even in Communist countries which were making fast strides in economic development, management was making a major contribution.

Prof. Natarajan reviewed some of the developments in the field of Management: in the first instance, a move towards giant structures common to a wide variety of countries the USA, Russia, the UK, Japan, China—creating many problems in the process; and an increase in the ratio of blue collar to white collar workers, not only in the USA, but also in Russia and even in India. Computerization was likely to intensify this tendency, for there were already some 40 computers working in India.

Regarding education of managers, the Russians insisted on University degree. Even in the USA, increasing emphasis was being given to the desirability of having managers with degree qualifications. *In respect of salary and tax differentials, the USA and Russia were coming closer.* In the USA, the difference in salary between a manager and a worker was of the order of 6 : 1; in Russia, it was 4 : 1. In the matter of taxes, a Russian manager with a wife and three children paid 13 per cent of his salary, while a similarly situated American manager paid 17 to 19 per cent.

Prof. Natarajan also drew attention to two facts about Soviet industry: rigidity of specifications and the diffusion of information. In this respect, Russia was ahead of the whole world including the USA. As soon as a new technique came to be known, the information was circularized to all concerned. Feed back was then obtained as to how it worked. Finally, amended instructions were circularized for the correct use of the technique. Russian factories were thus very quick in the adoption of new and efficient techniques.

The Russian manager has many powers including the right to hire and fire, and to buy and sell certain things within limitations. As trade unions are part of the Communist system, they are much less troublesome to the Russian managers than are trade unions in the United States. The power structure is, however, quite different. In the United States, power is concentrated in the Company's President. In Russia, management decisions are taken by a sort of presidium, consisting of the manager or the director, the Communist Party representative and the trade union leaders.

While in Russia, there is no close or systematic study of human relations in industry as in the USA, the fact that *every manager starts work on the shop-floor*, is important. Suggestions from workers play an important part in Russian factories. Prof. Natarajan cited a case—of course an old one—in which in a Moscow Factory, savings equal to 3 per cent of the annual wage bill—and 6 per cent of output—were effected as a result of implementation of workers' suggestions. However, labour turnover in the Soviet Union is high: sometimes as much as 30 or 40 per cent, though the explanation for this state of affairs, however, is not clear. In the USA, a lot more

attention is paid to the theory and practice of human relations but despite the 'Log Cabin to White House' tradition, it is not common for managers to start at the shop-floor level.

Prof. Natarajan added that the Russian economy suffered from a major handicap in the lack of a yardstick against which to measure performance. The competitive economy of the United States had profit as a yardstick of measuring efficiency. In Russia while the production system is well-organised, they are still searching for a yardstick. Here the Reverend Batchelor, the editor of the Volume, has added in brackets that recent developments in Russia suggest that they are moving towards profit as a yardstick there also.

Prof. Natarajan's talk was followed by a series of questions, and a discussion regarding the type of Managing Director needed in India. Prof. Natarajan said that the Managing Director must have certain qualities such as loyalty, analytical ability, the ability to help people develop and a grasp of the whole picture, not just one aspect of it. A discussion then developed as to the profession the manager might belong to. Sri K. Srinivasan suggested that the answer would depend on the type of industry: where a standard product was produced and the main need was to break down market resistance, a market-oriented man would make a good managing director. On the other hand if it were a new industry with much innovation and a lot of investment was needed, a scientist, a technologist or an engineer would be the best man. A question was asked about the civil servant, but it appears that the civil servant was not generally favoured as a Managing Director.

The discussion was followed by a theoretical analysis of the case study method as evolved at the Harvard Business School and as subsquently developed at a number of places: "...The case study method develops human thinking—it does not help us acquire facts. A case always has more than one solution. The manager has to identify the incipient imbalance in a situation and do something to meet it. His job is to preserve the balance..."

The discussion of the case study method was followed by a presentation and detailed analysis of a number of case studies, of which two may be cited as significant: (1) *Shanker's Case*—a case study in discipline—where a materials controller, a qualified engineer with 8 years of service commits the indiscretion of taking an alkathene sheet (which the Company manufactures) from the waste heap for packing lunch. His Boss, the Manager of Euroka Manufacturers, drops into his office, asks him to open his lunch box, and, on finding it packed in alkathene, warns him; the engineer promises to improve, yet he is given a show cause notice and, despite explanation, he is actually dismissed. When the case is discussed and additional information is furnished that the Managing Director wanted to find a job for his nephew and that his nephew was actually given the dismissed employee's job, it turns out to be a significant and representative case.

Another case that was discussed was that of *Gopal Cotton Mills*, in which the Managing Director went to Japan, saw the working of automatic looms and found that the market for Indian cloth was weak because of its manufacture on non-automatic looms. On return, he built up a new loom shed with automatic looms and better working conditions. With certain resistance, the management was able to persuade the workers of the old hot, humid, poorly illuminated, noisy loom shed to opt for the new loom shed. In the process, however, the distance between the workers and the superintendent (the same fellow who cotrolled the old loom shed) increased and the high-level efficiency of 88 per cent attained within two months declined progressively to 80 per cent; with this, the earnings of the workers were less than before; and they went on strike. A new technically qualified superintendent took the place of the old superintendent; he began

taking disciplinary action and carried out drives for higher productivity, etc. etc.

Lastly, in the series, a *strike case* was discussed in which the workers asked for a minimum increase of 50 per cent in the existing dearness allowance as interim relief. The immediate cause of the strike, however, was the non-availability of the boiled type of rice which the workers were used to, and an increase in its price. Though the general strike lasted for only four days—continuing for two more days in certain units—it entailed a loss of 57,567 man-days, Rs. 2,85,000 in terms of wages and Rs. 7,30,000 in terms of ouput.

A number of questions were asked as to why management failed to avert the strike. What kind of leadership was management giving in the situation? What skill in human relations was it showing? The concensus was that the managent in this case did not show any sign of skill in human relations.

The discussion on the case studies was followed by an exposition of what is known as the Incident Process. Professor Natarajan gave an idea of how this system was developed and how it actually worked. There were a number of incidents that were actually discussed. For example, on a certain Wednesday morning the Plant Superintendent of a certain concern ordered one Mr. Calvetti (a worker and president of the local union) to remove his car from the restricted area : he impressed upon Mr. Calvetti the seriousness of the offence, and the consequences of wilful violation of the parking rule. At noon the same day Mr. Calvetti was overheard saying to a group of employees : "I am going to see if they will fire me; I don't move my car."

Mr. Calvetti left his car where it was; and so he was discharged by the manager. The case went to arbitration. In the discussion of the incident, a number of interesting facts came up and the participants divided themselves into two groups : those who agreed with the Company's decision and those who did not. Each group was given time to prepare its case; then each group, through a spokesman, tried to convince the other of the rightness of the decision. Normally, this goes on till there is complete unanimity on what the decision should be. In this case, however, due to want of time the two groups presented their conclusions.

A second incident was discussed in which on a certain Monday morning the foreman went to the shop-floor and found a drinking tap open and water flowing out. Sweeper Swamy was busy in sweeping the floor. The foreman Mr. Green shouted: "Swamy! close that tap." Swamy kept quiet; then Green shouted again, Swamy answered back: "It is none of my business to close the water tap." The foreman issued him a memo fining him one rupee, for insubordination. An interesting discussion followed because this was a representative incident in foreman/worker relations and the shouting was a common occurence.

The discussion on the incident process was followed by Role Play, conducted by the late Sri Gopal Rao of NPC. This related to the *case of Mehta & Co.*, an old concern operating in a small community of fifteen thousand people. The Company's production workers were about 500. The industry to which the firm belonged was generally prosperous but there was a general strike for a wage increase. It was found that while the strike in other concerns was generally peaceful, at Mehta & Co. it was characterized by considerable bitterness and even violence. The top management was naturally worried and wanted to find out the real cause of the employees' reaction to the Company. In order to get at the truth, they decided to employ a firm of managment consultants for reasons of objectivity, and secondly, as the atmosphere was rather charged, it was decided to survey supervisory opinion as a substitute way of getting at the climate of opinion in the Company. Each supervisor was asked two questions in an informal personal interview

with the staff member of the consultancy firm :

(i) Why do you think our employees are so disturbed in this strike ?

(ii) Do you have any comments on your work in the Company ?

Each supervisor was guaranteed that his responses would be treated as confidential and would not be identified by Company officials. It was found out that a former plant superintendent had for years practised favouritism, putting man against man, making no attempt to develop his subordinates, discouraging team work etc., etc. As regards the organisation, it was said : "The Company is not a team; rather it is a congress of individuals, with a one man's show. The company is run by a small family group. . . I don't honestly know what the policies are around here. I have always to feel my way around in doing my job. There is an iron curtain between the front and back door . . . I have been working for the Company for over 10 years and no one has ever told me how I was doing the job..." Such were the comments made by the supervisors.

The particular case was discussed against the general principles of industrial and business organisation, such as the Span of Control, Principle of Delegation, Ultimate Authority, Unity of Command, etc., etc. Then the whole situation was role-played and it was discussed whether the consultants were able to penetrate the smoke screen set up by the aggressive managing director whose role was played by the late Sri Gopal Rao. The consultants were criticised for failure to consider why the workers were so disturbed. In fact, they appeared to have dismissed this important and patent fact altogether. Instead they went along a blind alley and got nowhere. It was, however, argued that the cousultants were just pitched into a difficult situation; and they could not possibly have done better. The role playing opened up not only the basic characteristics of the situation but it also enabled the participants to have an insight into the character of the management.

This role playing was followed by lectures on some aspects of industrial relations in India, personality problems in industry and an evaluation of the whole programme. Sri K. Sreenivasan's lecture on Industrial Relations was a highly analytical piece, pointing out how difficult it was under the current social and economic circumstances to manage large numbers of persens in industrial life : of all resources, manpower is the most difficult to manage, because it is the most unpredictable, and then there is the difficulty of group psychology : "...if there were 100 people working under one roof, their total productivity need not be the same as that of 100 people working individually. A group of people coming together for carrying out common objectives and working together acquired their own specific characteristics, feelings, ethics and developed a sense of identity as a unit." Later on Sri Sreenivasan pointed out how the problem was further terribly complicated by inter-union rivalries : how these challange management and defeat the very purposes for which normal trade unionism should function.

Where Sri Sreenivasan breaks fresh ground is the new concept of industry that has come up in the postwar period : "... industry exists primarily for the production of goods required by the community and to sustain the national economy by providing employment to a section of the people. It means that *industry must be stable, efficient and forward-looking instead of being opportunist.* It must provide quality goods at reasonable prices and good working conditions and wages to their employees. Profit is recognised as a legitimate reward for the owners of the industry but only when the above requirements are fulfilled..."

This looks very much like what Henry Ford said, when he told a court of law that the Ford Motor Company was "*organised to do as much good as we can, everywhere, for*

everybody concerned to make money and use it, give employment and send out the car where people can use it, and incidentally to make money..."

When Judge Stevenson repeatedly asked Ford, if "your controlling feature is to employ a great army of men at high wages, to reduce the selling price of your car, so that a lot of people can buy it at cheap price and give everybody a car that wants one, Ford replied : "If you give all that, the money will fall into your hands, you cannot get out of it..."

