PRACTICAL ACTION
Technology challenging poverty

WHAT IS APPROPRIATE TECHNOLOGY?

The term technology is often interpreted as meaning machinery, equipment, or 'hardware'. Technology, however, is much more than pieces of equipment; it also encompasses 'software'. Technology is a combination of tools (the equipment required to produce goods or services); of techniques (the knowledge, skills and facilities required to operate those tools); of organisation (the processes by which techniques are marshalled); and of products -the goods and services which result from this process.

Ever since the discovery of fire, technologies have been in a constant state of development to serve humanity's purposes. Men and women have always sought to improve the technologies they utilise, in order to fulfil their needs for greater convenience, higher productivity, improvements in the quality of life or increases in income. Technology is determined primarily by need, and each society has developed its own technologies in order to fulfil its specific needs and wants.

"Technology is determined primarily by need"

In some cases, despite very differing contexts, technologies have developed along remarkably similar lines. Traditional technologies designed to meet certain basic needs, such as farming or fishing, construction or cooking, show a high degree of consistency across societies.

Advances in technology have stimulated developments in society, and developments in society have led to advances in technology .The Industrial Revolution in Britain could not have occurred without the technological advances of the Agricultural Revolution. The social impacts of the Agricultural Revolution - the emergence of a surplus labour force, urbanisation and the growth of the mass-market - paved the way for the Industrial Revolution. The Industrial Revolution in turn led to advances in manufacturing, construction, transport and many other technologies.

The level of technological development of a nation or a society is generally taken to be synonymous with its level of economic and industrial development. The more sophisticated and specialised the technologies available to a society, the more advanced that society is considered to be, thus the example of cooking technologies, which are present in some shape or form in every household in the world. The majority of households in the South cook on open fires or simple stoves, fuelled by wood or charcoal, which are designed to meet basic needs. Their use demands a great deal of time and effort, and a high level of organisation and skill. In the North, by contrast cooks use much more sophisticated appliances fuelled by gas or electricity. These are comparatively simple to operate, but maximise returns to labour and allow cooks to satisfy a wide range of specialised demands.

Similarly, the manufacturing sector in the South is characterised by small-scale, decentralised, low-cost, labour-intensive methods of production geared towards meeting the needs of local markets. The North, on the other hand, boasts large-scale, centralised, highly specialised, capital-intensive technologies designed to meet the demands of the commercially led mass market. In economic terms, the technologies of mass production are

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viewed as far superior to production by the masses, and in this sense the North is regarded as 'developed' while the South is, at best, 'developing'.

Appropriate and inappropriate technology

The 'modernisation' theory of development, which still dominates much of the formal development debate, argues that Northern technology is a prerequisite of economic development in the South. The logical conclusion of this argument is that the simple introduction of such technology will lead naturally to development.

However, the introduction of advanced technologies is no guarantee of their success, nor of their suitability. Technologies evolve in response to, and in accordance with, prevailing social, cultural and economic circumstances. Unless these circumstances are taken into account, any attempt to transfer an advanced technology from the setting where it has developed naturally is almost certain to fail. Responding to the modernisation theorists, Schumacher argued in *Small is Beautiful* that:

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'certain new economic activities... will be beneficial and viable only if they can be sustained by the already existing educational level of fairly broad groups of people'.

In other words, if a society does not have the software - the skills, knowledge and modes of organisation -to employ a particular type of hardware, then the technology must be viewed as inappropriate. An appropriate technology is one, which evolves or is developed in response to a particular set of needs and in accordance with prevailing circumstances.

Numerous governments and development agencies have learnt to their cost the fallacy of the assumption that rural electrification is a precursor to economic development. Rural industries and artisans do not convert to the use of advanced, highly productive appliances simply because a supply of electricity becomes available. The use of electricity and its associated hardware also demands the application of appropriate knowledge, skills and patterns of labour, which may differ significantly from those applied to traditional technologies, and do not come as part of a ready-made package. Need determines technology; technology does not determine need.

Naturally, what is appropriate for one sector of society may be inappropriate for another, and what is appropriate for society as a whole may be inappropriate for individuals. In Asia, the Green Revolution of the 1970s and 1980s was designed to maximise rice production through the introduction of scientifically-developed High-Yielding Varieties (HYVs) - an advanced technology, which built on the existing skills, and knowledge of traditional rice farmers. In a number of countries the Green Revolution has had the desired effect of preventing food shortages, even of providing surpluses, and from the macro-economic point of view the technology can be regarded as appropriate for meeting a particular set of needs.

