The Work of the Intermediate Technology Development Group in Africa

E. F. SCHUMACHER [1]

Origins and aims

THE CREATION OF THE Intermediate Technology Development Group in 1966 was the result of an initiative by people from the professions and industry in the United Kingdom, all with extensive overseas experience, who found a common basis for action in the approach of " intermediate technology ". This Group, which is keenly aware of the world-wide dangers inherent in the build-up of unemployment taking place in virtually every poor country, is a company limited by guarantee and a registered charity endeavouring to furnish the poor and the unemployed in developing countries with the means to work themselves out of poverty.[2]

The concept of intermediate technology was first introduced by the author in a report prepared for the Indian Planning Commission (1963) and subsequently presented in a paper to the Cambridge Conference on Rural Industrialisation in 1964.[3] The *raison d'être* of the Group was, and continues to be, that the source and centre of world poverty and under-

[1] Chairman of the Intermediate Technology Development Group Limited, 9 King Street, London WC2.

[2] The author feels it appropriate that this article should appear in the *International Labour Review* because the ILO is concerned with people rather than with the instruments of mass production and because it has consistently advocated and promoted job-creating programmes in the developing countries—because, in short, it has been among the first to recognise the significance of the ideas that have informed the ITDG since the creation of this Group. See, for example, Keith Marsden: " Towards a synthesis of economic growth and social justice ", in *International Labour Review*, Vol. 100, No 5, Nov. 1969, and " Progressive technologies for developing countries ", ibid., Vol. 101, No. 5, May 1970.

[3] See also my " Social and economic problems calling for the development of intermediate technology ". This paper and other basic material have been incorporated into an " IT Kit ", obtainable from the ITDG headquarters.

development lie primarily in the rural areas of poor countries, which are largely by-passed by aid and development as currently practised; that the rural areas will continue to be by-passed and unemployment will continue to grow, unless self-help technology is made available to the poor countries with assistance in its use; and that the donor countries and agencies do not at present possess the necessary organised knowledge of adapted technologies and communications to be able to assist effectively in rural development on the scale required.

It is now widely acknowledged that the most urgent need of the developing world is employment—productive employment measured in millions of new jobs every year. It is also increasingly recognised that for jobs to be created on anything like the required scale, the technologies and methods of production must be appropriate to the conditions of poor people in poor countries; that is, they must be cheap enough for jobs to be provided in very large numbers and simple enough to be used and maintained by rural and small-town populations without sophisticated technical or organisational skills and with very low incomes. It follows that equipment of this kind will have to be provided largely from indigenous resources and employed largely to meet local needs.

The labour-saving, capital-intensive technologies of the rich industrialised countries do not meet these conditions. Even on the simple test of capital cost per job [1], leaving aside all other considerations, the high-cost technology of the rich countries would condemn the third world to mass unemployment on an unimaginable scale. The choice between new work positions costing £1,500 each and, say, £150 or £100 each may be the choice between half a million jobs and 5 or 7.5 million jobs. It is no exaggeration to insist, as the Group has done from the outset, that the choice of technology is the biggest single collective decision facing any developing country today. It was—and still largely is—the denial of such a choice to the developing world that brought the Group into existence—to make it known that the possibility of choice exists and help to introduce techniques that poor communities can afford to use and operate for themselves. What, in short, the Group identified is a major gap in aid and development: the virtual absence of organised, systematic efforts to provide the poor countries with a choice of low-cost, self-help technologies, adapted to meet their needs for labour-intensive and small-scale development. This deficiency cannot be made good by accelerating conventional aid programmes any more than, say, a housing shortage can be alleviated by building more supersonic aircraft.

The Group therefore set out to compile practical data on intermediate technologies, to test them under operating conditions, and to make them widely known and freely available. It started by producing *Tools for*

[1] That is, the cost of "equipping" a work position, excluding the cost of land and buildings.

progress, a guide to relatively simple tools and equipment made in the United Kingdom. Since 1968 it has embarked on more searching and detailed investigations into the basic technologies required for rural development—those concerning building, agricultural equipment, water, food technology, rural health, small industry, power, education and training, co-operatives and women's activities. Each work programme seeks to identify basic needs for simple technologies, to document appropriate techniques and equipment and to demonstrate their practical application through overseas field projects.