Sri K. Sreenivasan did not go that far, but he did seem to imply some sort of Henry Ford philosophy for industry. He even seemed to be somewhat optimistic about the present state of industrial relations in India : "...I believe that industrial relations in India have today reached a stage where a level of social and economic equilibrium has been achieved and in which management and the trade union have understood the extent, as well as the limits of their powers and responsibilities."

Of course, few would agree with this judgment; in fact later on in the context of more recent developments Sri Sreenivasan appears to have modified his general position when he commented on the highly legalistic nature of industrial relations in India : "...there is no attempt on the part of the unions and the management to discuss their differences in a realistic and constructive manner and to find acceptable solutions..." Managements are not willing to concede even what is reasonable because they are afraid that any concessions on their part would weaken their case before a Tribunal..."

How it adversely affects industrial productivity is very clear; "...there is hardly any time in many companies that there is no dispute pending. Needless to say, such procedure is not only time-consuming but is also expensive..."

So far as the unions are concerned, the effect on their growth is still more adverse : "...the unions do not have any opportunity to become mature... they have not learnt to swim because they have never been pushed into water..." Yet the role of the trade unions in raising productivity is obvious, for the maintenance of good industrial relations is a vital factor in raising productivity. Sri Sreenivasan emphasises the idea of collective efficiency in which the unions can play a crucial role and without which wages and standards of living cannot rise.

Sri Sreenivasan went on to say how multiplicity of unions was extremely harmful to industry, how it led to deterioration of work relationship in the factory. 'Not only is productivity affected but if the workers are piece-rated, their earnings suffer and it adds to the bitterness of already strained relations. "The unions remain at an agitational level and members treat the unions as a sort of commission agents."

On Labour participation in management, Sri Sreenivasan has given an adverse judgment. Management is a highly specialized business and such participation would lead to a weakening of the whole decision-making process : "It is my view that this is not a workable solution. I believe that when people in India talk of labour participation in management, what they have in mind is not participation but consultation. A part of the support to this idea is based on a desire to prevent labour from taking an extremely political stand...what is necessary and desirable is not labour participation in management but the right of labour to be consulted on major as well as minor problems that are likely to affect their future..."

At the end of this series of lectures, an evaluation was attempted of the seminar and what needed to be done in the future. For the top management, it was suggested that there should be more of such seminars and of a longer period. For the middle management it was generally agreed that

there should be a four years' course of night classes, designed to give specialists in the one field some knowledge of other fields and to help them to progress. The first three years would be devoted to lectures on different topics, the fourth year would consist of case studies. The Canadian Management Association successfully runs such courses.

Among the subjects for discussion, besides personnel, industrial relations, management functions, psychological factors in industry, productivity and job evaluation were also suggested; and it was decided that all methods should be employed, including case studies with role playing, incident and situation processes, lectures, syndicate and discussions, management games etc., etc., and for the females, it was suggested that they should have lectures on business, child psychology, and health and beauty! Another topic suggested was the relationship between industry, the community and home.

This Seminar on Industrial Relations was followed by another seminar on Aspects of Top Management. The general theme of discussion was planning and decision-making; and a whole session was devoted to PERT. Two other topics were also considered: Human Relations in Industry and Top Management Controls. The women discussed The Impact of Industry on the Home and Community, and there was also a joint session (with the men) on Women in Industry.

The best part of the seminar was a lecture by Prof. N.S. Ramaswamy on PERT. He gave the principal uses of PERT and CPM as follows:

(a) PERT is used where the emphasis is on shortening and monitoring project execution time without too much concern for cost implication.

(b) CPM is used where the emphasis is on optimising resource allocation and minimising overall cost for a given project execution time.

Illustrating the potential benefits of this new technique, he gave the example of the cement industry in the Fourth Plan. Normally it takes over three to four years to put up a cement plant. If the time could be reduced by say three months, we would get an additional output of two and odd million tons, besides Rs. 40 million for further investment in industry.

Detailed discussion of PERT showed that it could be an excellent planning tool, compelling managers to do logical thinking, though it was certainly no substitute for managerial competence.

Tracing history of PERT, Prof. Ramaswamy said that in India also PERT was used by some of the progressive managements in the public and the private sectors. The Committee on Plan Projects has published information regarding PERT application in the Durgapur Fertiliser Plant. TISCO has used PERT in the relining of the blast furnace and it is understood that they were able to reduce down-time substantially. ACC is using PERT in their 5-million expansion programme and they were able to reduce time and cost considerably. Refineries apply PERT for maintenance. Hindustan Lever, Mahindras, Union Carbide, Glaxo and many others are using PERT now for a variety of jobs. Defence also uses PERT in construction work. PERT was, of course, evolved, he said, from the traditional Gantt Chart used for scheduling and progressing of activities. The major drawback of the Gantt Chart was that it could not show interdependence among any two or more of the activities involved in the task whereas the essence of PERT was to exhibit these interdependencies and to so schedule the progressing of the project to see that nothing was held up at any point. By a series of simple charts and illustrations, Prof. Ramaswamy illustrated beautifully how the PERT net-work diagram was drawn and used; and how the critical path showed that the longest time could be determined along with float etc. A further series of illustrations followed, showing how 'earliest expected time' and 'lowest allowable time' could be determined. He also showed

how procedures could be developed to reduce the project duration time with the minimum increase in the project direct cost by buying time along the critical path where it could be obtained at least cost. He has also shown a method of calculating the through time estimate for each activity: optimistic time, the unlikely but possible time if everything goes well, with one chance in hundred; the most likely time, the value of which is likely to occur more often than any other value; the pessimistic time: the unlikely but possible performance time, if everything goes badly, with one chance in hundred.

Prof. Ramaswamy has also worked out the steps for application of PERT. In his opinion the cost of PERT is negligible as compared to its benefits. In fact, most of the work connected with PERT, has in any case to be done. PERT is merely systematising the procedure, revealing bottlenecks much in advance so as to enable corrective action, which otherwise would have perhaps confronted managers at a crucial time later, to be taken in time.

An opinion is offered here that the failure to attain the targets of economic planning in this country is due to the fact that such techniques as PERT were not utilised : "...Our poor performance in the last 15 years in the planning and execution of numerous projects shows our inability to fix targets correctly and to achieve these targets with regard to time and cost. Inordinate delays have resulted in escalation of project cost, putting industrial development out of gear."

Prof. Ramaswamy has suggested that all applications for industrial licences, import licences and for such facilities as power, water, land should be accompanied by a PERT network diagram to be submitted by enterpreneurs and industrial managers along with other documents. In a Network made for such a purpose, the loss to the country in terms of production could be quantified for every month's delay in processing of such applications. Perhaps the tempo of industrial growth will be accelerated if bodies like the Planning Commission, Development Wing, Import Controller, Municipal Authorities, etc., also appreciate the usefulness of this technique and thus realise the importance of time element in the difficult situation of the country today.

In a developing economy where time is an important resource, PERT, *it has been argued, would increase the productivity of capital*, by a quicker conversion of input resources into outputs than would otherwise be possible. Prof. Ramaswamy again repeats: "Our performance in the three Plan periods in most of the projects has been a catalogue of delays, increased costs and lost opportunities." Of course, there is the other side, competently dealt with by Sri HVR Ienger in a piece published in the preceding issue of this Journal.

Prof. Ramaswamy went on to give a catalogue of the delays in time that have occurred and are likely to occur in many public sector projects; and he gave a whole table of public sector undertakings in which the total original estimate of Rs. 665 crores rose by 66 per cent to Rs. 1109 crores, due to these delays : "...a part of it at least could have been avoided by the application of scientific management techniques and timely decisions."

Discussing the scope for PERT with particular reference to the Fourth Five Year Plan Draft (alas, now dead!) Prof. Ramaswamy gave the following calculations : Out of an estimated outlay of Rs. 21,500 crores, organised industries have been allotted Rs. 5266 crores. Out of this, with the available know-how and technical facilities, PERT can be effectively applied in projects involving an investment of Rs. 4000 crores. With an assumed capital—output ratio of 1 : 1, the gross value of output would be Rs. 4,000 crores and the net value added of output at the rate of 1/3 of the gross annual value of output, Rs. 1333 crores. Assuming a saving of time through PERT of three months, the additional net value added on

account of this technique would be Rs. 333 crores. Further there would be savings in cost by better allocation of resources amounting to about 5 per cent, about Rs. 200 crores. Not calculating the multiple 'multiplier' effect on the effective economy as a whole from the speedy execution of projects, the potential gain from the application of PERT to the organised industrial sector would be of the order of Rs. 530 crores, against an expenditure only of about Rs. 40 crores on the training of technicians and appreciation courses for senior management personnel. *Among the many organisations mentioned by Prof. Ramaswamy for Training in PERT*, he also suggested the NPC and the LPCs

Apart from organised industries, Prof. Ramaswamy has argued that PERT could also be effectively used in irrigation projects, transport and communications, power schemes, Government regulating agencies, etc.

Not satisfied with only lecturing on the subject, Prof. Ramaswamy actually gave the participants a number of exercises in the application of PERT, analysis of network, computation of earliest and latest times, preparation of float tables, tracing of the critical path, etc., etc.

This was followed by a programme on the incident process, with an actual case in which the branch manager of a telephone company (also saddled with banking functions) chose to spend his time on an urgent repair job : he was asked to explain why he did not deposit cash with the bank, as per standing instructions.

There was another lecture in the series by Dr. Pareek on Human Development in Industry, in which the author discussed some of the new forces affecting modern management : separation of ownership from management; growth of trade unionism; undermining the authoritarian approach; increasing professionalisation of management : rapid growth of technology and technological change. Dr. Pareek discussed the main points brought out in recent literature on these subjects, the X theory and Y theory, sensitivity theory etc., etc.

He made out quite a number of useful points :

(a) Companies where workers work hard but they don't feel any pressure are generally successful companies.

(b) Any concern where supervisors show faith in their workers, productivity is high. However, there is no simple connection between attitude and productivity.

Prof. Pareek discussed at some length how laboratory training helps people to live through change. In this connection, he referred to the experiments at the SIET Institute at Hyderabad, adding that there were a number of qualified Indians who could give training in this field. Sensitivity training has been summarised as follows : "*Laboratory training 'unfreezes' people :* it helps them unlearn much that they have learned, so that they can change and help others to change. Such training first creates a kind of vacuum; the group (there should never be more than 20) is allowed to do whatever it likes. There is no agenda. After a brief introduction the trainer simply sits in the group and contributes when he thinks he should; he refuses to act like a traditional lecturer or teacher, and so will not take the initiative. This usually causes the participants to grow frustrated and angry with him, and he tries to bring these feelings out into the open."

When the participants finally give up trying to force the trainer into his traditional role, they compete among themselves for leadership and control. Sometimes one person will be accepted as a leader for quite a long period. But then this, too, begins to fail. Not everyone is satisfied with his leadership; it is questioned and criticised. During this stage the trainer is often ignored or, as it were, put to one side.

The final stage is when the group really becomes a group. Then no one person always takes the leadership; different people lead in different activities. Each person makes a contribution to the group. The group becomes integrated. Now the trainer is included as a valuable member of the group, with a special contribution to make.

