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TECHNOLOGY - THE CRITICAL CHOICE FOR  
DEVELOPING COUNTRIES,

THE WORK OF THE INTERMEDIATE TECHNOLOGY DEVELOPMENT GROUP <sup>1/</sup>

by

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<sup>1/</sup> The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

A. The Intermediate Technology Development Group was formed in 1965 by Dr. E. F. Schumacher and a few of his close associates; in the following year it assumed its present form, that of a company limited by guarantee (a non-profit company) and a registered charity.

The ideas that have informed the Group from its formation are now gaining wider acceptance. They can be summarised in two propositions.

The first is that the technologies which industrialised countries tend to promote in an effort to develop the poorer economies of the Third World are sophisticated, large-scale and capital-intensive (i.e. labour-saving). These are the technologies with which the rich countries are familiar; and most of the world's research and development effort is devoted to them.

But these mass production/mass market technologies are not appropriate for countries where markets are small, seasonal, dispersed and largely rural. For several reasons they fail to achieve development. They by-pass the rural areas and indeed aggravate their problems by driving traditional manufacture out of existence. They increase dependence on imports from industrialised countries. They carry with them systems of management, administration, financial arrangements, education, forms of infrastructure and patterns of consumption of a kind that widen the gulf between urban and rural life. Above all, they fail to provide employment on anything like the scale required by rapidly growing populations. In short, the result of relying almost exclusively on advanced technologies has been mass migration into urban slums, mass unemployment and a growing threat of mass starvation.

The second proposition is that developing countries need new kinds of technology, appropriate to situations where labour is abundant, where local markets need to be generated and use made of local materials, local skills and organisational capacities. Methods are required which will multiply workplaces; which create millions of new jobs. This demands intermediate technologies which fit rural environments and are cheap, simple and small:

- In developing countries, 80 to 90% of the population live in rural areas. Hence effective development calls for new jobs to be created in these areas. Also these jobs should meet basic needs arising from agriculture and agro-based industries - for example farm implements, storage and processing facilities, water supplies, transport equipment, household goods and building materials.

- The new workplaces should be cheap enough that they can be created in large numbers. If one workplace costs £3,000 - a typical figure for highly industrialised technologies - £300 million would provide 100,000 jobs. At £300 per workplace, the same money would provide one million workplaces. Moreover, if the technology makes use of local materials, it will be still cheaper and less dependent on imports.
- If production methods are relatively simple, they will be more appropriate to locally available labour skills and capacities for management, organisation and maintenance. Also they will be less exacting in their requirements of specialised raw materials.
- In many cases the appropriate technologies will also be "intermediate" in terms of size. "Economies of scale" depend on such local factors as size of market or purchasing power, transport facilities, marketing know-how, managerial skills, manpower supplies and availability of capital. In the situation typical of developing countries, the most economic scale of production will often be relatively small. An appropriate technology is "intermediate" in size as between the hoe and the tractor, or the sickle and the combine harvester.

None of this implies "second-rate" technologies. The very best scientific knowledge is required to develop intermediate capital-saving technologies appropriate to local conditions. Alternative technologies of varying degrees of sophistication are available to suit differences in conditions, and intelligent choices between them are required.

#### Choosing what is appropriate

The choice of technologies is one of the most important collective decisions facing a developing country. It is a choice which affects the whole fabric of the economic and social structure. It determines who works and who does not; the whole pattern of income distribution; where work is done and therefore the urban/rural balance; and what is produced, that is for whose benefit resources are used.

But developing countries are far from aware of the choices open to them. At present the scales are heavily weighted in favour of capital-intensive methods. The bulk of the world's research and development effort is under

the control of the rich countries and is devoted to making their technologies increasingly labour-saving and sophisticated. There is a great deal of information about such super-technologies, as well as high-pressure salesmanship, both political and commercial, behind them.

In contrast, there is no major commercial or political interest in making known the existence of less costly capital-saving and labour-using methods of production. Nor do aid administrators in donor countries possess the necessary knowledge of appropriate techniques to be able to assist effectively. It is the objective of the Intermediate Technology Development Group to close this "knowledge gap".

The Group's objectives are:

B. the systematic assembly of data on efficient self-help techniques suitable for rural and small-town areas in developing countries (whether such techniques already exist, or have to be adapted or invented for the purpose):

the effective communication of such information to the developing countries, both directly through publication and the media, and through aid-giving governments and other organisations and groups in the developing countries; and

helping with the field application of intermediate technologies through demonstration projects, collaboration with field programmes of all kinds, and consultancy.

Extensive work programmes have developed from these three basic tasks.

