Transfer of Technology : An Overview of the Tanzania Case

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PART I : INTRODUCTION

Current discussions on the « New International Economic Order » have focussed a lot of attention on the role technology can play in transforming the economies of the less developed countries (LDCS). The belief that technology can play such a vital role has mostly been influenced by the incontestable fact that technology developments and innovations over the past two and half centuries have been responsible for much of the advancement in the developed countries. What is contestable though (or even refuted outright), and this is the paradox we are out to discuss, is whether the transfer of some of that technology to the dependences (and Tanzania in particular) has gone anywhere near achieving the same goal. Many observers have already come to the conclusion, and I concur with them, that such transfers, especially in their present form, will never help to transform the dependences to the often longed for and talked about self-reliance.

We should like to point out from the beginning that *neither* the development, application and assimilation of technology in the advanced countries *nor* the lack of it in LDCs have come about by accident. The historic developments and material conditions pertaining in these countries were largely responsible for this development. For example the most crucial landmarks in technological inventions took place in the countries that are now classified as « developed ». The factory system (resulting from a combination of Kay's spinning shuttle, perfected by Hargreaves, Arkwright and Crompton, and of course Jenny's mule together with the steam engine perfected by Newcomen and Watt), the Bessemer Process (used in the production of steel) the Tele and Radio communication systems, and now, automation and the computer systems (to mention but a few), were all great landmarks in technological development. On the other hand, the not-too-aggressive approach towards technological inventions plus colonial exploits and domination were largely responsible for the LDCs predicament. By so saying we are not suggesting that the invention of a particular technology in a country is a necessary and sufficient condition for its successful application. The fact that Britain is now « the sick man of Europe » when she led the world in tech-

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nological inventions and innovation invalidates such a contention (1). But what is nevertheless true is that the scientific and technological level of a country and the institutional set-up that facilitate easy transfers of technology into it would, in most cases, determine the rate at which (and in what form) a particular technology will be assimilated, adapted or improved upon. Countries with advanced levels of technological development have the necessary work-cultures and structures that allow for smooth horizontal mobility of technology. Their long history of technological innovations, especially so in the advanced capitalist countries, has developed technically-biased skills that facilitate not only the acquisition and utilisation of such technologies but also the manipulation of the same to serve local interests or requirements. Even where production is for export (like some of the technology exported to LDCs most of the benefits from the use of those exported technologies accrue to nationals and/or the countries of origin. Few developing countries, least of all Tanzania, can boast of having anything close to this.

One would have expected that since most technologies have universal applicabilities (e.g. a cement plant designed and manufactured in West Germany should produce cement in Tanzania just as in Germany, depending on whether the input mix is correct) users of such technology should be able to reap benefits that are not markedly unequal. Experience in the LDCs has shown that most of the technologies have been used by their exporters to promote their (exporters) exploitative and domineering designs. While technological transfers among developed countries lead to *technological interdependence* (i.e. mutual dependence) and are therefore beneficial to all parties, transfers between developed and LDCs lead to the subordination of the latter by the former.

In this paper we intend to briefly look at the problems attendant to the transfer of technology to LDCs with Tanzania's experience being used to illustrate some of our contentions. Before we embark on this task, we would like to point out here that our views on this subject have been greatly influenced by the works of many development economists. Notwithstanding, should readers find here what already exists in other writings, it is not so much a result of our deliberate efforts to plagiarise other people' works, but rather a result of the propinquity in ideas.

PAR II : THEORETICAL EXPOSE

A brief exposition of our conception of the phase « transfer of technology » might help to make the case we are about to present more easily comprehensible. We will not divert very much from the conventional method of classifying technology into three broad categories (2), namely :

a) technical and commercial information that can be used in research and development of new (or improvement of old) methods of production of goods and services and, in the marketing and purchasing of technologies and their products ;

b) highly trained manpower that can design, develop and carry out research on technology, and make decisions about the efficient utilisation of such technology (engineers, designers, managers, etc...) ;

c) embodied technology or physical assets that are manmade and are used in the transformation of inputs into products and in the use of these products in the development and rendering of services as well as in the generation of further productive capacities.

If the above categorisation is accepted, then the phrase « transfer of technology » should be understood to mean the acquisition, by that country, of what statisticians would call « the combination and permutation » of the above three categories. That is to say the importation of either a or b or c, or a + b, or a + c, or b + c, or a + b + c, into a country would constitute a transfer of technology. Such transfer can either be temporary or permanent. This is an important distinction we would like to make about technological transfers. Our point of view is that any technology that is not assimilated within the importing country either by adaptation and/or improvement to fit in the local resource base and requirements is no real transfer at all. It is what we would prefer to call « pseudo-transfer » of technology. We shall take the example of Coca-Cola technology in Tanzania to make our point. If the formula for producing this beverage is as closely guarded a secret as it is today (3), and the highly skilled manpower together with all machinery were imported, it is hard to see how the technology of producing Coca-Cola in Tanzania could be permanent. Today, a decision by the Coca-Cola multinational to withdraw its expatriate staff, together with a ban on the exportation of ready-made inputs, is enough to cause the Coca-Cola technology to disappear from Tanzania overnight. Such import of technology is a « pseudo-transfer ».

It is our contention that *only* that technology that can be absorbed directly or adapted and/or improved upon, or that which leads to the development of new types of technology that are appropriate to the requirements of a particular country should be imported. The alternative to this is usually a cluster of enclave technologies whose ultimate effect would be to acquire for the importing country a « passport » to dependence and of course its natural concomitant, exploitation.

Before we discuss the mechanics and intricacies involved in the transfer of technology we would like to clear one fallacy, and that is the view held by some people that the stock of technology in the

world is so abundant that all that is required is for one to make a choice from the available alternatives. Far from that. Much as the stock of technology in the world is large, and even increasing, the bulk of it is really relevant only to the advanced economies for which it is developed (4). Since literature abounds which has dealt with this issue more exhaustively, we shall content ourselves with the endorsement of some of the views expressed by some writers that are in line with our thinking. The second General Conference of the United Nations Industrial Development Organisation (UNIDO) held in Lima (March 1975), for example, recommended among other things «...the indigenous development of science and technology in developing countries... » and called for « ...a redeployment of world industrial capacity to increase the present share of technology in developing countries ». Other international organisations (UNCTAD IV, Group of 77, Commonwealth Secretariat, General Assembly VII and VIII Special Sessions etc) (5) together with a number of prominent development economist — Samir Amin, H. Singer, J. Rweyemamu, C. Cooper etc — have echoed similar calls in their literature. All of them are agreed that there is urgent need to :

a) develop local or indigenous technologies and/or capacities ;

b) set-up institutions through which training and/or research could be carried out to achieve (a).

Because occasions have arisen when the phrase « indigenous technology » has been used too loosely, we would like to endeavour to put our own conception across. When discussing indigenous technology, distinction should be made between :

(i) the technology that has existed in a particular society over a long period of time, one generation inheriting it from another. Shadoofs and dykes in Egypt, handlooms in India, spearmaking and backcloth making in Tanzania being examples of this type of indigenous technology ;

(ii) the technology that is developed within a society using modern scientific methods. This type of technology is developed with the use of modern science within the country, with the aim of maximising the use of local resources to develop local capacity.