The lecture was followed by a general discussion on *laissez faire* **versus** the authoritarian type of management. The seminar then discussed the emerging concepts of management particularly with reference to Blake and Monton's idea of the managerial Grid. Some men are concerned with people and some with production and some with both in varying degrees. The different styles of management produced different work climates in the organisation and the top management has to decide what kind of climate they would like to have in their organisation.

Some time was also spent in discussing motivational research, particularly the interesting work done in the field of achievement motivation : that is, the desire to excel, how it is related to higher entrepreneurial activity: ".. It has been shown by researches that a father who closely guides and supervises his son's activities, and is too much concerned with the details of how his son works at his problem, produces a son with a low level of achievement motivation. Providing enough freedom and opportunity to take moderate risk and helping his son to learn from mistakes produces a high level of achievement motivation in the son... McClelland has also made a study of different historical periods. He discovered that wherever the art and literature of a country scored high in achievement motivation imagery, within twenty to thirty years of that period there was increased economic activity in the country."

It was argued that if achievement motivation could be developed in people, say in groups of potential entrepreneurs in particular towns, it could be proved that in the course of time the economy of those towns would be beneficially affected. The characteristics of an achiever were discussed at some length : "The achiever always wants more time; he wishes that a day had 25 hours...An achiever tends to persist in adversity. If he cannot overcome an obstacle he will find some way around...An achiever is oriented towards the future."

At the end of it, Miss T. Dawson delivered a highly learned lecture on 'Women in Industry' : the tremendous physical and psychological adjustments they have to make on entering industry. In the course of the lecture Miss Dawson quoted Nietzche,* and the classical economists on wage being equal to the marginal product of labour : "...The need for welfare measures for women labourers arises due to the profit motive of the employer, that is, of having a labourer at the cheapest cost." Employers have also to pay more for women workers on account of guaranteed benefits, provision of creches, etc., etc. Miss Dawson supported her thesis by a large number of statistics, though one wishes that the statistics used by her could be more recent. To some extent, Miss Dawson's attitude to women in industry is surcharged with emotion : "...our working women have come to stay as a class, they will be organised and will rise with men to fight the battles of the new proletariat. They should be given opportunities for getting vocationally trained. No attempt has been made to transform women workers into a scientifically recruited body. It is especially so when that section is compared to men workers. The nature of a new race depends upon women. That nation cannot rise where the social economy leads to the degradation of its women. The people perish who drive their mothers underground and employ them without shame in low occupations."

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* "God created woman; and boredom did indeed cease from that moment, but many other things ceased as well."

Miss Dawson devoted some paragraphs to working women in Japan and the Netherlands but everywhere women's wages are lower than those for men.

Quite a useful discussion followed about the role of the wives of managers among the workers. Miss Dawson felt that the workers should try to influence the husbands through their wives. One wife present said frankly, "The manager's wife would have to come down to the worker's level if she wished to help. Who wants to do this ?"

This was followed by a lecture by Prof. Natarajan on 'Top Management Controls'. He made it clear that he was not using the word control in the sense of restricting or constraining; rather it was used in the sense of seeing whether something was or was not going according to plan; and the plan must include certain standards by means of which the control is exercised. Prof. Natarajan detailed the five essentials in management as planning, organising, activating, directing and controlling. Detailing the importance of controls, Prof. Natarajan mentioned materials inventory; the control of men through manpower budget, skill budget, training budget, wage budget, and what he called a motivating budget; production control; sales control; financial controls; and a series of administrative controls including work study organisation, research etc.

Going somewhat deeper, Prof. Natarajan tried to distinguish between controllable and non-controllable elements : "...The control must be controllable...sometimes what you think is non-controllable is in fact controllable." He added that the control must be continuous, self-regulating, commensurate with the results and quantitative in its evaluation.

He detailed seven essentials in any control. It should reflect the nature of the activity, should have expeditious reporting built into it, be flexible, economical, understandable, ensuring corrective action : what is most important, it should reflect the organisational pattern.

Regarding techniques of control, Mr. Natarajan discussed the budget dealing with allocation of resources, besides the use of a wide variety of model charts, input-output analysis, feedback, the biological method, the increment analysis, internal audit, enterprise self audit etc., etc.

A discussion followed centering on the point that the top manager in India has often to concern himself with day to day problems; and the problems in India are generally more difficult because the type of available services is poor, education is not adequate, and technological changes are slow.

Prof. Natarajan commended the Russian system of feedback : the Russians claim that such a system increases efficiency by as much as 30 per cent.

This was followed by a discussion of the case relating to Montana Machinery Manufacturers, who, prior to the war, manufactured quality equipment under a very simple system of direct supervision. The end of the war had a sudden impact on the company's whole organisation pattern, in fact, its employment, output etc. The executives of the Company thought that they had done an excellent job but they found that another company was manufacturing the same kind of tanks and the same number with only 1200 employees as against their 1500 employees. Further the other company was making substantial profits as against the meagre profits of the company under consideration. The problem was one of postwar adjustment to conditions of the market and the consequent need for re-organisation.

Summing up, Prof. Natarajan said that he was beginning to feel that most seminars were a waste of time. "Do people take away anything with them ?" It was an "uphill task, because not sufficient top managements are really interested in management as such. In Russia if a new idea, a new technique comes out, it is seized on and tried and tested,

and made as widely known as possible. There they were anxious continuously to improve the quality of management."

However, this may be, the seminar had an excellent speech from Sri V V Giri, now Vice-President of India. Describing labour as his '*first love*', Sri Giri said : "Both sides should understand that only on the proper and efficient running of the undertaking alone will they be able to achieve their object—whether it is a rise in profits or increase in wages."

Referring to collective bargaining and compulsory adjudication, Sri Giri said something that still remains very significant : "...I have always emphasised that collective bargaining and arriving at solutions through mutual negotiations and discussions is the best method of solving differences and disputes between Labour and management... I have always believed that compulsory adjudication is enemy Number One of the working class and resort to this machinery for solving differences or disputes has done much damage to the growth of the trade union movement, and will not promote good industrial relations, nor provide the basis for lasting peace. The machinery, instead of bringing out a final settlement to a dispute, always keeps the parties discontented and perpetually at war. There can only be at best transient truce but no lasting peace."

Sri Giri made some significant suggestions for labour-management co-operation : "...Good faith must be constantly demonstrated ..It must be clearly understood that this co-operation cannot serve as a substitute for fair wages or decent working and living conditions... Management should share with workers the gains from higher productivity... Management should give the workers necessary information for their intelligent participation in the affairs of their undertaking."

It is obvious from the above analysis that through the organisation of these Seminars and the publication of their proceedings in the pamphlet on Aspects of Top Management, the Industrial Team Service of the St. Marks Cathedral (Bangalore) has done a remarkable piece of social service ●●●

Talking of Management

This is an absolutely first rate Book, recording as it does (straight from the oven) the experiences of some of the top men in Indian industry, ruling the empires of the IBM World Trade Corporation, Balmer Lawrie, Burmah Shell, Imperial Chemicals, Imperial Tobacco, Hindustan Lever, DCM, etc.

It is true that most of these top men are foreigners and practically all of them control companies which are branches or subsidiaries of foreign, for the most part British Corporations, but as the contributions show that living in India and earning their bread here, they have acquired a second nationality : one is really struck by the breadth of their outlook, the generosity and progressiveness of their attitude and their down to earth grasp of business affairs.

In fact, the downright intellectual honesty of these distinguished contributors looks like a refreshing wind from another sphere. It is only the Chairman of the ICI (India) who has the courage to say : "Let

*A selection of 13 talks delivered by distinguished visitors at the Administrative Staff College (Hyderabad, India) ; Published by Asia Publishing House, Bombay, pp 133, Price Rs. 12/-.

me mention only my idea of the attitude of mind which a No. 1 should have. First, *workers until recently have had a raw deal in this country*, and provided they will do a fair day's work they are entitled to a bigger slice of the cake." It is the General Manager of the Burmah Shell who says: "...We all know that great changes have taken place in the last decade or so in ways of thinking on the real purpose of a business enterprise and it is true to say that no large business is any longer a concern purely private to itself..."

One particular contribution, a series of four talks by Sri Bagaram Tulpule, President of the Mill Mazdur Sabha, Bombay, needs to be specially mentioned. It is in the fitness of things that the Administrative Staff College should have invited a distinguished trade union leader to speak to managers of Industry on Industrial Relations in India.

Apart from his association with the Quit India Movement, Sri Tulpule is a first-class (first) alumnus of the Poona College of Engineering. Seldom does one find such an honest, straightforward and, at the same time, strong and progressive exposition of the Labour point of view.

The following extracts from Sri Tulpule's talks have, therefore, been selected, largely for their significance in the context of the national economy, and partly as exemplifying this labour leader's intellectual integrity and strength :

"...The initiative in problem-solving has to come from the side of the management just as the initiative in problem identification normally comes from the side of the union... If joint consultation becomes talking about trivialities, then trade unions and workers have no interest in it... As one person very picturesquely described it, if the field of consultation is going to be only to the extent of investigating whether there is soap in the bath-room or not, then nobody is going to be greatly interested in it... So many Management Councils find they had no agenda before them... Just as on the side of the workers there is an insistence that at least a certain minimum scope should be given for consultation, on the side of the employers there is a reluctance to have recourse to any degree of consultation at all... After all is said and done, a question might arise as to why have joint consultation at all. In a country like India, it may be said workers are ignorant, workers don't have education, the Trade Union leadership is from outside, they have no real stake in the welfare of the industry—these are the usual arguments that are advanced both against the leadership and against the Trade Unions... In an under-developed country like India, what are the incentives or what are the inducements which you are going to offer to workers in order to evoke their maximum response to this challenge of planning and development and improving productivity and these various other things ? In India, today, financial incentives are not large enough to meet their requirements and in the foreseeable future, we cannot see them advancing at a rate which will be fast enough to evoke any enthusiasm on the part of the workers. It is, therefore, the aspect of creating a feeling of belonging among the workers in this whole productive set-up that becomes more important and this I believe is the overriding importance of doing our best to make this process of consultation and participation succeed .. "Well, if you think that it has not worked, why do you ask for it?" We ask for it, firstly, because we feel that it can work. So far it may not have worked, but the difficulties are not intrinsic to the process of consultation. If the Trade Unions are to discharge their obligations within these economic limitations, then certain psychological, certain social satisfactions will have to be given to the workers, certain conditions will have to be created where the worker can have this feeling of belonging in this whole productive set-up, and that is where we feel that, even if we have made mistakes, we shall have to try to continue this experiment and we shall have to try to make joint consultation succeed."

The above extracts have been printed here at some length because of the vital interest of NPC in the advancement and welfare of Labour and also because the point of view represented here appears on the face of it eminently reasonable and practicable.

The really juicy pieces, however, are those dealing with management, particularly, the ones which deal rather intimately with the *topman's concept of what the topman is or ought to be.* Of course, in the background there is a studied attempt—in some cases very artfully done—to put forward the image of the companies these great men represent; but this appears quite natural, and nothing with which anyone can find fault.

