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# MACHINE ECONOMY AND DISPLACEMENT OF LABOUR, WITH SPECIAL REFERENCE TO INDIA

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THIS subject has a special fascination for countries such as India, where, though agriculture has been for generations the principal occupation of the people, land is predominantly under-exploited or undeveloped, and consequently man succeeds in getting out of the soil a standard of living which is in great contrast to what agriculturists in other lands are able to make. And this difference in the yield from land is not due to nature being niggardly. Certain unfortunate areas apart, as in the tropics generally, nature in India is renowned for its bountifulness. The difference is due more to man-made factors, of which there are a great number, several of them no doubt of quite a baffling character but many capable of being successfully tackled by concerted action on the part of the people and the State.

One of these man-made factors is the failure of man to apply to the cultivation of land the discoveries of science and engineering, discoveries which one may see in common use on the farms of western Europe and America but which are a rare find on the Indian farms. Though at first sight this might seem quite a simple hurdle, a closer view will reveal its baffling character, as tractor-ploughing, the use of the electric motor, &c., imply large farms, adequate capital, the necessary technical skill, and so on, none of which can be created overnight. Any one of them singly might present exceedingly obstinate and formidable problems to the most determined administration or planning council, especially in a country where poverty and illiteracy reign supreme and where land is fragmented and subdivided into tiny plots, large numbers of them no bigger than tennis courts and these often under multiple proprietary rights. For the present we may leave these practical difficulties alone and concern ourselves primarily with the economic expediency, on more general grounds, of the application of the science of engineering to the cultivation of land, with particular reference to the impact upon employment of mechanization. While confining ourselves to this restricted field it will perhaps be useful, if only to fix our ideas, to relate our argument to a background of the requirements of an economy like that of India.

The application to India of the colonial economic policy had meant that while the old handicrafts could no longer hold their markets in India or abroad against the mechanized products of the West, industries based on the new technique could not spring up in the country, with the result that we witnessed the strange spectacle of progressive de-industrialization of the country from about the latter part of the nineteenth century. This, coupled with the usual growth in the numbers of the population, naturally increased the pressure on land, the only alternative means of subsistence. The complexities of the problems of agrarian reform were thereby added to, among them the problems of subdivision and fragmentation referred to above. The contemporary trend in other countries, especially in western Europe, was exactly in the opposite direction. In Great Britain, for instance, while on the one hand men were drawn off the land into the new industries, money made out of the Industrial Revolution found its way into agricultural investment, and farms grew larger and estates expanded.<sup>1</sup>

The pressure of population on land has sustained, if it has not also been the origin of, the theory which is rather extensively advocated in India that any attempt at mechanization of cultivation must lead to the emergence of rural unemployment on a colossal scale, so that whatever advantages may be claimed in support of technological improvement they are most likely to be more than negated by the problems of unemployment and resettlement which it will create. The argument of the theory runs on familiar lines. Since large farm-units are essential to the success of mechanization, it will be attended by integration of the fragmented plots and farms, the population now existing on them being thrown out; for a given agricultural operation, mechanization will demand less manpower than now and probably little or no bullock-power, and the displaced men and bullocks will of necessity grow into an army of unemployed; the present hordes of seasonably unemployed, which the rural population to-day generally is, will get converted into almost as large hordes of perennially unemployed with the additional difference of being landless and possibly also homeless.

This enunciation of the gloomy prospects of mechanization, it must be added, is not usually supported by factual data drawn from experience of the devastation supposed to be worked by the tractor, the electric motor, and the like. The alleged or real horrors practised in order to bring into being, and later to continue in efficient working, collective farms in Russia are often cited as

<sup>1</sup> L. F. Easterbrook, *British Agriculture*, London, 1944, p. 11.

illustrations of the kind of social and ethical consequences one may expect of mechanization, especially in a background which requires the consolidation of split-up holdings into economically successful units.<sup>1</sup> It is also usual to quote accounts of the unsuccessful attempts to mechanize agriculture in certain European countries<sup>2</sup> such as Hungary, without, of course, inquiring into the special economic circumstances which contributed to their failure. And any very critical examination of the fundamental issues of mechanization is generally lacking.

Before proceeding to examine the validity of this theory it is well to make our mind clear that it is not merely *employment* for all that should be the aim of economic policy. If this were the only consideration before us not much policy-making would indeed be necessary for, as Malthus said long ago in criticism of this view, if *employment* were the only problem facing us, it could easily be solved by abandoning the horses, the plough, and other such contrivances, and the entire community, men, women, and children alike, could at once find full-time employment on comparatively few farms, digging with the fingers of the hand in order to raise a few crops! What we want, however, is not merely employment for all but full employment at a rising level of wages and income and also more abundant leisure for engaging in cultural pursuits.