It is the latter (ii) that we are interested in here. This is so because we think it is dynamic enough to be relevant to (a) and (b) recommended above. Nevertheless, we would not like it to be misconstrued that by saying so we mean to imply that traditional technology has no contribution to make to modern science. We welcome such contribution when it is made. But where technology does not adjust to the times, we feel there is little worthy of glorification about it. It is true, for example, that shadoofs and dykes on the River Nile have served Egyptian peasants for so long a time that these peasants might find

it difficult to treat with respect anybody who holds their technology in contempt. That notwithstanding, we would favour the development, using modern science, of more efficient methods of irrigation for these peasants. Our most considered view, which we hope represents sobriety on our part, is that while we understand the limitation imposed by scarcity of resources, we are totally opposed to society, or any section of it, holding conservative views about technology. For we know that modern technology is not only the engine of growth but also the source of strength for any country. We hope to be able to justify this stand as our case unfolds. Before we do that we would like to briefly discuss what we think are some of the reasons why technology imported into LDCs perpetuates dependence and exploitation as mentioned in the introduction.

Every type of technology has its base. This base being determined by the material and social conditions pertaining in the base country. That is to say, a particular type of technology thrives best under particular conditions. Contrary to what some bourgeois economists claim, technology is *not* neutral. It serves specific purposes in society, mainly in helping the ruling classes to have command over productive processes. To put it in an economist's language, the development of a particular technology is meant to fulfill a particular objective function. The material conditions and the social and economic goals pursued by the society (or the ruling class in that society) being the determinants of that objective function. Cognizance should be taken of the fact that some of these conditions, which determine the objective function, are not easily transferable. This is so because of the simple reason that material and social conditions differ from one country to another. It is for this reason that some technologies fail to take root in some countries while they thrive very well in others. As Prof. Erik P. Hoffmann, a Soviet expert connected with the Columbia University's Russian nstitute in New York, observed « what they fail to realise is that there are cultural aspects to technology. And if you reject those, you may lose the benefits of the technology in the bargain ». The failure, on the part of importers of technologies into LDCs, to take cognizance of this important condition leads to the super-imposition of technology on false bases. Most developing countries, including Tanzania, have been importing technology without first taking care of this prerequisite — the creation of the necessary material conditions and institutional framework under which imported technology could thrive and take root (6).

It is not only the false technological base that is the problem. There is also the problem of misplaced social and economic goals. While in developed countries technologies are developed or imported to supplement what already exists, in LDCs it is the absence or dearth of technology that compels them to import. The problem now arises as to which technologies should be imported first so that others can

be developed or imported to supplement them. Either because of lack of the necessary skills to make the right « first choices », or because of misdirection by interested parties (aggressive salesmanship on the part of owners of technologies), or due to selfish interests of a group of local people technologies are imported on the basis of the so-called « established demand » which most often has a false base. It is a well-known fact that most of the commodities with « established demand » in developing countries are final consumer goods which are consumed by a very small section of the population. This section normally takes its cue, on consumption patterns, from the metropolis. It might be of interest to discuss how this comes about.

Multinational corporations, through their mastery of global distribution and marketing, advertising, product differentiation, helped by colonial legacies such as « the demonstration effect » (the yearn to ape consumption patterns of former colonisers), have shaped the consumption patterns of the small but all important privileged groups in LDCs. In Tanzania, this group of people constitutes only 5 % of the total population (15 m). Despite that it constitutes what one would rightly call the « consuming class » as it is this group which has the necessary purchasing power. Decision makers in this country come from this group. It is they who decide on what to be produced locally. Since the commodity to be produced markedly influences the technology to be used, and since the decisions on both the commodities to be produced and the technology to be used are made by members of this « class », it is unlikely that such decisions would not reflect their « tastes » and « interests ». One may, in passing, ask whether it was by accident that the beer, wine and hard liquor industries plus the cigarettes, smoking pipes and butter industries (to mention but a few) were some of the *first* industries to be established in Tanzania. While, for purposes of workers' mobilisation, it might be necessary for us in LDC to evoke Marx's clarion call, « workers of the world unite... », we are positive in our assertion that trying to emulate consumption patterns of workers in advanced countries, when our countries lack the economic base for such a move, would only lead to the creation of a superficial superstructure. For instance, whereas in countries like Britain, miners and dockworkers normally end up in pubs to down pints of ale (drawn from barrels or cellars) for refreshment after duty or after a meal, in Tanzania beer is a luxury which only a very small section of the population consumes for refreshment (7). We contend that the importation of technology to produce such goods locally, although it leads to increased output and therefore GDP, only helps to perpetuate the « demonstration effect ». We believe that these types of industries will never lead to the organic transformation of production processes that could minimise dependence. On the contrary, they will perpetuate it.

If decisions about what to produce and what technology to use are so influenced, there are other practices which suppliers of technology perpetuate to ensure their continued technological domination. We shall briefly discuss some of these.

There is the problem which most importers of technology in LDCs have to contend with and that is the problem of artificial barriers created by suppliers. Most of the technology in the capitalist world is privately owned. In most cases it is patented and/or secret. In those rare cases where it is free-for-all, prices are inhibitive. The existing legislations on patents and trademarks, which stipulate that imported technology be used unaltered (8), just reinforce monopoly capital's hold on technology. Since the duration and validity of trademarks are infinite, modification and adaptation of such technology in LDCs are difficult to initiate. As a result, those who are genuinely interested in importing technology into LDCs find themselves in such an imperfect market as to have no room for manœuvre. To begin with the technology they purchase will not necessarily be the best available. To make matters worse, the patent and trademark legislations will not allow them to manipulate that technology to serve their own interests.

It is not only through patents and trademarks that artificial barriers are created. There is also the problem of control of technology. In any operation or use of technology, there must be harmony between owners of the unit of production, management and operatives. In most imported technologies, the suppliers of technology control all the three. They normally supply the capital, management and the skilled operatives (engineers, chemists etc...). With this control the suppliers of technology do further their interests at the expense of the importing country. Even in those cases where political pressures are brought to bear on them to localise either ownership and/or operatives, it is done in such a way that there is no doubt as to who benefits most. For example, localised operatives will be the type with least or no inventive capacity. The practice of window-dressing is common enough to need no elaboration.

Arguments have been advanced by apologists of monopoly capital that multinationals offer at one and the same time technology which is a package of crucial inputs such as finance, organising ability (management), machinery and other intermediate goods, and the marketing channels if the commodities are for export. But the point that is missed by these apologists is that it is exactly that type of package (with the attendant barriers and strings) that prevents LDCs from making any headway in technological innovation and development. Most of the package technology *cannot* be unpackaged. In many cases these package imports have explicit stipulations that the recipient must not use another technology that competes with the supplier's wheter the technology is local or foreign. In many cases

they use the technology itself to pull the strings. In what is termed « technological lock-ins », the importer of technology can be « locked-in » (9) to the technology of the original manufacturer where machinery to be used in production are designed in such a way that only inputs and spare parts from the parent manufacturer can be used. How can indigenous technology develop under such terms and conditions of imported technology ? Since it would not be in the interests of exporters of technology to liberalise conditions under which technology is acquired from them, they strive to preserve their advantage by consolidating control over the capacity to generate technology. Would the United States, for example, willingly part with $ 2,760 millions in overseas receipts of royalties and fees earned from the transfer of technology abroad by USA firms (1972), 85-90 % of which went to multinational corporations ? (10).

