Village Technology in Eastern Africa

edited by Jim McDowell

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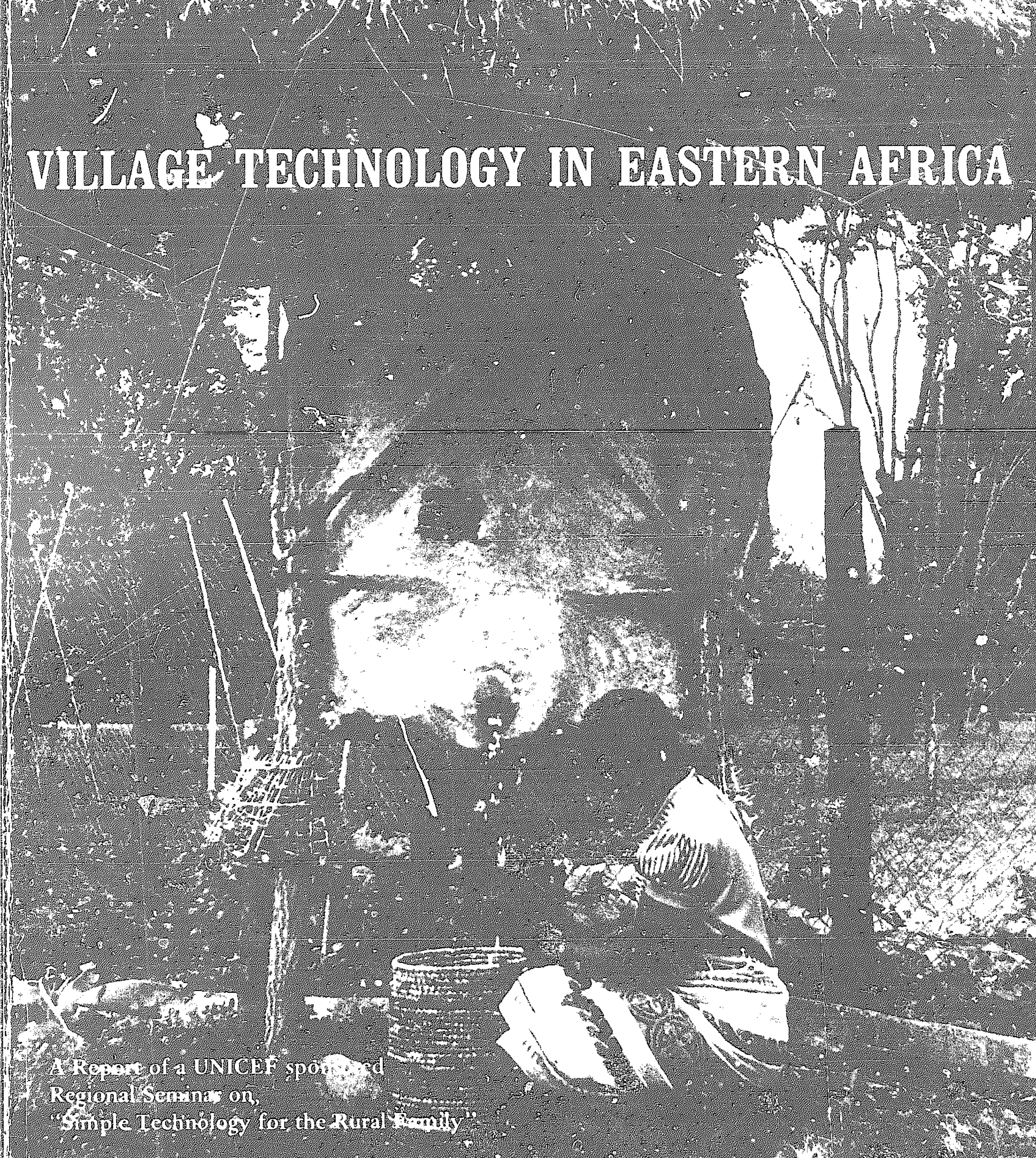

A Report of a UNICEF sponsored
Regional Seminar on,
"Simple Technology for the Rural Family"

VILLAGE TECHNOLOGY IN EASTERN AFRICA

A Report of a **UNICEF** sponsored **Regional Seminar**

on

"Simple Technology fox the **Rural** Family"

held in Nairobi 14-19 June 1976

edited by

JIM McDOWELL

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UNICEF Eastern Africa Regional Office

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PREFACE

At its meeting in 1974, the UNICEF Executive Board was seriously concerned as to the possible deterioration in the condition of children in the developing countries. It was at that time that village technology was identified as an activity which should be of concern to UNICEF in view of the potentials it offered for indigenously self-sufficient approaches to the problems affecting low-income families and children.

Since the UNICEF Eastern African Region embraced many of the hard-hit countries, and since there was already a burgeoning interest and some ongoing village technology activity in a number of these countries, this region was selected as the focal point for initial efforts.

The first step was seen to be that of creating awareness amongst Government and UNICEF field staff as to the possibilities offered by village technology in the improvement of food and water availability, in the improvement of the purity of water supplies, and in home improvements particularly with reference to reducing the work load of mothers. There was also seen to he a need for the mutual sharing of viewpoints and experience, so that understanding could be reached as to the value seen by Governments in the village technology approach and, the manner in which the practical implementation of projects might best be achieved.

It was felt important that any such discussion or consultation should deal not only with concepts, but also with specific approaches at a practical level. The provision of concrete examples of potentially appropriate technologies as a focus for discussions was regarded as being a most important facility for achieving meaningful conclusions.

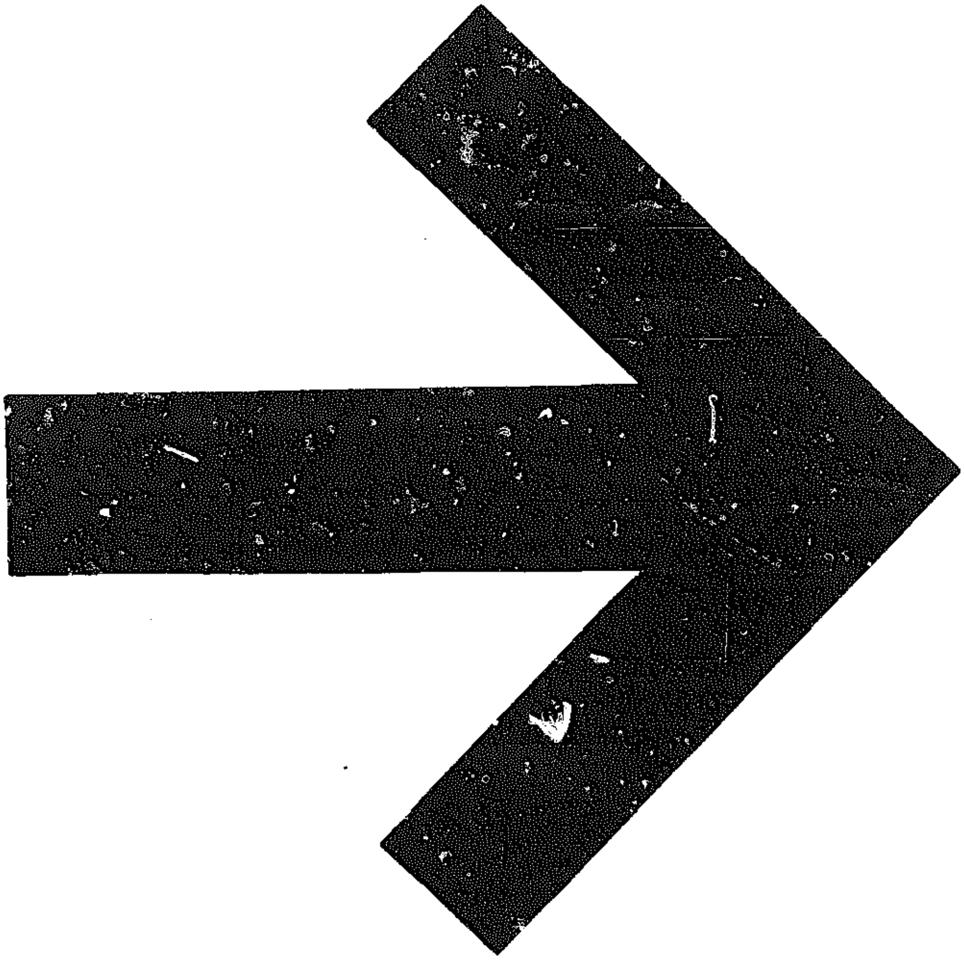
Since the Youth Deveiopment Division of the Kenyan Ministry of Housing and Social Services was already very involved in development and extension of appropriate technologies through its Village Polytechnic programme, and since the Division's Centre for Research and Training was anxious to provide a practical focus for training in this field, mutual interest led to agreement that UNICEF would assist in the creation of a Village Technology Demonstration and Development Unit within the Centre.

Plans were therefore put in hand for the construction of the Unit and for the holding of the Seminar reported in this book to coincide with the opening of the Unit.

The Seminar, entitled "Simple Technology for the Rural Family", was attended by representatives of Governments from countries of the region; by UNICEF staff from within the region; from other regions in Africa and from UNICEF Headquarters-New York. Representatives from other interested and involved UN Agencies–ILO, FAO, WHO and UNEP-also made valuable contributions.

Since this was the first meeting of its kind to be convened in Africa, and since this report represents the compilation of many individual viewpoints on a topic which has not previously been discussed in Africa in a widely representative forum, it was felt that the report should be produced in the form of a statement of concensus emerging from the meeting. In producing the report in this manner, it is hoped that it may serve as a useful baseline document and source of reference for all those interested in the application of appropriate technology in the service of the peoples of Africa and indeed, of the peoples at a similar levee! of development throughout the "Third World".