Each subject is tackled by a panel of experts—engineers, scientists, architects, building technologists and others with wide overseas experience, who serve in a voluntary capacity, guiding and supervising teams of full-time research and development officers. This work organisation has brought to bear on the task of filling the intermediate technology gap not only the expertise of the hundred or so senior professional people who serve on the Group's advisory panels but also that of many industrial concerns. Close working links have also been formed with institutions specialising in different aspects of technology.[1]

From the start the Group's aim has been not merely to supplement the existing aid and development programme but to change its emphasis: to move it away from treating the poor countries as if they were already rich towards recognising and acting upon their need to develop methods of self-help and self-reliance. One thing that emerges from the Group's few years of existence is that it has demonstrated how such a change can be brought about and what needs to be done and can be done to discover, devise and make known a new range of self-help techniques adapted to the actual conditions and resources of developing countries: technologies that they can afford and that make possible the mobilisation of their labour power for productive activity (both for capital creation and for consumption).

A second conclusion founded on the Group's experience is that, for this kind of work to be fruitful, a considerable part of it must of necessity be done in the developed countries. There are several reasons for this. The basic work of assembling and systematising knowledge of low-cost technologies can be started and promoted most readily in centres where: (i) the required technical and organisational knowledge and facilities exist or can be relatively easily mobilised; (ii) communications—internal and external—present few obstacles; (iii) world-wide coverage can readily be achieved; (iv) there can be freedom from " project " pressures.

The first three reasons require little elaboration. The industrialised countries have the necessary technical knowledge and research facilities

[1] For example, the agricultural equipment project is based at the National College of Agricultural Engineering, Silsoe; the food technology project in housed at the National College of Food Technology, Weybridge. Other research work is based at the Department of Applied Physical Sciences, University of Reading, and the Royal College of Art.

at their command. The direction of research and development requires changes of emphasis and scale, but the essential knowledge and the effort are readily available there to be mobilised. The need for efficient communications, among centres of knowledge within a country and internationally, is a precondition for organising knowledge and expertise [1]; and so are ease of access to and contact with the developing world, if knowledge is to be adequately obtained and disseminated. The fourth reason may be less obvious but it is crucial; the task of producing generalised information requires freedom from the pressures generated by " country " projects. To take an example, the Group's Co-operative Panel recently produced a manual on simple accounting techniques for co-operatives. This has already been adopted by Sierra Leone, and may well appeal to other countries without an established system of co-operative accounting. There is a need, that is, to make known the *kinds* of choice that exist before the detailed work of local adaptation can take place. The same would apply to the industrial profiles now being prepared by the Group on woodworking, metalworking and agricultural equipment capable of local manufacture.

The question is often asked: is the demand for intermediate technologies forthcoming on anything like the required scale? To this there is a decisive counter-question: can people demand something when they are not aware of its existence? In other words, the primary task is to assemble detailed, practical information on simple techniques and make known the fact that they exist—" making known " here includes both communicating the information and showing how it can be applied with advantage.

The argument for siting the work of mobilising organised data on intermediate technologies in the centres of existing technical knowledge —and bodies similar to the Group in the United Kingdom and VITA (Volunteers for International Technical Assistance) in the United States exist or are foreshadowed in Australia, Canada, the Federal Republic of Germany and India—is little affected by the possibility of some initial overlapping; the potential field of work is so vast that a degree of international specialisation could easily be introduced. Nor, it must be noted, is this an argument for not starting intermediate or appropriate technology centres in the developing countries themselves as points, first, for receiving information about the choices available, making known their specific needs and adapting techniques to their own environments, and then, when their resources allow, for developing their own research and development facilities. This is now happening in India, which already has a considerable industrial sector and well-endowed research facilities, and where an Appropriate Technology Unit has been set up within the

[1] Just as the United Nations and the specialised agencies are located in Geneva, New York, Rome and elsewhere. The need to decentralise their activities once they have built up cadres of specialists and the relevant knowledge simply reinforces the point.

Ministry of Industrial Development. It has been happening—as far as one can gather in a more decentralised way perhaps—in the People's Republic of China for some years past.

The essential point, however, is that the initial drive—the change of emphasis, the mobilisation of technical knowledge for the evolving of self-help techniques—must come from the countries that possess such knowledge now. Only if this occurs can a useful dialogue on technology develop.

The account of the Group's work programme which follows should perhaps be read as an indication of what can—and should—be done on a much larger scale.

The building for development project

The first project to be started was on construction—a basic part of the development process. As development proceeds, the standard of building and construction required by developing countries changes. A greater variety of building *types* is required, in greater *numbers* and *distributed* over a wider area. The traditional demand simply for shelter becomes a demand for schools and clinics, administrative buildings and post offices, roads and bridges. Can the capacity of indigenous construction industries in developing countries meet this growing and changing demand?