If so, any improvements in the arts of production which may help to raise the standard of income of the community that adopts them must be welcomed and not shunned merely on the ground that, before they are, so to speak, assimilated by the economy, transitional unemployment may result in the trades directly affected. Most, if not all, technological progress, including the mechanization of agriculture, may be said to belong to this category. The transitional unemployment it gives rise to is inevitable, just as the introduction of the plough and the horse may throw out of work an army of men and women engaged in digging the soil in the pre-plough era. But to hold up for this reason the application to production of technological advancement would be entirely short-sighted, as such a policy would be detrimental to the interests of the workers themselves. For the initial unemployment, of which we are disposed to talk so much, is only the first impact of mechanization. But it has a second reaction which is vastly more welcome in its results. Mechanization, besides rendering labour less irksome and less tedious, also lowers the cost

<sup>1</sup> M. R. Masani, *Inaugural Address to the Indian Society of Agricultural Economics*, Karachi, 1946, pp. 7 et seq.

<sup>2</sup> *Report of the Co-operative Planning Committee*, p. 35.

per unit of output. When the demand for the commodity turned out enjoys a high degree of elasticity, the quantity of it indented for by the community might multiply to such an extent and trade may consequently expand to such a degree that, notwithstanding the labour-saving devices applied, the volume of employment in the trade (if we take into account its sum-total requirements and not merely the number engaged in the particular process that has been mechanized) may actually be larger after mechanization instead of the opposite. If so, the ultimate effect of mechanization upon employment even within the trade will be to the advantage of labour.

But this may not be the universal rule. More usually a labour-saving device may in fact be labour-saving in the sense that fewer men can be employed in a trade as a result of the application of such device to it, though the quantity of the product turned out may be larger than before. Indeed, if a community with a given supply of labour should have at everyone's disposal increasing varieties of economic goods with abundant supplies of each and also ample leisure, fewer men would be enabled to produce more, which is what mechanization is meant to do. Looked at from this angle we should cease to regard mechanization as an evil because it is labour-saving; it should, in fact, be welcome for that very reason. It helps to release man from the occupations he is now engaged in for newer and more varied ones. In a country where such large numbers of the population (quite unnecessarily, it would seem) are locked up on the land and with such poor results, mechanization of agriculture, while increasing agricultural output, would at the same time make available abundant supplies of essential labour for employment in industries and other trades. It would render possible industrialization of the country at as rapid a pace as the available supplies of capital would permit. Without agricultural mechanization shortage of labour may prove a second and more difficult bottleneck. Collectivization and the tractor were thus essential to the success of the Russian five-year plans. Similar steps will be essential, too, to any large-scale scheme of industrialization for India.

When the same problem is viewed in terms of the national dividend, we come to the same conclusion. Mechanization, through multiplying the productivity of a unit of labour, would augment the national income. The larger national income would correspondingly increase national outlay or disbursement, either on account of expenditure on consumption goods or as investment of savings, i.e. as expenditure on capital goods. The increased flow of money expenditure would

bring more jobs with it for producing the larger stream of goods now demanded and therefore would create a greater demand for labour *than had existed before mechanization*. The employment position, one degree removed from the initial stage of mechanization, would be if anything shades better in favour of labour than had been the case previously. Wages would increase and employment would become fuller. Multiply this process, i.e. allow the régime of mechanization to spread and to intensify, and we would soon have a community where labour is scarce and wages, income, leisure, and employment are high. In other words, the permanent effects of mechanization upon incomes and employment are the opposite of that feared. So far from making man cheaper, it would contribute directly to raising his value. Under mechanization India's national income would come to be worth several times more than Rs.2,200 crores, its pre-war magnitude, and man would be consequently vastly more valuable than Rs.65 per annum.

This way of viewing the problem at once exposes the fallacy of the theory we are examining, the theory, namely, that labour-saving devices cause unemployment and therefore must be resisted. As we have seen, the unemployment caused will be confined to the trade which is being mechanized and will in any case be only transitional. The compositors thrown out of work by the coming of the type-setting machinery, the manpower released by the tractor, the handloom weavers rendered idle by the power-loom, and so on, need not be a permanent addition to the nation's unemployed when the overall demand for labour being now larger absorbs them in the same or in allied or other trades. The history of mechanization in Great Britain, in Europe, in America, and elsewhere reveals not a depressing narrative of mounting unemployment but the remarkable story of rising numbers of the population being maintained at higher and higher standards of living. The successive five-year plans of mechanization did not bring unemployment in Russia though the Russian agricultural economy before these plans was not much different from its Indian counterpart; nor has the coming, with the Jews, of more capital and the new technique of production brought unemployment in Palestine. It cannot be different with India.

