

UNITED NATIONS  
AFRICAN INSTITUTE FOR ECONOMIC  
DEVELOPMENT AND PLANNING

DAKAR

CS/2673-14  
INSTITUTE OF DEVELOPMENT STUDIES  
UNIVERSITY OF SUSSEX

BRIGHTON



52<sup>nd</sup> SEMINAR ON

STRATEGIES FOR INCREASING PRODUCTIVE EMPLOYMENT IN AFRICA COUNTRIES  
(DAKAR 10 NOVEMBER - 12 DECEMBER 1975)

RURAL CONSTRUCTION WORKS - THE IMPACT ON RURAL TECHNOLOGICAL CHANGE

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NOVEMBER 1975

RURAL CONSTRUCTION WORKS--THE IMPACT ON RURAL TECHNOLOGICAL CHANGEIntroduction

Rural construction works of all kinds (roads, water development, food storage facilities etc.) are important elements in most rural development efforts. Moreover, as the construction process and the maintenance of rural works have a substantial employment potential it is often recommended that employment-intensive rural works programmes become an element in employment oriented development strategies.<sup>1</sup>

How far such a recommendation is accepted depends on a large number of matters. The most important of these are: (a) the objectives which the society in question expects to achieve by an increase in rural employment; (b) the relative weight which these objectives are given vis a vis other objectives; (c) the existence of alternative ways to create rural employment; (d) the capacity to plan and implement relatively labour-intensive construction and maintenance works. From a theoretical point of view the question of whether or not the employment potential embodied in rural construction and maintenance works should be exploited is a question of defining the most appropriate rural works technology.

The most appropriate technology

The core of the commonly used argument for the application of "appropriate technologies" points to the need for the technologies to be adapted to the so-called local conditions. In other words, the criterion for appropriateness has first of all been referring to local conditions.<sup>1</sup> However,

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1. See for example "Employment Incomes and Equality. A Strategy for Increasing Productive Employment in Kenya", ILO, Geneva 1972, page 309 to 313, and 579 to 584.

advocates of this choice of technology seem not to have been successful in very many fields. The lack of adoption of other than the "normal" equipment-intensive technologies in rural construction works in a case in point. Personally I have experienced a number of futile discussions with executive technologists about the appropriateness of various alternative construction methods for rural works. I call these discussions futile because we have been talking only about purely technical aspects, and whenever I did argue that a given equipment-intensive technology was not appropriate to the local conditions, I was met with the counter-argument that the local conditions should be made appropriate to the technology.

This, of course, misses the point, which has to do with items (a) and (b) of the introduction. The point is that the criterion for the appropriateness of a technology should refer primarily to the objectives of the technological activity under review. The 'local-conditions-adaptation requirement should become an implied or secondary condition. Thus, the most appropriate technology is the technology the result of which leads to optimum attainment of the social, economic and political objectives of the society in question. This definition is of course fraught with ambiguities. The definition is not more precise than the articulation of the given objectives. It will be necessary to decide whether the formulation of the objectives should be that of the ruling political powers or perhaps that of some other more or less articulated groups of the society in question. And even if there may seem concurrence in the case of each objective, there may be divergences in perceptions of orders of priorities. A last and perhaps not the least source of ambiguity has to do with possible divergences in opinion about the effect which the application of various technological alternatives will have on attainment of the objectives.

The definition may appear to be of a commonplace and tautological nature. I have nevertheless two specific reasons for insisting on using the concept as defined, both of which have a political-educational aim. (a) By saying that some technologies are appropriate we are implying that others might be inappropriate. In other words, we emphasize the fact that in most cases there is a choice. (b) By "forcing" the technologists consciously to consider the objectives of their activities we might gradually bring them out of the widespread belief that technology is something neutral with no political connotation.

The last point perhaps needs some clarification. My argument is that technologists must be made to understand that when they are asked, for example, to build a bridge, they are not asked to build that structure for its own sake. The bridge might part of, say, a rural development programme which has been designed to attain specific objectives. These objectives should therefore be conveyed to the technologists with the instruction to make their choice of bridge-building technology in accordance with the said objectives.