Because construction embraces such a wide variety of skills and activities, including design, component manufacture and assembly, and the management of men, materials and plant, it provides a rich field of training and experience for a large number of people struggling to increase their standard of living. Construction is usually the second biggest employment sector in an economy, second only to manufacturing industry in a developed country and to agriculture in a developing one.

The scope for investment, both public and private, in physical infrastructure is so extensive that it should contribute more to the development process than just the buildings and construction works. It should contribute to the formation of an industry which can expand, renew and maintain these buildings; and it can and should, therefore, be planned with the specific aim of developing the local construction industry.

Construction, by enabling people to obtain training and experience, can assist them in making the necessary transition from agriculture to industrial work. In this sense it can provide valuable midway jobs between agriculture and manufacturing for between one-tenth and one-fifth of a country's manpower.

While half of the gross capital formation in most countries goes into construction, developing countries are forced to import most of the

necessary construction capacity. Development plans are often little more than " shopping lists " for building and civil engineering projects, and pay no regard to what could be done locally. The Building Panel therefore tackled the question how to assist indigenous construction industries. This work was started in 1969 as the building for development project. Its aim is to help to improve the efficiency of building operations in developing countries by making available to local construction industries guidance on appropriate technologies and business procedures. The project team, comprising an architect, an engineer and an economist, identified the small contractor as being most in need of attention. There is adequate training for the professionals—architects, engineers and the technical staffs of ministries of works. Yet they have to rely on indigenous contractors to an increasing extent to implement their building programmes, and these builders generally receive no training or development guidance. Everywhere the gap is the same—growing construction programmes without the indigenous skills needed to execute them.

Initially the team concentrated on Nigeria and Kenya. In Nigeria it started by identifying the needs of government-registered building contractors in the northern states. With the co-operation of the state Governments it ran a series of six four-day conventions for contractors and government technical officers in early 1970, at the Kaduna Polytechnic. Teaching material covering elementary management skills for small building firms was presented to the contractors in a wide variety of ways: through lectures, seminars, films, exhibitions, dramatisations. The conventions were a test both of the project team's own understanding of builders' needs and appropriate teaching techniques and of the contractors' ability and keenness to learn.

The conventions clearly demonstrated that the great need was for advice on management and business methods. They also showed that contractors, men without formal education, *can* be taught these skills, without which few indigenous organisations can develop into efficient construction firms.

Using the experience of the Kaduna conventions, the project team began work in Kenya to help the National Construction Corporation to provide training programmes for African contractors. The team produced a series of teaching kits which can be adapted to suit the level of the participants. The idea underlying these kits is that the main information barrier in the African situation is not so much between teachers and taught as between those who devise educational material and the teachers. The kits are being developed into a complete elementary management series useful to teachers in many different African countries and situations. The team is currently exploring with a number of East and Central African governments new opportunities for applying and extending its experience in the training of contractors.

Water projects

One of the chief factors influencing development at village level is the availability of water for human, animal, and agricultural purposes. In most tropical and subtropical areas rainfall is seasonal and governs the type and scale of traditional agriculture and animal husbandry.

Before appropriate forms of land use and agricultural practice can be specified, it is necessary to identify existing simple techniques for water storage and handling, and to evaluate these in terms of cost and benefit, efficiency, and the technical skills required.

The Group started by assembling the data available in the United Kingdom on small-scale, low-cost water technologies. This work was completed and the results published early in 1970.[1] The conclusion was that there is a big gap in the knowledge recorded in written form on what might be called the theory and practice of small-scale rural water supplies—the design and construction of the various devices for obtaining, lifting, transporting, purifying and, particularly, storing water which are suitable for individual villages, individual farmsteads, or even individual homes. These include means of catching the rainfall on the spot, of leading it into the tank or cistern, of holding it safely in store, of drawing it out when needed, and of purifying the water, if necessary, to suit the purpose for which it is intended.