#### Mobilising Information

The work of identifying needs for intermediate technologies, and mobilising the relevant practical information is carried out largely through the Group's structure of panels and working parties. Each panel tackles a particular technology or family of technologies; and each panel comprises a group of experts in the subject - engineers, scientists, architects, doctors, building technicians and the like - generally with overseas experience. They serve voluntarily and in their individual capacities, and together they represent a formidable team of some 230 men and women of a very high level of professional competence.

In forming the panels we try to ensure that industry, the professions, academic life and administration (including government research establishments) are all represented. Our experience has shown that this kind of mix, which brings a wide range of experience to bear on each subject that is tackled, produces the most practical results.

Panel meetings are convened by individual panel chairmen three to six times a year, and in many cases sub-panels or working groups continue work on specific projects during the intervening periods. The panels at present cover the following subjects: agriculture, building and building materials, chemistry and chemical engineering, co-operatives, ferro-cement, fertilisers, forestry and forest products, homestead technology, nutrition, power (wind, solar, methane and hydro-electric), rural health, low-cost printing techniques, transportation and simple vehicles, and water.

Most panels have found it useful to start their activities by reviewing the "state of the art" in their fields, that is the existing state of documentation and the main problems in relation to which this knowledge needs to be assembled and disseminated. This enables them to assess the dimensions of their task and to identify "gaps" in terms of development needs. Equally important, it results in a body of documentation - catalogues, bibliographies, drawings, design specifications, photographs, industrial profiles and other descriptive materials - designed to make administrators, extension workers, and teachers in developing countries aware of the technological choices available to them. It also facilitates valuable contacts with other relevant institutions.

Once "needs" have been identified, panels usually embark on a series of specific research and development projects for filling some of the more important gaps. This work ranges from "bench" research to construction of prototypes and testing of these prototypes in field situations. More often than not the objective is to incorporate the results of the research in a series of publications which can be disseminated to developing countries.

There is a close relationship between the R & D work of the panels and that carried out by ITDG technical officers. Panel members help to develop the work programmes of the latter, and act as assessors of the specifications and designs produced by them.

A closely related function of panels is to provide technical advice on issues related to their field of competence. Requests for such advice may at times come from project officers, the ITDG Industrial Liaison Unit, academic and research institutions, private industry, governments, and development administrators as well as individuals in developing countries. Responses to such requests may take the form of replies to enquiries, the sending of experts abroad under the auspices of Intermediate Services Ltd., and the preparation of information and training materials related to specific needs.

Panels also act as sounding boards and advisory bodies for actual research and development projects being carried out by our technical officers or consultants, and sometimes by panel members themselves.

In this section we briefly describe the research and development work being undertaken by the panels in the second half of 1976:

#### BUILDING MATERIALS

The chairman, with advice from panel members, is providing the Pilkington Glass Company, under contract with ITDG, with expertise on building techniques and markets in developing countries. Research is well under way on the development of a technology for mud wall protection with glass fibre reinforced cement. The project involves the manufacture of African-style mud bricks at a Lincolnshire brickworks. If the experiment in the UK is successful, a pilot demonstration scheme will be set up to evaluate the technology in a rural area in the Third World.

The panel, through the chairman, are advising the government



of Sudan on the expansion and rebuilding of a brick and tile plant (in Kit) which had been derelict for eighteen years. A second larger plant is being constructed at Juba. The project is financed by Christian Aid. Hitherto the South Sudan has had to rely almost exclusively on the importation from Kenya of cement for block-making and corrugated sheets for roofing; locally manufactured bricks were in very short supply and their quality was such that reputable builders were reluctant to use them, while the manufacture of tiles had ceased completely. The establishment of a viable local industry will create savings in foreign exchange, reduce the costs of building and provide local employment.

A panel member who spent ten months in South India investigating small-scale lime burning techniques and the manufacture of lime possolanas is planning, with advice from the panel, to continue this research in England and to establish a pilot project in Africa.

#### CHEMISTRY

Panel members in collaboration with the Forestry panel are advising the Tropical Products Institute on its work on portable gas units for converting wood waste to engine fuel.

Various members of the panel are pursuing experimental work on the development of small-scale cement plants.

#### FERRO-CEMENT

Panel members continue to act in an advisory capacity to the ferro-cement boat construction project in the Sudan. Following the completion of a prototype boat at Juba in 1974, a two-year boat construction programme was started early in 1975 on behalf of the Sudan Council of Churches with funds provided by Christian Aid. A boatyard, workshop, stores, housing and slipway were installed and the first production boat completed. The project aims to build boats for local sale to government departments, aid agencies or private individuals, and to establish local maintenance and repair facilities. The objective is to test the feasibility of a locally based boat building industry staffed and managed by Sudanese.