Practically all of these pieces are full of great humour which shows that whatever words these people use, *the prime characteristic of the topmen appears to be good humour.* Further, from whatever each one of them has said, it is very clear that *whatever else may be the truth, each one knows his job as thoroughly as it can be known.* This gives us another lesson that to go up to the top and, above all, to remain there, an absolutely thorough knowledge of the job and a confidence to do it well, are essential characteristics in the topman. Also in spite of a little bit of sales talk in a few of these pieces, practically most of the pieces by top managers are both in form and substance elevating and penetrating. In fact, we have plagiarised many of the quotable passages and printed them as fillers in this issue of the Journal.

The Administrative Staff College must be complimented on the excellence of their selection of speakers ; and the Editor, Prof. MS Doraiswamy, now of UPSC, it must be said, has done a really remarkable job.●●●

Profiles in Productivity

For the Third Time, *The Baroda Productivity Council has brought out its profiles of Productivity. Congratulations are not sufficient for the painstaking work this little volume embodies. Rightly the Editor has observed that the Boys who have accomplished these magnificent increases in produc-

*There is hardly a reference—except the Shakespearian 'Once again we present...' (the Editor's page begins with these words)—to the important fact that this is, so far as our record shows, the third in the series of Profiles in Productivity. In Vol. III No. 3 of the Productivity Journal, the Second Issue was reviewed as follows :

"This is the second in the series : the first publication on 'Profiles in Productivity' was brought out by the Baroda Productivity Council in 1965. It was a marked success; in fact it was a continuation of NPC's own adventure in the field : the "Impact of Productivity." The Baroda Productivity Council has thus earned the unique distinction of providing industry with good case studies, pointing the practical way to increased productivity. The studies cover the improvements brought about in Alembic Glass, Jyoti, Sarabhai Chemicals, Alembic Chemicals, and Sayaji Iron & Steel Company. The case histories are concerned with material substitution, materials handling, work study, wastage reduction, quality control, cost accounting, productivity in agriculture, etc. One wishes that the book had a Contents Page or Index : it's an avoidable defect in an otherwise beautiful publication.

Incidentally, the Baroda Productivity Council has used the opportunity in announcing that they have undertaken the preparation of an English-Gujarati dictionary of technical words used in connection with Productivity."

This shows, how, like all human beings, we in NPC and the LPCs have a short memory. A friendly complaint was made at the last LPCs Conference that NPC publications had not even noticed the *Profiles in Productivity*; and we did not contradict either, for NPC and LPCs are a family and it would not be proper for an elder brother to contradict an enthusiastic younger brother, who is repeatedly putting up such excellent profiles ! We can only offer our heartfelt congratulations, with a promise to pinch, when we bring out a second edition of ...

—Editor

tivity "have done this through a combination of an attitude of mind which refused to accept things at their face value; a daring spirit wanting to put their engineering knowledge and skill to the acid test of performance, and above all a burning desire to make improvements. In all humility we congratulate them."

The publication has an underlying recession-consciousness which is very healthy, though in sentiment somewhat pre-Keynesian. Referring to it as "our first recession,*" calling it "a new and frightening experience," the Editor feels that it is "perhaps a good thing...a god-sent opportunity for the Productivity movement...the technicians to prove (to) themselves..."

The President of the Baroda Productivity Council, referring to the "unprecedented recession," draws pointed attention to the marked anti-productivity phenomenon : "a spectacle where machines and men are tending to remain silent without work". He adds, what is significant : "During the past 3-4 years, we have retreated from our responsibilities...It is only a dynamic society, which, by and large, could be tuned to take out of nature and society the means for better living .."

* Most of us were not born, when the Great Depression overtook this country during 1929-33. In this Depression, the harvest price of wheat in parts of the country (particularly the West Pakistan area) reached the level of one Rupee a maund, and there were no buyers !—Editor

It is happy to feel with Sri Srivatsa that "...India has always survived .." More important is his new productivity philosophy : "Productivity by avoiding waste, ostentatiousness and jealousy, self-interest and manipulations; and to feel that there is much more necessity to give than to take..." '

Then follows a series of case studies from Jyoti, Alembic Chemicals, Gujarat Refinery, New India Industries, Sarabhai Chemicals—all statistically illustrated with technical details and resulting improvements and gains. The case study material is supplemented by a series of articles, showing how Statistical Techniques Help Saving in Coal Consumption, Reservation Procedures on Railways, Productivity From the Drawing Board (contributed by British Productivity Council), Programmed Instruction in a Self-Correcting Teaching System (University of Sheffield, Department of Psychology) : all the material is again illustrated.

The volume also contains a Productivity Digest, covering 12 Ways to Cut Avoidable Absenteeism, Do You Review Decisions Made by Subordinates ?, Workers' Participation in Hindustan Insecticides, Motivation Today, etc., etc. As if this were not sufficient, we have a whole section of Book Reviews : it shows conclusively that knowledge of Productivity is not limited to NPC and its regions, but it is fairly widespread among the LPCs; and in the Roll of Honour, the Baroda Productivity Council, through its *Profiles* and other like literature, has earned a high place for itself. ●●●

Khadi Gramodyog*

THIS is a remarkable publication, both for its intellectual vigour as also the cleanest and the most powerful exposition of the case for Khadi and Village Industries. UN Dhebar's analysis of the position, in the changing context of the times, deserves to be written in letters of gold as Gandhiji used to say; that this is no exaggeration can be seen by anybody who reads the piece. Uniquely free from nostalgia or sentiment, Dhebar shows almost a Shakespearian grasp of the dynamics of society, and the urgent need for emotional adjustment among the Gandhians who swear by Khadi and Village Industries ; yet by powerful strokes of analysis, support-

**Khadi Gramodyog*, the Journal of Rural Economy Anniversary Number 1967.

ed by hard-hitting statistics, Dhebar proves conclusively the case for the continuance of unstinted support, in the social interest, of Khadi and Village Industries : "...At the rate of growth envisaged in the Plan, calculating the population rise at 2 to 2.2 per cent or thereabout, there is no hope for the lowest 30 per cent of our people securing a national minimum of Rs. 35 per month per capita *till the end of the century*...."

It is in this context, that the profound economic analysis of K Mukerjee that the subsidisation of Khadi and Village Industries must necessarily be of the nature of a holding operation, needs to be read. If Dhebar's analysis is right, we have to sustain this holding operation till the end of the century ! Can we then call it a holding operation ?

More than 30 years ago, Dr. Gyanchand, who has also contributed to this Volume—now he is much older but still *talks of* the *Toofan* of *Gramdan*,** considering it a sort of social revolution, this great economist wrotea Book called *The Teeming Millions*, in which he argued that in a country with a population in hundreds of millions and a registered factory employment only of a few million—at that time it must have been less than 2 million—small industries of all kinds, some with advanced technology and many with not so advanced a technology, would necessarily have to take care of most of the population : we are quoting from memory, the book being out of print.

Reverting to Dhebar's thesis on the present position and future programme of Khadi and Village Industries : he deals in the first instance with the Recession that has equally well hit the Khadi and Village Industries. But he is more conscious of "a shift in the power equation. Voices are being heard against the need for these programmes in higher quarters." The intellectual honesty of the man is remarkable, as alsohis acceptance of the dynamics of life. .."It will not be right for us to expect the country to accept the need for it as a matter of routine ; nor will it be right for us to expect this merely because Gandhiji gave khadi that prime of place that they will take it for granted even in the rural areas. Once the spirit of questioning which is the sign of life develops, as it must with the spread of education, with the expansion of organised industries and with the development of political consciousness, the people would want us to explain to them why they should accept khadi and village industries programmes in the new context .."

The present social and economic position could not be better described and, in fact could not be even better justified :" ..we should in the first instance understand the implications of the climate in the country. Industrialisation—rapid industrialisation—is on. It is a new age that has set in India whether we like it or not, Its vocabulary is different. Its aims are different. Its norms are different. Modern thinking, as it is called, believes in a life of plenty. This is the implication of industrialisation. It aims at ever increasing supplies to meet the ever growing material needs of the community. In India it has a further justification. Our people are short of supply in every direction and if the country has to cope with their emergent needs for even essentials of life within a reasonable time, it is the view of a large majority that it is possible to do so only on the basis of rapid industrialisation. The process of industrialisation will march ahead with every passing year with increasing rapidity.."

The advice to the Gandhian believers in Khadi and Village Industries is given in straight terms :".. It is necessary that we understand this process and the basis of it. In a complex society with science and technology marching forward, it is futile to turn a blind eye to the conditions round

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** At a time, when our economic and political systems are in a state of great disarray, the fact that gramdan movement is going ahead and has resolved to take the rural economy by 'storm'—*toofan*—may be taken to be a really bright spot in a scene of otherwise unrelieved gloom.

about us. We can only function by being continuously alert about those conditions and emphasising the relevance of our programme in the context of those conditions..."

With respect to the village economy and Gandhiji's dream of it, and the position of Dhebar and other Gandhians in the matter, the statement of the thesis is worth a repetition : "...We have also to realise that new processes are at work in the village too. Indian village of 1967 is not the village of 1947, nor will it continue to remain the same in 1987. Moreover, the village is becoming the subject matter of attention of those who are ardent believers in industrialisation as a way of life. Every one speaks now of agricultural development as if it were an industry. Science and scientific practices will now enter the village in a big way. It is in the interest of India and more especially in the interest of the villages that science should enter in a big way in the villages. It will be a mistake to think that it will go against the dream of Gandhiji. If it is rightly handled, it can bring the dream nearer. But then every change must of sure produce a new leadership and the new leadership can orient that change in its own light. Khadi and village industries may suffer if only we do not ourselves take a lead in scientific orientation of the village life on our own lines or we dont keep a live touch with it. We have to carry conviction to the new leadership that in the context of Indian conditions the khadi and village industries programmes have a relevance even if maximum scientific development takes place..."

The economics of handspinning are explained with no reservation and in real terms : "...The handspinning programme is perhaps one of the programmes that can offer to this great mass of people a helping hand...The goods that are produced with their assistance are no doubt costly as compared to the similar goods in the market . . . Handspinning on traditional charkhas assists about a million people and adds to their scanty income about Rs. 30 to Rs. 40 every year...these Rs. 30 or Rs. 40 or Rs. 50 in India have a value of their own. The average annual income of an agricultural labourer comes to approximately Rs. 100 in India and the additional income of Rs. 30 or Rs. 40 or Rs. 50 is by no means a trifling contribution to his level of living....."

Dhebar supports his case by quoting at length from the Report of the Estimates Committee of Parliament : "...The Committee note with concern that in spite of a decade and a half of planning the country is still faced with the problem of vast and increasing unemployment in the villages... With an estimated increase of 53 million in the labour force during the Fourth and Fifth Plan periods, the bulk of which will inevitably come from the villages, the problem will soon acquire a vast and unprecedented magnitude.

Foreign experience has been well quoted in support of subsidisation of low rural incomes : in such advanced countries as Sweden about half of the owners of small holdings have income from social security Dhebar also argues powerfully for the encouragement of such subsidiary occupations as cattle breeding, dairying, horticulture etc., which in countries like Switzerland and Finland provide the farmers with nearly 75 per cent of their gross income. Over some pages which are worth reading, Dhebar mentions a number of subsidiary industries that can be easily developed on the basis of materials available in the villages.