At the same time the project disclosed the existence of a great deal of experience and data on the design and construction of dams and reservoirs of the order of a few million gallons, which are customarily filled from the transient flows of streams during the rainy season so that water is available during the long rainless season. This information is well documented and needs no further elaboration. But by their nature these types of reservoir are almost always situated at a distance from the villages. Very often—even usually—these sizeable sources serve the needs of several villages and the villagers and their animals have to carry every drop of domestic water from the source to the home. This imposes a heavy daily workload, particularly since it is the women who carry the water and who very often are responsible for the work of cultivation as well, and it forces villagers to make do with far less water than they need; it denies them the small but vital amount necessary for raising seedlings for the household vegetable garden; it cuts down the efficiency of the animals used for transport, for drawing the plough and for other services, because much of their time is spent walking to the dam or reservoir to drink instead of doing productive work. There can be no doubt whatever that the much-needed improvement in peasant farming productivity in the rain-fed zones would be greatly helped if the techniques for collecting

[1] ITDG: *Bibliography on low-cost water technologies* (London, 1970).

and conserving rainfall were extended to small village units, farmsteads and even households.

In view of the scant amount of information on such techniques that was obtained from written sources, the Group has launched into field trials and investigations. An investigation was carried out in collaboration with the Department of Agricultural Economics at Reading University, which is conducting research into village development around Ho, in Ghana. The purpose was to make a detailed study of village water requirements and to find ways of meeting them.

A further project stemmed from the ITDG's work on water catchment tanks in Botswana, a detailed account of which the Group published in 1969.[1] A project officer with practical experience of the work carried out in Botswana went to Tanzania, Kenya, Malawi and Swaziland, and revisited Botswana, demonstrating the field application of water catchment techniques. As a result of his work in Swaziland his services have been officially requested to carry out an extensive programme of small-scale water catchment development in that country: he will also be training other field officers to do similar work in East Africa.

These programmes of work offer a good illustration of intermediate technology in action. The idea of catchment tanks is of course not new; the construction of a tank or cistern in the ground, with a "catchment apron" alongside, is an ancient way of holding rainwater for use in the dry season. It had largely fallen into disuse but is now coming into its own again, for two reasons. The first is need—there are great tracts of semi-arid territory where population growth is creating pressure on the drinking-water supplies, which in order to be adequate require large numbers of catchment tanks to ensure that water is available just where it is wanted, namely at the farm, at the school or in the household. The second reason is opportunity. Within the last couple of decades modern science has produced revolutionary new materials in the form of cheap impervious membranes. These materials open up the way for a really massive attack on a problem which is becoming more and more acute as the years go by. The techniques are cheap, simple, labour-intensive—ideal for turning underutilised labour into essential capital assets.

Supporting research and development work are being carried out in the United Kingdom to discover the different techniques and materials that can be cheaply and usefully employed to improve traditional methods, and so provide more water of better quality. Much of the work involves trying out new waterproofing materials such as different types of impervious membranes, emulsions derived from coal and oil, and water-repellent dressings. This has been planned as a two-year project, and it started in mid-1971.

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[1] ITDG: *The introduction of rainwater catchment tanks and micro-irrigation to Botswana* (London, 1969).

Agricultural tools and equipment

The application of adapted technology to agriculture offers wide opportunities for diversifying and upgrading rural life. Many new and improved agricultural inputs—especially farm tools and equipment, means of transport and facilities for the storage of crops—can and must be locally manufactured to an increasing extent. Yet the technology of agricultural development, looked at from the standpoint of local needs and resources—what the farmer's needs and resources *are* as distinct from what foreign experts think should be done—has been virtually neglected until very recently.

The programme of the Agricultural Panel is designed to identify needs for improved agricultural equipment and to promote the local manufacture of such equipment. It is being undertaken in collaboration with Wye College, University of London, the National College of Agricultural Engineering at Silsoe, and the Governments of Zambia, Nigeria and Tanzania.

The first of the field projects now under way in Zambia is based at the Agricultural Research Station at Magoye. Two others are in preparation, in Nigeria and Tanzania. Their essential purpose is to identify the constraints on increased agricultural production and to provide selective mechanisation. There are periods in the farming calendar of most peasant communities when every available pair of hands is fully occupied; the shortage of labour to perform critical tasks during these periods acts as a constraint on farm production. Selective mechanisation of the tasks in question could therefore increase productivity without causing unemployment. Such mechanisation might involve the development of equipment to meet specific needs, the adaptation of existing types of equipment and the use of equipment already developed and appropriate for the job. This approach would not, for example, rule out the introduction of tractors or other forms of mechanisation—the test must always be: what job needs to be done? how can the local community best afford to do it on a permanently improved footing?

The agriculture team has designed the framework for a field project to identify socio-economic constraints on production as a first step towards the introduction of innovations appropriate to local circumstances. The aim is to introduce such innovations and build up indigenous capacity to make and maintain improved equipment by means of on-the-job training of local artisans and craftsmen.