Another vile aspect of « technological lock-in » in the transfer of technology is the *overpricing* of « locked-in » inputs. It is common practice for manufacturers of technology to use a common marketing ploy of selling cheap the original equipment knowing fully well that they will recoup whatever losses from the sale of spare parts and inputs. In many cases, especially where a monopoly supplier of the technology is involved, not even the original machinery is sold cheap. In their detailed surveys of pricing in Columbia and India, C.V. Vaitsos and M. Kidron respectively, found very stunning cases of overpricing of inputs and spare parts. In Columbia, for example, Vaitsos found that of the 11 subsidiary pharmaceutical firms, inputs were overpriced by 165 %. In India, Kidron reported the case of an India dye-stuff firm which paid up to 200 % of the market price for its inputs (11). Should the product being produced by the subsidiary be for export, then the practice of *under-invoicing* is evoked. Exports will be priced below the real market value which will mean a net loss in capital inflow to the exporting country. The difference is appropriated by the parent company abroad. At this rate of net transfers of revenues from the subsidiary firms to their parent firms abroad, how could developing countries expect to benefit much from the surpluses generated by the use of imported technology ?

These and many other problems attendant to the transfer of technology make it difficult for LDCs to benefit much from imported technologies transfered from advanced (especially capitalist) countries, under existing conditions.

PART III : THE TANZANIA EXPERIENCE

Tanzania like most other former colonies, is a country with all the characteristics of peripheral development. The economy is appended to the industrialised centre countries through the export of the bulk of her products from the monetary sector (processed and non-

processed primary goods) and the importation of much of what she utilises and/or consumes (capital, intermediate and final goods). To produce most of what she exports and to consume or utilise what she imports she needs technology. The dearth of indigenous technology militates that she imports the technology she requires.

Before independence (1961), the importation of technology was almost entirely a preserve of private investors — individual capitalists, companies and multinationals. They imported technology through their economic ventures. Even in cases where the colonial government sponsored or financed projects (mainly economic and social infrastructure) private firms were contracted to import the necessary technology to be used. As is the case with all private economic ventures, the main objective was to maximise profit (12). Thus the technology that minimized their costs and maximised returns in the quickest time possible was prefered. Since their economic activities were mainly directed at the production and processing of raw materials for export, so was the technology they brought in.

After independence, especially so after the Arusha Declaration, the government had a say in most of the investments that were made. But because of the absence of local capacity, foreign firms continued to dominate the importation of technology into the country. In fact most of the projects that were established after 1961 were joint ventures between the government and foreign private firms mainly because the latter was to provide technology (equipment, management and marketing if for export) and part of the investment capital. Due to the fact that the partners in these joint ventures had diffferent objectives and interests to achieve and nurse, there was bound to be a conflict. Whereas the government's main objective and interest was the development of the country and the welfare of the people, that of private/foreign firms was maximisation and repatriation of revenues abroad. As is normally the case with most conflicts, it is the stronger and more established who carries the day. In matters attendant to technology, foreign firms were the stronger of the two partners. We shall demonstrate this when we look at the firms we surveyed.

One of the guidelines to the development planners for Tanzania's First and Second Five Year Plans (1964-69 and 1969-74) was that whenever economically possible, labour intensive technology should be given priority when it came to a choice of technique. Two main reasons were advanced for this. One was the government's desire to fulfill one of its social welfare functions, namely, increasing employment and aggregate consumption. Secondly, it was believed that the smallness of the market necessitated the use of technologies with low output capacity. As most economists are aware, these two reasons have been contradicted by one of the latest economic schools of thought (13) which contends that one could actually achieve the

objective of increasing employment by adopting capital intensive technology. The argument goes that much as labour intensive technology appears to achieve this objective, it does so only in the short-run and therefore is limited in scope and non-dynamic. It is further contented that since capital intensive technology usually produces higher output, the unit cost of production will be lower. As a consequence, profits will be higher. The higher profits from the higher output could then be ploughed back to expand production or be used in setting up new projects. This, it is argued, is a more dynamic process of increasing employment than what labour intensive technology can provide. On the question of capacity under-utilisation due to the smallness of the market, it is argued that it might be cheaper to incur higher costs at the beginning with capacity under-utilisation than the cost that would be incurred when installing new capacity as the market expands.

While it cannot be disputed that in many cases capital intensive technology produces more output, two of our case studies showed that this is not always the case. In any case one has to have full information about the available range of techniques to choose from and the freedom and capacity to make the choice. Or else the issue of choice does not arise. The case studies will bring out many of the points we want to make here.

To simplify things, our analysis of technological transfers into the country will be divided, somewhat arbitrarily, into two main phases. The first is the pre-independence phase dating between 1891 (when the Imperial German Government imposed an administration on Tanganyika Mainland) and 1961. The second phase will be the post-Independence period (1961-1977) althought some people would prefer to split this phase further into the post-independence and pre-Arusha (1961-1967) and the post-Arusha period (1967-1977).

Shakespeare might have wanted us to believe that, « All the world is a stage, And all the men and women merely players », (14) but experience in Tanzania on matters attendant to technological transfers has shown that some men are more players than others. In the first phase (1891-1961) we had, as the stage manager, the colonial administration, with the investors (monopoly capital and individual capitalists) being main players. Tanzanians were mere accessories or watchers to the exploitation of their resources. The investors were also the importers of technology and as we have pointed out, their main objective was to maximise profit throught the exploitation of local resources. Since at that time the main interest was in the production, and processing of raw materials for export to the metropolis, the technology imported was specifically for that purpose. That is to say, the technology that :

a) extracted minerals (gold, diamonds) at least cost ;
b) produced the most demanded raw materials (cotton, sisal, coffee) at least cost ;

c) processed all these primary products (to reduce weight) at least cost ;

d) transported all these products to the main ports (Tanga, Dar Es Salaam) at least cost.

It will thus be observed that the technology imported to Tanzania during this period was concentrated in the mining and agricultural sectors. It comprised burrowing equipment for mining, farm equipment tractors, etc.) for plantations, processing equipment (cotton ginners, coffee curers, sisal decorticators, etc.) and rail engines to haul the rather bulky raw materials long distances to the coast.

In Tanzania most settler plantations were enclaves in a sea of peasant subsistence agriculture. There was no link what-so-ever between the two except for the casual labour that was drawn from the latter by the former. The techniques used in plantations were relatively modern (mechanised, fertilisers, crop-rotation etc.) — which the casual workers with their rustic origins could not assimilate and transfer to their own small holdings. The same was true of the mines, processing plants and transport equipment. Technology used in their operations was too unfamiliar to the indigenous people. Since all the machinery, the technical staff and spare parts were imported there was hardly any way such technology could have taken root in the country. It thus remained enclave technology all the way through.