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However, the introduction of HYVs imposed heavy demands on individual farmers, who were obliged to adopt the different cultivation patterns demanded by the new varieties, including the use of chemical fertilisers and pesticides. While this increased the farmers' returns to labour, it also had the effect of increasing their vulnerability. Traditional varieties, which had evolved over time in response to prevailing agricultural practices and climatic conditions, were resistant to a range of diseases. By planting a number of varieties with different

characteristics and requirements, farmers were assured of a return to their labour. The Green Revolution, on the other hand, introduced a small number of varieties, which flourished only in closely controlled conditions, and were susceptible to a wide range of diseases. The introduction of 'advanced' farming technologies has actually had the effect of reducing farmers' options. They are slaves to the technology, rather than its masters and mistresses.

The Imposition of advanced technologies may not only be inappropriate to the conditions in which they are introduced; it can also have the effect of devaluing traditional technologies and disenfranchising their users. As with the Green Revolution, the genetic diversity of many other crops is threatened by the increasingly widespread use of a small number of genetically engineered varieties, sponsored by transnational corporations. In response to this trend, Intermediate Technology has joined forces with other development agencies in a campaign to promote the concept of biodiversity: the maintenance of traditional crop varieties which are suited to widely differing circumstances, and help to ensure the maintenance of farmers' options.

User must be choosers

Economic progress is dependent upon the development of technologies, and technology choice is crucial to this process. The process of choice is rational. Given the opportunity, an individual will choose a course of action, which suits his or her particular purposes in the light of a particular set of circumstances. In this sense, 'appropriate' and 'rational' are synonymous: a technology that is appropriate is one which has been developed or adopted as the result of a rational process of decision-making.

What is appropriate in one set of circumstances, or from one point of view, may not be so from another, and this raises the question of who chooses. People are not passive recipients of a technology. Any technological development makes demands upon its users, and so it is the users -the intended beneficiaries of a technology who should decide whether or not it is appropriate for their circumstances and needs. Users must be choosers, and users' participation in the decision-making process is vital if choice is to be appropriate.

Technology choice begins with information. An informed decision demands an understanding of the needs a technology is intended to serve, knowledge of the options available, and of the techniques; skills and resources which are entailed in their adoption. Choice of technology also implies access to the tools, the techniques, the resources, knowledge and organisational capacity required for a technology to be adopted successfully.

Livestock plays a vital role in the lives of pastoral peoples. It provides nutrition, represents wealth and security and is an important part of cultural heritage. In Kenya, huge herds of cattle have been wiped out by epidemics of rinderpest and other diseases, Traditional medicines have proved ineffective against these, and modern veterinary services are generally inaccessible. Intermediate Technology has worked with the pastoralists of Samburu and Turkana districts, providing them with training in simple veterinary techniques and helping them to gain access to basic supplies of medicine, which enable them to treat their animals cheaply and effectively. Appropriate technology choice has come about through a process of consultation, identification of needs, exploration of options and the provision of access to tools and techniques which build upon established skills and knowledge.

Denial of Choice

Given the opportunity, anyone can make a rational choice. However, people do not always have that opportunity. There are many ways in which choice is denied: sometimes unwittingly, at other times intentionally. The process of development is a reflection of established patterns of power and control. Users are not given the opportunity of becoming choosers, because their opinions are not sought, because they do not have access to information, or because it is in the interests of those in power to maintain the subordinate position of other sectors of society. The ultimate effect of these courses of action is to hinder development rather than stimulate it.

In the process of development, choices are often made on behalf of, and ostensibly in the interests of, the intended beneficiaries of a technology, but without the beneficiaries' participation and without taking into account the prevailing circumstances or the real needs and wants of those who will be affected. To impose a technology because it appears rational from the donor's point of view is not offering choice. While this may arise as a result of misplaced good intentions, the donor is nevertheless guilty of a lack of understanding of the beneficiaries' needs, and failure to give them the opportunity to participate in choice.

In other cases, decisions are taken by governments, companies, individuals or development agencies for commercial, political or personal reasons. Numerous countries are home to projects which bear no relation to the needs of local people, and serve as little more than monuments to the personal and political agendas of their rulers. Many development projects arise as the result of commercial imperatives.