J. McDowell



LIST OF CONTENTS

Preface 2

Introduction 4

Chapter 1 ....Basic Concepts and UNICEF's Policies 7

Chapter 2 ....Social Aspects. 11

Chapter 3 ....Technical Considerations. 15

3.1. ......The Energy Factor 15

3.2 ......Food Production 18

3.3 ......Food Conservation 22

3.4 ......Food Preparation 27

3.5 ......Water Supplies. 32

Chapter 4 ....The Technology Unit 37

Chapter 5 ....Practical Application of Appropriate Technologies. 45

Chapter 6 .... Inter-Agency Collaboration in Village Technology Activities 53

Chapter 7 .... Guidelines and Conclusions. 55

Annexe I ....List of Participants 61

Annexe II ....List of Papers Presented 62

INTRODUCTION

The topics and concepts under discussion in this, the first seminar of its type to be held in Eastern Africa, represented a relatively new field of interest for both the organisers and the participants. This gave the meeting a special character. Rather than the "normal" type of seminar where participants are usually experts in their particular field, and where authoritative statements are presented and discussed, this meeting tended to take the form of a consultation in which an exploratory sharing of information and ideas led to a mutual discovery of principles and the development of attitudes as to the potentials and pitfalls inherent in applications of appropriate technologies, as tools for human and economic development in Eastern Africa.

The necessity, for example, to achieve a common understanding as to what was meant by "simple" technology in this context, provided a useful exercise. Some participants felt that the term "simple", with its connotations of naivety and, possibly, simple-mindedness offered possibilities for misinterpretation. it was also felt that many so-called "simple" technologies, although they might be applied through the use of simple materials, could represent the exercise of a greater degree of ingenuity than was required for the application of similar principles through the use of more conventional "sophisticated" materials. As a result of this debate, participants moved towards a shared understanding as to the level and form of technology with which the meeting was specifically concerned.

It was generally agreed that the term "appropriate" technology would be better than "simple" technology so long as it was understood that "appropriateness" in this context meant conformity to the needs, resources, capabilities, and social and cultural mores of the community to be served. The need for "appropriate" technologies to be essentially community-based, to use, as much as possible, materials available locally at low cost, and. to promote self-sufficienty and self-reliance, rather than continuing dependence upon external sources of materials and skills, was particularly stressed. Against the background of the severe economic crisis facing many of the countries of Eastern Africa, it was recognised that, in many instances, significant progress in rural development would be largely dependent on application of indigenously-based, rather than imported, technology.

The major focus of the discussions centred upon the potentials inherent in appropriate technologies for improving the overall quality of life for mothets and children. Specific emphasis was placed on: (i) improving availability and quality of local food supplies through appropriate methods of cultivation and improved food conservation; (ii) improving the home environment and home hygiene; (iii) improving the availability and quaiity of water supplies; and, (iv) overall approaches to the conservation of energy and to reducing the physical. work load of mothers.

These approaches were seen in the overall context of the UNICEF policy on development of basic services for children, and it was recognised that the application of appropriate technologies would, in many cases, be a fundamental component of the extension of the Basic Services approach.

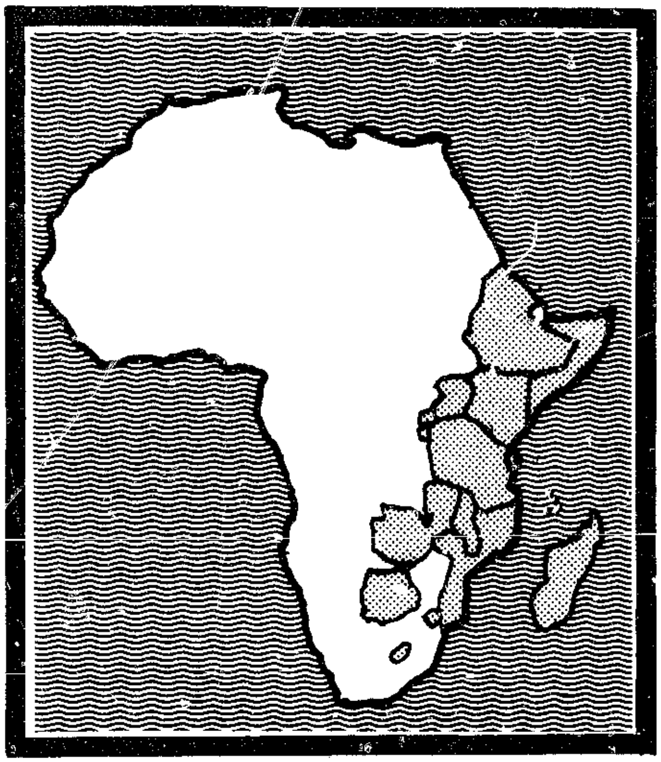
Discussions were maintained on an essentially practical level, since in most cases, it was possible to relate topics directly to the examples of appropriate technology provided in the Village Technology Demonstration and Development Unit, established jointly by UNICEF and the Kenya Ministry of Housing and Social Services at Karen, near Nairobi. This Unit helped define in practical terms the level of technology which might he regarded as "appropriate". The fact that participants were able to see the various items in reality, and to assess their merits and demerits on-the-spot, contributed in no small measure to the essentially practical basis of the seminar.

The reader will discover, however, from the following pages that the seminar was concerned, not only with the practical, mechanical, or economic appropriateness of the technology, but, equally, with the matter of its appropriateness in the cultural and socio-economic milieu in which it must be applied. The question of cultural appropriateness was regarded as being vitally important. In this respect, it was recognised that, where possible, the improvement and further development of existing traditional technologies which, by definition, were already culturally appropriate, could provide a good baseline for progress.

The format of the following report reflects, to a great extent; the exploratory nature of the seminar. Although a number of papers were presented on a wide range of topics (see list in Annex II) none of these are reproduced verbatim as delivered. The papers were intended to serve as discussion triggers, rather than as definitive statements on specific topics, and it was felt that the outcome of the seminar could be best presented by attempting to merge the points covered by the papers, and the equally important points raised in discussion, into one overall rounded statement on each of the general areas of discussion. It is hoped that this approach will provide the reader with a balanced, rounded and more readable document than might be obtained through direct presentation of papers and verbatim reporting of subsequent discussions.

The overall intention of the report is to help the reader derive an accurate impression of the sense of the meeting and the overall conclusions reached. It is not possible to present a set of specific detailed conclusions which would be appropriate for application in all of the diverse cultures and economic situations pertaining in the countries represented. For this reason conclusions tend to he of a general rather than a specific nature, and it is left largely to the reader to derive from the information presented, his or her own conclusions as to the appropriateness or otherwise of particular approaches in relation to known local circumstances.

EASTERN AFRICA



he **needs** *of mothers.*

Inseparable from the needs of children are the needs of mothers.

CHAPTER ONE

Basic Concepts and UNICEF's Policies

1. Basic Needs

Interest in "appropriate", i.e., "simple", low-cost. indigenously-based, technology as a means of improving the quality of life for families and their children, stems from the realisation that no other form of technology could effectively serve, at affordable cost, the millions of very low income families throughout the rural areas of the developing world.

The needs of the children of these families are basic. They need health care, more and purer water supplies, more and better food, and a form of education which will allow them to develop their potential to live a full and useful life as members of their community. UNICEF seeks to encourage and to assist governments to provide these basic services for children and, in consequence, sees very great potential in the application of appropriate technologies to this end.

Inseparable from the needs of children are the needs of mothers. Maternal health and well-being are prerequisites if mothers are to bear heaithy children, and be able to care for them adequately. Yet, many mothers are heavily burdened with demanding physical labour, which restricts their ability to care for their children, and also creates an energy demand greater than meagre diets can satisfy.

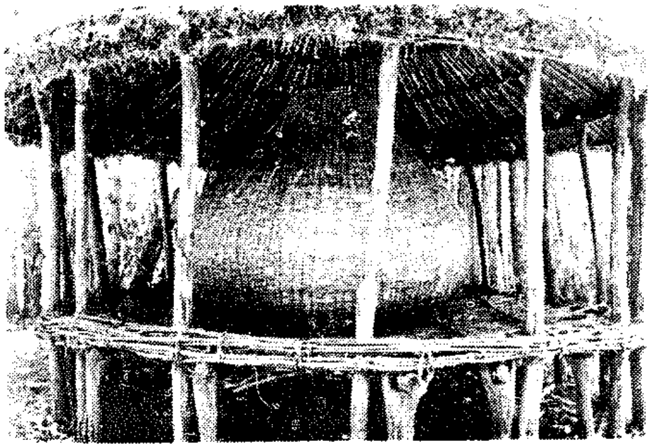
Thus, the use of appropriate technologies which can reduce the time and labour content of women's work, which can provide better nutrition allow more time for child care, and social, educational, and income-producing activities, could have a role of incalculable value in the improvement of family life, living standards, and child welfare.

2. Appropriate Technologies

What, then, is an appropriate "simple" technology? Like all technology it is a practical means of performing a task, whether that task be filtering water, storing food, threshing grain or carrying a load. There are many and varied technologies for performing these tasks. However, those which have been developed for the affluent, convenience-oriented, and highly mechanised societies of the industrialised world, are unlikely to be appropriate for the subsistence farmer and his family with their two-acre plot somewhere in the African hinterland. In this situation cash resources are virtually nil, mechanical and artisan skills are at a premium, and attitudes to life are conditioned to survival in an often inimical and demanding environment. In this environment resources are meagre: clay, stones, grass, timber and tree and root fibres and, perhaps, bamboo. The sun, the firewood and the labour of the farm family are the only sources of energy.

Within the rural environment, the African peasant, through the exercise of intelligence and great ingenuity, has put these limited resources to good use. There is, indeed, hardly any available material which is not employed in traditional technology. Traditional technologies are, in a very important sense, both "simple" and "appropriate". They represent the use of no-cost materials fashioned with simple tools or woven by methods handed down over the centuries. They have thus been time-tested in the laboratory of survival. If any particular method is still in use one can be sure that it represents the most effective, currently ***available*** means of performing that task. There is no question as to whether traditional technologies are culturally acceptable. i'hey do, in fact, form the fabric of the culture.

Yet, at the same time, it is obvious that due to limitations of raw materials or limitations of knowledge, the appropriate traditional technologies are failing to cope with the needs of



Traditional technologies are in a very important sense both "simple" and "appropriate".

expanding populations and the aspirations of the peopie.