The focus is then put squarely on the objectives and the discussion of the most appropriate bridge-building technology becomes as much a discussion of the purpose of the rural development programme as of the combination of factors of production. The crucial question of "development for whom" might even enter into the discussion.

#### The necessary condition for technological change

In order to illustrate the application of the theoretical arguments of Section 1 and 2, I shall now elaborate further on the example of choice of bridge-building technology. Frantz Fanon is very clear in his opinion about which objective, and which criterion derived thereof, should be used

in choice of technology for rural works projects (and I presume, for all other projects) when he writes:<sup>1</sup> "If the building of a bridge does not enrich the awareness of those who work on it, then that bridge ought not to be built and the citizens can go on swimming across the river or going by boat. The bridge should not be "parachuted down" from above; it should not be imposed by a deus ex machina upon the social scene; on the contrary it should come from the muscles and the brains of the citizens. Certainly there may well be need of engineers and architects; sometimes completely foreign engineers and architects; but the local party leaders should be always present, so that the new techniques can make their way into the cerebral desert of the citizen, so that the bridge in whole in part can be taken up and conceived, and the responsibility for it assumed by the citizen. In this way, and in this way only, everything is possible". Thus, according to Fanon a technology is appropriate provided it enriches the awareness of those who are involved and supposed to make use of the technology. In the following I shall specify this argument and deliberately make an effort to use the same categorical language as Fanon in order to make the reasoning as clear as possible.

One of the preconditions for "everything to be possible" in the area around the site of the bridge is that some technological change is brought about which directly affects and includes the population in the area. Such change is not happening in the case where the inhabitants - hands in pockets - are only spectators to a foreign contractor who unexpectedly starts operating at the river with his own gang of skilled labour, his own equipment and material-delivery organization, and puts up a bridge in reinforced concrete of his own design.

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1. The quotation is from Frantz Fanon: "The Wretched on the Earth", Penguin Books, 1967, (p. 167). Original in French: "Les Damnés de la Terre", François Maspéro, Paris, 1961, (p. 148).

Even if the contractor were to employ some of the onlookers, those thus employed would function as "hostages" only. The application of the technique of the contractor would not be dependent on the participation of the casual labourers employment. They perform only auxiliary tasks and would, by and large, be bystanders on a par with the rest of the population. Should some of these auxiliaries nevertheless pick up some skills during the construction period, these skills would be linked with a type of tools and materials which they most probably will have no chance ever to acquire. They could not go back to their villages and make copies of these tools and thus make use of their new skills, let alone convey these to others. They could be inclined to follow the contractor when he moves away with the tools to another site. In this respect the so-called (and often highly praised) demonstration effect of the foreign technology would be negative.

The bridge by itself would not represent any technological change in the area where it is placed. It would appear as an improvement of "nature". This improvement might contribute to some economic growth in the area if, say, it now became easier to get the local produce to a wider market, and provided a quantitative expansion of production were possible. But the building of the bridge would not have brought about any change in the conscious activities of the population which could lead to a change in the prevailing production technology. The prospective economic growth would take place without technological change.

The course of events could, however, have been different. Perhaps the contractor could not bring in all his equipment or materials according to schedule before the rains made construction impossible. Or perhaps some of the equipment had some serious breakdown which required spare parts from abroad. The contractor would then probably readjust his technique to this "local condition" and employ more divisible types

of tools. This in turn would lead to more employment of workers, and thus to more direct participation of the local population in the production process than before. In this case the skill-formation on the job would have a quality which is more relevant to the situation of the workers, particularly to their capability of acquiring the corresponding tools. Moreover, they would be acquainted with advantages of an organized structure on a larger works site, and they might have experienced hitherto unknown social relations which might contribute to new dimensions in their political awareness.

In contrast to the first case, the probability that the wages paid would be consumed immediately and entirely would be much less. The knowledge induced could with much less extra input than otherwise be transferred and be applied in other local infrastructural works (e.g. self-help projects) such as minor irrigation schemes, storage facilities or water - and sanitation-installations. Some influence on the agricultural technologies in the area would likewise be practicable, particularly if the completion of the bridge were followed up by an immediate offer to the paid-off workers to buy farm inputs (e.g. farm implements, fertilizers or new types of seeds). The preconditions for some technological change in the area together with economic growth would be created.

