

DISSEMINATION OF APPROPRIATE TECHNOLOGIES

By: Harold Dickinson*

1. The Problem

The large international aid and development organisations endeavour to use the economic solutions of rich countries to resolve the problems of poor countries. This situation has led to the establishment of complex and capital intensive industries which have little impact on the needs of the poor and almost none on the needs of the poorest peasants who remain outside the monetary system.

The poor peasants remain in an economic sector based on traditional modes of production. Agrarian reform has produced widespread social and political change but has had relatively little impact on the production techniques of the bulk of the rural poor. It is possible that acceptable new technologies are to be found in other regions or other countries but the peasant sector of an economy does not have access to sufficient capital or credit to obtain imported technology.

2. Technology Levels

In the practical evaluation of technologies it is convenient to consider production processes at three different levels:

Cottage Industries - where there is little differentiation of labour. All members of the family, or extended family, play some part in the production process using traditional skills that have been little influenced by modern technology. To extend the range of products it is necessary to seek new cheap and simple processes, to improve access to markets and to offer the possibility of exchange of local products for industrial products. To improve cottage industries the

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capital available is likely to be small and any acceptable technology must be almost costless.

Small Industries - where the proprietor is both an entrepreneur and an artisan who works alongside his workers. Such industries may use simple, often old or antiquated, machines and require several different manual skills. The differentiation of labour, however, will not be great. The problems of such production units are relatively complex and it is unlikely that the proprietor has any conception of the relationships between the various factors of production. Industries of this kind have great difficulty in finding external capital, as the risk is great, and possible innovations must be cheap enough to be financed from the proprietor's savings.

Modern Industries - where specialised machines are used with a demand for highly skilled and responsible workers. The plant is likely to represent a considerable capital investment and to obtain a return on capital competent managers are required.

All three levels of manufacture require specialised forms of education or practical instruction. For cottage industries the instruction process is dependent on association and assimilation. For small industries there is an informal education process including elements of assimilation and apprenticeship. For modern industries there is need for a range of formal instruction and apprenticeship for the various activities and skills.

In all kinds of production situations it is necessary to find a technology that can meet production requirements whilst making fullest use of immediately available resources - raw materials, credit, capital, labour, transport, markets - and which is acceptable, or adaptable, to the society that wishes to make use of it. Such a technology is called an 'Appropriate Technology' and it must be both technically and socially appropriate.

3. Characteristics of Appropriate Technologies

- with particular reference to the rural sector.

It is possible to describe a large number of features that may help to identify an 'appropriate technology'. In any practical situation it is possible to envisage a range of alternative technologies that could meet the immediate, and near future, production needs but final selection would have to take into account a complex set of economic, social and technical relationships. With particular reference to the rural economy it is necessary that an 'appropriate technology' should:

3.1 meet the technical needs of the production situation by:

3.1.1 using local materials and power resources.

3.1.2 minimising the content of imported materials.

3.1.3 ensuring that the product will be produced in adequate quantity and acceptable quality for existing or potential markets.

3.1.4 ensuring that the product can be conveyed to market by available transportation without deterioration and in sufficient quantity and with adequate regularity to encourage demand.

3.2 meet the social requirements of the production situation by:

3.2.1 using existing or easily transferable skills and avoiding complicated, time-consuming and costly retraining.

3.2.2 offering continuing, or expanding, job prospects.

3.2.3 minimising social or cultural disruption by increasing production and productivity by successive small increments rather than by larger single steps - individual income steps in excess of, say 10% are likely to be socially disruptive.

3.3 meet the economic requirements of the production situation by:

- 3.3.1 minimising the capital demand from local or national resources.
- 3.3.2 minimising foreign exchange requirements.
- 3.3.3 ensuring that capital is used in a way that is compatible with local, regional and national economic plans.
- 3.3.4 ensuring that the main economic benefit returns to the producers and is not captured by a new class of middle-men.
- 3.3.5 obtaining greater integration of producers into the monetary system - in many peasant societies money is only used for beer and funerals.

4. The Source of Appropriate Technologies

There are several possible lines of investigation that may be followed in order to find an 'appropriate technology'.