It is, at this point that a further injection of knowledge and ideas about new ways to use local materials, and ways to incorporate new materials with traditional ones may provide a breakthrough in which the benefits can be seen to outweigh the additional costs

There will bc additional costs. No real development can take place without costs in time, labour, materials or the social costs inherent in the adjustment to changed ways of approaching problems. However, if the improved technology can be properly designed so that it is economically *and* socially appropriate, the costs will inevitably be less than those incurred in any attempt to transplant a technology from the industrialised world into an African village.

To be fully appropriate, a technology should, ideally: grow from within the society rather than be imposed from without. The need for the technology must come from the needs which the people themselves feel and recognise, and in regard to which they are motivated towards progress. Ideally, the technology should be community-based, i.e. within the understanding and skills of the people, and in its construction and maintenance. In this way, the technology will fit closely into the fabric of their lives and will not be regarded as a foreign artefact which gives service, but for which they have no feelings of personal involvement or responsibility.

We thus arrive at a composite definition of an appropriate technology as one which can be applied at low cost (both financially and socially); which uses mainly local materials and skills, or alternatively, materials and skills which can be locally procured or developed; which meets a recognised need; and which fits closely with local life attitudes and local aspirations for improvement. One possible simple definition for appropriate technology could be "traditional technology plus".

3. The Appropriate Technology Attitude

The value of appropriate technologies must also be seen against the background of the severe financial hardship imposed upon many developing countries by the current world economic situation. It is not possible to transfer technology from the industrialised world on the scale which would be necessary to reach all of the people, especially those most in need. Furthermore, the acceptance of transferred technology usually involves creating of a dependence on outside inputs, the cost of which is outwith the control of the recipient, whereas the development of indigenously-based appropriate technologies promotes self-reliance and self-sufficiency and a tendency towards greater economic independence.

There is, thus, recognition of the fundamental role which application of various appropriate technologies can play in the development of basic services for mothers and children. This recognition implies the need for development of a mental attitude which seeks first to explore and fully utilise inherent indigenous potentials, rather than attempting to base development on economically and socially appropriate models from the industriaiised world. In this type of approach, UNICEF is anxious to work with the governments and peoples of Eastern Africa to devise and apply development technologies which arc truly appropriate, which can meet the basic needs of mothers and children, and which in themselves can provide the physical and altitudinal springboard for further progress and development.

4. Appropriate Technologies and Basic Services

UNICEF concern for the development of basic services seeks to meet the needs of children and families. There are many needs, often of a generalised nature which are recognised by the people. There are the needs for the basic essentials-more water in arid and semi-arid areas, more food, education for children, better health services, improved incomes etc.

The application of a range of appropriate technologies in the fields of raising water, improving water sources. transporting water, collection and conservation of rain water; food drying, conservation, and storage; less laborious means of food preparation; and income generating activities can, thus, provide the means through which basic services can be provided to meet these needs.

There are also observed needs which may not always be recognised by the people, such as the need for ***purer*** water, for immunisation of children, for better home and environmental sanitation, and for nutritionally effective food budgeting and use. Motivation in regard to these needs requires a credible educational approach. An obvious and vital component of such education wiil be practical demonstration that improvements in these areas are possible, beneficial, and, most important, within the peoples capacity to implement. The use of appropriate technologies can provide a foundation for this approach in many cases.

Examples of poeentiaily appropriate technologies in this area are: protection of water sources, filtration of water, home and sanitation improvements, and appropriate means of home production and preparation of foods.

the need for purer water

A fundamental component of basic services for children must be a basic education which seeks to provide the child with a learning situation relevant to its environment, whilst, at the same time, providing the educational background necessary for further academic progress. Such an education must involve exposure to basic technological principles and techniques.

Unfortunately, educational systems in Africa have tended to develop as stereotyped replicas of European systems, and technological aspects have often been related to examples drawn from the industrialised countries, which have had little direct relevance to a system of "education for iife" in the Third World.

The development and application of appropriate technologies will offer locally based examples of applied technology, in which basic technical principles are expressed through local materials and skills for the performance of tasks which the child can see to be of practical value to his community. Thus the use of appropriate technologies as an integral part of the learning situation offers exciting possibilities for the ***development of really appropriate curricula.***

Such an approach would also be fundamental to the further development of appropriate technologies themselves.

The fact that the technical education of today's decision makers has been based on western examples, often to the disparagement of traditional values and technologies, can present serious barriers to the development of appropriate technologies, since influential thinking is oriented towards the "western way". The incorporation of appropriate and relevant approaches to technology in today's basic education will foster an attitude of mind which seeks to develop and explore potentials inherent in the local situation, and which are in tune with the local culture and way of life.

It is not easily possible to inhibit the curiosity and ingenuity of a new generarion, and if children are involved in learning through appropriate technologies and are encouraged to experiment, innovate and conceptualise on topics relevant to their own surroundings, each child will be given the potential to become to-morrow's self-reliant "appropriate" innovator.

It is not easily possible to inhibit the curiosity and ingenuity of a new generation.

There are thus many facets to the application of appropriate technologies as an essential and fundamental component of the "basic services" approach. Jndeed, it is difficult to envisage the provision of basic services for people who have virtually no cash income except through the use of low-cost and indigenously-based tech-nologies.

CHAPTER TWO

Social Aspects

(This Chapter is based on the presentation by Norman Scotney on Social Aspects of the Introduction of Simple Technology, and on discussion of this presentation.)

1. Societies and Their Technologies

The technologies of a society – the tools and techniques utilised – have a very close relationship to the structures of that society; to its sources of income and sustenance, to its working relationships, its residence patterns, authority structure, and to its basic values. The relationship is best conceived as a dynamic one, in which any change in one part of the organic whole predisposes to and facilitates change in each other part, so that, in time, there is a total adjustment in the society's way of life. Each society has a predisposition to accept and absorb technological elements – new tools, machines and devices which accord with its current aspirations and value priorities. Each innovation affects certain groups, families and individuals in particular, and can also have an influence on the kinds of social change -- rapid or gradual – occurring in that society.

Technological innovations which fit the way of life of the rural family, and which bring benefits believed to be greater than their initial and maintenance costs are likely to be rapidly adopted. They should, so far as is possible, be based on local resources, i.e. employ locally available materials and the skills of local crafts--men, be capable of repair ***locally*** and should not consume fuels or materials that have to he purchased from outside. Each society already has, in essence, its appropriate technologies and also embodies the social assets arising from the technology of its past. In western Europe many of the roads, bridges. houses, churches and cathedrals built in past centuries are still in use. In Asia there are temples and other monuments unequalted in the West. In Africa there is Zimbabwe, the Pyramids, and many other constructions and, in lower key, irrigation furrows, fish traps, and a wealth of other assets. Much of African traditional technology in, for example, bronze casting, iron working and the production of cult objects, in decoration, in craftsmanship in leather and wood, including the devising of musical instruments, has been overlaid and partially obliterated by the products of western technology. However, the original tends to persist. These skills can contribute to developing a village technology that would not he aimed at reproducing the past but, rather, towards constructing artefacts and devising social assets to enhance present day living. Machines and devices could be produced to improve the life of the housewife and household, to improve agriculture and food preservation and storage, to permit irrigation, to convey water, improve communications, increase incomes and enhance social life. Skills in working with mud and sun-

/k-b society already has, in ***essence, its*** *appropriate technologies.*

burnt brick could be utilised in fabricating objects of cement, and pottery. Skills in black-smithing would be developed to include welding, forging, riveting, filing and other metal crafts. Skills in carpentry could lead to joinery and timber working. Skills in working with animals could lead to more use of animal power. The underlying technologies might be simple but the products could be complex and valuable. The essential for each is that it should arise from, and meet the needs of, the society so that it could be maintained, restored, duplicated, and improved by local people from their own resources. The era of the machines introduced from outside and not used, or broken and never repaired, would then be over.

Today, even in the countries where hign-level technology has reached its most sophisticated development, simple hand tools, machines and devices inherited from the past, but sometimes modified, play their part. The bicycle, wheelbarrow, garden tools, metalworking tools, and simple repair workshop devices have not become unimportant. Complex technologies include, and will always utilise, simple technologies.

2. Introducing Simple Technology

The one sure basis on which any innovation can occur in the village situation is that it meets the needs of the village people as *they* perceive them. The gap between our view as "outsiders" of what people need and the "insider's" own perception of the nature of the problems pressing upon his family and community, needs to be closed. Our "gifts" can only become acceptable if they are felt by the receivers to harmonize with their priorities, to fit the skills and resources they are able to call upon, and to conform with their way of arranging their lives.

Although its importance can easily be exaggerated, what we have to contribute could he of undoubted significance. Essentially our contribution would be towards a wider knowledge of possibilities, stretching potentially to a world-wide knowledge of new uses for skills or innovations tried and adopted, and the results attained. To learn what is appropriate to the circumstances of rural people we must first be *their* pupils, learning from them why they live as do, what are their skills, and what they most want to change. If we cannot do this directly -- going to meet people and learning from them -- we must encourage those through whom we work to do this by every means possible. To contribute effectively, and before proceeding to encourage change, we need to discover people's real needs and resources and then to match these with suitable devices, techniques, and tools.

In addition to the skills and resources possessed by a family or a community, it is necessary to be conscious of its capacity for organization, for joint effort, for the allocation of tasks and responsibilities, and for continued cooperation.

joint effort

In the village situation the separation of tasks into "women's work" and "men's work" is often quite inflexible, and cooperation is possible only in a limited range of activities. In the village, the size and possible activities of the working group may depend upon persistence of traditional authority or the strength of newer groupings and the sense of identity. With these, the introduction of many family assets – latrines, improved cooking facilities, house improvements, etc., may demand new patterns of cooperation. Also, in the fields of water supplies, irrigation, roads, etc., combined effort and cooperative groups must be the basis for development. If successful cooperation produces quite quickly a small improvement this may open up the way to more ambitious collaboration.