Mention should also be made of the technology which was imported to sectors other than mining and agriculture. It consisted of technology imported for the provision of services and the production cheaply of some consumer goods. The services produced by this technology went mainly to urban centres where the administrators, who ensured that law and order for the smooth exploitation of local resources prevailed, domiciled. Thus thermal electric plants, water pumps, banks, etc., were introduced to provide services to towns and production centres. The enclave nature of these technologies can best be observed through the services they provided. The smallest minority of the population benefited from these services.

The story of the technology that was used in the production of the limited range of consumer goods was not any different. Not only was the range of products limited but also the scale. After all the demand for manufactures by those with the necessary purchasing capacity (mainly settlers, businessmen and administrators) was very small. These included food products, soap, beer, cooking oil and beverages. The gross output of these accounted for over 75 % of the manufacturing sectors' total output. (Incidentally the manufacturing sector as a whole accounted for only 3.4 % of GDP in 1962). The most plausible explanation as to why they were produced in Tanzania was that they were the type of products which did not pose much of a threat to the market of imported consumer goods. For example, when a Japanese match factory was set up to produce

matches in Tanganyika, the colonial government imposed such a heavy excise duty to protect their market of £ 1,400 worth (1928) of imported matches that the factory collapsed. The same fate was suffered by a local firm which in the early 1930s set up 3 factories to manufacture binder twine (from sisal) for export. While in the former case the British were trying to protect their Tanganyika market for matches, in the latter case they were protecting their home market from a cheap import from Tanganyika. In both cases, there was one thing in common, and that was that Tanganyika had to be denied the technology which might pose a challenge to the interests of the British. Since one of the industries would have produced for a larger section of the population (incidentally peasants also consume matches) and the other manufactured goods for export (instead of exporting merely processed raw materials), weren't these the types of industries whose technology Tanzania needed ?

On the whole, therefore, there was hardly much of industry or technology to speak of at independence. The little that passed for technology was in enclave production units. As one colonial report summarised it in 1949, « Sisal is decorticated, cotton is ginned, rice, maize, sugar and timber are milled, oil of groundnuts, coconut and sesame is expressed, tea is processed, coffee is hulled but exported in the bean, tobacco is cured but exported in the leaf, papain is extracted from pawpaw, and ghee clarified, butter separated from milk, soap is made from local coconut oil and imported caustic Soda. There is a brewery, furniture establishments as well as leather goods, shoes and boots establishments » (15). By 1961, the structure of industry had not changed much from this. It will be observed that apart from the maize, rice, oil and sugar milling, soap and possibly shoe making, there was hardly any other industrial activity that was not enclave in nature. The same is true of technology.

During the second phase (1961-1977) the TANU Government not only emerged as the new stage manager, but also as an active actor in the investment and import of technology play. The newly installed government did not have illusions about the economy it inherited from the colonialists and wanted a structural change.

It was decided from the beginning that structural changes be brought about in the economy through planning. But as is common with most plans in LDCs, the 1st and 2nd Five Year Plans were comprehensive only in as far as they identified priority areas of economic activity. The plans lacked coherence and sense of direction. In fact the first plan looked very much like a shopping list for foreign aid. For when the expected aid (78 % of the entire development budget) was not forthcoming (due to the ruptured relations with the supposed main donor - Britain), the plan was in trouble well before it was through with one year of implementation. But the Plan's problems were not only financial in nature. The proposed projects

seemed to have been randomly picked. As individual projects, they looked impressive, but they were not integrated. There was hardly any interdependence or linkages in proposed projects (16).

One of the first industries to be established (1964) was the cement plant in Dar es Salaam. It was jointly owned by the government and a foreign firm which was an amalgamate of Portland Cement Manufacturers Ltd., and Cementia Planungs und Beratungs A.G. Zurich. The latter also provided the management, at a fee. In addition to the management fee that was to be paid to Cementia Holding (2 swiss-francs-equivalent to T. Shs. 4/20 per tonne before the devaluation of 1975), the management agreement provided for, among other things, the :

1) choice, by the management, of the technique to be used in production of cement ;
2) training of nationals, by the management, to take over all the managerial and technical posts at the expiry of the contract (10 years).

The technology chosen for the Wazo plant was the most modern and capital intensive in East Africa. For example, with its capacity of 350,000 tonnes p.a., it employed less than 600 workers (1974) compared to the labour intensive plant at Tororo (Uganda) which employed over 1000 workers (1972) with a capacity of less than 200,000 tonnes p.a. The technical composition of capital, that is to say, the capital/labour ratios of four East African Plants were as follows (1972) :

Wazo Hill (Dar Es Salaam) : 1.62 (the most modern plant) ;

Tororo (Uganda) : 1.15 ;

Bamburi (Mombasa, Kenya) : 0.87 ;

Athi River (Nairobi, Kenya) : 0.71 (the oldest plant).

Source : Prof. Z. Svejnar (See footnote 18 below for title), p. 13.

Capital/labour ratios, however, tell one too little for them to be used as the basis for a choice of technique. For example, in cement production, we have the wet and dry processes, both of which are widely used all over the world. The dry process is normally used in large rotary kiln installations which not only make substantial savings on fuel, but are also known for their good quality cement and minimisation of waste material (dust) that sometimes causes costly accidents (17). On the other hand the wet process is known for its small kilns, sometimes requiring several of them to constitute one plant. These are particularly suitable in low-consuming markets or in markets with fluctuating demand where some kilns can be closed or opened depending on the demand position. This would not be economic with the larger rotary kilns used in the dry, process.

When still on the issue of K/L ratios, it should be borne in mind that the technique used in any production process is not the only deter-

minant of the level of employment. As Professor Z. Svejnar pointed out, « The differences among plants in the manning of broadly similar equipment may be accounted for partly by differences in the amount of employment in servicing departments such as those providing maintenance, training, medical, recreation and canteen services. These differences in turn may be related to differences in external conditions such as the availability outside the firm of training facilities, transport, maintenance and social services. Differences in the utilisation of equipment and efficiency of management may be another partial explanation » (18).

Granted that the above observations are enough caution against the use of K/L ratios as the sole or main criterion in the choice of technology, the following are the observations we made in our study of the Wazo cement plant.

(a) The technology chosen for Wazo Hill used oil and electricity in the burning process instead of coal. It is granted that at that time (1964) nobody could have predicted the frantic oil price rises (19) of the 1970s. It is also true that at that time an oil refinery plant was planned for the country. But if one was to view this decision in terms of comprehensive planning, one could not be excused for ignoring the fact that Tanzania had large coal deposits which by then were already proven as exploitable.

The limestone deposits at Wazo Hill were estimated to last over 50 years of exploitation. Surely one should have had the oversight to envisage the exploitation, sooner or later, of the coal deposits in the country's southern region of Mbeya. Today, Wazo Hill is pushing ahead with plans to fire the plant's kilns with coal, not because of the need to integrate production with the proposed coal industry (20), but because of the high import bill of inputs into the oil and electricity industries whose high costs are being transmitted to the plant through furnace oil and electricity. It could even be argued that the use of coal in a large and expanding production unit like the Wazo plant would have expedited plans to exploit Tanzania's coal deposits for both local and foreign markets.