The case finally is squarely argued on the basis of efficiency and the capacity of the Khadi and Village Industries Organisation to deliver the goods: ..."Khadi and Village Industries Commission is a service institution and not an industrial organisation. This difference has always to be emphasised. Part of the misunderstanding that prevails is due to lack of understanding of the difference between the role of an industrial organisation and a service institution. Our

masters are the artisans. We are trying to assist them in various ways and fulfil this role earnestly, devotedly, efficiently and consciously..."

"...The time is against us and we owe it to ourselves, our philosophy and programmes that we try to make up for the lost time. Khadi and Villiage industries cannot exist independently. They have either to demonstrate their potential usefulness in utilisation of idle manpower resources, providing supplementary incomes to the village mass on a reasonable scale and even absorb a good proportion in full-time occupation or be set aside. The developing agriculture and animal husbundry open out opportunities for us to expand the processing industries. The instrumentation that we possess for that purpose has to march with the rising level of technology in the country and has got to deliver goods on the two fronts, viz., providing worthwhile opportunities to idle manpower and converting the raw materials into goods and services which the local community have to buy and can buy..."

With regard to Dhebar's position that the goods and services must be brought by local communities, Dr. Lokanathan, in a paper published in the same volume. has stated, the other side of the case, of course in 'somewhat strong words' as he puts it. But his position is worth restating. "..... Let me restate that the problems thrown up by rural poverty cannot be solved by the present methods of developing cottage industries nor by the present pattern of thinking of the leaders of the Khadi movement. *Their obsession wtih the means tends to obscure the ends, for there is no virtue in having self-sufficiency in a village.* To say that the people in the village must buy all the goods they need from villages is both impossible and unjust ; impossible because no village can produce all the things that the villagers want and unjust because if it is attempted, it will be ruinous to them. Take, for instance, the principle favoured by some that Khadi should be sold only in the village where it is produced. The utter impossibility of this objective is clear from the fact that today such success as has attended the khadi operation is due to the enormous sales effected in the major cities in India. From this we should learn a lesson. Whether a product is produced in the village, small town or large town, we should take full advantage of the markets wherever they may be. Utilisation of local resources, local labour, local skills, local management, local government facilities, etc., is all very desireable, but to say that everything for the village should be produced within the village would not only be uneconomical but unsocial. It would bring a social disaster because the village, in-grown and insulated, would recede further into ignorance and backwardness..." This is. of course, not quite fair to Dhebar, but the argument as stated by Dr. Lokanathan is extremely sound.

In fact, from the economic and social standpoint, the position as stated by Dr. Lokanathan is the logical as also the most practical under the Indian circumstances. He begins by saying that "Despite 15 years of planning, the problem of rural poverty is still with us." Very profoundly and very bitterly said !

Then the various facets of rural industrialization are stated in very clear and precise terms. "...Rural industrialization has many facets. The organisation of cottage industries, utilising the skills of craftsmen with a view to producing better quality goods which can meet the local as well as the neighbourhood urban demands, can go some way to provide employment and also additional incomes to the rural community. The establishment of rural industries to process local material is another important aspect of rural industrialisation. A third aspect is the development of skills of the craftsmen through technical and other education with a view to making them more efficient in their work, thereby enabling them to get more income..."

The strength of the case for rural industrialisation becomes very strong because as Dr. Lokanathan put it : "The social costs of urban industrialisation are serious..."

Dr. Lokanathan is rather critical of the position taken by Khadi and village Industries protagonists. For instance, the place of power or the place of machinery in the development of rural industries is very obscure, and is made more obscure by a compromise which is accepted by the protagonists of the khadi movement without economic, social or moral justification. They of the movement are prepared to accept power for carding and certain other operations, but not for spinning. Is it that they are against power as such or is it that they think there is a special virtue in handspinning ? Would they rather allow people to remain poor than give up their pet theory of handspinning ? In other words, what is important ? Is it the elimination of poverty or the perpetuation of methods claimed to be effective in removing poverty ?..." The whole position about rural welfare and its correct position in the social economy is clearly stated by Dr. Lokanathan in unambiguous terms : "...The whole trouble about the people who interest themselves in so-called rural welfare is that they presistently confuse between means and ends. What after all, is the end of all our activities in the rural areas ? It is to eliminate poverty, reduce arduous physical labour, give sufficient opportunities for education and recreation and through these means bring some joy into the villagers' lives. Clearly this cannot be done by clinging on to outmoded and wasteful methods of production. We have to develop industries with methods which utilise local skills as fully as possible but which do not create problems that inevitably arise in the wake of industrial growth in urban centres. We should, therefore, boldly take the stand that machine as such is not bad, nor power as such injurious; people working together in a small factory as such is not a sin. On the other hand, we must equally boldly stand up for all means which increase the output per worker without uprooting the worker from his home or disrupting his family life and without creating hostile conditions of living..."

If the point of view is corrected as advised by Dr. Lokanathan, rural industrialisation has a great future. "...with this shift in the point of view, rural industrialisation can progress better in the future than it has done in the past. One can visualise greater emphasis on processing of agricultural product within the rural community—many more small plants to dehydrate vegetables that are now running to waste, to preserve and process fruits or vegetables or to turn milk into dairy products such as ghee, butter, cheese and so on. Again, as in the case of milk products one could visualise a group of villages joining together in setting up a modern well organised poultry industry..."

Dr. Lokanathan has argued for a 20 or 30 year Plan in which we 'should evolve methods of permanently improving the welfare of the rural community, using the emerging market townships as the spearhead of a widespread drive for rural industrialisation.

There are many other useful articles in this Anniversary Volume of *Khadi Gramodyog* Journal, particularly the one on Economic Development and Small Industries by K. Mukerjee which has already been referred to. This deals in some depth with productiviiy and wage differentials in a detailed and significant manner.

The Editor of the Journal deserves to be congratulated on covering such a large range through a number of intellectuals of very differing backgrounds. The Editor's own position appears to be full of contradictions, commencing with an editorial which is a poetic Dedication, in which he sings with considerable pathos : "...In the twenty-first year of freedom, poverty, hunger, privation, pestilence, squalor and ignorance continue to stalk the ancient land of Buddha, Mahavir, Asoka, Gandhi, Tagore and Nehru .." There are tragic references to the fall of social

norms, the decay of national character, and the consequent need for "a joint venture on the part of right-minded persons" (or probably like-minded persons) for thinking out "corrective measures" and for taking "bold and decisive action." There are references to the slowing down of economic progress and "the full flowering of national genius," and there is a call for a new and dynamic approach.

Then Sri JN Verma, the Editor, in a signed article printed at the end of the volume, goes over to a factual analysis of the Indian economy, "At the crossroads" : "As we scan the credit side of the balance sheet...we find a laudable record. The average agricultural growth has increased to 3.9 per cent from a stagnant rate of 0.5 per cent prevailing before 1950. There has been a rise in food production by 61.8 per cent from 549 lakh tonnes in 1950-51 to 890 lakh tonnes by 1964-65*... The yield per acre of food-grains increased fom 1,219 lbs in 1949-50 to 1,669 lbs in 1964-65. The production of cash crops has risen by 74.9 per cent...The irrigated area has increased by 2.8 crore acres to 8.2 crore acres. The area under improved seed has risen from virtually nil to 12 crore acres... About 30 per cent of the country's population can read and write, nearly twice as many as in 1947. The number of children going to school has more than trebled. The generation of electricity has gone up five times. One out of 10 villages has electric supply now as compared to one out of 150 before 1951... There has been 15 times rise in the output of aluminium. As a result of the stepping up of health services, the expectation of life of the people has risen from 32 years to 50 years..."

Many of the advances in economic magnitudes have, of course, been cancelled by extremely large increases in population; therefore it should not be considered "baffling' that despite large investments, "the number of unemployed registered a higher level at the close of each plan." Under such circumstances, the plight of the middle class was bound to be deplorable and the economy must show contradictions and imbalances, unless the leaders of the community are possessed of Gandhian wisdom, which we were deprived of in 1948 by a cruel act of fate. Gandhiji finished his mission by winning independence for the country. It was left to commoner mortals to develop the country. Luckily for quite a long time, for nearly two decades, we had at least for three-fourths of the period the unusual dynamism, integrity and broad-mindedness of the late Jawaharlal Nehru. Now politically and economically, we are in a period of Recession; fortunately this Journal shows from the dynamism and quality of thinking of such men as Dhebar that intellectually and emotionally, at least, there is still a fairly thorough grasp of the imperatives of national life : it is rather surprising that such men as Dhebar have left the Central Platform of Power.●●●

*Now we are in the region of 950 lakh tonnes, which is the estimate for the current year

The NHS and the CHS

I have had sober and serious senior medical men agree with my suggestion that possibly up to 80 per cent of drugs handed over to patients could just as well have stayed in the chemists' shops for all the benefit they bring to their consumers. Incidentally, Russia, that nest of super-socialism sees nothing wrong in making her citizens pay the market price for their drugs—except, of course, in the case of the young, the old, the chronic sick and the pregnant.

(Prescriptions : The Right Decision)
DONALD GOULD
New Statesman, 19 January 1968

ENTERPRISE*

A RATHER unusual journal, both in its name and quality of material and presentation, the *Enterprise* is the organ of the Vidarbha Industries Association, published in furtherance of its desire to achieve a rapid and broadbased industrialisation of the Vidarbha region in particular, and of the State of Maharashtra in general. While this is certainly a very laudable objective, the striking thing about this Journal, beginning from the cover through textual material and cartoons, is that somebody is surely using his imagination, creatively and progressively, sometimes a little poetically, as shown in the following extract: "...today, innumerable islands of achievements adorn the geography of India...testifying to the miracle of Plann ing. In the lengthy ledger of Credits, many entries are enshrined—thanks to three 5 year Plans which should have produced a buoyant Balance-Sheet of solvency.

But what started as the sacred journey of the Ganges to meet the sea, soon became an Odyssey of a wandering mendicant.

The perspective of planning was lost like the proverbial needle in the haystack of pompous papers. The priorities of planning were derailed in the shunting, shuttling and shrieks of debating drivers. The idealism of planning was unrecognisably defaced with the tar of faked pragmatism. The inspiration of planning became an illusion of idiocy."

This is rather too hard, for when all is said and done, India is a democratic country and all of us are responsible for all that has happened. Both the credits and the debits are ours, intellectually and emotionally.

We say this becsause the guidance as also the editorship appear to be very obviously of unusual quality. Practically the entire text material shows a depth of analysis and historical knowledge of industry, both nationally as well as regionally, that are really very rare in this country. Behind everything that has been said in the few issues published so far, there is a background of research; and it's all illustrated in a most colourful and lively manner, as shown in the cartoons printed here, by courtesy of the Editor.

The Journal is singularly free from any pettiness. There is hardly any acrimony regarding the private or the public sector: it just gives a feel of going forward, of the resurgence of industrial life in Vidarbha, of a creative collaboration with all concerned (Government including).