Participation in the building of community assets is often weighed against the welfare of a person's own family, especially where economic individualism has already become significant. At that point, donations, subscriptions, and, eventually, taxation may be appropriate. In this way cooperation in the use of simple technology to develop community assets is transferred to the community decision-making process, perhaps involving the villagers through District Committee. The introduction of rhe skills and devices of a simple technology may well be impeded by lags in the transmission of ideas, by hesitations, and by resistance from individuals and groups currently benefitting from the existing range of tools or machines. In this situation the process of percolation of ideas, the dissemination of plans for devices and machines, and their implementation can often be greatly accelerated by use of communication media, and also by training in institutions of informal village education. Often, major resistance can only be reduced by a progressive process of discussion and demonstration.

In the final analysis, any innovation is adopted or rejected hy the people on their assessment of the balance of presumed advantages against the costs. People living close to the subsistence level have been forced continually to make careful calculations before they decide upon change. Their priorities reflect their struggles for survival; food, safety, children, health, and sometimes animals, before people. As they are able to count their increasing assets they can then make investments designed to secure more food and safety, etc. It has to be recognised that their priorities also change, e.g., investment in the education of children is now often seen as a form of security. The complexity of the decisions involved in introducing simple tools, assets, or devices for the home and farm, can not be underrated. Home improvement and reducing women's toil may long continue to be a low priority so far as the people are concerned. However, as more people become aware that the mother is the child's first educator and should be available to guide and assist in the formative years of life, the change towards more investment in helping mothers to a less strenuous way of life may accelerate.

3. The Future

The very breadth of the ideas involved in the concept of "simple technology" creates problems. Convincing expositions are made difficult. The number of possible channels of activity is bewildering. There is, nevertheless, unanimity that simple technology should be a component of all basic services, and agreement that the simple technology approach was a logical component of UNICEF activities. One group reporting to the Seminar as a whole, gave priority to the potentials of simple technology to produce increased incomes. The value of accelerating social change on a wide front by increasing incomes is widely accepted. The suggestion of the group, however, emphasizes that societies are not made of loosely linked components, but are best envisaged as organic wholes. Consequently, rapid change in one part of the "organism" may directly influence change in another part of the society. The need for imagination and foresight, soundly based upon studies of societies in change cannot he overstressed The need for this type of holistic and community-conscious approach to the introduction of simple technology must be stressed.

Studies of societies in change cannot be over-stressed.

The need for radical refocusing of government policy envisaged in many of the ideas proposed, especially in those countries which have already developed an industrial base, was frequently referred to by participants. Though positive tendencies towards self-reliance have already become evident, and are becoming more and more dominant, it is observed that the political climate is not always uniformly favourahle for a new emphasis on village technology. Expectations of progress in industrialisation and of favourahle export balances, permitting the purchase of very sophisticated equipment have become widespread. Men and women have been trained, some on scholarships, for the new technical posts envisaged. Thus there may be resistance to introduction of simple technology in the mistaken belief thar it represents a step backwards. The need to see this form of technology, not as a total alternative approach to technological development, hut rather as a complementary approach which is of particular relevance to low-income communities must he clearly recognised

Expectations of progress in industrialisation

Awareness of the limited benefits so far achieved in the years since independence in the more remote and economically less viable areas of countries generates a favourable climate for a "new" approach. Simple technology might help these areas to use their assets – manpower, skills, land, herds, natural resources – to better effect. In this way means may be found to reduce the widening gap between the cities and prosperous areas and the remote and iess favoured areas. Nation building must rest upon cohesion and must demand egalitarian policies and social justice. Widening disparities can lead to disaffection and violence. However, it is increasingly evident that countries are beginning to emphasize development '"from the grass roots". Impressive examples are provided by the plans emerging in newly independent Mozambique to involve villagers far more in the planning and running of their own institutions, and by Kenya's development of Village Polytechnics. Despite the hesitant climate of opinion in some countries, administrations are moving strongly towards programmes compatible with the simple technology viewpoint. These trends are likely to continue and to gain momentum with the deeper appreciation of the significance of longer term world economic trends.

The country representatives in the Seminar did not produce blue-prints for action developed by their particular countries but, without exception, emphasised the importance for them of the Simple Technology approach. The next decade will see many developments and plans to promote technologies appropriate to village life. Upon this the Seminar reached agreement. No one, however, ventured to forecast the consequences. It was recognised that the introduction of changes of the kind contemplated for the benefit of rural families, and especially for those in less favoured areas, was beset by many pitfalls. To stimuiate technological development compatible with the way of life of rural peoples of great cultural diversity requires, as has been mentioned, a variety of skills and capabilities. It also requires patient work. However, there is massive evidence that the time to begin that work has arrived.

CHAPTER THREE

Technical Considerations

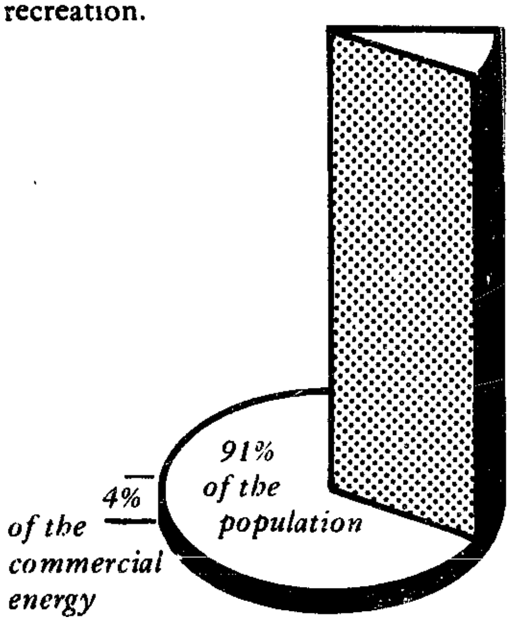
Apprc ,priate technologies must have technical credibility, i.e. they must apply technical principles effectively and be capable of performing efficiently the task for which they are designed. The fact that a device is constructed from low-cost', or locally available materials does not provide an excuse for inefficiency in functional performance. The basic challenge posed by the appropriate technology concept consists in applying low-cost techniques ***and,*** at the same time, achieving technical efficiency.

The following chapter deals with the technical considerations relative to a range of "appropriate" approaches.

3.1 THE ENERGY FACTOR

(This section is based on the presentation and discussion of Prof. A.K.N. Reddy's paper on Simple Energy Technologies for the Rural Family.)

All aspects of life and all technological approaches are concerned with the utilisation and/or conservation of energy, whether this be the solar energy needed in crop production, the fuel energy needed to cook foods, or the human or animal energy expended in work or recreation.



Energy from centralised production facilities i.e. "commercial" energy, rarely flows in quantity to rural areas. For example, World Bank figures for Africa show that 91% of the population lives in rural areas but consumes only 4% of the commercial energy produced. Rural electrification is well known to be uneconomical because rural poverty results in low load factors, from which the costs of installing and maintaining the expensive distribution network can never be recouped. Moreover, because energy from the different sources: electricity, oil, gas, charcoal, etc., has different costs, the poorer the section of the population, the cheaper the energy source it adopts. Whilst non-commercial energy sources (firewood, dung, etc.) may be obtained at practically zero financial cost they may be associated with very high social costs in the form of environmental degradation (deforestation, soil erosion, desertification), and. in terms of the energy expended in their collection.

This leads to an important conclusion: if development involves the satisfaction of basic human needs, and energy is one such basic need, then development cannot be achieved without satisfying the minimum energy need of the population. It is also important that rurai energy needs should be met in a way which does not degrade the environment; otherwise the development process will not be sustainable.

The importance of energy to rural *families* has generally been underestimated, and, indeed, hardly discussed. But, in developing countries, energy for rural families can be shown to be of profound importance. For example, preliminary studies in Indian villages indicate that a landless labourer's family requires about six hours a day to collect firewood, about four to six hours a day to bring water from a nearby -well. and another four to six hours a day to graze cattle, goats or sheep. Since such 2 family cannot afford to hire labour, and cannot buy labour-saving gadgets, its only rational response is to have at least three children to satisfy its energy needs, and thereby survive. Thus, there can be a close relationship between population problem and the satisfaction of minimum energy needs of families. In other words, a more abundant supply of energy may tend towards limitation of family size. In the case of the very poor families, the labour contribution of children is essential and, therefore, it is in their interest not to allow the children to go to school to receive a questionably relevant pattern of education. It is not surprising, therefore, that there is a very high percentage of school drop-outs from these sections of the population. Hence, educational planning must also have regard to the provision of minimum energy needs. The foregoing provides only two examples of the importance of energy to rural families, but many others could be cited.

3.1.1 Methodology of Approach to Meeting Energy Needs

It is desirable, where the introduction of energy technologies are being considered, to adopt a logical methodology in the decision-making process.

The first step should involve a study of the locality and the listing of energy-consuming tasks or activities, within the community under examination. Consideration of expenditure distribution may point the way to a source of finance for community shared facilities, where the resources of the poorer sector would be inadequate for individual family facilities. For example, biogas plants being produced in India are equivalent in cost to the total income of a rural family for one and a half years. Such plants can only be purchased by communities or by the rural rich.

The second step is to break down family expenditure into food, clothing, etc. This will enable one to see how much a family spends on energy. It will usually be found that, in areas where the poor families survive on non-commercial energy, the fraction of the family budget going towards energy is almost nil. This fundamental factor is of crucial importance in deciding upon an upper limit for the cost (capital and/or running) of energy technologies for families.

The third step in the methodology is to list the energy-consumption tasks or activities and to determine the energy budgets of rural families. In other words, what arc necessary are pie-charts for the energy needs of rural families, depending upon their income levels. It is important in these listings and pie-eharts to include also those tasks and activities which require human energy. Thus, there would be included in the pie-charts, sections for cooking, lifting and transport of water, grazing of livestock, lighting, etc.

The fourth step in the methodology is to list against each energy-consuming task or activity the various available and possible alternative techniques for accomplishing the tasks or activities.

The final step in the methodology is to consider carefully the various techniques and to make a choice of the tecnniques most appropriate for accomplishing the tasks or activities. This choice must take into account the following sets of factors: (a) technological efficiency; (b) size and energy component of family budgets; (c) social acceptance; and (d) environmental impacts.