From these more general observations let us proceed to visualize, in outline, mechanization of agriculture at work in the Indian background. Our experience in this field is scattered and in isolated spots. We have no information on the number of tractors in use for the country as a whole. But for two provinces, Bombay and C.P. and Berar, the pre-war figure comes to 248 as against 150,000 tractors at

work in an industrial country like England,<sup>1</sup> which is smaller in area and population than some of our provinces. What little experience we have gained in the field indicates, however, that the tractor, with suitable appliances attached, may be utilized with advantage both as a stationary source of power for operations such as pumping, spraying, threshing, winnowing, chaff-cutting and grinding, and as a mobile source of power for tillage of the soil especially on large estates, for eradication of deep-rooted weeds such as *dhub* and *kans*, for clearing land originally under jungle, for making roads, bunds and channels, and for anti-erosion work. The oil engine and the electric motor can also be employed as a source of stationary power for irrigation, as a chaff-cutter, or for grinding corn, the electric motor being generally cheaper than the oil engine.

The advantages of the tractor over the bullock need no recitation. As the bullock can work efficiently for only eight hours a day, four in the morning and four in the afternoon, while the tractor can work twenty-four hours if necessary, about forty-eight pairs of bullocks would be required to do the work of a 30 h.p. tractor in twenty-four hours, and their capital cost, at present prices, would be double that of the tractor.<sup>2</sup> Further, as bullocks depreciate faster, are subject to epidemics and disease, have to be fed throughout the year, unlike the tractor, which 'eats' only while working, and as the larger number of bullocks required will need more men to attend to them and need attending all the year round, the running and maintenance costs of bullock-power cultivation would work out higher than tractor cultivation. For an area which can be operated by a 30 h.p. tractor, the former (excluding the cost of feeding bullocks) has been estimated at Rs. 24,000 per annum and the latter at Rs. 16,000 per annum.<sup>2</sup> To this difference in favour of the tractor must be added, on the one hand, the additional cost of feeding the bullocks and the additional income from dairy-farming if in place of bullocks it should be decided to rear, under tractor cultivation, dairy cattle.

Nor is this all. The tractor is capable of preparing the soil when it is too hard for bullocks, in advance of the monsoon instead of having to wait for it, which in certain areas may render two crops possible where only one is raised to-day.<sup>2</sup> Timely tillage alone has been found to increase yields of cotton and *jowar* by 20-30 per cent. in Khandesh, by 8-10 per cent. at Poona, and by 75-80 per cent. at Mohol.<sup>3</sup> Further, when climatic conditions dictate, and certain

<sup>1</sup> W. Burns, *Technological Possibilities of Agricultural Development in India*, p. 125.

<sup>2</sup> 'Mechanized versus Agricultural Farming', *Capital*, May 1947, p. 931.

<sup>3</sup> W. Burns, *op. cit.*



operations of tillage or the carrying of a hay crop have to be completed on a given day, the advantages are worth far more than any immediate costing can disclose. The agricultural worker, too, may be said to get his share of the benefits of the tractor, as, in addition to bringing vastly higher wages, it would relieve him of the strain of holding and guiding the ploughs and, what is more, as tractor-driver he would ride while with the bullocks he has to walk.

In terms of output and profits of cultivation, the results of mechanization would be quite impressive. The aggregate output may in certain areas be multiplied, and a 1,000-acre mechanized farm may yield a dividend of 40 per cent. on the capital invested, which is several times the returns that capital applied to land brings to-day. And as against about 200 men now engaged on land of 1,000 acres, the number of men required to maintain a mechanized estate of this size would be less than fifty.<sup>1</sup>

This does not mean, however, that the rest of the men would be thrown out of work or even off the land altogether. Mechanization creates several new classes of employment: to make, to manage, and to repair machines, and to supply or distribute the spares, the fuel, and the lubricants. The larger incomes would leave more money to invest and to spend than previously and would also yield more revenue to the State. The larger revenue would bring more roads and more schools, and the additional money to invest and to spend would create a demand for more and better houses, clothing, food, furniture, and so on. Modern means of transport, electricity, and the cinema would begin to invade the countryside. And if this process of change is accompanied—as for complete success it should be—by schemes for industrialization, the new jobs that will spring up will absorb all the men released from the soil, some in the country itself and the rest in industries. Nor in a régime of economic regeneration such as this can wages be lower than now; national income being larger, wages—the worker's share of this income—must be larger too.