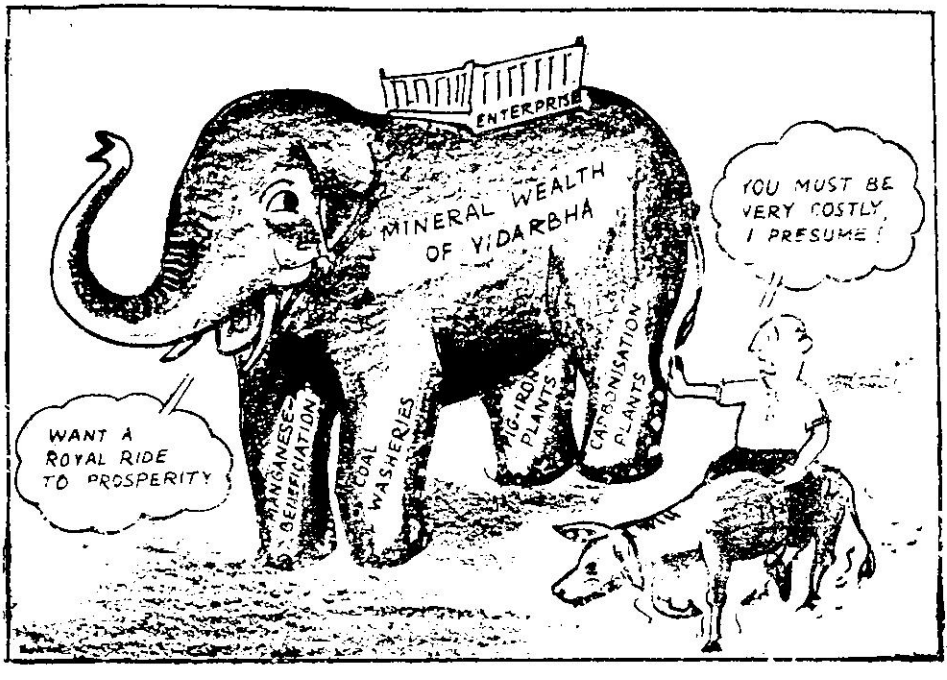
And the Government of Maharashtra deserves to be congratulated, for once in the history of government in this country, a State Government goes out of its way to place all the cards on the table, in response to bona-fide public criticism. There is a story of Lord Keynes: When he was an officer of the British Treasury and bursting with information and enthusiasm, he was snubbed by his superiors, who asked him to write nothing in particular in 'cold' official type memoranda, in response to public demand for official information concerning matters affecting the people.

By and large, governments in India continue working in the same British bureaucratic tradition; but what has appeared in this Journal in the name of the Government of Maharashtra is a happy break with this barren tradition. In its September 1967 issue, the *Enterprise* wrote a Leader Feature, in its usual poetical style, on the muddled mosaic of mining in Vidarbha, calling upon the Government of Maharashtra to order a full scale exploitation (exploration in the first instance) of the Ruhr of India, Vidarbha, as Sri Chavan had promised, when he was Chief Minister of Maharashtra:

"What could be the industrial condition of a region which has a known reserve of 5,000 million tons of Coal, more than 44,000 million tonnes of estimated reserves of newly located deposits of Iron Ore, holds 27.3% of the entire Manganese reserves of India ? How

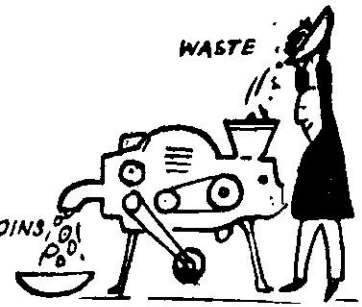
* Journal of Vidarbha Industries Association, Nehru Marg, Nagpur-1


NOT WORKING
INCOMPLETE
CLOSED DUE TO RECESSION
SHIFTED FROM HERE
NO SALES, SCRAPPED
SCRAP FOR SALE


ENTERPRISE
MINERAL WEALTH OF VIDARBHA
MANGANESE BENEFICIATION
COAL WASHERIES
IG. IRON PLANTS
CARBONISATION PLANTS
WANT A ROYAL RIDE TO PROSPERITY
YOU MUST BE VERY COSTLY, I PRESUME!


NO TOBACCO GROWN HERE
"AS VIDARBHA WILL NOT INCREASE TENDU, BIDI INDUSTRY MAY DIE. LET US BE READY WITH THE ALTERNATIVES OF TOBACCO SMOKING"


NO FEAR OF CANCER NOW AND NO FEAR OF GUILT IN SMOKING BIDIS ... THE PACKING IS LIKE THE BEST CIGARETTE ... I CAN TAKE THE TIN TO MY CLUB
CLUB
GOLDEN FILTER HEAD BIDI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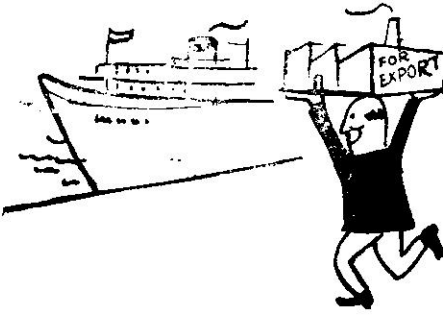
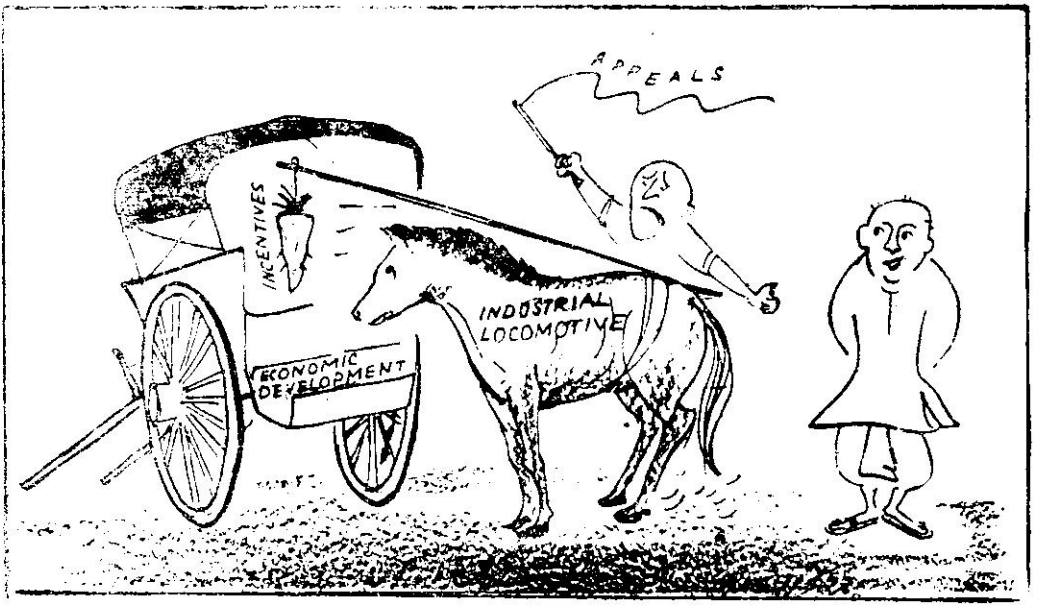
GANGAJAL FOR EXPORT

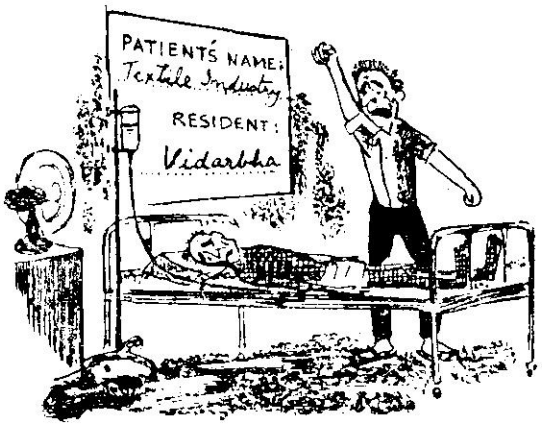

FOR EXPORT


I WANT A REPORT ON THE REPORT, REPORTING REPORTED PROSPECTS OF FOREIGN MARKET
REPORT


REPORT
REPORT


SHORTAGE OF RAILWAY WAGONS
CUT IN SALES
WAGES
BREAKAGE IN TRANSIT
CANT YOU WALK WITHOUT STICK ?
MINING INDUSTRY
PRICE INCREASE BY 3 RED ON


APPEALS
INCENTIVES
INDUSTRIAL LOCOMOTIVE
ECONOMIC DEVELOPMENT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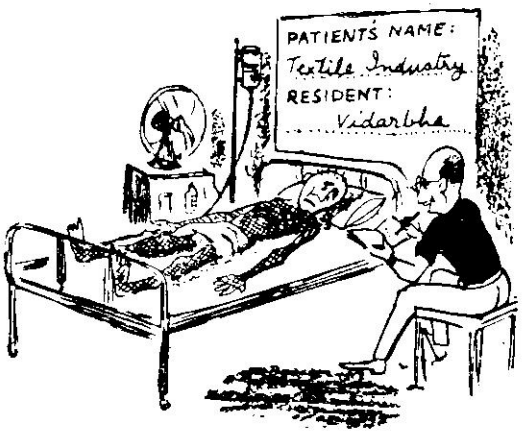
RESIDENT:
Vidarbha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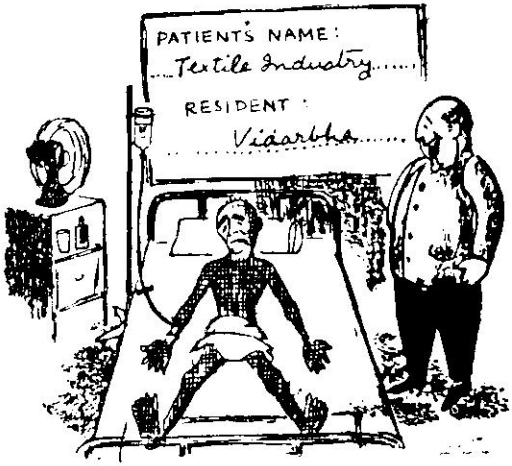
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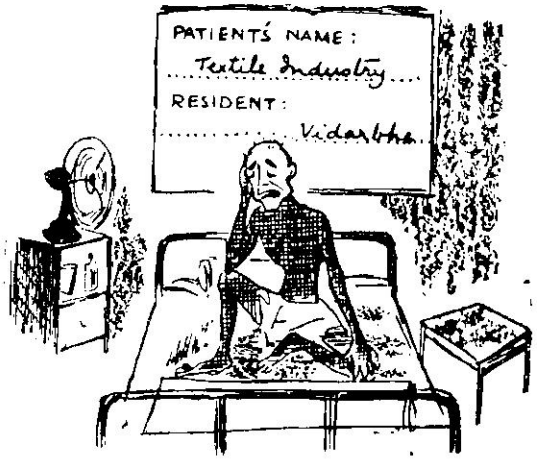
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Textile Industry
RESIDENT:
Vidarbha


HOW TO BE MORE ENTERPRISING

will you assess the economic strength of a reigon which stocks vast deposits of Limestone, Dolomite, Kyanite, Sillimanite and other minerals used in ceramics, refractories and glassmanufactures? An area with assured reserves of steel-hardening metals like Chromium and Tungsten, rarer elements of industrial importance like Antimony and Copper and innumerable semiprecious and decorative stones and gem stones will naturally be expected to hum with industrial prospecting. If the formidably favourable advantage of geography is added to this picture, Vidarbha may look like an Indian Ruhr.