A supporting programme of documentation—detailed specifications and working drawings and the construction of prototypes—is being carried out by the Group's unit based at the National College of Agricultural Engineering. Among the innovations already developed at Silsoe are an improved seed riddle-broadcaster—redesigned to eliminate castings

and so make possible local manufacture—now being tested in Botswana, and a hand-operated, multi-purpose metal-bending machine. Contact has been established with some fifty institutions concerned with various aspects of farm machinery research throughout the world, and the systematic compilation of documentation on locally made, field-tested equipment is now in hand. The value of this clearing-house of technical information is already becoming apparent.

The agricultural research staff are also compiling a guide to hand implements and animal-powered farm equipment that are still commercially available in the United Kingdom and other European countries.

Many new tools and pieces of equipment and various forms of improved co-operative husbandry have been designed and tried out in farming systems just because it was assumed that a particular task was limiting or onerous or that current yields would be greatly improved; very often the experiments have failed. The starting point of the Group's work in Zambia—carried out under the auspices of the Zambian Ministry of Rural Development—is that innovation must be based on detailed knowledge of the farmer's problems and needs, and on an accurate picture of the farming calendar and cropping sequence in a locality, taking into account communal customs and obligations and the economic pattern on which the present farming system is based.

The work of identifying needs and building up local manufacture is being carried out by two of the Group's field officers attached to the Magoye Research Station. An investigation of the labour inputs of small farmers cropping from 5 to 20 acres is being made at three sites in the locality.

Meanwhile the engineering field officer is investigating the availability and quality of local timber and steel supplies, the current level of rural craftsmanship and the development of appropriate basic tools for rural blacksmiths.

Although this project is in the early stages, certain types of equipment have already been identified as suitable for local manufacture and testing. These include a single-row, ox-drawn maize planter with fertiliser hopper attachment; single and double-row planters for maize, groundnuts and other common crops, using the notched-wheel principle; equipment to separate groundnut pods from the haulm, and other equipment for grading and shelling groundnuts; low-cost tools for blacksmiths; and improved ox-carts.

As an indication of the utility of linking the Silsoe base in the United Kingdom with field projects, when the Zambian project was launched at the end of 1971 the home base provided it with some forty technical specifications drawn from India, Nigeria, Tanzania, VITA and other sources.[1]

[1] See the supplementary note on documentation at the end of this article.

As field projects proceed, the methodology of the tested rapid-survey technique will be passed on to government field extension staff for wider application, and local artisans will be trained in the metalworking and woodworking techniques which are necessary for making farm equipment in each locality. The nucleus of farm machinery units thus created should offer good prospects for establishing a number of rural development centres and extending operations to cover production of a wider range of crop storage facilities, processing and other forms of local manufacture.

Field experiment, demonstration, and local involvement from the outset are, in the Group's view, essential parts of the process of disseminating knowledge of low-cost techniques. The programmes envisaged for northern Nigeria and Tanzania (which, like that in Zambia, are guided and supported by the home base in the United Kingdom) are broadly similar, though in both instances considerable work has already been done by government agencies as regards identifying needs, and the Group's contribution can therefore be largely concentrated on developing equipment and promoting its use and local manufacture.

Small industry

Early in 1969 the Group formed an Industrial Liaison Unit, with the object of linking feasible projects for small-scale industrial development overseas with appropriate technologies adapted from British industry. The overseas end of this project is in Nigeria, where the Group's engineer is identifying products and processes suitable for local manufacture, and has set up a small workshop for the manufacture of prototype equipment. The home-based unit is preparing a series of industrial profiles, starting with woodworking and metalworking, to provide a range of technologies at varying levels of cost and technical sophistication. This is being done in collaboration with universities, technical colleges, industrial research organisations and private firms. The work of the Industrial Liaison Unit is a practical exercise in the transfer of technology. This is a subject on which the literature is rapidly growing. Much of it is of a theoretical kind; it is generally misdirected and beside the point because it is concerned with the largely insoluble problem of how to transfer mass production to the poor with the capital-intensive technologies of the rich. It is surely more practical, and much more deserving of the attention of research workers, to start by considering the needs of poor countries, adapting technologies to meet these needs and helping to introduce new techniques.

By the autumn of 1970 the Group had approached more than a hundred United Kingdom companies in various branches of engineering, food technology, leather and textiles, etc., which expressed interest in helping to develop appropriate machinery and equipment. The first

industrial profile, on iron founding, is nearly completed. This will comprise, first, a profile of the simplest possible forms of charcoal-fired crucible foundry, requiring only manual power and very little capital; then an alternative between the oil-fired crucible foundry and a coke-fired cupolet; and finally a more sophisticated unit to indicate the possibilities for expansion. Simple training manuals will accompany these profiles along with guides to sources of equipment.