A sub-group of the panel is developing a pilot demonstration project for a small grain silo in collaboration with the Tropical Stored Products Centre.

Various panel members have been conducting tests designed to establish the feasibility of local, small-scale manufacture of wire mesh in developing countries, wire being one of the main components in ferro-cement construction which is now being imported at considerable cost.

#### FORESTRY AND FOREST PRODUCTS

In collaboration with the Building Materials panel, panel members are developing a prototype of a low-cost portable saw which would be simple to use and maintain. Such a piece of equipment should be capable of cutting large logs; be light enough to be carried into forests over uneven ground without roadmaking; be capable of sawing logs lying on uneven ground without moving them; avoid the need for digging pits; and use indigenous power.

Consideration is being given to a hand-saw fitted on a normal agricultural tractor which could be transported on a trailer, lifted off hydraulically and placed over a log on a fairly rigid frame, all within ten to fifteen minutes. It would be easy to set up, cheaper than conventional saw mills, would require the minimum of equipment and would be more efficient than pit saws in coping with individual scattered trees. In some areas a hand-pumped saw might prove more suitable.

#### HOMESTEAD TECHNOLOGY

A member of the panel has been appointed, with Christian Aid funds, as Research Officer on village technology for the Pan-African Women's Centre of the Economic Commission for Africa in Addis Ababa. She is working closely with the panel on the development of appropriate technologies to ease the burden of domestic work for rural women and to increase their ability to improve family life.

#### NUTRITION

The panel is advising the Ross Institute on its research into the "energy density" of certain foods. The intention is to prepare a guide to the calorie density of prepared mixtures in respect of a limited range of weaning foods.

#### POWER

The panel is collaborating on experimentation at Reading University with improvements to the Stirling cycle engine designed to run

on any combustible fuel including mud or dung and which can be built cheaply with village blacksmithy facilities. The aim is continuous production of approximately 100 watts of power suitable for small-scale irrigation pumping or similar application.

Panel members are collaborating with the Methane panel on experimentation with a small methane digester at the National College of Agricultural Engineering, Silsoe, UK. It is hoped to build a similar unit at Dar-es-Salaam University in Tanzania for field testing.

Various members of the sub-group on wind power are experimenting with windmills. At Reading University, for example, improvements are being made to the windmill designed for the Omo River Project in Southern Ethiopia which was described in a recent ITDG publication "Food from Windmills." This prototype has a 6 m. diameter wind-wheel, and is all metal and fully automatic with a built-in governing system to cope with high wind. It is intended for limited local manufacture in developing countries.

#### RURAL HEALTH

The Hearing Aids sub-group of the panel is advising the Department of Health and Social Security on its experiments with a simple acoustic hearing aid which can provide an extra boost to sound levels for those in the developing countries who are not hopelessly deaf.

The panel is also considering a proposed project for developing a prototype for an alternative form of diagnostic X-ray assembly which would cost in the region of £6,000 for the complete system, including the dark room. The system would be simple to maintain and could be used by non-professionals; it would also be safer than the conventional system.

#### TRANSPORTATION

Various members of the panel are working on designs for hand-drawn and pedal-driven vehicles suitable for developing countries, particularly in rural areas which are often served by roads of relatively poor quality.

#### WATER

An ITDG project officer has been working at Silsoe on a hydro-

static pump. This is a slow speed rotary pump which has been tested only in miniature versions. Components have been collected for assembly of a full size pump to be operated by one person for lifting water through a height of three metres. When completed its characteristics will be compared with those of other types of hand-operated pump. Meanwhile the technical officer is in Ethiopia working with the Garage Well Digging programme.

#### INDUSTRIAL LIAISON UNIT

A special type of panel on a more substantial scale is the Group's Industrial Liaison Unit (ILU). This was set up with the help of funds from the Ministry of Overseas Development, for the purpose of establishing a continuous and close link with British industry. It consists of a staff of four officers. The functions of this Unit are: to respond to technical enquiries, to publish information on small-scale processes and to carry out original development work.

In order to carry out these tasks the Unit has built up an extensive reference system and established contacts with over 500 firms and 200 product groups which have expressed interest in helping to develop appropriate technology. It also maintains contact with academic institutions.

Examples of advice which the Unit has given to African countries for the setting up of small-scale industries are: barbed wire in Swaziland, metal windows and door production in Nigeria, woodworking in Botswana, and small-scale copper rolling in Zambia.