The question of technological efficiency is particularly important in the light of the 1974 American Physical Society Study Group's work on the "Technical Aspects of Efficient Energy Utilization". According to this study, the efficiency with which energy is utilised in 2 particular category of end-use, task, or activity depends, firstly, on the device, and secondly, on the type of energy used.

The basic idea is not to use high-grade sources of energy such as electricity for tasks (e.g. grain drying) which can be accomplished by low-grade sources of energy such as waste heat from stoves, or by use of solar energy.

The size of the family budget and the fraction of it which goes to energy will determine whether families can afford the energy technologies on an individual family basis, or whether they are so poor that the only solution is to meet the energy needs on a communal basis, for instance, whether they can afford family-size biogas plants, or whether their poverty implies a community-size biogas plant with pipeline distribution of gas.

The social acceptability of technologies is a factor that must be considered in detail. The main aim should be to ensure that all technologies which are proposed should blend into the fabric of social life, rather than disrupt it, and will have roots in traditional ways of life, rather than violate them. For instance, if live-stock rearing is a traditional practice, it is far more appropriate that the proposed technologies are linked to cattle (e.g. biogas plants operating on cattle dung) rather than based on the elimination of cattle.

Usually, there is more than one technological option for the achievement of a given objective, and it is obligatory to consider the environmental impacts of the various options and choose that option which is most in tune with the environment.

3.1.2 Application of the Methodology

The methodology proposed above has not yet been implemented in detail, and therefore no case study can be presented. However, one can indicate broad lines along which the methodology can be applied.

For instance, in the case of the distribution of expenditure, it is known that about 50% of the Indian population has a per capita expenditure of less than 12 U.S. cents per day, U.S. $20.00 per month, for a family of five members. It is these families which are the primary targets of the development process, and it is their energy needs which should receive the highest priority in the design of simple energy technologies.

'Within the U.S. $0.60 per day per family, it is said that about 80% to 90% goes for food. As regards energy, the expenditure is virtually zero, which means that this section of the population consists of energygatherers. Of course, this may not be true in the strict economic sense, because one would have to consider the opportunity cost of their labour in gathering energy. Nevertheless, their almost-zero expenditure on energy must be accepted on a constraint in the design of energy technologies.

Unfortunately, there are virtually no studies of the energy budget of such families, but one can list a number of their activities which consume energy. Thus, the list would include the collection of non-commercial fuels (e.g. firewood) for cooking, the process of cooking itself, the lifting and transport of water for drinking, washing, etc., the grazing of livestock, water heating, drying of agricultural produce, space heating/cooling, grinding, crushing, winnowing, milling, and lighting. One may also have to consider water purification, heating in rural industries (e.g. brick-making), and transport. It may not be possible at this stage to construct a pie-chart which will indicate the break-up of the energy budget into the above energy-consuming activities, but it is reasonably sure that the collection of non-commercial energy and cooking, the lifting and transport of water, and the grazing of cattle will together constitute the overwhelming portion of the budget, and therefore energy technologies to meet these needs will deserve the highest priority.

The technologies which are eventually selected must best serve the interests of the families and the community at large. The choice can only be made after detailed study – there are no universal solutions. Appropriate energy technology for rural families will only emerge from a close in -action between the innovators and workshops on the one hand, and the actual beneficiary communities on the other.

3.2 FOOD PRODUCTION

(This section is based on presentation and discussion of Mr A. Manyindo's paper on Appropriate Technologies for Food Production.)

3.2.1 Traditional System

In Eastern Africa the traditional system of shifting cultivation has been a predominant feature in the agricultural scene. Under this system the cultivator, after harvesting his crop, moves on to another piece of land allowing the former plot of land to revert back to its original vegetative cover before its fertility is seriously reduced, and before there is a dominant build-up of weed growth. During the period of fallow the soil fertility is revived by minerals brought to the surface in organic forms by deep rooting plants, and the vegetative cover, and root and microbial activities improve the fertility and physical condition of the soil.

For the rural cultivator with his simple needs and limited assets, this system is very sound and economical, provided that land is not a limiting factor. He is able to select an area of high fertility which he judges by the look of the vegetation. The traditional techniques he uses, such as initial burning, separation of plots, and infrequent cultivation, help to reduce to a minimum the danger from pests and diseases. The thick virgin bush or forest from which his plot is cut has long since suppressed all weeds likely to affect crop cultivation, and soil conditions on freshly cleaned land are generally excellent for the initial crops.

With increase in population and related demands on food and water, the emergence of cash crops mainly for export purposes, the expansion of urban societies and industrial areas, and the demands made by increasing livestock populations, the pressure on land has increased, thereby tending to break down this traditional system of shifting cultivation. The results in terms of erosion and general decline of soil fertility are rapidly becoming evident in many areas. This is being aggravated by transplanting into deveioping countries foreign agricultural systems which cannot easily be sustained due to the high cost of inputs and the reduced ability of many countries to import the inputs upon which these farming systems are based.

The development of this situatior points to the vital need to focus on systems which are independent of foreign and costly inputs, but which can thrive on resources, manpower, and technologies which are within the economic and technical limitations of the country.

3.2.2 Mixed Cropping or Intercropping

This is a common form of cropping system traditionally practised in Africa, and, with the reawakening of interest in its potentials, various studies have been undertaken recently on mixed cropping in a number of African countries.

Some of the benefits of mixed cropping are:

- Sowing and planting dates can be coordinated to optimise labour requirements during cultivation and harvesting.
- The yield per unit area of land is generally higher, resulting in profit maximisation and the provision of a variety of foods which caters for nutrient requirements generally over a longer period than is achieved by monocropping.
- The resources available for any given area of land are better utiiised.
- Risks due to crop failure are minimised, and the mixed plot gives some insurance against problems of insect pests, diseases, weather, price fluctuations, etc.
- The greater ground cover provided is advantageous for soil conservation by protecting the soil from water and wind erosion. Good ground cover and varying heights of plants tend towards very efficient use of solar radiation.
- There is greater possibility for retention of soil fertility through nitrogen fixation by legumes, and greater potential for nutrient utilisation through root feeding at different. levels of the soil and over different periods of time.
- Cowpeas, beans and other fast growing crops can assist in controlling the growth of weeds.

—In some areas; tomatoes are grown only in winter months since the hot, dry winds and the low relative humidity of the summer months do not allow vegetables to grow. Inter-cropping of tomatoes with pigeon peas modifies the environment and makes it possible to produce tomatoes during summer.

-Mixed cropping is an existing practice which is profitable and popular, and better use of the system is possible with the introduction of some elements of appropriate technologies.

3.2.3 Use of Fire

Controlled burning is a good way of preparing land for cultivation provided availability of land and sufficient material for burning is not a limiting factor.

In Southern Sudan, where sorghum cultivation is important, the burning of the matted vegetation is timed just after the initial rains have germinated the dormant weed seeds, so that the potential weeds, dead grass and possible pests are destroyed together, and the crop seed is sown in the resulting layer of ash which is rich in potassium and phosphorous necessary for sorghum cultivation.

Use of fire.

In some parts of Malawi, the hoed-up sods of vegetation are inverted, placed in line and burned to encourage nitrogen producing bacteria, and to partially sterilize the soil. The soil is then scattered, and it is common knowledge that crops thrive better where grass or weed has been burnt.

Controlled burning is an efficient method of pasture management. Burning sections of the farm land at different times of the year enables the farmer to practise rotational grazing. This practice also helps prevent worm and disease build up on farms and to control tsetse fly problems

3.2.4 Varying Cultivation Practices

Ridge cultivation allows deeper working of the soil Weeds and crop residues are buried by placing them in the furrows and splitting the old ridges to make new ridges on top of them. This method permits better absorption of rain water and enables crops with tuberous roots to develop larger roots. The system is practised in the Lake Province of Tanzania and by the Matengo tribe in the Southern Highlands. In Zaire, all maize is grown on such ridges. In Zambia, a modification of the above type of cultivation with contour ridges and tied furrows has been reported to give complete protection from soil erosion and substantial crop yieid increases during dry years.

The system of making mounds varying from 18 inches to two feet in diameter to large ones several feet wide, is also a widely practised system of cultivation on lighter soils. The mounds bury turf and surface grass vegetation following a fallow, and are particularly suitable for root crops. The mounds can be broken down to give place to flat or other cultivation practices in which case they have the effect of simple slow compositing units.

3.2.5 Crop Sequence

The planting dates of crops are staggered so that at any time of the year the soil is protected and soii nutrients are used to the maximum. in Lango district, Uganda, finger millet, which is

water is the most important limiting factor

the staple food, is interplanted with pigeon peas. The finger millet is harvested after 4-5 months leaving the straw and tall pigeon pea plants to shade and protect the ground through the rest of the year. Often, shortly after the harvest of millet, sesame is planted. Pigeon peas, being a very deep rooting crop, can survive a long dry season and do not compete for nutrients with the shallow rooting finger millet, or sesame.

3.2.6 Improvement of Soil Fertility

Since water is the most important limiting factor in many cases, increasing rain absorptive capacity and water retaining capacity of the soil arc of great practical importance in soil fertility improvement.

Use of farmyard manure in drier areas with sandy soils has shown substantial crop yield increases in the first year and residual effects up to 8 years.

Excellent results in improvement of crop yields can be achieved by use of compost made from a mixture of grass, leaves, crop residues, home sweepings, livestock droppings, wood ash and soil.

A simple way of preparing compost is as follows:

-Clean all weeds and bushes from a 2-3 metre radius shady place near rhe grassland. The actual size will depend on the availability of

composting materials and the size of the garden for which compost is required.
-Spread out grass, leaves and crop residues without compacting to allow for aeration.
-Wet the grass and leaves.
-Add 6" to 12" layer of wood ash or animal droppings and home sweepings and spread a layer of soil on top of it.
-Repeat the process of layering till the heap is about 1.5 metres high.
-The heap will warm up and after about 3 weeks it will cool down. Mix it well with a hoe, fork or shovel and turn it upside down. A piece of wood inserted horizontally into the heap and withdrawn indicates the temperature inside.
-Leave for one month and add more water if it tends to dry out.
-Turn the heap again and leave it for another month, after which the compost is ready for use.