Isolated examples of mechanized farming in India do not justify the apprehension that mechanization might aggravate the problem of rural unemployment. In Coimbatore, assisted on the one hand by cheap electric power which became available with the advent in 1933 of the hydro-electric scheme at Pykara and on the other by the profits earned in the textile industry which, the community dominating this trade being drawn from agricultural stock, sought investment in agriculture, the experiments in mechanized farming, though still in the initial stage of their development, indicate how the application

<sup>1</sup> 'Mechanized versus Agricultural Farming'.

of labour-saving devices can be accompanied by an increased employment of labour at a higher rate of wages.<sup>1</sup>

Farms in this area, in the past, usually ranged between 5 and 10 acres at the most and were irrigated by a well or two with bullock-lifts, a pair of bullocks being able to tackle no more than 3 or 4 acres. With the coming of the electric motor, the wells have been bored deeper and wider and now irrigate over 50 acres each. Besides a motor the bigger farms have also introduced a number of labour-saving implements mechanically worked. The result is that the bullock-lift is getting out of use. Less manpower is required for irrigation. Under the bullock-lift labour accounted for 32 per cent. of the irrigation costs while under the electric motor labour accounts for only 12 per cent.—bullocks are now required only for ploughing, hoeing, and threshing, and costs of agricultural production generally are lower. Nevertheless, the demand in the area, for bullocks as well as for men, has increased, and wages have gone up. This is because the larger farms have made possible the application of improved techniques of cultivation, profits of cultivation have increased, and the agricultural industry is expanding under the stimulus of it. Land is being subjected to a greater diversity of cropping, new land is claimed under cultivation, dry land is brought under irrigation, all of which require more labour, and labour-consuming crops such as Cambodia cotton, tobacco, sugar-cane, vegetables, and fruits are coming to be preferred because they bring better profits. Labour is also in demand during the off season for repairs, reclamation, and improvements to land and for collecting leaves for manure. No wonder this area suffers from a shortage of labour, and migration of labour from outside is encouraged. More bullocks, too, are in demand as there is now more ploughing to be done, and, being relieved of the exhausting toil of lifting water, the bullocks are now easily able to tackle improved iron ploughs.

Multiply this test of Coimbatore a hundredfold, and the experience in respect of the impact of labour-saving devices upon the demand for labour and wages may prove to be not much different. This is, however, only the first stage of mechanization. The next will be for tillage and many of the remaining agricultural operations to be taken over by the machine, say, the multi-purpose tractor and the consequent enlargement of the farms to about ten to twenty times their present size. The requirements of consolidation of the new processes over, at the second stage of mechanization the present

<sup>1</sup> K. C. Ramakrishnan, 'Mechanized Farming in Coimbatore', *Eastern Economist*, Feb. 21, 1947, pp. 367-9.

supplies of labour are likely to prove surplus to the land. But even so this should cause no unemployment if it is accompanied by a programme of industrialization of the country adequate for absorbing the surplus labour.

This is not to say that we could go full steam ahead with the mechanization of agriculture without reference to the pace of progress of the rest of the economy. Such one-sided development might conceivably lead to what we may call 'over-mechanization' of agriculture, i.e. mechanization at a rate which releases from agriculture more labour than can be absorbed by the new industries set up in the economy. Mechanization might then be attended with lasting unemployment. Alternatively, full employment might be secured only at the cost of the wage-rate. No relief may result until over-mechanization has been rectified.

It would appear that it is a situation such as this that is described when we are told that in Hungary, before the war, steam ploughing was much more costly than horse ploughing, 'at least three times as dear' and that tractor ploughing was also dearer, this being confirmed by the fact that on many farms 'tractors bought in 1926-30' were lying idle.<sup>1</sup> Labour being cheap and abundant the ox or the horse-team was more economical. The situation, however, would at once begin to alter if the labour force rendered surplus by the tractor, but which is not surplus to the horse-plough, could be taken over by new industries. The rest of the economy, too, would then advance, and over-mechanization would cease; cheap labour would not lie side by side with mechanization.

The Hungarian experience, then, which is so much made of in India, is no condemnation of the tractor. It is only an indication of the lop-sided development of the economy for which no justification could be offered. It merely proves what is obvious, namely, that mechanization of agriculture which is out of step with the progress of the non-agricultural part of the economy cannot be an economic success.