The ILU is also engaged in publishing a series of "industrial profiles", the first of which described the working of small-scale foundries. A "profile" is a description of the range of small-scale techniques within a particular industry. Other industries which are being similarly described are candle making, woodworking, leather work and glass manufacture. Through an exchange of minutes, attendance at panel meetings and consultation between officers, the work of the ILU is made to relate closely with the work of ITDG technical panels.

#### PANEL CONTACTS WITH THE UNITED NATIONS

Increasingly panels are linking their activities with United Nations bodies.

As a result of deliberations of the Rural Health panel concerning

a vaccine refrigerator for use in rural clinics, a panel member was recruited as an ITDG consultant to the World Health Organisation in connection with their mass immunisation drive.

The chairman of the Building Materials panel, after attending a programme planning meeting of the UN Environment Programme in Kenya, has submitted a proposal to UNEP for collating and field testing the results of research on the use of mud as a building material. If this project materialises the panel will act in an advisory capacity.

ITDG has approached the United Nations International Children's Emergency Fund (UNICEF) concerning a proposal for a pilot project for surveying existing printing and reproduction facilities in a developing country and the extent to which they meet the demands of local people at the district level and below; and for investigating low-cost techniques and equipment for improving these facilities. If the project is approved the Printing panel will act as technical advisers.

ITDG was approached by the Protein-Calorie Advisory Group (PAG) of the UN for collaboration on a project for collecting and systematising existing documentation and research data on issues related to women's participation in the supplying, processing, distributing, and preparing of food and their key role in respect of family nutrition. Papers were submitted by the Nutrition panel and the Homestead Technology panel to the team which will compile a comprehensive document for discussion at the PAG meeting in September 1976.

A member of the Co-operatives panel was recently commissioned by UNIDO to submit a paper and act as Consultant and Rapporteur for one session, on Industrial Co-operatives, of an Experts' Meeting on Small-scale Industry in Developing Countries. Subsequently this member has been engaged by the International Co-operative Alliance to prepare a paper on Co-operative Insurance in Developing Countries for discussion at the June 1977 session of the UNCTAD Committee on Invisibles and Financing Related to Trade.

The Water panel was commissioned to prepare on behalf of ITDG one of the two position papers for a UN Conference on Water; and a member of the Homestead Technology panel has been appointed to the Economic Commission for Africa as ITDG Research Officer on Village Technology.

Finally it is worth mentioning that a growing number of panel

members are being recruited by the ITDG, through its subsidiary company, Intermediate Technology Services Ltd., as consultants to various UN projects, including United Nations Industrial Development Organisation (UNIDO), World Health Organisation (WHO), Food and Agriculture Organisation (FAO), International Labour Office (ILO), and the World Bank.

### Bridging the Communication Gap

Almost without exception the production equipment - and its associated services and institutions - that has been transferred from the rich to the poor countries was developed by the rich countries to suit their own conditions and resources. It was not developed with the poor countries in mind; that it is generally inappropriate to meet the needs and resources of poor countries is now becoming widely recognised by both aid-giving and aid-receiving countries.

Yet it is this kind of technology that continues to be most powerfully, and almost exclusively, promoted in the developing world. The high-cost technology of the rich has a pervasive and effective communications system: it is promoted through private foreign investment; through trade; through capital aid and technical assistance programmes. Institutions of higher education and research are also usually potent means of high-cost technology transfer, being generally modelled upon those in rich countries and staffed by expatriates or people trained only in the high-cost technology institutions of industrial countries.

In contrast, the Group has pioneered the development of a parallel flow of information into the developing countries, of technologies that are less costly and more appropriate to their resources. This is being done through our own rapidly expanding publications programme, and through the building up of an international communications network centred on organisations working on intermediate technologies within the developing countries themselves.

By the mid-1970's, the publications list of the Group's subsidiary company, IT Publications Ltd. contained over 80 publications, ranging from buyers' guides on low-cost tools and equipment to detailed drawings and specifications on a do-it-yourself basis. A quarterly illustrated journal, Appropriate Technology, carries news about practical applications of low-cost technology from every part of the developing world.

The Group's panels are closely associated with the publications programme. The guiding principle is that every publication should be capable of leading to useful, practical action.

#### LITERATURE SURVEYS AND BIBLIOGRAPHIES

The Homestead Technology panel is engaged on a systematic survey of the literature on techniques and equipment for easing the work of women in developing countries. The work is directed towards a two-phase objective: a) collection of a centralised file of available documents which can be used in answering enquiries, for briefing visitors, and for more intensive research, and b) preparation of a selected annotated bibliography for dissemination to developing countries.