Since 14 years after the establishment of the plant, there are hardly any signs of striking oil (despite the intensive drilling and exploration) the choice of a technique that consumed large quantities of oil sentenced the Wazo Hill plant (and the country as a whole) to perpetual dependence on inputs with a very high import content (21). This, as we pointed out earlier, is one of the main characteristics of enclave technologies which perpetuate dependence.

(b) Because the management at the Wazo plant was German, it was reasonable to expect them to import German technology. Nevertheless the choice of the ultra-modern equipment, which not only required specialist training to handle but also needed heavy capital investment, could easily be construed as a design on the part of mana-

gement to maximise capital flight through payments to expatriate technicians and the heavy interest and loan repayments. Since most of the capital investment was foreign (Portland Cement Manufacturers Ltd., 40 %, Cementia Planungs und Beratungs A.G. Zurich 40 %, Smith Mackenzie 10 % and the government through the NDC, only 10 %), the management and technical staff was foreign, many of the inputs were either direct imports (paper bags, spare parts, etc.) or had a high import content, one wonders whether the large foreign exchange payments involved were not too heavy to be compensated by the mere *high output* of the technology, which management kept citing as its main advantage. In any case, even this supposed advantage (of high output) mostly benefited the management.

(c) As we pointed out above, the management fee was paid on the basis of the quantity of cement produced. So the technique that maximised output ipso facto maximised the management fee to be paid. This was paid gross in convertible currency. Was it not in the best interests of management that it should prolong its stay by using a technique which was not easy to handle (22) ? I am made to understand that two of the main reasons that led to management's unceremonial replacement were its resistance to have the terms and management agreement renegotiated, and the breach of contract by management's failure to train Tanzanians for top jobs. Although the agreement stipulated that they train Tanzanians to take-over from them on the expiry of their contract, they never organised any training programme for nationals. As a consequence of which 8 years after (with only 2 years to go) there was only one Tanzanian holding a managerial post (the sales manager) and none on the senior technical staff (engineers, chemists, electricians, etc.).

(d) Lastly but not least, I will briefly elaborate on my earlier contention about technological interdependence and linkage in the production processes. As I have pointed out elsewhere (23) the choice of the technique and the location of the production site at Wazo, although it suited best the interests of the foreign management and the largest share holders, did little to foster interdependence and linkages.

There are two main processes which are common in the production of high quality portland cement. One uses gypsum rock as the primary raw material input, the other uses limestone rock. Although the limestone process is less costly at a plant's level, the gypsum process is more promising especially so if cement production is coupled with the production of sulphuric acid as co-products (24). In addition, the gypsum process require coke as an input. We have already said that Tanzania had coal from which coke could have been acquired. Since the largest gypsum deposits were located in Kilwa where electric power supply is very short indeed, coal would have been the natural choice as a source of fuel and power for the cement and

sulphuric acid plants. When one looks at these and other linkages that could have been forged had the gypsum process been adopted, one is persuaded to believe that Tanzania would have benefited more from this process than the limestone one. In terms of technological interdependence, we would have had the cement technology which had direct linkages with the coal, coke and sulphuric acid technologies. With systematic comprehensive planning, these linkages were not difficult to establish.

In summary, the cement technology that was transferred here served the interests of the foreign management and shareholders. Their choice did not take into consideration long term effects on technological developments in the country but rather their short term interests — the maximisation and repatriation of revenues as quickly as was humanly possible. It is only the government, through a systematic comprehensive plan, that would have made decisions taking into consideration the long term requirements of the country. A foreign management team representing foreign/private interests could not have done so.

Friendship, Mwanza and Kiltex Textile Mills

If we had had the luck to get from these three plants even a quarter of the information we had from Wazo Hill, these would have made the best sample for our study. The three plants are of different technologies, with different sources and different terms. Friendship Textile Mill in Dar Es Salaam (1968) is a labour intensive plant supplied by China (Mainland) on very soft loan terms. The Mwatex plant in Mwanza (1968) on the other hand is jointly owned by Tanzania (80 %) and a French firm Amenital (20 %). The latter provided the technology, consultancy and management services. The plant is modern and capital intensive (French origin). Kiltex Textile Mill was originally privately owned by local and foreign private firms but has since been nationalised. The plant was imported second hand from Britain.

Friendship and Mwatex are the two largest textile mills in Tanzania. While the capital intensive (£ 4 m. T. Shs. 80 m/ =) Mwatex plant employs only 1000 workers and produces 24 millions square yards of cloth per annum, the labour intensive Friendship plant (£ 2.5 m. T. Shs. 50 m/ =) employs over 3000 workers and produces over 24 million square yards of cloth and 1,000 tons of yarn per annum (1972). That is to say by being capital intensive, Mwatex does not have any advantage over Friendship in terms of quantity. If anything, contrary to theory, it is the opposite. In the initial years of production, Mwatex was definitely producing better quantity cloth than Friendship. But with workers in Friendship improving their skills and efficiency, the quality is now almost at par.

The comparison does not stop there. While Mwatex still has quite a number of foreign experts, Friendship, because of the crush

training programme organised by the initial Chinese experts, was fully Tanzanianised by 1971. What is more intriguing is that while Mwatex had been making losses almost all the way through up to 1972, (25), Friendship had been making handsome profits which enabled the plant to embark on an expansion programme that increased the capacity of the plant to 33 million metres of cloth p.a. (see Daily News, Tanzania, 30/12/76). It is true that an expansion programme (which would increase the capacity to 43 m. metres) worth shs. 312 m/ = is planned for Mwatex, but this is with the help of a World Bank loan of shs. 107 m/= (Daily News 5/6/75).

When it comes to the Kiltex textile mill, the investment seems to have been a blunder. The second-hand machinery from Britain had a notorious record of breakdowns. Acording to an accountant of the plant, the machinery was not only a « dump and useless » but it was bought at a very exhorbitant price. It was a question of the foreign exporter trying to squeeze the local importers. Two different lots of management have been brought in (since it was nationalised) but none has managed to reduce the rate of breakdown despite the very much improved maintenance work and quite advanced spare parts manufacture at the plant site. The plant has now reverted to using imported synthetic fibre (which the plant was apparently designed for) to make polyester cloth. While such a measure might be seen as a way of bailing the plant out of its chronic problems, at a macro-level it can be viewed as nothing more than another outlet of the country's foreign exchange earnings.

Our study on the textile mills has blown-up one of the myths — that capital intensive technology produces higher output than labour intensive. At the same time it has vindicated us in our forebodings about some of the technologies we import from capitalist countries. While our study does not prove the appropriateness of Chinese technology to our requirements, it at least shows some of the positive aspects that could be used in future technological transfers.