In the first case I assumed that the contractor himself made the design of the bridge, i.e. that he made the choice of product. Three matters were decisive for this choice: (a) the standard drawing which he brought with him from his drawing office, and to which his knowledge was adapted (b) the equipment in his possession by the time he was awarded the contract for the bridge; (c) the long term agreements he had for materials-delivery with the steel manufacturer.

If the choice of "result" or product had been made on the spot and not influenced by the above mentioned matters, the bridge would perhaps not have been made of reinforced concrete but, say, of timber and sandstone, depending on which materials were available locally. But then the contract might not have been awarded to the foreign contractor but to somebody else of indigenous extraction who knew how to make use of the local materials. In this case then, the workers on the bridge would have gained awareness about the potential use of the materials surrounding them, and would have acquired some skills in the use of these materials. Consequently, the prospective technological change in the area would become less dependent on inputs from the outside, and would be likely to have a more self-sustained quality than otherwise. The workers on a bridge, which was constructed in accordance with the last procedure, would not stop caring for the bridge when it was technically completed. They would go on building a roof over the bridge and carve decorations in it. And they would maintain it, having acquired the insight necessary for the proper upkeep of it and familiarity with the smallest detail of its function and structure. They would have conceived the bridge in the way insisted on by Fanon.

#### Some methodological considerations

"To enrich technological awareness" then could be an objective worth pursuing concurrently with the objective, "to increase aggregate consumption". Before this can be done, however, the awareness objective needs to be made operational to an extent that it can be viewed against the growth objective, or for that matter against any other objective. To make an objective operational primarily means to establish a measurement model with a scale of "yardstick" to which goal attainment can be related. This scale further needs to be related to the decision variables of the problem. In case of choice of appropriate technology the decision variables are mainly the product, the organization, and the technique (i.e. the combination of the factors of production). Of these variables the combination of the factors of production expressed by, say, the



degree of labour-intensity is the most manageable variable to use in operationalizing the awareness objective. This is so, because there can be little doubt about the existence of a direct correlation between the degree of labour-intensity of a technique and the extent of technological awareness created through the application of the technique - within certain limits of course. In other words, employment creation can be taken as a yardstick for the awareness objective. Employment is usually also made the yardstick for other objectives first of all for the various objectives "to redistribute consumption or income". To me, the awareness objective is the more fundamental, although accumulation of both technological awareness and income is necessary to initiate technological change.<sup>1</sup> Apart from the difficulties of making the various objectives operational another analytical problem must be solved before any appropriate technology definition becomes applicable. I am referring to the fact that we lack a practicable methodology to solve multi-objective decision problems.<sup>2</sup> However, once the various objectives have been agreed upon, and once these objectives have been made operational, the analytical difficulties are not insuperable.<sup>3</sup>

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1. Technological awareness can of course be induced by other means than through employment. Technical schooling and various forms of extension services are examples of such other means the effectiveness of which, however, I have my sincere doubts about.
  2. See Erik Johnsen: "Studies in Multiobjective Decision Models" Studentlitteratur, Lund, Sweden, 1968. (p. 47).
  3. This contention I have tried to render probable in my "Choice of Technology in Underdeveloped Countries; Exemplified by Road Construction In East Africa", Ph.D thesis, The Technical University of Denmark, 1973.

C O N C L U S I O N S

As rural construction works are probably going to be carried out on an increasing scale, the choice of technology for that activity seems to be a crucial decision. Given the price structure in many African countries the equipment-intensive "parachuting" choice might be the most appealing from a direct cost point of view. This choice, however, presupposes an adaptation of the local conditions to the technology, e.g. improvement of supply lines of spare parts and fuel as well as training of equipment operators and mechanics. The cost of this adaptation is normally not taken into account in the direct cost calculations. The more ~~employment~~-intensive choice also requires some adaptation of the local conditions, e.g. training of works overseers. But if technological change for the masses of the rural population is taken seriously as an objective for rural development, the government should be prepared to pay for the attainment of that objective by accepting the possibly higher cost of an employment-intensive approach.