In dryer areas, where water is scarce and strong winds are prevalent, pits can he used to prepare compost in the same manner.

3.2.7 Correct Plant Population
Correct densities of plants per unit area are important for optimal use of land, fertilisers, solar intensity, and soil moisture, and to ensure the protection of soil from rainfall impact and caking caused by intense tropical heat. It is very important to make sure that seeds planted are of good quality to achieve the required plant density. A simple seed germination test which can be done by the rural farmer will assure that the seeds are not wasted.
-Stir up the available seed to get a uniform mixture.
-Take about 100 seeds and plant them on wet sand spread out under a shade.
-Cover up with damp hessian cloth or grass and keep moist.
-After one week count the seeds which have produced a young plant.
–If 70-80 seeds have germinated, it is necessary to plant two seeds per hole.
-If less than 60 seeds have germinated, the seed should be discarded as unsuitable for planting and a further supply should be sought.

3.2.8 Planting Time
In Eastern Africa, very little irrigation is used, and most of the crops depend on rainwater. Planting early to take full advantage of the rainwater yields good results. At Alemeya in Ethiopia a scientifically laid out experiment showed that Katumani maize (early-maturing 60 days) yielded 8,000 kg per hectare when planted early and 1.300 kg per hectare when planted late.

Planting should be done to take advantage of availability of labour. Early planting should be planned so that labour will not be needed for weeding and harvesting during normal labour peak periods. Staggered early planting and choosing a proper planting sequence should be based on maturity periods of various crops, their water requirements and other crop characteristics.

In the case of groundnuts, for example, the most critical growing period is during the flowering stage when soil must be fairly loose and friable. If the sod is hard and ovaries are not buried, they will fail to develop into pods. For a combination of beans and groundnuts it would be better to start with slow growing groundnuts and then plant the fast growing beans later in the rains.

3.2.9 Pest and Disease Control
It is, firstly, very necessary to start with materials which have the least possible amount of infestation by selecting seed before harvest or earmarking seed on a farm which is relatively free from pests and diseases.

A careful watch could be maintained to identify any initial infestation which occurs in a few plants. These plants should be removed and destroyed if it is fungal, virus or small insect infestation. For the larger insects it would suffice to destroy the insects during the early stages.

Recent research in East Africa on mixed cropping has produced evidence that insect infestation is more severe in cowpeas planted as a single crop, and that when cowpeas were interplanted with sorghum or maize, insect infestation was less severe, and tended to be localised rather than spreading through the crop. It is suggested that the barriers provided by the cereal crop reduced the movement of the insect pests.

The value of early planting which allows the crop to come to maturity before there is time for a serious build-up of pests and diseases is also recommended.

Problems of pests and diseases are usually related to the build-up of the infestation over a period of time. Thus, if a plot of land is used continuously for the same crop pattern, a serious build-up of pests affecting those crops is likely. This reinforces the wisdom inherent in the traditional system of shifting cultivation and emphasises the need for a well-planned system of crop rotation and use of fallow where at all possible. Other appropriate approaches to pest control are the growing of plants which repel certain insects amongst the crop, or the ihterplanting with crops which attract spiders which destroy the corn-borer moth, and the interplanting with crops which attract harmless insects which prey on the pests. For example groundnuts are known to attract spiders which destroy the corn-borer moth, and the interplanting of groundnuts and maize can provide effective biological pest control so far as the maize is concerned. In addition, the maize may provide a barrier to the movement of pests and diseases through the groundnuts.

Interplanting of groundnuts and maize.

32.10 Conclusions

There is obviously much wisdom and local knowledge embodied in traditional farming systems. The combination of this wisdom with newly recognised principles can provide the basis for productive food farming which is largely independent of expensive and imported inputs and techniques.

3.3 FOOD CONSERVATION

(This section is based on presentation and discussion of J. McDowell's paper on Principles and Practice of Food Conservation at Village Level in Africa.)

3.3.1 Food Losses

There is massive loss of food in Africa. Staggering average figures of 25 to 30 per cent are quoted, and for the more perishable foods, losses can amount to and exceed 50 per cent of production. This means, in effect, that about one-third of the food produced in Africa is wasted and, hence, one-third of all the land, inputs, and labour used to produce that food are being wasted. It can be calculated that reduction of food losses by even one-half could transiorm Africa from a continent of food scarcity to a continent of plenty – without bringing a single additional acre under production, or without making any change whatsoever in existing agricultural methods. The application of appropriate food conservation technologies could thus solve many of the existing food scarcity problems, and offers a more sensible approach to meeting existing food needs than often highly expensive and importdependent approaches based on increased production, and attempts which are not always appropriate to modernise or "westernise" agriculture on a capital-intensive basis. Labour-intensive agriculture combined with food conservation seems to provide a very logical approach to food supply problems since, in contrast to mechanised agriculture, it can also provide employment in the rural areas and help counteract the urban population explosion.

3.3.2 Food Conservation

Conservation of most foods in the village situation utilises the same basic technical principles as the most sophisticated conservation approaches. However the technology, i.e. the manner in which these principles are applied, can be adapted to utilise low-cost or no-cost materials readily available in rural areas.

Simply stated, the processes involved are:

i) Drying the food rapidly to a moisture content (usually below 15 per cent) where the natural processes of decay or seed germina-ation are arrested, and where mould growth cannot take place.

ii) Storing the dry food in a manner which will allow it to remain dry.

iii) Removing any insect infestation present in the food, and excluding insects from the storage container.

iv) Ensuring that rats and ‘other destructive small animals cannot gain access to the stored food.

Food conservation thus requires effective drying and secure moisture-proof, insect-proof, and rodent-proof storage. These requirements can be met at village and domestic level at very low cost and in an entirely feasible and appropriate manner.

3.3.3 Food Drying

Drying foods by traditional approaches, whereby the food is spread out on the ground or on mats in the sun, is rarely effective. Such drying is slow, usually taking several days even in good conditions, and this gives rise to a number of hazards. Firstly, natural decay takes place when the food is exposed for a long time in warm, moist, conditions which are also ideal for the growth of destructive, and sometimes toxic, moulds. Secondly, exposing the food in this manner provides an open invitation to insect pests which will cause serious damage once the food is put into store. It also exposes the food to rodents, birds, and other animals and to many forms of contamination with undesirable dust and dirt. Foods dried in this manner cannot be expected to keep well during storage.

Drying foods by traditional approaches ... is rarely effective.

The principles of drying are simple. Drying takes place when the moisture in the food evaporates under the influence of heat and is absorbed by the air surrounding the food. The rate at which drying takes place depends upon three main factors:

i) The amount of heat used.

ii) The ability of the surrounding air to absorb the water which is evaporated (the hotter the air the more moisture it can absorb).

iii) The ease with which moisture can escape from the food.

These factors provide the basic guidelines for effective food drying.

3.3.4 The Village-Level Solar Dryer

The logical source of heat is the tropical sun since, in most areas, there is usually plenty of sunshine during the post-harvest period. The first requirement is to concentrate the sun’s heat as much as possible to heat the food and the air surrounding it. As anyone who has entered a car which has been sitting for some time in the direct sun knows from uncomfortable experience, a closed box which allows the sun's heat to enter can be a very effective oven. This is the basic principle of the enclosed solar dryer. This is, simply, a box, constructed of mud and wattle, clay bricks, or wood, and which is covered by a transparent plastic cover. This device will produce temperatures near to the boiling point of water (60° to 80° centigrade) i.e., at least twice as hot as the outside air. Because the air inside this "box" is so hot its ability to absorb moisture is also much greater than that of the outside air, and moisture will evaporate rapidly from food placed in this box The hot moist air (which rises to the upper part of the box) is allowed to escape through ventilation holes at the top of the dryer, and ventilation holes are provided at the bottom of the dryer to allow fresh air to enter. The food placed on open-weave trays in the box is thus surrounded by a stream of hot air. As hot moisture-laden air escapes, fresh air enters below the food, passes through the drying food, is heated, picks up moisture, and passes out of the upper ventilation holes. In this type of dryer most foods can be dried thoroughly in one day, and some, such as green vegetables, can be dried in two or three hours. For foods other than seeds or grains, the rate of drying is greatly increased by slicing or chopping the food into small pieces, thus exposing a much larger surface area to the heated air, and allowing moisture to escape more rapidly from the food.

A most important feature of this dryer is that the very high temperatures achieved destroy or expel any insect pests already present in the food, and the food is protected from any external contamination or from wetting by rain showers. Food coming from this dryer is thus clean, dry, insect-free, and in ideal condition for storage.

3.3.5 Fuel-Fired Drying

The use of fuel, i.e., firewood, for drying is also possible. But, unlike solar drying, fuel-fired drying involves labour and, possibly, expense in acquiring fuel. Its environmental costs in terms of denudation of scrub and woodland can also be high. However, there may be some situations, where rain is so frequent, or where cloud cover is so extensive, that solar drying becomes difficult. In these cases foods can be effectively dried in simple fuel-fired dryers. Whenever possible agricultural wastes, e.g. coconut husks, maize cobs, or bagasse, etc., should be used as fuel.

A large fuel-fired dryer can be constructed by digging a square pit and laying in the bottom of this a firebox made of oil drums with their tops and bottoms removed and laid end to end. This firebox is fitted with a chimney. An openwork grid is then laid over the top of the pit and the food placed on this grid. The fire burning in the firebox heats the oil drums, which, in turn, heat the air in the pit. This hor air then passes up through the food.

A large fuel fired drier.

3.3.6 Smoking

The conservation of foods (usually meat or fish) by smoking is, in reality, another form of fuel-fired drying where the food is exposed directly to the heat and smoke from a wood fire. The drying achieved is the main factor in preservation, but the wood smoke also deposits tarry substances on the food. These substances act as antiseptics, restricting decay by microorganisms, and they also act as deterrents to insect infestation.