General Tyres International (T)

This was one of the industries the Kampala Agreement of 1965 allocated to Tanzania as part of an exercise to correct the imbalance in industrial installations among members of the East African Community. The plant was therefore supposed to serve the entire East African market. As its name suggests General Tyres is a multinational which quite happily accepted a minority shareholding with a proviso that it supplied not only the equipment but also management, all raw materials, spare parts and rubber moulders. It is from these inputs that G. T. makes much of its income on the investment. Unlike many other turnkey projects in Tanzania, this firm has a direct relationship with the parent plant. Because it is the parent plant that runs the

Arusha plant, management ensures that it is run as efficiently as possible, firstly, to keep its international image and therefore ward-off the threatened competition from the Kenya upstart, Dunlop and, secondly to maximise revenues on sales of inputs to compensate for the relatively small share of profit and the unusually small management fee.

Unlike other projects, the 7 year old second-hand plant brought in from Holland at shs. 74.7 m/ = operates very smoothly indeed. The products are of very high quality — reputed to be the best in East Africa. The plant's annually declared dividends are very high. Which implies that the investment was real and not a show-piece to carry the General Tyre flat in East Africa. In fact there are no indications that the operation is being subsidised with funds from somewhere else just to keep it going.

All that has been said about GT might appear rosy at first sight but one does not even need close scrutiny to discover the enclave nature of the industry. Not only are most of the inputs imported together with the technology, but also most of the outputs are consumed by high import-content utilities. The vehicles that consume tyres from the plant are all imported. Thus the domestic demand for General Tyres products is a function of the foreign exchange drain. Except for public transport, the people who consume services rendered by G.T. products are the privileged few among the minority 5 % group — private vehicle owners. In any case the technology at the Arusha plant is unlikely to take root in Tanzania in the near future. Not only are backward linkages non-existent but the forward ones are themselves enclave. The tyre making technology will stay so long as Tanzania allows General Tyres (I) to run the show. Since multinationals are not known for commiting economic suicide that easily, we could as well stop dreaming that they would and do something about it.

PART IV : RECOMMENDATIONS AND CONCLUSIONS

What then are some of the measures that a developing country like Tanzania can take to maximise benefits from imported technology ? As it is generally accepted technologies are developed to make man's work easier in the production and/or cosumption of goods and services. It therefore follows that a correct decision about what should be produced and consumed by society goes a long way to facilitate a correct choice of technology to be imported. It is our most considered view that developing countries cannot afford the luxury of importing technology at random (26). Technology like production should be planned and, not in isolation, but as an integral part of the overall development plan. That is to say, whatever technology is imported should be consistent with overall development objectives.

We also concur with those who contend that since many production processes are interdependent, strategies should be worked out on how (27) :

i) to import technology ;
ii) to train personnel to handle the imported technology ;
iii) to assimilate the imported technology ;
iv) to adapt and/or improve on imported technology to fit the local resource base and requirements.

When this is done a link should be established between these four measures in order to minimise « enclave » tendencies of imported technology. In addition there should be established a mechanism through which appropriate technology should be chosen from *known* alternatives. Whichever technology complements national technological development and sustains local investiveness should be given priority. The specific technology to be imported being chosen using, among other things the following parameters that are inherent in technology but are not too commonly used as guides (28) :

i) productivity and efficiency of a particular technology ;
ii) versatility and flexibility i.e. the multiplicity of uses ;
iii) complexity or simplicity of technology and its training requirement (taking into consideration local resource base) ;
iv) commercial life expectance (for equipment) ;
v) use of factors or inputs (again with emphasis on local resources) ;
vi) potential degree of adaptability to local conditions and the social and economic impact expected ;
vii) then finally direct costs (royalties, etc.), terms of other credit and collateral assistance (e.g. marketing of products), delivery dates and guarantees for equipment, etc.

To us therefore, the question of whether a particular technology is capital, or labour intensive is irrelevant. What is relevant is the appropriateness of that technology. Whether it is adaptable to local conditions ; whether, in the long run, it can be assimilated ; whether it is simple enough for the existing skills to handle, whether it is possible to train, within an acceptably short period of time, local skills ; whether it uses to the maximum local inputs, whether it will finally reduce our dependence. The importation of any technology that does not fulfill most of these conditions will be a pseudo-transfer, whether that technology is capital or labour intensive. If in the existing stock of technology there is none that fulfills the requirements, there is more need to develop one that does. Hence the necessity for institutions to carry-out research and development (R & D) on technology which is suitable to LDCs. Whatever technology is finally designated as suitable should possess these properties :

i) it should be self-generating, and
ii) it should be self-sustaining.

The issue that we would like to discuss in passing is what we consider are the technological innovations that are self-generating and self-sustaing and therefore require priority ranking. According to Adolphe Lowe, there exists a group of industrial activities in the field of equipment goods that are capable both of producing other equipment goods and also reproducing themselves. These, according to J. Rweyemamu, «... are the engineering industries which are the progenitors of *all* other machinery and *also* of themselves » (29). We concur with this view. Now that plans are at hand to set-up a steel industry (using local iron and coal from S. Tanzania), the machine tools industries should be a logical sequel as these would provide a « natural » forward linkage. What has to be borne in mind is that this link is not automatic. It has to be forged through planning. In the plan, the industrial activities should be sequenced in such a way that they are not only compatible with the resource base, but are also consistent with the country's overall development programme. This is not possible without restructuring the present institutional framework.

We would therefore like to stress the urgent need for structural changes that should facilitate not only the transfer of technology, its application, adaptation and modification, but also the development of indigenous capacity. As we have said before, LDCs (and Tanzania in particular) do not have the necessary economic structures that can allow for self-generating and self-sustaining technological developments. Since experience has demonstrated that private firms or institutions could not be expected to effect these structural changes, and since developments in advanced countries are such that they work against the development and invention of science and technology in LDCs, the onus falls on the government. The government must therefore take charge of not only establishing the institutions, but also direct the activities of such institutions in accordance with national objectives and goals.

The other problem that the government should directly involve itself with is the planning and training of manpower. This should be done in conformity with the identified priority areas. For example the orientation of science, especially solid or fundamental science, should be influenced by national objectives. That is to say, there is little point in having a department of nuclear physics in a national university when the country's immediate problem is how best to harness hydro and geo-thermal energy from the existing potential. It is not uncommon, for example, to find the highest institutions of learning churning out products (graduates) that are least relevant to the nation's immediate needs. Recently a workshop was organised by the East African Academy in Arusha and one of the themes on which papers were invited from one of the East African Universities was « Nuclear Energy ». Surely research findings on such themes have

little or no practical use in the near future. They end up being of purely academic interest for intellectuals « to fascinate themselves with ». That is why work-shops and conferences are turning out to be mere arenas for academic gymnastics where participants thoroughly enjoy themselves by wallowing in superfluities.

What Tanzania needs are well-staffed research institutions and workshops where our scientists, engineers designers etc., can indulge in serious productive work, hopefully with the end result of a new invention. But as we pointed out the invention of technology is not a necessary and sufficient condition for its successful application. Therefore institutions should be set-up to carry inventions a stage further — their practical application to problem solving in the country.