In addition to answering over 200 technical inquiries a year, the Unit is now providing specific advice on the setting up of industries—for example on the establishment of small-scale barbed-wire production in Swaziland, metal window and door production and a craft unit in Nigeria, and a woodworking shop in Botswana—and is also taking on research and development work to meet specified technical requirements. A simple example is the redesigning of equipment used for weighing babies in the rural areas of East Africa. A much more complex case, arising out of requests from a number of African countries, has involved the complete design and fabrication of a prototype machine for making packaging materials; this involved work by the Unit itself, the Royal College of Art, London, and the Department of Applied Physical Sciences at Reading University.

Food technology

Towards the end of 1970 the Group set up a Food Technology Unit. This started by assisting with a rice storage project in Liberia, and is now engaged in a research and development programme aimed at making better use of traditional foods. Arrangements are in hand to conduct field trials in a group of Tanzanian villages. The home-based unit is at the National College of Food Technology, Weybridge, which will provide research and development facilities for the project.

Consultancy

During the past two years the Group has undertaken consultancy assignments in Africa for the ILO, the United Nations Economic Commission for Africa (ECA), and the United Nations Industrial Development Organisation (UNIDO). These assignments were handled by the Group's consultancy wing, Inter-Technology Services (ITS), a wholly-owned subsidiary.

In the latter part of 1970 the Group helped to man a mission to Botswana, Lesotho and Swaziland to report on small enterprises and entrepreneurial development. In this venture it was working in collaboration with the Research Institute for Management Science, Delft. A request had been made to the ECA by Botswana, Lesotho and Swaziland

for a specialist mission to help accelerate the development of local enterprise and job creation and in particular to identify the industrial, managerial and training inputs required. The joint team that carried out the mission issued a report, and it is hoped that in implementing its recommendations the Group can form close links with ILO-assisted small-enterprise programmes in Swaziland, which are breaking new ground in the field of technology transfer.

At the request of the ECA and UNIDO the Group has recently undertaken assignments in West Africa. One was centred on the Kumasi University of Science and Technology, Ghana, where during the previous two years a group of university staff had been voluntarily advising small local business. The University wished to expand this service and the ITS team worked with it to investigate how a permanent technology consultancy centre could be organised and operated. The immediate result was that an experienced engineer, a lecturer in the School of Engineering Science at Edinburgh University and a member of the Group's Power Panel, was sent at the expense of the Inter-Universities Council to Kumasi, where he stayed six months to assist in setting up the new centre.

Another assignment was related to the production of locally manufactured hospital equipment in northern Nigeria. The Group assessed the technical and economic feasibility of setting up manufacturing units to supply hospital equipment on an operational scale in the northern states, and such units are now being established there. The purpose of the feasibility study was primarily to follow up the work already done at the Institute of Health, Zaria, where there has been considerable progress in the design and manufacture of locally made hospital equipment.[1]

It was found that there was a growing potential market for locally made, good-quality products. Their manufacture was encouraged by the federal and state authorities as a means of promoting import substitution, providing an opportunity for local participation in industrial development and making an important contribution to the creation of employment.

In the study of this industry in particular, attention was paid to the training of management and other personnel; methods of design and production; and the vital aspects of local financing and marketing. Investigation showed that good potential in these respects already existed within the country and that, with initial technical help in setting up production units, a viable local small-scale industry could be developed. It was considered important that it should be started at the level of the finance and technical skill that were readily available within the country at present. As skill and competence developed through experience and training, more ambitious small-scale manufacturing ventures could be

[1] An account of this work is given in ITDG: *Bulletin No. 4* (London), Feb. 1969.

envisaged. The method of setting up and developing such an industry is as important as technical know-how and financing, and this venture could become a prototype for many other enterprises.

This type of enterprise encourages the maximum use of local materials, personnel and finance in the badly needed programme of self-help, small-scale industrial development that is being developed for the six northern states for which the feasibility study was commissioned; but it is also relevant to similar situations in other developing countries.

Work done in collaboration with the ILO has resulted in the establishment of two key posts in intermediate technology in Tanzania (financed by the ILO); one is for a technical officer attached to the Tanzanian Agricultural Machinery Testing Unit, the other for a full-time liaison officer between the Group and the Government of Tanzania.