The Chemistry panel has started collecting information on dyes from natural sources - chemical and botanical aspects, extractive procedures, dyeing equipment etc., with a view to eventual publication of an annotated bibliography.

The Rural Food Technology Advisory Group is recording available literature on the technologies of preparing, processing and preserving the major crops in developing countries with a view to publishing a series of pamphlets indicating the range of small-scale equipment already available and the further work that needs to be done.

The Power panel has obtained funding from the Ministry of Overseas Development for the preparation of a catalogue of available prime movers up to 100 KW suitable for use in developing countries.

The chairman of the Rural Health panel has prepared a bibliography, published by ITDG, on Training of Auxiliaries in Health Care.<sup>1</sup> It includes information on textbooks, course descriptions, and visual aids.

The Water panel advised on the preparation of A Bibliography of Low-Cost Water Technologies,<sup>2</sup> which ITDG has published in a third edition. It appraises information assembled on low-cost, low-skill water technologies, including sources and references on water supply, storage, transport, lifting and use.

The Methane panel has prepared a selected annotated bibliography on Methane, and the Simple Vehicles panel is preparing one on vehicles.

The Transportation panel is working on a catalogue of existing simple vehicles appropriate for load-carrying in developing countries, including animal-drawn, manually-propelled, pedal-driven and simple motorised vehicles.

#### PROFILES

The Water panel has completed a comprehensive survey of the technological aspects of water supplies with particular reference to rural areas in developing countries. This has been submitted as a background paper for the United Nations Water Conference to be held in Argentina in March 1977.

Members of the Fertiliser panel have drafted a series of papers on various aspects of small-scale fertiliser production, organic and chemical, which are being collated for publication by the ITDG.

Several members of the Chemistry panel have been working on a description and assessment of techniques for small-scale cane sugar production.

A sub-group of the Rural Health panel is collecting information on methods for low-cost production, packaging and distribution of pharmaceuticals in developing countries.

The printing panel is drawing together details on the existing range of simple inexpensive equipment for disseminating printed information to the "grass roots" village level in developing countries; and hopes eventually to publish an annotated bibliography.

The Agricultural panel is monitoring work going on at Silsoe (the National College of Agricultural Engineering, where the Group's agricultural engineer is based) in connection with preparation of a series of profiles on agricultural activities, starting with one on Land Clearing.

The ITDG technical officer at Silsoe is also consulting the Agricultural panel on a paper describing the equipment needed to set up rural workshops at various levels in the developing countries.

Two publications recently issued by ITDG, one on Hand Dig Wells and the other on Chinese Chain and Washer Pumps, were closely monitored by the Water panel; and the revised version of Chemicals from Biological Resources is the result of work by several members of the Chemistry panel.



## BUYERS' GUIDES

The Agricultural panel has been closely associated with the current revision and expansion of the Guide to Hand-operated and Animal-drawn Equipment which gives details and lists of manufacturers for a wide range of low-cost farming and food-processing implements in the UK and abroad.<sup>4</sup>

## SEMINAR PROCEEDINGS

Two one-day seminars arranged by ITDG panels (Methane and Building Materials) have resulted in publications. Methane covers 12 papers, discussion and references relating to methane production by anaerobic fermentation; and Lime and Alternative Cements contains 14 papers, discussion and references to cementitious materials.<sup>5</sup>

A one-day seminar held in June 1976 by the Transportation panel is likely to result in a publication on simple vehicle designs for developing countries - particularly hand-drawn, pedal and small motorcycle engine powered vehicles.

## MANUALS

The Co-operatives panel is making good progress on a series of seven programmed learning Co-operative training manuals which are being field tested and published with financial support from the Ministry of Overseas Development. These relate to Basic Agriculture, The Organisation of a Co-operative, The Committee, Business Calculations, Prevention of Losses, Office Organisation, and Self-build Co-operative Housing. In addition, the panel is collaborating with the International Co-operative Alliance on the preparation of a fourth co-operative accountancy manual, on industrial co-operatives, which will be added to the three produced earlier (on thrift and credit, consumer co-operatives and marketing co-operatives) when the series is reprinted later in the year.

A revised edition of Water Treatment and Sanitation,<sup>6</sup> a manual of simple methods for rural areas of developing countries prepared with the help of the Water panel, has now been published; and the panel is advising on the drafting of a manual on Water Bacteriology Testing. Earlier it helped with preparation of a manual on the Automatic Hydraulic Ram Pump.<sup>7</sup>

The Ferro-Cement panel is supervising the preparation of two manuals, one on the construction of boats and the other on water containers.