Last but not least there is the problem of co-ordination which if not well handled can render efforts expanded in different activities less fruitful than would be the case. Here we agree with « The Sussex Group » when they assert, « There must be firm connexions between every link in the technology application chain. Thus :

a) technologists, able to understand the contributions of fundamental research, but familiar with industrial needs and problems, should provide liaison between fundamental and applied research functions ;
b) as close a contact as possible should be encouraged between fundamental research scientists, technologists, applied scientists, extension officers and potential industrial and agricultural users ;
c) liaison and extension officers are also needed to help potential industrial and agricultural users to recognise their technical needs and problems, and to relate applied scientific research to these needs and problems » (30).

With such co-ordination, there is hope for success.

CONCLUSION

In our hastily assembled overview, we have come out with certain observations which we hope we have emphasised strongly enough to need no more recapitulation. We have built our case on the dependency theory and come to two main conclusions :

i) that technological transfers from developed countries can only be useful if they are absorbed internally and used in the promotion of set objectives that are pro-people. That is to say objectives that serve the majority of people in society ;
ii) that technological transfers without our own internal effort cannot possibly lead to the reduction of dependence and promote self-reliance.

With these and other guidelines we have discussed in the paper, we think developing countries and Tanzania in particular can make a headway in the development effort using imported technology.

FOOTNOTES

(1) In 1950, three Soviet scientists registered a process for the dry production of fluorine aluminium, a technique that the French aluminium giant, Pechiney, has now used successfully for 15 years. Yet up to now no Soviet factory has adopted the technique. Also, the Imperial Chemical Industries of England currently employs a vinyl-astate production process developed in the USSR in 1961 yet the technique has never been used in any Soviet plant.

(2) For the definition see IDRC — 060e, *Andean Pact Technology Policies*, Ottawa : International Development Research Centre, 1976.

(3) It is said that one of the most closely guarded industrial secret is the formula used in the manufacture of Coca-Cola. The USSR scientists for years tried to rediscover this formula but failed. They had finally to import American technology to produce Coca-Cola in the USSR. Even in the USA itself, other firms have tried to find the secret formula but failed. But because of their technological base, they managed to produce close substitutes as Pepsi-Cola, Rite-Cola, etc. some of which are giving serious challenge to Coca-Cola. What LDCs lack is the capacity to develop such substitutes on their own.

(4) See H. Park and M. Todaro *Technological Transfer, Labour Absorption and Economic Development*, Oxford Economic Papers, Vol. 21, 1969.

(5) See UN Documents on Transfer of Technology ID-CONF. 3-31 ; ID-CONF. 3-SR. 18 ; ID-CONF. 3-SR. 18-Add 1-REV. 1 and UNDOC E-AC 62-4 TD-190 ; TD-B-593 ; TD-B-595 ; UNCTAD, TD-106, 1971.

(6) It is not only in LDCs where one finds such phenomena. Newsweek (9-2-76) observed, « Over the past few years Russia's leaders have spent billions on Western technology from computer installations to procedures for making fertilisers, from metal-plating to formulas for veterinary medicine ». But despite the fact that the USSR is not a « technological wasteland », it continued, — there are already clear signs that Western technology is not taking root in Russian soil — ». Although Western press reports on developments in the USSR have to be swallowed with a pinch of salt, we would be very surprised if the contrary is the case.

(7) Neither will copying life patterns of our socialist friends offer a better alternative. While workers in the USSR break seals off Vodka bottles and empty contents down their throats like water during work-breaks, their counterparts in Tanzania have water instead to refresh themselves with. Konyagi, which is a locally produced spirit quite close to Vodka, is a « celebrity » that can be afforded only by the topbrass in the country. With locally produced whisky, brandy and gin on the local market, locally made Vodka should be around the corner. Of course we are import substituting !

(8) For a more detailed analysis, see V. S. Vaitsos, « Patents Revisited : Their Function in Developing Countries » in C. Cooper (ed) *Science, Technology and Development*, London : Frank Cass, 1973. Also see J. O. Wellington, *Parents and the Legal Forms : Role in Transfering Technology to Developing Countries With Emphasis on Tanzania*, (Unpublished LIM Thesis) 1975 for a detailed study of the Tanzania case.

(9) See C. E. Barker, M. R. Bhagavan, P. M. Mitschke-Collande & D. V. Weild *in Industrial Production and Transfer of Technology in Tanzania : The Political Economy of Tanzanian Industrial Enterprises*. (Unpublished), 1975, University of Dar Es Salaam, ch. III, p. 6.

(10) United States Senate, Committee of Finance, *Implication of Multinational Firms for World Trade and Investment for United States*, Washington : Government Printing Office, 1973, p. 557.

(11) C. V. Vaitsos, *Transfer of Resources and Preservation of Monopoly Rents*, Cambridge, Mass : Harvard University Press, 1970. M. Kidron, *Foreign Investment in India*, Oxford University Press, United Kingdom, 1975. Also quoted in Barker, Bhagavan Mitschke-Collande & Weild *Op. Cit.*, Ch. II, P. S.

(12) As one capitalist economist put it, « A start can be made with the simple assumption that the motive of an individual or a group who set up in business is to make money, and (as a temporary expedient only) that they wish to make as much money as possible ». David M. Smith, *Industrial location : An Economic Geographic Analysis*, New York : John Wiley & Sons Inc., 1971, p. 181.

(13) See R. B. Sutcliffe, *Industry and Underdevelopment*, London : Addison - Wesley Publishing Company, 1971, Chapter 5.

(14) Whilliam Shakespeare, *The Complete Works of Shakespeare* in « As You Like It », Act. II Scene VII, Spring Books, Mamlyn Publishers, 1958, p. 218.

(15) See Barker, Bhagavan, Mitschke-Collande and D. V. Weild, *Op. Cit.*, p. 5.

(16) For a detailed analysis, See P.M. Kuuya, « Import Substitution As An Industrial Strategy », Economic Research Bureau Paper (ERB Paper) 76.10, Universiy of Dar Es Salaam.

(17) The Collapse of the entire roof of the Tororo Cement factory in 1973 was caused by the solidification of accumulated cement dust. A (rain) drizzle caused the dust to solidify into a solid mass of cement whose weight could not be born by the roof.

(18) Prof. Z. Svejnar, « Some Factors Affecting Employment and Choice of Technology in African Industry : A study Based on a Survey of Thirty-Seven Plants in a Region of Tropical Africa », Geneva : International Labour Office (ILO), 1972.

(19) For a detailed discussion of the effect of oil price changes in the cost of production of cement at the Wazo Hill Plant, See P. M. Kuuya, « Inflation : Tanzania's Dilemma » Economic Research Bureau (ERB Paper) 75.8, University of Dar Es Salaam, 1975.

(20) The State Mining Corporation (STAMICO) is pushing ahead plans to exploit the coal deposits in Mbeya. A railway line is being constructed by the Chinese to join the coal deposits at Ilima (Rungwe) and the iron ore deposits at Liganga (Chunya) to the Main Tazara Railway line.

(21) Although Tanzania has a 750,000 tonnes capacity oil refinery plant that produces, among other things, furnace fuel consumed by the cement plant, the high import content of the refinery's products makes a mockery of any efforts to be less dependent. The refinery is one good example of an enclave investment.