The panels and documentation

The Group's research and development programme relies upon research grants and donations from aid and charitable organisations. The activities described above have all secured short-term grants of this kind. Other panels, which have not yet received financial assistance, have nevertheless produced valuable work. Thus the Power Panel, created to investigate and produce data on simple power sources, has already published a detailed bibliography on a multi-fuel engine.[1] It intends to produce a profile of small power sources already available, setting out their technical capacities and the kind of uses for which they are appropriate, and then to investigate, in particular, power sources derived from wind, water and solar energy. The uneven distribution over the globe of commercially available sources of coal and oil and the not far distant scarcity of oil (even at present rates of consumption) give particular importance to the work of identifying cheap, simple and small-scale ways of using unconventional (but permanent and non-polluting) sources of energy. Here again—and this applies right across the field of intermediate technology—the Group is decidedly not advocating a return to nineteenth-century machinery; the need is to build modern science and technology into methods that may start with old-established principles but emerge as new techniques in terms of both quality and performance.

As an example of the kind of question put to the Power Panel, it has recently been asked to find or devise a method of cane-crushing for northern Nigeria (diesel engines have been specifically excluded) to replace the primitive horse-operated device currently in use. To such problems there may be a fairly readily available answer—something appropriate may already exist—but it may well require considerable

[1] ITDG: *Sterling engine bibliography* (London, 1971).

design and fabrication work in the United Kingdom before field trials are undertaken.

The Co-operative Panel is looking at ways in which co-operatives can function more effectively, especially because they are themselves vehicles for rural change and innovation. It has recently completed a series of three manuals on simple accounting methods for co-operatives. The first of these [1], published by the Overseas Development Administration in 1970, deals with thrift and credit co-operatives and has aroused widespread interest in African countries.

The Panel on Rural Health, set up to explore effective ways of bringing medical care to the rural populations of developing countries, has produced its first piece of documentation, on health manpower and the place and functions of the medical auxiliary.[2] This includes the first-ever annotated bibliography on the subject, and the text, written by three members of the Panel, is a manual or guide to the economic and medical advantages of the medical auxiliary. Drawing on examples from many African countries, as well as from other parts of the developing world, it shows that the system of health care in the rich countries is singularly unsuited to the needs and resources of developing countries, and describes an alternative that is both cheaper and more effective.

Other panels whose work will have an obvious bearing on the needs of rural Africa and are still in course of formation or just starting to identify their tasks are those on women's activities, education, and forestry and forest products.

The panel method of operation is proving remarkably successful as a means of bringing together the three elements essentially affected by the work of identifying the gaps that can be filled by intermediate technology, of assembling the necessary practical data, and of engaging in field trials to demonstrate their uses. We call them the ABC of development—the administrators, the business and industrial community, and the communicators or academic fraternity. In the established, conventional routine of aid-giving and associated research, these three seldom, if ever, work in collaboration. We believe that the work of the panels, multiplied and extended, could begin to redress the existing imbalance in research and development, whereby some 95 per cent of the effort undertaken in this respect throughout the world is of benefit only to the rich countries.

An important supporting activity recently undertaken by the Group consists of the implementation of student projects. These were started largely in response to the growing interest shown by students and by various university faculties in applying themselves to action which could be of use to the developing world. Through these projects the Group

[1] ITDG: *Thrift and credit co-operatives* (London, Overseas Development Administration, 1970).

[2] Idem: *Health manpower and the medical auxiliary* (London, 1971).

hopes to widen considerably the range of technical information available to it, for field trials and ultimate documentation.

All the panels referred to have been built up and their work programmes formulated within the past three years. Their experience has shown that the information gap to be filled is a wide one. The need for data on simple techniques can be envisaged as existing at the following three levels, which the Group is using as a general guide, though obviously even such broad criteria have to be modified in real situations:

(1) Home industry: local resources, hand tools, family members, up to £20 per work position, handmade articles generally for local use.

(2) Village industry: more a community operation, small groups of artisans, co-operatives, basic technical terms capable of translation into the vernacular, locally purchased materials, hand and simple machinery, up to £100 per work position, production for the local and surrounding communities.

(3) Small industry: local companies, bigger co-operatives, normal technical terminology, indigenous or imported materials, powered machinery, relatively skilled labour, up to £500 per work position, machine products for district or national markets.

With such categories in mind, the Group's plans for documentation envisage, broadly, the following:

— Technical profiles, which cover a range of technological choices in the intermediate categories, up to small-industry level. These profiles are intended for departments of industry, government planners, international agencies. They will give an outline of the inputs and operations necessary for, say, the three categories shown above, illustrating the technical choices available for each.