"This is what it may appear to any objective analyst. This is how Sri Yashwantrao Chavan the then Chief Minister of Maharashtra—described it. Let it be recalled here that the First Report for the establishment of Tata Iron & Steel industry favoured the site of Chanda—before settling at Jamshedpur.

"That Vidarbha did not achieve the distinction of a paper-Ruhr (leave alone the solid substance of industrialisation) even on the designing-desks of Indian Planners illustrates the neglect of the rulers and the apathy of the ruled."

In response to this, the Government of Maharashtra submitted to the Vidarbha Industries Association, a detailed memorandum, listing the many projects of exploration, testing feasibility etc etc., published in the October 1967 issue of Enterprise.

The detailed cost analysis that is characteristic of the material published in this Journal, is really enviable. In the write up of the *bidi* industry in Vidarbha, a detailed break up of the entire range of costs is graphically presented : tobacco, tendu leaf, labour, packing, labelling, handling, manufacturer's and retailer's margins, and significantly for two widely separated years, 1941 and 1967; and the cover page (printed opposite) of this Special Issue on *Bidi* shows that we are going full scale American style.

In fact, the first issue of the Journal was a special one on the Textile Industry, described as a colossus on crutches. The detailed historical and analytical treatment of the cotton textile industry is really extraordinary by any standard. Even the present writer, who has been for some decades a close student of Indian Economics, did not know that on the "First day of January, 1874, the Indian entrepreneur Jamshedji Tata floated the Empress Mills at Nagpur for cotton spinning and weaving." This is only the beginning. In between, the article is packed with richest material, significantly illustrative of every single aspect of the working of the textile industry, subjecting it to a diagnostic treatment that we do not find even in the professional journals of the textile industry.

Such is *Enterprise*. It has a Hindi (not Marathi) supplement: no comment, lest some fellows who happen to see this may burn *Productivity* along with *Enterprise:* not bad, metaphorically speaking...It is said that some fanatics wanted to organise a bonfire, in Hyde Park (London), of HG Wells' *Outlines of World History*, and informed him accordingly. He wrote back: "...It would be better for all concerned, if you read rather than burn my *Outlines of World History*...To me, it would make little difference. In fact, I would get a royalty on each copy, whether burnt or read...In order, however, that you should be able to get sufficient copies for a bonfire, may I suggest, you place an advance order, lest you be disappointed..."

Enterprise was hesitant, when it made its debut on the fateful date of 15 August (1967) on the ground that this country is flooded with Journals; and one more may be frowned upon. It is true that we have more journals than may be justified on grounds of quality; but other countries have many more journals, of high as well as low quality. This country has very few quality journals; and *Enterprise* is surely one among them. Probably, *Productivity*, too.●●●

Enterprise

OCTOBER 196
VOL. 1 NO.

JOURNAL OF VIDARBHA INDUSTRIES ASSOCIATION

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Shivraj

Editor's Correspondence

Publicity and Comparison of Productivity

Thank you for your letter of December 5 concerning my article published in your summer issue 1967 of the *Productivity* Journal. The copy was received and studied with much interest though I am sorry that I have not yet had any comments from readers as I anticipated. If anybody writes in to you I should be very pleased to answer their questions.

I was interested in your Editor's note on page 22 about being un-Keynesian but, of course, he had not taken the remainder of my sentence into consideration. Income can be either spent or saved: Those are the only two things that can be done with it. Spending includes giving it away or having it stolen? Tax? Saving includes investing it in someone else's business as well as one's own business or for individuals buying such things as land, houses, jewellery which can be sold at a later date. Few people keep their money in a tin box under the bed. If they put in a bank that money is saved and even if it is a current account the bank can lend it to help others create further incomes for themselves.

My re-appraisal of setting out a business account, together with a diagram showing the balance of business, is enclosed.

Statement of Resources or Balance Sheet

PART 1

A record of all the savings on loan
that are being used to run the business.
Issued Shares
Debentures, loans, overdraft
Reserves (retained profits or losses)
Withheld payments (due as tax, creditors)

TOTAL MONEY RESOURCES USED
TO RUN THE BUSINESS (1)

PART 2

A record of how all the money on loan
to the business is tied up.
Land, accommodation plus appreciation
Machiney, equipment, tools less depreciation
Materials, work-in-progress, finished goods
on loan to others

TOTAL RESOURCES USED BY THE BUSINESS
(Equal to 1.) (2)

PART 3

Statement of Receipts and Expenditure

A record of all money due to the business as invoiced from the sale of goods and services.

Less debts not yet paid and irrecoverable bad debts.

Finished goods and services
Part finished goods
Off cuts, scrap
Dividends and interest
Rents
Less debts not paid

TOTAL RECEIPTS OF MONEY EARNED BY THE BUSINESS (3)

PART 4

A record of all money spent by the business to provide materials and services to convert into saleable goods and services.

Raw materials, part finished Proprietory items

Heat, light, power, gas, coal, transport, water

Telephones, Post, stationery

Insurance, legal, accountancy, audit, bank charges

Welfare, canteens, health centers, sports

Plus stocks on hand at end of period

EXPENDITURE OF MONEY ON MATERIALS AND SERVICES (4)

PART 5

A record of all money paid as incomes to the leaders, the led and the lenders involved in the business, rates for local government and taxes to central government including welfare.

Salaries, wages, interest, dividends

Rates, Road Tax, Special Taxes Income Tax, Profits Tax, Corporation Tax

Purchase Tax, Import/Export duty

Pension schemes and pensions, sickness benefits.

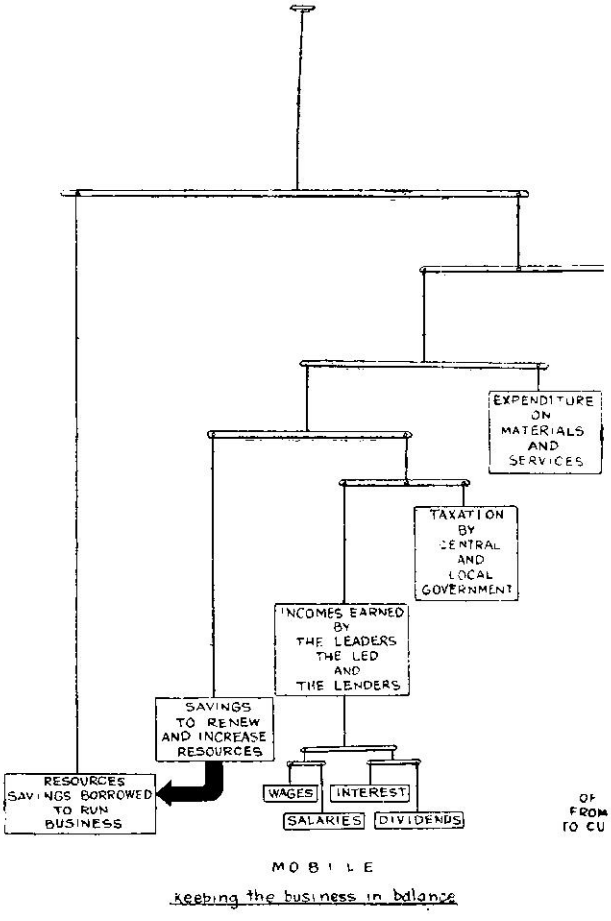
Holiday Funds

EXPENDITURE OF MONEY ON INCOMES PAID TO THE LEADERS, THE LED, THE LENDERS AND TAXES (5)

TOTAL EXPENDITURE OF MONEY ON MATERIALS AND INCOMES (6)

(Notes 3=4+5=6)

$$\text{Creativity of income Productivity} = \frac{\text{Incomes}}{\text{Resources}} = \frac{\text{Output}}{\text{Input}} = \frac{\text{Total 5}}{\text{Total 1}}$$



I should much appreciate a regular copy of your journal...—**DAVID HARTLEY, The Woodlands, Sundridge Avenue, Bromley, Kent.**

Automation in India

I read with interest Sri R.P. Nadkarni's reply to Sri Rathor's letter. Each computer installation in our country, be it in Railway, LIC or Reserve Bank of India has always been greeted with All India protest born out of an inner fear of large scale retrenchment, displacement and replacement, coupled with loss of job opportunities. Of all the fears anticipated due to automation I feel displacement and replacement staff poses the greatest threat. Since special aptitude and higher educational level are required for staff to fit in for automation, it is quite evident that persons manning punched card equipment (forerunner of Computers) would be the first victims and they form the fountainhead of opposition to computerisation. This being the fate of persons already working in a mechanised section the frustration of staff working in other sections can very well be seen in their protests and agitation. I have known cases wherein staff working in data processing section for 10 years have been transferred to other wholly new jobs just because they were not up to prescribed qualification or they do not possess the required degree of aptitude as assessed by an aptitude test. In the new setup they just pull on without any job satisfaction and patiently grieve over their loss of valuable experience and job opportunity. The counselling of Managements that nobody would be retrenched on automation reasons, would any make public support and sympathy shift from workers to Management side.

As regard change of college curriculum to teach the necessary skills to future technicians, it is not such an urgent matter. As and when the degree of Automation increases there shall be a gradual change in college curriculum. The existing polytechnics can diversify their courses and include Diploma Courses in computer programming, Systems Analysis etc.

Sri Nadkarni's contention that it is not suitable at the present moment to instal computers in India on a considerable scale, seems to me to be incorrect. When India is Planning to put into orbit its own make of satellite, when its rockets are soaring in space and when it boasts of its capacity to manufacture atom bombs, is it not the opportune time to go in for automation without hesitation? Though the word Automation is very elusive in it meaning, I mainly mean Electronic Computers. Count down of a rocket firing, tracking of an orbitting satellite and manufacture of atom bombs are all an impossibility without computers. There is no better time than the present to introduce Automation in India. There shall be minute and careful Planning without affecting the existing staff by way of job opportunities or the slightest doubt about their future. If that can be achieved I do not think, there is any other obstacle to the introduction of Computer in India.....
M. ANANDA RAO, 20 V Main Road, Chamarajpet, Bangalore.

... ...

Thanks for your letter dt. 17.1.68 forwarding the comments of Mr. Ananda Rao on my reply to Sri Rathor's letter. I am happy to see that the subject, although declared closed, is attracting attention even now. My reply to Sri Ananda Rao is as follows :

I fail to understand Sri Ananda Rao's point as to how punch card personnel will be the first to be thrown out as a result of computerisation. On the contrary, I feel, a Punch Card dept. will get enlarged by introducing computers because the basic information will still continue to be punched in the cards. You will require more punchers and verifiers to keep the computer fed all the time. However, promotional chances of Punch Card men may get marred by the introduction of computers but they will not be out of job.

Sri Ananda Rao agrees with me that computers will call for a different type of skill, intelligence, education and training

of the personnel to man them. Taking into account our slow-moving machinery at the State level in respect of everything, and education is no exception to it, I believe, a beginning should be made now itself to orient our existing educational curricula to meet the needs of computerisation from theoretical, practical, operational, technological, engineering and management angles, if we are really serious about embarking on computerisation on a good scale. We must have the complete knowhow of manufacture, maintenance and useful and effective applications of computers before we can think of toying with it.