Nor is this peculiar to mechanization of agriculture. Over-mechanization of any industry singly can result in more harm than good. If, for instance, the trade-union organization in the building trades in Hungary was very close and very strong, as we are told it is or it was in the United Kingdom, the union might succeed in forcing up wages above the comparable wage-rates in the country to such a degree that the entrepreneurs in the building trades might

<sup>1</sup> Doreen Warriner, *Economics of Peasant Farming*, Oxford, 1939, p. 160; see also P. L. Yates and D. Warriner, *Food and Farming in Post-War Europe*, Oxford, 1943, p. 73.

feel compelled to over-mechanize. There might then co-exist in the cities of Hungary mechanization, plentiful labour, and low wages. But that would be no condemnation of mechanization, or any justification of the view that mechanization is a wholly unsuited doctrine to the overcrowded cities of Europe any more than the emergence of a similar situation in agriculture, for similar reasons, can be advanced as justification for the view that the use of agricultural machinery is 'quite unsuited to a crowded continent'.<sup>1</sup> It is only a simple case of over-mechanization and should be dismissed as such without undue moralizing.

The remedy for the Hungarian experience is clearly an orderly advancement of the economy. Introduce only so many tractors as the Hungarian economy can take; that is, only so many as would release a quantity of labour which could be easily taken over by the newly planned industries. Progress in this manner slowly or as fast as the available supply of capital and other factors will permit. We will not then be disposed to blame the tractor nor the over-crowding, and the position of Hungary may in due course become similar to that of Russia, the United Kingdom, or Australia, where mechanization has become an organic part of the economy without causing unemployment.

In Australia, where mechanization of agriculture has perhaps gone the farthest and where industry too is mechanized, it is significant that labour-saving devices, so far from being suspect, are regarded as essential to success. Owing to the rapid rise in the price of jute and the lack of substitutes, the Dominion is investigating the possibility of growing jute in Australia or in New Guinea where suitable soils and climate similar to the jute-growing areas of Bengal are said to exist. But, we are told, 'mechanization of the crop from sowing to retting would be necessary if it were to be successfully grown in Australia'.<sup>2</sup> In other words, Australia would envisage agricultural expansion on no terms other than mechanization. The machine has rendered man so dear in Australia that to-day no productive activity in the Dominion can be an economic success without the machine.

The above, it must be noted, indicates the possibility and the danger of over-mechanization only in particular trades. It is well to note that there is no such thing as over-mechanization of the economy as a whole, i.e. there cannot be said to exist over-mechanization in all the trades simultaneously, provided that mechanization has been

<sup>1</sup> Yates and Warriner, *op. cit.*, p. 73.

<sup>2</sup> *Australian News Letter*, No. AGH 158, issued by Senior Australian Trade Commissioner in India.

effected at a commensurately uniform rate all round. The simple reason is that the wants of man are unlimited. There is no known ceiling above which the standard of living of mankind cannot rise. If the machine produces more and more of *everything* in the right ratios, nothing can be said to be over-produced. Theoretically, as there can be no general over-production, there can be no general over-mechanization. Over-production and over-mechanization can only be in individual trades.

Our conclusion, then, is that mechanization of agriculture need not, contrary to the common fear, cause intractable problems of rural unemployment or resettlement, if only such mechanization is accompanied by orderly progress of the economy in other directions. Part of the labour force rendered surplus to the agricultural operations proper might find employment in the countryside itself now rendered possible by the increased money expenditure from out of large incomes, and the rest may be absorbed in newly planned industries. If mechanization is so planned and so regulated that it displaces only so much labour as can be easily taken over by the new industries to be set up and no more, the transformation would cause little distress. Under such co-ordinated development there need not result any over-mechanization and consequent unemployment. Progress in this manner can be slow or rapid according to the availability of capital equipment and other essential requirements.

In the Indian background, however, such progress would have to be more slow than rapid as both capital and the necessary technical skill, apart from other practical difficulties such as the difficulties presented by land tenure, would be great limiting factors. Scarcity of capital would compel a régime of priorities for the application of the new technique, which, consequently, will have to be done by stages both in respect of the intensity of mechanization and the area to be mechanized.

This limitation should remove much of the apprehension of the colossal scale of rural unemployment which we are told might ensue mechanization of agriculture and which constitutes the main ground of opposition to such mechanization. Displacement of labour cannot be on a colossal and unmanageable scale as extensive mechanization in one step is impracticable. The direction in which we must apply our limited resources is, however, clear, though progress may of necessity be slow.