— Instruction manuals, containing the detailed information (including technical drawings) necessary to put the available choices into practice.

— Directories, catalogues of equipment in the intermediate range. These may be catalogues of commercially available equipment, or of local self-help equipment and tools.

— Annotated bibliographies, covering intermediate technology applications, on such subjects as water and rural health.

— Special project reports, which give a step-by-step account of field demonstrations of particular techniques.

Conclusion

The importance of technological choice, more particularly the need to make low-cost technologies widely available in usable form, is gradually entering the consciousness of economists and development planners. There would appear to be four stages in the process, judging by reactions to the work of the Intermediate Technology Development Group: the first was widespread rejection of the idea; the second, now in vogue, is widespread acceptance, but with little support or concerted action; the third would be active involvement on a considerable scale to mobilise knowledge of technological choices; and the fourth would be the practical application of such knowledge, again on a significant scale.

There are certain hopeful signs on the horizon. The fact that jobs are needed in their millions by the developing world is now universally acknowledged. The inescapable question of how much can be afforded for providing each job, when millions are needed, must very soon compel equal attention. There are extensive moves by international agencies towards finding labour-intensive methods for public works. These are important not just in themselves but also because of the opportunities they can provide—by increasing rural income—for other forms of rural employment. There are the growing points of action in a few countries on low-cost technologies, to which reference has been made earlier. The only criticism that can be levelled at these—and the Group's—efforts to fill the " technological gap " are that they are on too small a scale in relation to needs. They represent an insignificant fraction of total aid expenditure. (The Group's budget now runs at about £3,000 a month, along with a total outlay on field projects of about £70,000 a year—less than one-twentieth of 1 per cent of the United Kingdom's expenditure on aid.) Yet unless practical, useful work on these lines is rapidly expanded and multiplied, there can be no hope for the poor and the workless; nor any, perhaps, for the rich either.

Supplementary note on documentation

In addition to the publications mentioned in footnotes the Group has produced the following documentation in connection with its building for development project:

The Nigerian building contractor : practices, problems and needs; *An educational strategy for the Nigerian building contractor*; *Construction and reconstruction : towards a policy for the Nigerian construction industry*; *Contractor development : report of the Conference on the Training of Nigerian Building Contractors*; *A management handbook for the Nigerian building contractor*; *The Kenyan building contractor : practices, problems and needs*; *Bradford Seminars I and II* (report on the study seminars on the construction industry held at the University of Bradford's Centre for Project Planning for Developing Countries).

Teaching manuals for the construction industry (in five kits): *How to decide business policy*; *How to do accounting*; *Contracting and the client*; *How to estimate and tender*; *Planning for the contractor.*

The following list of technical specifications provided by the Group from various sources for the Zambian field project gives a further idea of its documentary services:

Indian standards: *3-tined cultivator, animal-drawn* (IS:3342); *V-blade hand-hoe* (IS:3185); *Soil-scoop, animal-drawn* (IS:3360); *Single-row cotton seed drill, animal-drawn* (IS:3310).

From the Industrial Development Centre, Nigeria (figures in brackets refer to special report numbers of the IDC): *The plough bolt* (70-1); *The wood bearing* (69-8); *IDC weeding attachment* (70-2); *The plough gauge wheel* (70-6); *Blacksmith entrepreneurs and their capabilities*; *The IDC singletree* (70-5); *The IDC single ox-yoke* (70-4); *The IDC Clarkson ox-yoke* (69-3.1); *The IDC Bornu groundnut lifter* (69-5).

From other sources: *Workshop designs*; *Hand and workshop tool lists*; *East African timbers list*; *Blacksmith's hearth, COSIRA design*; *Blacksmith's forge, Pearson design*; *Home-made anvil*; " *Thought starters* " *on welded design*; *Steel fabricated vee pulleys*; *Manufacture of harrow tines*; *All-welded steel vice*; *All-welded M.S. vice*; *VITA foot-powered wood lathe*; *Drawings and specifications—*" *Animal-drawn equipment and basic tools for farmers, suitable for local construction* "; *The Samaru bicycle cart*; *The Samaru ox-cart*; *The fuffle*; *The Shinyanga lift pump*; *Chitedze multi-purpose ox-drawn tool bar*; *Hand-operated flap-valve water pump*; *Animal-drawn tool bar.* Technical drawings of animal-cart wheel and axle jig assembly, universal welding jig, ploughshare welding jig.