Smoked foods, provided they are effectively dried, can have a good storage potential, but it must be noted that the keeping quality of such foods and their freedom from food poisoning bacteria is influenced, not only by the effectiveness of the smoking process, but also by the condition of the food and the extent of hygiene involved in its preparation for smuking. Special training of people involved in smoking is necessary if food poisoning hazards are to be avoided.

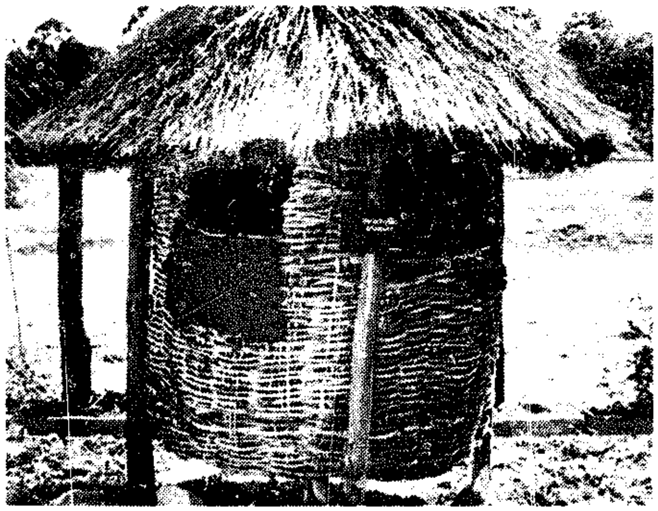
A simple smoker for use at village level is, basically, a chimney built over a fireplace and in which the food can be placed on trays or suspended so that it is exposed to the heat and smoke from the fire. The simplest type would be a mud brick chimney perhaps 2 ft in diameter and 3 ft high with a metal or wooden grid placed over the top.,, from which the meat or fish can be suspended.

3.3.7 Food Storage

Any container for storing food must be moisture-proof, insect-proof, and rodent-proof. Containers of this nature can be made at no cost, or very little cost, at village and domestic level using materials mainly or entirely of local origin.

The traditional African storagegranary is usually a large basket structure, either unplastered, or plastered with mud or dung, supported above ground level and provided with a thatched cover to keep off rain and provide shade. Such granaries are unlikely to be moisture-proof, insect-proof, or rodent-proof and, consequently, stored foods are often rapidly destroyed by insects, moulds or rodents. Many of these granaries are, in fact, built deliberately in an openwork fashion so that grain can dry out during storage. This practice provides its own comment on efficiency of traditional drying methods.

It is, however, possible to improve many types of traditional granaries to provide adequate storage for well dried grains. Plastering the container thoroughly both inside and out with mud or a mud/dung mixture can provide a good insect barrier, and the granary can be made completely insect-proof by fitting it with a wooden or basketwork lid which is plastered and sealed in position once the granary has been filled. When a granary is sealed in this manner, a small emptying spout (made from the neck of a gourd with a tight-fitting wooden plug, or from a press-lid tin can with its bottom



The traditional African storage granary.

removed), is fitted to the bottom of the granary so that grain can be removed as needed without the risk of insects gaining entry. The final precaution needed is the raising of the granary on wooden legs to about one metre above the ground (i.e., above the normal rat high-jump record) and fitting these legs with rat guards, made either of metal cut from beaten out "debbies", or by lashing a dense barrier of thorns around each leg.

As an alternative to the improved traditional granary, it is possible to build a mud-brick granary using sun-dried bricks made from local clay, to any desired size. The only external input needed may be cement for mortar for joining the bricks. However, if limestone is available this can be burned and slaked and used in admixture with sand to make a satisfactory mortar. The mud-brick granary is also provided with a cover which can be plastered in place, and a small emptying spout at the base. It should also be provided with a thatched cover to provide shade. This type of granary will give complete protection to dried foods.

Large locally-made clay pots, or the cement jar (described on page 43), if fitted with tightly fitting closures also make ideal storage containers.

3.3.8 Control of Drying

Whichever type of drying is practised it is necessary that it is brought to completion, and that the farmer is able to recognise the point where the food is fully dried.

General "rule-of-thumb" methods are available to assess the dryness of foods. Grains can be considered adequately dry if they break into a dry flour when smashed between, two stones, and there is a traditional method of testing hardness between the teeth. This latter test when performed by an experienced person has been found to rival the accuracy of an electronic moisture tester.

Brittleness of dried vegetables and roots, which allows them to break into a powder or a dry flour when pounded, is also a good measure of adequate dryness.

It can be more difficult to assess the dryness of some oil seeds which, because of their high oil content, do nor break easily into a flour but their ability to burn without "spluttering" can provide evidence of adequate dryness.

3.3.9 The Hazards of Insecticides

Food properly dried and stored in an adequate granary or container will keep in good condition for months, and even for years, in some cases. However, there is an increasing tendency on the part of some advisers to encourage the use of insecticides to control infestation in stored foods. This represents an admission of failure to tackle the basic problems of disinfesting food and excluding insects during storage. All insecticides, with the possible exception of the very expensive pyrethrins, have some degree of toxicity to man, and some are very poisonous indeed. Their use in the generally uncontrolled village situation can involve many serious hazards, since villagers have very little knowledge of insecticides. The mistake of using a similar-looking dangerous compound, or the risk of uneven dosage, resulting in dangerously high concentrations on some parts of the food, are some of the hazards associated with insecticides. Apart from this, environmental pollution caused by insecticides is well recognised as a reason for concern. In some cases insecticides which are banned bv food laws in the industrialised countries are freely recommended for use on foods in Africa.

There is also the problem that many insect species have developed a resistance to certain pesticides, and this means that pesticides have to be selected to deal with particular pests, so no single compound is likely to be 100% effective for a wide range of infestation. This problem is compounded by the dangers of further resistance developing, so that common-and less toxic pesticides have less and less impact.

From the purely practical standpoint, the potential for effective use of insecticides at village and domestic level seems to be very low. Almost insurmountable distribution problems exist, and since these products have to be imported, and since they are also very expensive. it seems unlikely that any nation could afford to import the quantities which would be necessary, or that the individual villager could hope to afford to buy them, even if rhey could be made readily available.

3.3.10 Appropriate Pest Control Methods

An appropriate technology for food storage should attempt to deal with pest control without the use of insecticides. The basic requirements for this approach are:

- -avoiding infestation and removing infestation before putting crops in store
- -use of insect-proof and rodent-proof storage units, i.e. well-plastered and sealed granaries, or well-sealed pottery or cement jars
- -restricting penetration of insects through the grain by:
  - **a)** threshing and winnowing all grain before storage
  - **b)** admixture of ash or siliceous earth with the grain (this not only restricts penetration but is also insecticidal)
  - **c)** admixture of small grains (e.g. millet) with larger grains
  - **d)** admixture of dry sand with the grain
- -mixing plants known to have insect-repellent properties with the grain (e.g. pennyroyal, mint, tansy, garlic, wormwood, rosemary etc.)

-placing a lighted oil lamp (a wick floating in a small gourd) on top of the grain in thegranary before it is sealed, so that the oxygen content of the air inside the granary is reduced.

All of these methods are possible without any expenditure whatsoever on the part of the villager.

If the grain is to be stored in bags in a store hut, the risk of infestation and rodent damage is much greater. The bags should be placed on a platform raised at least six inches from the ground and should not be stacked against the walls. A space should be left all around the bags so that they are well ventilated and can be frequently inspected. The storage area must be kept scrupulously clean, since any accumulation of spilled grain or dirt will attract pests. Any holes eaten in bags by rodents should be immediately repaired to prevent such spillage. If insect infestation is noticed in any bags, these should be removed and, if possible, the contents sieved, or sun-dried and winnowed again to get rid of the insects. Any grain suspected of insect infestation should not be stored in the same room as sound grain. Placing leaves of plants with insect repellent properties amongst the grain in the bags and on the floor around the stack can help reduce infestation. Also, building a loose six-inch thick barrier of ash or siliceous earth on the floor all around the stack can help to deter insects.

3.3.11 Application at Domestic and Village Level

The need for better and more secure storage of foods is one which generally does not need to be "sold" to rural people, since they have already developed many basic technologies related to food storage, usually on a trial-and-error basis. The introduction of appropriate technologies which apply basic scientific principles, largely through the medium of local materiais and skills, offers the possibility of a synthesis of the old and the new, which, if conscientiously applied, could solve Africa's food problems at affordable cost.

The potential of improved solar drying, not only to dry foods for storage, but also to dehydrate vegetables to produce nutritious concertrated foods for child feeding is enormous. Further, the use of solar drying to enhance the value of commercial crops, and to produce dried crops for export offers the possibility of increased earning opportunities for rural families.

All of these possibilities exist as technical realities which have only to be applied.

3.4 FOOD PREPARATION

(This section is based on the presentation and discussion of Miss J. Ritchie's paper on Simple Technologies for Food Preparation with Special Reference to Foods for Children.)

3.4.1 Food Resources

On the basis that a high proportion of children in the ordinary low-income families in Africa do not suffer from malnutrition, it can be assumed that the range of foods available to these families, if properly used, will be sufficient to maintain an adequate level of nutrition.

The list of reasons for lack of success in eliminating malnutrition in Africa is long and comprehensive, but it is possible that one important factor has been the educationa. approach and its emphasis on foods, particularly those of animal origin, which in most cases has been unrelated to the life style and resources of ordinary families.

It is now recognised that Africa has many excellent foods of vegetable origin, which, singly or in combination, can rival the nutritional value of animal foods. On this basis it is logical to base appropriate technologies for child feeding on use of those local foods such as cereals, legumes, and vegetables, which are relatively inexpensive and readily available to low-income famiiies.