The first is to modify existing practices, at the technical or economic level, so that production may be increased or diversified without large demands being made on resources or on the structure of local society. Innovations at this level may involve minor design modifications of traditional tools or machines, the introduction of new materials or the modification of a traditional use pattern for existing materials, or increased monetary circulation by improving the access to markets. The stimulation of demand for new products from the town may well be the most important factor in stimulating production for marketable surpluses rather than for a static local demand. This is the more usual way in which economic and consequential social change, occurs at village level but by its dependence on a number of barely understood factors the process tends to be haphazard and difficult to integrate with wider economic aims.

The second is to revive and introduce an older well-tried technology from an earlier stage of development of a different economy. This approach is particularly attractive in that the earlier experience with the technology may be expected

to lead to success more readily than with an untried innovation. There is, however, a difficulty that may be insuperable: whilst the technology may have been effective in the past it is unlikely that any record exists of the way in which it was economically and socially integrated into the society that made use of it.

The third is to invent a new technology, or change the scale of a modern technology, to meet the needs of a particular situation. This is the slowest way to produce innovations. It is also costly and demands a range of skills experience and knowledge that are unlikely to be found in a poor country.

For all these approaches design requirements have to be conditioned to a situation where capital is scarce and unskilled labour plentiful in contrast to the situation in wealthy countries where technological design is conditioned by relatively dear labour and a plentiful supply of cheap capital or credit.

Every society in the world has developed a wide range of technologies on which it depends for survival. These technologies have changed with time to meet changing needs and until relatively recent times all changes have been slow. With the rise of modern industry and the growth of scientific understanding technological innovation has become almost exclusively confined to a few countries. Over 95% of scientific and technical research and development is carried out in the wealthier countries and almost all applied research is directed to the problems of the wealthy. What little research is done in the poorer countries is carried out by nationals or expatriates trained in, and accepting the values of, the wealthier countries of the world.

5. Dissemination of Technologies

We have seen that to further economic and social development it is necessary to provide new ideas and new impetus based on an understanding of the economic, social and technical requirements of a particular situation. Thus there is a need

for organisations to offer consultancy services to all levels of manufacturing industry, from the peasant producer to the estate corporation, in the same way that agricultural extension services are provided by many colleges, universities and governments. (We see the start of such an organisation in Kumasi in the Technology Consultancy Centre of the University of Science and Technology).

The problems of such a service are greater than can be borne by a single institution no matter how well endowed and it is essential that supporting organisation be set up to develop new technologies, to exchange process and device information, to carry out research on technical and social adaptation of new techniques and, above all, to produce a corps of professional workers in what is essentially a new field of service based on the formerly separate approaches of economics, sociology and technology.

There are two immediate problems of orientation that will have to be changed if appropriate technologies are to be developed and introduced at a reasonable rate. Firstly the wealthier countries must, as part of their aid programmes, channel first-class scientists, technologists and sociologists into research and development work that seeks to solve the problems of the poor in the context of the conditions in which the poor live. Secondly, the professionals of the poor countries must be persuaded to seek education and experience as a means of bettering the lot of their fellow nationals and not as a means of abandoning their national problems and joining, superficially at least, the wealthier world. In this the institutions of the wealthier countries can play a part by taking the problems of the poor as being as important, and in their own way, as complex as the problems of the rich.

If these steps can be achieved there is the prospects of an increasing deployment of the worlds resources to back up national or local consultancy or advisory services that are the key to the transfer of technologies to the point of need and application.

6. Conclusion

The central problem of finding 'appropriate technologies' for the development of poor countries lies in giving the poor access to scientific and technical knowledge in a form that both reflects their needs and is assimilable by them. No one doubts that the laws of science are universal but access to the benefits of science depends on the quantity, quality and cultural orientation of the available scientists and technologists. Until responsible scientists and technologists with adequate funds are available to enable poor countries to obtain freedom of technical choice there is little likelihood of the mass of the world's population escaping from poverty. Should suitable technologies become available the choice to use them or not will still depend on the wisdom of political leaders - new technologies can only offer new opportunities they cannot guarantee results.

The main problem of the world is poverty. The only way to escape is to make the fullest intelligent use of all available economic resources. 'Appropriate Technologies' are now seen to be a very important factor in development and they may well be the only factor that is not too costly to use.

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