The chairman of the Building Materials panel is drafting a manual on How to Make Bricks, and the panel has worked with an ITDG project officer on manuals on The Maintenance of Buildings in Developing Countries.<sup>8</sup>

The most ambitious set of instructional materials published by ITDG has been the series of technical drawings with texts on farm implements, designed for local construction prepared at Silsoe by the ITDG technical officer with advice from the Agricultural panel. Additions are currently being made to this series.

#### Field Application: Low-cost Technology in Practice

The testing and demonstration of intermediate technologies under operating conditions form an integral part of the Group's activities. This may take place in the course of a research and development programme. For example, one of the work programmes started by the Group's Agricultural panel was to identify specific needs for agricultural tools and equipment, and to develop ways of meeting these needs. Work on these lines was carried out in Zambia and Nigeria, and the results of these two field projects - covering a period of nearly three years - have been published. That relating to the work in Zambia, An Example of Farm Survey Technique using Local Resources,<sup>9</sup> comprises a detailed description of a rapid survey using local personnel, to identify technological bottlenecks in agricultural production, and the kind of new and improved equipment needed to increase output; and how to develop such equipment. That on the Nigerian project, Report on Farm Equipment Development Project, Nigeria,<sup>10</sup> includes an account of the design, development and introduction of small-scale farm machinery to meet specific needs revealed by surveys of the kind done in Zambia.

Another way in which the Group is directly involved in the field application of intermediate technologies is through consultancies. To undertake consultancy work the Group formed a separate company, Intermediate Technology Services Ltd., a wholly-owned subsidiary of the main Group. For such assignments it draws not only upon its own professional staff, but also increasingly upon the reservoir of knowledge and experience represented by its 200-plus panel members. Here are some

typical examples of recent consultancy assignments:

#### **AFRICA 1969-72**

Research in several areas into ways of promoting improvements in the efficiency of building operations at intermediate levels in developing countries, followed by the publication of teaching manuals on small contractor training; undertaken on behalf of the Ministry of Overseas Development.

#### **CAMEROON 1971 and 1976**

Assistance in establishing a rural crafts industry; followed up in 1976 with a further visit to report on development progress.

#### **ETHIOPIA**

**1971:** Recommendations for the introduction of village water supplies and small-scale conservation works in Tigray Province.

**1973-74:** The identification of sites and construction of prototype surface water retention and spreading systems for irrigation of fodder crops in the N.E. Rangelands of Wollo Province; undertaken at the request of the Ethiopian Government's Livestock and Meat Board as part of its drought relief programme, on behalf of the Ministry of Overseas Development.

**1974-76:** Provision of a senior consultant to the National Water Resources Authority to advise and assist in the planning and establishment of low-cost rural water supplies; undertaken on behalf of the Ministry of Overseas Development.

**1975-77:** A two-year pilot project to establish village water supplies through self-help programmes; undertaken on behalf of OXFAM, Quebec.

**1975:** Advice on the adaptation and upgrading of locally manufactured windmills for irrigation; undertaken on behalf of OXFAM, UK.

#### **GHANA 1971**

Advice and assistance on the establishment of a Technology Consultancy Centre at the University of Technology, Kumasi.

#### **JAMAICA 1971-73**

A techno-economic survey carried out at the request of the Department of Geological Surveys, Jamaica and the Ministry of Overseas Development, London of the feasibility of establishing rainwater catchment tanks in the limestone regions of Jamaica; followed by the construction of a prototype installation.

#### **NIGERIA 1971-73**

Research into the feasibility of establishing light industry production/training capability in the Northern States, followed by the establishment of a prototype workshop at Zaria to manufacture hospital equipment, school and domestic furniture, agricultural implements, etc. at the request of the North Central State Government, on behalf of the Ministry of Overseas Development.

## PAKISTAN

- 1973: Advice to the Government of Pakistan on the establishment of an Appropriate Technology Development Unit and on the introduction of intermediate technology programmes into its National Rural Development Plan; undertaken on behalf of the Ministry of Overseas Development.
- 1974: A techno-economic feasibility study of the possibilities of developing mini-plants for the manufacture of basic chemicals, fertilisers, insecticides, essential pharmaceuticals and minerals with particular reference to the selection of products, the scale of operation, availability of local inputs, viability, financial profitability and safety control requirements carried out at the request of the Government of Pakistan, on behalf of the Ministry of Overseas Development.