As I had said in my earlier letter the knowhow could be imported but it would be better if we could manufacture the computer in India. This will add another industry to our other industries—and mean an increase in the employment potential to some extent.

Computer time could be shared by smaller organisations who would find going in for one exclusively to be very expensive. Mind you, a computer is like Alladin's genie. No work is too big for it, and so, if you want to run it profitably, you must have full-time and useful work for it.

A computer could be purchased jointly by different organisations in the same industry so that certain programmes could be commonly used and no system or programme of study be individually made. It would also help in another way in that it would render inter-firm comparison very easy and effective. And if national progress is to be expedited, inter-firm comparison technique can be quite useful.

I now come to the application of computers which point has been misunderstood by Sri Ananda Rao. I am not averse to computers. In fact, I firmly believe that the computer enhances productivity as I said in my earlier letter. But the point I wish to once again stress, as I did in my earlier letter, is that, in Indian conditions obtaining now, computers cannot be used extensively but have to be used selectively. I shall elucidate this statement.

In India computers should be employed to solve complex problems in the technological/research/atomic fields. They could be employed in finding solutions to complex chemical/pharmaceutical/steel manufacturing processes in controlling the umpteen variable factors to ensure optimum and economic performance. They could be employed in decision-making (of course, it is understood that a computer will only give alternative solutions but what to choose out of them will still be the decision of the human brain ?) in industry and business, inventory control, problems of distribution and transport etc., where human power may have limitation in terms of both time and sheer inability. Such applications while expediting decision-making (with the right decision) will not displace manpower. And this is what I mean by the "Selective" use of the computer.

As against this, a computer could be asked to turn out all the work that an army of clerks and typists does, for example, maintaining various records, typing of invoices, letters, reminders, finding out balances, tallying stocks etc., etc. But this would literally throw a large number of people out of employment unless they are absorbed elsewhere in the computer industry/department of other industry/departments. Unless suitable alternative avenues of earning livelihood are ensured, there will be a mass catastrophe on the employment front. And this will be the result of "extensive" (wide, large scale) application of computer as mentioned in my earlier letter. To say this in the words of no less a person than the eminent philosopher Rabindranath Tagore :

> "It will be like employing a sword to shave the chin : it's bad for the chin and sad for the sword!"

—RP NADKARNI, Voltas Ltd. Dr. Ambedker Rd., Bombay-33

On Work Simplification Technique

I have read with much pleasure the article, work Simplification applied to an Accounts Office, written by Sri Srivathsa VSR Subramaniam and published in the Winter 1967 issue of the *Productivity* Journal. The measures suggested in the article in respect of Work Simplification appear to have been mainly discussed by way of an effective physical arrangement of work places, in order to facilitate speedy disposal of work at all stages in the Accounts Office. These measures, no doubt, do play a vital role in the attainment of the desired objectives. However, I shall feel obliged if the learned author of the article or any other Expert in this subject makes available, for study and guidance of the esteemed Readers of the Journal, the different Productivity and Work Simplification and Work Improvement techniques that can effectively be adopted in the work processes themselves, carried on from time to time, in the Account Office, at various cadres and stages, to make the entire working of the Accounts Office optimally efficient in all respects....—**RD KULKARNI, Chief Accountant, Kopargaon Sahakari Sakhar Karkhana Ltd., P.O. Kolpewadi (Dist. Ahmednagar Maharashtra).**

... ...

My technical paper "Work Simplification Applied to an Accounts Office" deals with effective physical arrangement of work places and improving departmental efficiency. In this analysis, time and work-flow technique was used.

The readers of 'Productivity' may be interested to know about other techniques, which could be applied to an Accounts Division to optimise the work efficiency. These may be classified under Planning, Control, Appraisal and Modernisation.

The 'Planning' aspect deals with the timing of different activities in an Accounts Division, so that the final annual accounts could be completed by the scheduled date. To aid this, Performance Evaluation and Review Technique or PERT is the most modern approach. This sequences the different activities, estimates the most probable completion time, and fixes target dates for each.

The 'Control' aspect compares the day today progress of each of the individual activities of the accounts personnel, with reference to the target date set by the planning division. Activity Control and Follow-up techniques are used to aid a visual comparison. Work completion and progress could be traced on graph sheets, which guide in advance to make up the work-lag.

The 'Appraisal' aspect diagnoses the reason for the variances between the planned and actual dates of completion of accounts activities. The positive and negative variances are listed either on a weekly or monthly basis through the Activity Performance Appraisal Techniques. The unit of measurement, method of appraisal, its frequency, and the way of expression depend on the firms, and the volume of work handled by the Accounts Division.

Finally, the 'Modernisation aspect' aims at a long-range perspective and is based on the concept of 'Return on Investment'. It analyses the existing investment in the Accounts Department, in the light of the turnover and financial outlay, and estimates the existing return on the investment. The future plans of the firm are studied, the expected increase in the accounts workload is evaluated, and the additional investment is estimated. This investment is analysed between the alternatives of either expanding the existing 'manual operation' or installing a 'data processing unit', with reference to the return on investment from each. The merits and demerits in selecting one among these, are analysed on the basis of impact on employment status, relative work-speed, error minimisation, benefits to other operating divisions, and management policy. All

these could be expressed in the form of mathematical equalities and inequalities in suitable units, and a 'Linear Programming' model could be constructed. The solution to this mathematical model leads to an optimal modernisation strategy.

However, there are no hard and fast rules among modern management techniques, "as applicable only" to an Accounts Office. There are innumerable techniques which have proved successful to a variety of management areas in developed countries. It is essential to study and convert them to suit Indian working conditions, and the basic set-up of the particular Division. A careful pre-implementation trial is generally helpful. My article, "Work Simplification Applied to Accounts Office", was an effort in this direction.

The books, which I happened to come across in the process of Research and Development in modern techniques of management, to suit Indian needs, are listed below for the benefit of the Readers of *Productivity:*

1. Project Management with CPM and PERT, by JOSEPH J MODER & CECIL R PHILLIPS
2. Schedule Cost and Project Control with CPM (A Comprehensive Guide for Programme Management), by ROBERT W MILLER
3. Office Management and Control, by Dr. GEORGE R TERRY
4. Systems Analysis for Effective Administration, by NORMAN N BARISK
5. Organisation and Management in Industry and Business (Chapter 12 recommended), by WILLIAM B COMELL
6. Techniques of Systems and Procedures (A Practical Book on how to do systems), by JOHN ROSS
7. Introduction to Operations Research, by C WEST CHURCHMAN, RUSSEL L ACKOFF & E LEONARD ARNOFF
8. Operations Research and Systems Engineering (Part III Case Studies, 27 Cost and Value Reports—Case Study in a Telephone Company, by MARVIEW A GRIFFIN, recommended) Edited by Charles D. Flagle, Willam H. Huggins and Robert H. Roy.
9. An Introduction to Automatic Computers Chapter 9 recommended), by NED CHAPLIN

...—VSR SUBRAMANIAM, Bombay

Industrialisation of Andhra Pradesh

I have read the write-up about the work of the Andhra Pradesh Industrial Development Corporation on pages 423 & 424 of the Winter 1967 issue of the NPC Productivity Journal. I appreciate your kind reference to the work of the Corporation and to me personally. It is always good to know that people like you appreciate the efforts we are making in our own small way for the industrialisation of the various parts of the country. **...RAM K VEPA, Managing Director, Andhra Pradesh Industrial Development Corporation, Hyderabad.**

Follow-up of IPY

The year 1966 was celebrated throughout the country as the India Productivity year. All of us have been conducting 'follow-up' work : in the Productivity Drive, the undisturbed continuation of this work in future years is a pious duty of every Indian citizen, particularly at the critical juncture, through which our country is passing, at present.

On the auspicious occasion of the ensuing New Year, I feel great pleasure to offer my heartiest greetings and to wish the NPC a very bright, prosperous and happy New Year...—**R.D. KULKARNI, Chief Accountant, Kopargaon Sahakari Sakhar Karkhana Ltd., P.O. Kolpewadi (Distt. Ahmednagar) Maharashtra State.**

NPC Journal

I was a subscriber to NPC Journal when stationed at Jodhpur. I have discontinued my membership on seeing that your Council had issued Journal Vol. VI, 2 & 3 on Agricultural Productivity, for this is not my subject and I am not a well-paid employee. I am interested to renew my subscription to the Journal, provided your *Productivity* deals with mechanical or electrical engineering topics. I am now working in the Railway Workshop, Lucknow. After hearing from your end, I will be your subscriber again. **...BUDH SINGH, 37/C Singar Nagar, Alam Bagh, Lucknow.**

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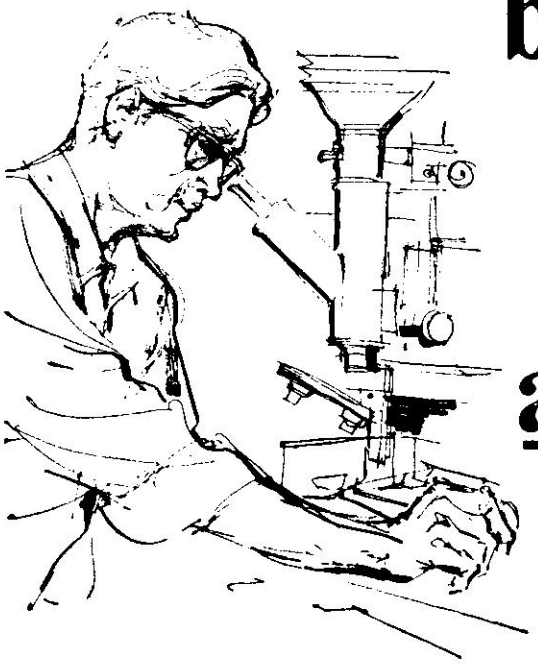

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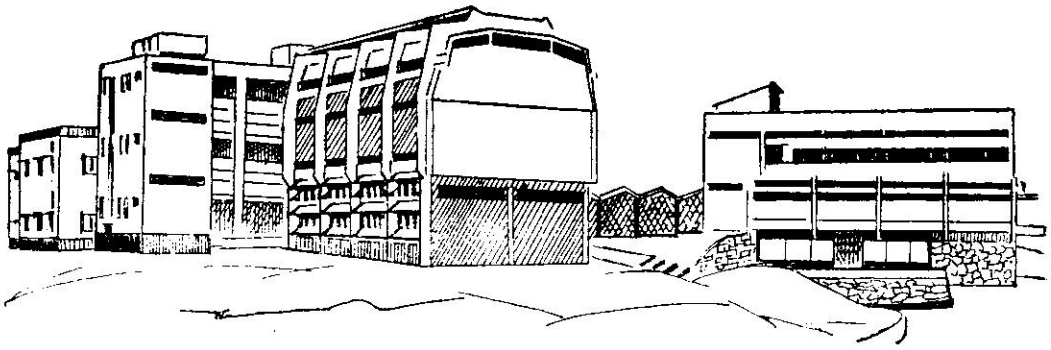

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