In the *1920s* the British colonial government in the Sudan embarked on a massive irrigation project in the area between the White Nile and the Blue Nile, south of Khartoum, in order to provide Britain with a cheap and reliable supply of cotton. Since independence in 1954, successive governments have extended the scheme in an attempt to maximise foreign-exchange earnings. The Gezira Scheme is now known as 'the world's largest farm'. However, reliance on a single commodity has led to huge losses as the price of cotton has plummeted in the face of competition from synthetics, and to environmental degradation through mono-cropping and the liberal use of chemical fertilisers and pesticides. Farmers have been forced to grow cotton at the expense of food crops, and food security has suffered at both local and national level. The decision to introduce a seemingly valuable cash crop may have seemed rational to the politicians who devised the scheme, but had the farmers themselves been consulted it would rapidly have become clear that the choice was neither logical nor appropriate. Many farmers have now turned, illegally, to growing sorghum, which provides both food security and income.

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A great deal of bilateral development assistance actually takes the form of 'tied aid', under which the recipient government is obliged to buy equipment and technical expertise from the 'donor' country. Of every £1 donated by the British government to developing countries in 1990, over 62 pence was spent on goods and services from Britain. By failing to transfer the skills required to operate, maintain and reproduce the technology, the 'donor' maintains the unequal relationship, and the recipient government continues to rely upon the 'donor' in order to operate the technology effectively.

Thirdly, poor people may be actively denied the possibility of technology choice. A large proportion of the population of the South has no access to information about alternative technologies, or opportunities for the further development of indigenous technologies, and in this way is excluded -often consciously -from the development process. This applies particularly to resource-poor, traditional, rural populations, who have little economic, and consequently little political, power. Development efforts are most often directed towards the modern, urban, industrial sector, where economic and political powers are grounded. Proponents of the 'dependency' theory of development argue that denial of choice is deliberate. In the dual economy it is in the interests of the centre to maintain the subordinate position of the periphery. In other words, the North is concerned that the South should remain in a dependent position, and the rich South is anxious to maintain its control over the poor South, Development efforts are directed at the centre, and the periphery is not offered the possibility of technology choice.

Participation choice and development

A society's level of economic development is generally measured by its level of technological development. Developing societies are characterised by the widespread application of traditional (low-cost, labour-intensive, 'inefficient') technologies. These technologies have developed

because they are appropriate to a society's needs and are compatible with its capacities and resources, but they do not indicate that a society is 'backward'; neither do they hinder economic development. Development is hindered by external circumstances. Established patterns of power and control mean that resource-poor people are denied opportunities to build on their skills and resources, to extend their knowledge, to gain access to alternative, advanced technologies and so to enhance their economic status and improve their quality of life.

The bulk of development assistance is aimed at achieving large- scale, macro-economic development, with decisions being made by governments and development agencies on behalf of, rather than in consultation with, the intended beneficiaries. 'Development' cannot be imposed, however. If a society is to develop in a manner which is beneficial and sustainable, it must do so on its own terms, at its own pace.

The people who are the intended beneficiaries of development programmes must be actively involved in defining problems, exploring and understanding ways of addressing these, assessing options and identifying appropriate solutions. This requires that traditional technologies be treated as the starting point of any development effort, rather than being viewed as an obstacle, and that development be geared towards building on indigenous skills, techniques, knowledge and resources, rather than attempting to replace them.

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The role of development agencies -national and international, governmental and non-governmental -must be to facilitate this process by enabling people to make choices which are appropriate for their own development, rather than imposing choice upon them. This can be achieved through providing information about alternative technologies, access to resources, and training in the particular skills required to use and benefit from a technology: in short, empowering people by making it possible for them to participate in the development process, rather than remaining excluded from it.

In the debate on technology choice, the key issue is that of choice rather than technology. When people are involved in decisions which directly affect their lives they will choose the course of action which appears most rational: that path which best suited to their particular needs and most appropriate to their circumstances. Choice necessitates involvement, information and access, and is a vital step on the road to sustainable development. Development results from choice, choice stems from empowerment, and empowerment arises through participation.

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References and further reading

Small is Beautiful by E. F. Schumacher, 1973, Vintage Classics
Information Feudalism: Who Owns the Knowledge Economy? by Peter Drahos & John Braithwaite, 2002, Earthscan
Enabling Innovation: A Practical Guide to Understanding and Fostering Technological Change by Boru Douthwaite, 2002, Zed Books

First published by Practical Action (then known as ITDG) as *Technology: Choice or Compromise?*

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Practical Action is a development charity with a difference. We know the simplest ideas can have the most profound, life-changing effect on poor people across the world. For over 40 years, we have been working closely with some of the world's poorest people - using simple technology to fight poverty and transform their lives for the better. We currently work in 15 countries in Africa, South Asia and Latin America.

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