## SUDAN

- 1973-74: Development of prototype ferro-cement river craft for local construction and use on the Upper Nile, carried out on behalf of the Sudan Council of Churches in collaboration with the Southern Region Ministry of Co-operatives and Rural Development and supported by Christian Aid.
- 1975: Advice on the appropriateness of plans to establish an ox-treadmill centre and the manufacture of agricultural equipment; undertaken at the request of the Sudan Council of Churches.
- 1975-76: Advice and assistance to the S. Sudan Regional Development Corporation on the upgrading of the local building materials industry and the establishment of labour-intensive bricks and tiles manufacturing facilities; undertaken at the request of the Corporation and the Sudan Council of Churches.

## TANZANIA

- 1972-74: Development of village food technology programmes and establishment of a Rural Food Technology Unit undertaken at the request of the Department of Agriculture and in association with the National College of Food Technology, Weybridge, England.
- 1974(a): Advice to the Tanzanian Government on the establishment of a production/training centre for small-scale lime production and other building materials.
- 1974(b): Survey and recommendations to the Small Industries Development Organisation on the development of small industry possibilities, undertaken on behalf of the Commonwealth Fund for Technical Co-operation.
- 1976: Advice and assistance in establishing production/training in brick and tile manufacture by village co-operatives. Undertaken on behalf of the Ministry of Overseas Development at the request of the Small Industries Development Organisation of the Government of Tanzania.

## U.N. ASSIGNMENTS

The Group's resident civil engineer has participated in ILO missions to Indonesia (1974: site and service schemes relative to resettlement programmes), Lesotho (1975: labour intensive road construction methods), and Sudan (1975: regeneration of local building industries). He is also participating in the preparation of training courses for small building contractors on behalf of ILO/NORAD.

Many developing countries require small-scale machinery, but as yet lack the necessary production facilities. To help to meet their needs, the Group started Development Techniques Ltd. as another wholly owned subsidiary of the non-profit parent company. Development Techniques was founded to design, develop and make available small and intermediate scale plant, equipment and tools for developing countries. It also identifies specific requirements for equipment and matches them with specialist suppliers. It negotiates the most advantageous terms and protects the interests of the customer.

Development Techniques itself can supply three machines: a paper pulp packaging machine (which makes e.g. egg trays); a 2/3 tons per day glass and glass container manufacturing plant; and candle making equipment. Other items of equipment will be added in response to demand from developing countries.

## III. INTERNATIONAL NETWORK

There are now a growing number of organisations both in the industrialised and the developing world, working on intermediate or appropriate technologies. The counterparts of ITDG in London are TOOL in Eindhoven, Netherlands; the Brace Research Institute in Montreal, Canada; VITA; Georgia Institute of Technology, and Technoserve in the United States; and GREP (Groupe de Recherches sur les Techniques Rurales), in France. Towards the end of 1975 Mexico announced the formation of an International Institute for work on Third World problems, and this was to include a unit on appropriate technologies.

During the past few years there has been a rapid increase in the number of technology units started in the developing countries themselves, many of them in collaboration with the Group. Ideally, of course, such units should be operating in every developing country, and should be the focal points of indigenous research and development programmes specifically aimed at developing technologies appropriate to local needs and resources.

Because the choice of technology is one of the most important choices confronting any country - because it determines, among other things, both how much new employment can be created, and where it can be located - units of this kind should be brought in on the early stages of any development plan: to advise on the alternative technologies available, and on the implications of different choices in terms of self-reliance, capital cost, foreign exchange costs, employment generation, local income and capital creation at rural level, consumption patterns, transport and other infrastructure costs, and so on.

The task of persuading senior administrators, treasuries and cabinets that intermediate technologies are feasible and often preferable is not easy, if only because of departmental pressures and practices and the educational backgrounds of the decision-makers. During the past year or so the Group have accordingly started to plan publications aimed at decision-makers (in addition to continuing its series for field workers). It is also looking for opportunities of permanent representation in the developing countries, in order to start dialogues with governments. This has been possible in Africa, with the attachment of a Group representative at the Economic Commission for Africa. He is collaborating with government departments in Tanzania and Botswana about the starting up of IT units, and will shortly be doing the same in one of the Francophone countries with the object of starting similar units there.

The work that is already being done by some of the existing appropriate technology units itself provides the best argument for expanding their activities and bringing the question of technological choice into the forefront of development policy and practice.

In 1976 there were something like twenty technology units in operation in different parts of the world. One or more appropriate technology centres existed in Botswana, Ethiopia, Ghana, Tanzania, Upper Volta and Zambia in Africa; and in Bangladesh, India, Pakistan and Sri Lanka in Asia. Elsewhere, Indonesia, Papua New Guinea, Colombia and Mexico are proposing such centres.

Many of these, it should be observed, are very small, lacking in funds and personnel and experience, and most are less than two years old. But all have identified areas of work that are of basic importance to the economics of their countries, and some have already launched extensive programmes of research and development.