(22) The equipment must have been quite advanced or quite peculiar to German technology for despite the 3 years the new management and technical staff from India have had since they took over, there are hardly any signs that the technique at the plant has been sufficiently mastered by the new experts. The constant machine breakdowns which have led to the plant's output to fall below 75 % of 1973 bears this out.

(23) See P.M. Kuuya « Import Substitution... », *ibid.*

(24) This could have been done by setting up a cement plant with a contact sulphuric acid plant that processed further the sulpher-dioxide discharged from the cement plant.

(25) According to the Minister of Industry's report to Parliament (Daily News 17-7-76) Mwatex made a gross profit of shs. 3.72 m/= in 1974 but this dropped to shs. 2.29 m/= in 1975.

(26) Many projects initiated in Tanzania during the 2nd Five Year Plan period were not planned (e.g. the Tazara Railway). Decisions were made about them as expedience or necessity arose. It is such decisions that are partly responsible for some of the random choice of technology.

(27) See IDRC — 060e, *ibid.*

(28) In some of the developing countries where the machinery for choosing technology is not systemised, the main guidelines that is used in the choices is the last parameter (vii). Tanzania is one of these.

(29) J. Rweyemamu « The formulation of An Industrial Strategy for Tanzania », Mimeo, 1976.

(30) The Sussex Group : *The Sussex Manifesto* : *Science and Technology to Developing Countries During the Second Development Decade*, Institute of Development Studies University of Sussex, England, 1970, p. 12.

RÉSUMÉ

Cet article procède à l'analyse des problèmes du transfert de la technologie aux pays les moins développés avec en exergue le cas tannzanien. L'auteur conçoit le transfert de la technologie comme étant l'acquisition par un pays quelconque de l'une ou d'une combinaison de deux ou trois des catégories suivantes :

a) les renseignements techniques et commerciaux qui peuvent être utilisés dans le cadre de la recherche/développement de nouvelles méthodes de production de biens et services et dans la commercialisation et l'achat des techniques et de leurs produits ;

b) un personnel hautement qualifié capable de concevoir, de développer et d'effectuer la recherche en matière de technologie et de prendre des décisions quant à l'utilisation efficace de cette technologie ;

c) un équipement conçu et réalisé par l'homme incorporant des techniques avancées et pouvant être utilisé à la transformation de biens intermédiaires de production en produits finis, lesquels produits sont utilisés à fournir et à développer les services et à créer de nouvelles capacités de production.

De tels transferts se font à titre temporaire ou permanent, mais quoi qu'il en soit un processus d'assimilation est nécessaire afin de les adapter ou de les améliorer en fonction des ressources et des besoins locaux. S'il en est autrement, l'auteur les qualifie de « pseudo-transferts », de grappes de techniques « enclavées » qui ne seraient pour le pays importateur qu'un passeport vers la dépendance et l'exploitation. C'est la raison pour laquelle les pays en voie de développement doivent s'évertuer à créer et à développer des techniques autochtones et mettre sur pied dans les plus brefs délais des institutions de recherche et de formation pour l'évaluation de ces techniques.

Toute technique est fonction de la base matérielle et des conditions sociales du pays d'où elle est issue. En d'autres termes, la technique *ne peut pas être neutre ;* le développement d'une technique répond à une fonction objective spécifique, les conditions matérielles et les objectifs économiques et sociaux de la société (ou de la classe dirigeante de cette société) étant les déterminantes de cette fonction objective. Bien souvent, ces conditions matérielles et ces objectifs économiques et sociaux ne sont pas transférables d'un pays à l'autre, ce qui explique que des techniques qui ont fait leur preuve dans un pays donné échouent en catastrophe ailleurs. Dans la majorité de pays en voie de développement, y compris en Tanzanie, on a procédé à l'importation des techniques sans s'assurer au préalable de la création des conditions matérielles et du cadre institutionnel nécessaire à l'enracinement et à l'évolution de ces techniques.

Les sociétés multinationales avec leur contrôle du réseau de commercialisation et les moyens publicitaires dont ils disposent ont créé ou encouragé l'essor de modèles de consommation répondant aux besoins d'un groupe infime mais puissant de privilégiés dans les pays sous-développés. En Tanzanie, ce groupe représente à peine 5 % de la population, mais constitue la « classe consommatrice », étant le seul détenteur du pouvoir d'achat nécessaire. Il décide du produit qui doit être fabriqué localement. et il n'est pas étonnant que les décisions soient prises en fonction des goûts et des intérêts de ce groupe.

Parmi les problèmes relatifs à l'importation de la technologie, il y a les barrières artificielles créées par les fournisseurs qui détiennent les brevets et les marques de fabrique dont la durée est indéterminée, ce qui rend toute adaptation extrêmement complexe. L'importateur est donc enfermé dans un carcan technologique qui ne lui laisse aucune marge de manœuvre. D'ailleurs, il n'a aucun contrôle sur les prix qui lui sont imposés par les sociétés exportatrices.

En Tanzanie, avant l'indépendance en 1961, l'importation de la technologie était de l'unique ressort de l'investisseur privé — personnes physiques ou morales ou sociétés multinationales — dont l'objectif principal évidemment était la maximalisation des bénéfices.

Après l'indépendance, et notamment après la déclaration d'Arusha, le gouvernement intervient de plus en plus dans tous les secteurs de l'économie, mais la capacité d'autofinancement locale étant encore très réduite, les sociétés étrangères continuent à dominer le secteur de l'importation de la technologie, La contradiction est flagrante ; tandis que l'objectif principal du gouvernement c'est d'assurer le développement du pays et le bien-être de ses populations, les sociétés étrangères n'ontd'autre but que la maximalisation des bénéfices et le rapatriement de leurs recettes à l'extérieur.

Une des premières industries à être créées (1964) après l'indépendance a été une cimenterie à Dar Es Salaam. Une société mixte a été mise sur pied avec le concours d'une société étrangère et la participation du gouvernement tanzanien. La société étrangère était responsable de la gestion, du choix des techniques, de la formation des ressortissants tanzaniens, etc... La technologie choisie était à forte utilisation de capital et l'une des plus modernes en Afrique de l'Est. Le combustible utilisé était le pétrole et l'électricité plutôt que le charbon dont les gisements sont importants dans le pays ; on n'a tenu aucun compte des liaisons possibles en aval ou en amont de cette industrie.

Parmi les autres exemples étudiés par l'auteur, le cas de General Tyres International, une usine pour la fabrication des pneus, implantée en Tanzanie dans le cadre de la défunte Communauté de l'Afrique de l'Est, ne semble pas mieux conçu. Tous les biens intermédiaires de production sont importés de même que les techniques et, de surcroît, les véhicules qui consomment le produit de cette usine (les pneus) sont

eux-mêmes importés. Il s'ensuit que la demande intérieure pour le produit en question est fonction de l'exode de devises.

S'agissant du problème général du transfert de la technologie, il importe peu qu'elle soit à forte utilisation de capital ou de main-d'œuvre ; ce qui importe, selon l'auteur, c'est que cette technologie soit susceptible d'être assimilée. L'importation de techniques n'est utile que si celles-ci répondent aux besoins des masses populaires et aident à réduire la dépendance dans le cadre d'une stratégie de développement autocentrée.