### International Effort Required

In the Group's experience there are certain aspects of work on appropriate technology that must be very greatly accelerated, if employment is to be generated in developing countries in anything like the required scale.

One area of work requiring immediate attention is the strengthening of existing units and organisations dealing with appropriate technologies in the developing countries; and the formation of such units where they do not yet exist. This should have the highest priority.

Another is the mobilisation of existing knowledge of appropriate technologies required to produce the basic needs of rural communities - technologies related to food, clothing, shelter, health and basic community services. Gaps in knowledge can then be filled by promoting relevant research and development programmes.

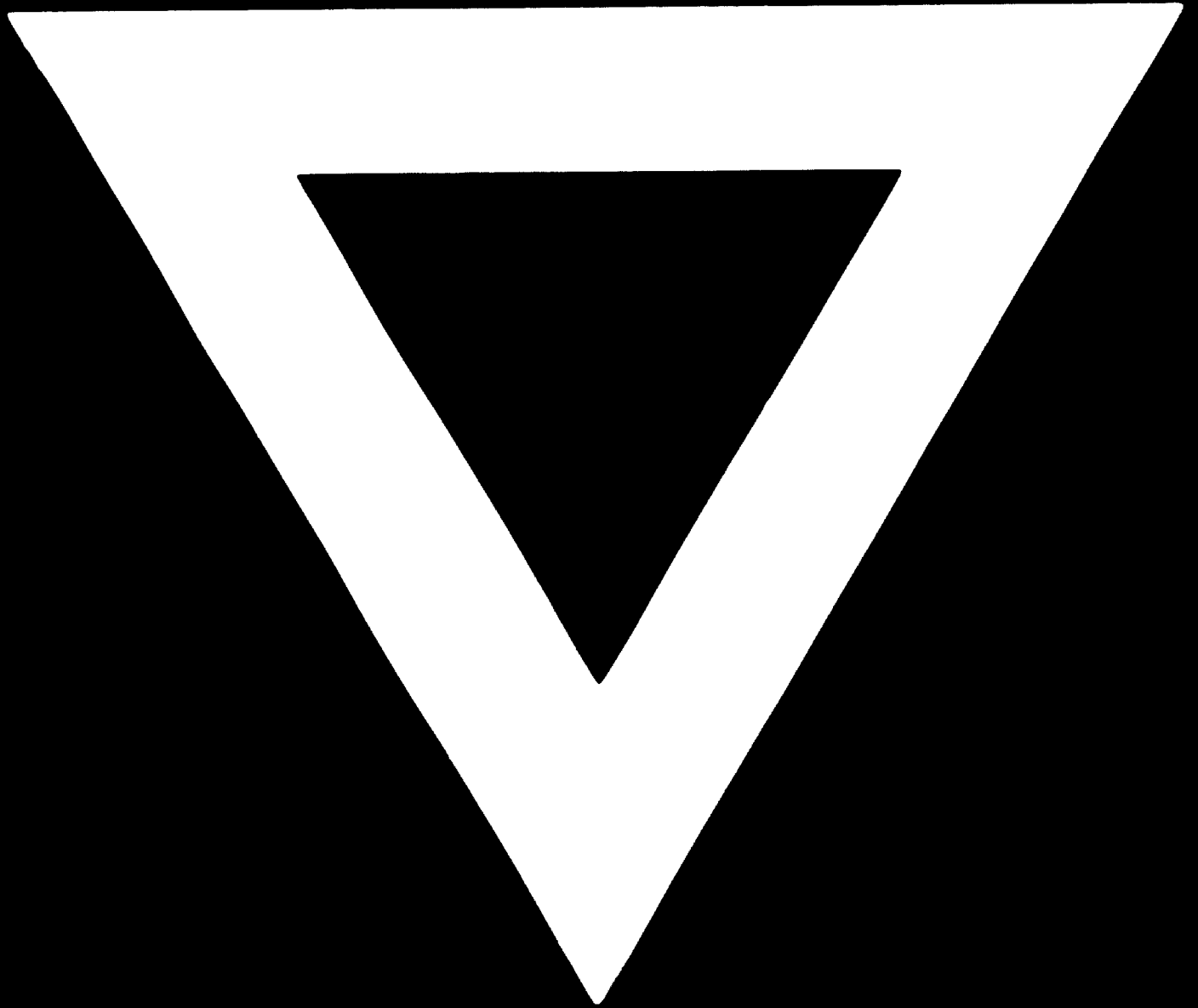
Netherlands. These lists are not all-inclusive and the literature is growing rapidly.

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