3.4.2 Supplementary and Weaning Foods

Foods of this type can fall into three categories:

i) The "European" type manufactured by large western enterprises and imported into Africa. These are usually breast milk replacers or specially formulated foods for the weaning child. These foods are prohibitively expensive and they cannot be afforded by low-income families. However, because of extensive advertising and promotion and the "prestige" image which this creates, many poor mothers become "hooked" and abandon breast-feeding for the expensive alternative which they cannot really afford. The outcome is that these formulas are often heavily diluted to make them go further, and are often contaminated in mixing:. When this happens the child is at serious risk of undernourishment, diarrhoea, dehydration, and death. The cost to countries in terms of foreign exchange expenditure on imports of these foods can also be very high. In one African country it has been estimated that the cost of substituting breast: milk with imported substitutes could amount to 40 million U.S. dollars per year.

ii) The second category is the specially designed and tested commercially manufactured high protein baby or weaning food mixes, produced within the country. These foods are much cheaper than imported weaning foods, but still too expensive for the people who need them most. Cost of processing, packaging, distribution and transport raise the price, and though they are of excellent quality and acceptability, the lower income group who need them most are unable to afford the extra cost. Practical experience has shown that commercial marketing of these foods in competition with well established brand names is extremely difficult. Welfare distribution, involving government subsidies, is difficult for most developing countries since governments tend to give low priority to welfare programmes involving heavy subsidies. The educational benefits are also marginal since most of these centrally processed foods cannot be prepared at home by the housewife using local ingredients. Many governments are seriously reconsidering the practicality of such welfare distribution programmes since it tends to create a group of people who become more dependent and less productive. UNICEF is, therefore, not advocating the concept of distributing weaning foods manufactured through a centralized processing facility.

Substituting breast milk with imported substitutes could amount to 40 million U.S. $ per year.

iii) The above-described approaches to provision of special foods for young children obviously represent inappropriate technologies so far as the vast majority of African families are concerned, and a more appropriate approach would seem to be the preparation, on a community basis, or in the individual home, of simple nutritious mixes based on local ingredients.

The ingredients of such mixes have to be culturally and otherwise acceptable, locally available, inexpensive, of good quality, and prepared in such a way that the young child can digest them easily. If prepared satisfactorily they can be used for children of 4-5 months of age to supplement breast milk, and also for children during the after weaning until they are old enough to digest the family diet.

In the preparation of mixes, all skins, seeds and bones should be carefully removed and if the mix is in the form of a porridge, foods such as beans which require long cooking should be precooked. Green leaves, or other vegetables or fruits should be lightly cooked and strained before being added. Children should be given very small quantities to start with but should gradually receive larger servings of as great a variety of foods and mixes as possible so that they learn to like most of the family foods before they share the adult diet.

Mixtures can be cooked at the same time and in the same pot as the family meal, for steaming, wrapped separately in leaves, or for boiling, enclosed in a screw-top tin. Before use, the child's package is opened and the contents mashed together. The food can be divided in two, and one half kept for a second meal.

Every African country grows some cereals or roots, some legumes, and some dark gree green leafy vegetables, so this kind of mixture is always possible.

In place of imported western-type jars of strained infant foods, African mothers can make their own convenience foods for small children, Peas, beans, groundnuts, simsim, green leaves and other vegetables can each be roasted, boiled for a few minutes or blanched as appropriate, dried in a sun-dryer, and pounded to flour. The flours can be stored in airtight jars or tins, or in plastic bags carefully knotted to exclude air. A mother can stir a spoonful of precooked high-nutrient flour and a small spoonful of powdered green leaves into a porridge or into the child's portion of any cooked staple food.

The use of homedried foods has many advantages. For example:

1. They can be kept for the season of shortage
2. If pounded and used as powders, they are easily prepared into a digestible meal for the young.
3. These pounded foods will be looked upon as '*small-children's foods" and there will be no competition from adults and older children.
4. A large amount of powdered dried food can be prepared at once.
5. Mothers may be taught to make such dried powdered foods into thick porridges instead of thin ones as no preconceived ideas on their use exist.
6. These food mixtures may be given in addition to breast milk during weaning.
7. In an emergency, the powdered food mixtures can be substituted for breast milk, if pre-cooked before drying or well cooked during preparation.
8. In addition to powders, ready-made soup or stew mixtures from vegetables, cereals, roots, pulses, dried fish, etc., can be made for preschool children and also for families.

One type of food with a high nutritive value and low water content is a protein-calorie rich biscuit. Such biscuits can be made from any mixture of flours from pulses, oil seeds and cereals, mixed with a small amount of wheat-flour for binding and some fat, and baking powder, with sugar or salt to taste.

About 130 gms of mixed flours, including always a fifth to a quarter of wheat flour, with 15 gms fat will provide 25-30 biscuits, each giving about 60 calories. Two biscuits will give about the same amount and quality of protein as 30 gms of fresh meat.

In Uganda, the acceptability of these biscuits has been tested using a simple technique easily applied in villages. Each person who tried the biscuits cast a secret vote by placing either a black bean for "like", a red bean for "neither like nor dislike" or a yellow bean for "don't like" into a tin. A very high proportion of women and children, with whom the biscuits were tested, liked them. Other low-moisture high calorie and protein foods are bread and the traditional doughnuts, fried bean cakes, millet cakes, pancakes and samusas made in many African countries.

3.4.3 Improving Local Dishes

Teaching improvements of accepted local dishes is more likely to be successful than trying to introduce new ones. A number of home economists in Africa have prepared recipes for doing this. For example, the Home Economics Training Centre at Buhare, has published a book "Tanzanian Food with Traditional and New Recipes", which gives many ideas on mixing local foods to provide nutritious and acceptable meals for the whole family.

A wide variety of household or community equipment to reduce labour and make the task of food preparation easier and safer has been suggested, and sometimes adopted. However, possible side-effects of a new technology must be considered before the idea is promoted so that advantages rather than disadvantages may be the outcome. The introduction of rice hullers in Thailand, for example. certainly reduced women's labour, but also brought beri-beri in their wake. The promotion of long-handled brooms may save women bending but may also prevent them sweeping efficiently since it is the side and not the end of the short broom which contacts the floor. The introduction of raised fireplaces in areas where women hold their ugali pots steady on 3 stones with their foot on a forked stick, may make it impossible to stir large amounts with both hands. Nevertheless, ***really*** 'appropriate technology could overcome all these problems *if* the

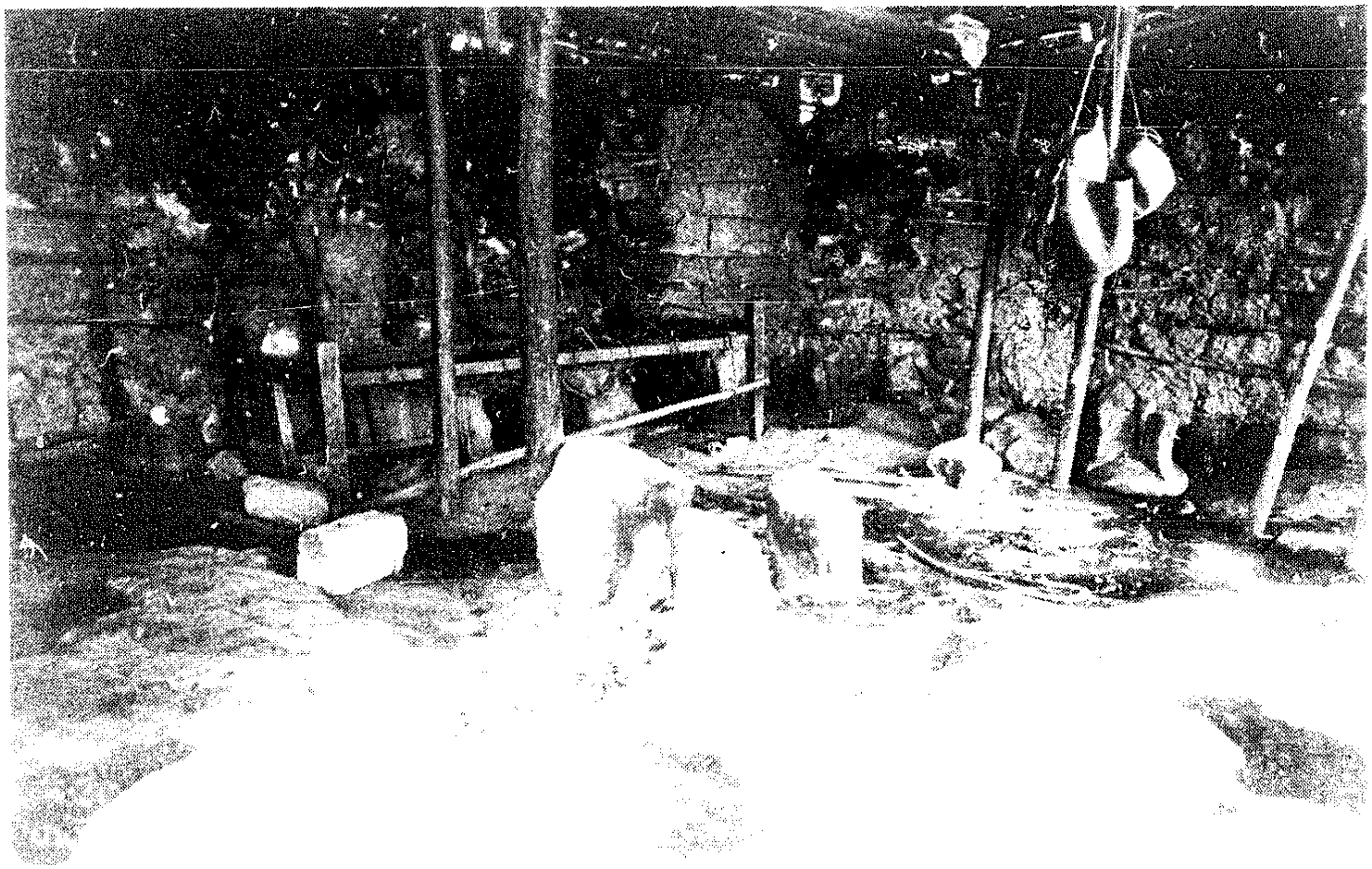
Improving local dishes

situation, present equipment, and the specifications for improved versions were studied and discussed with local people as well as with "experts".

3.4.4 Home Environment

Since much malnutrition is related to gastro-enteritis and other infections and parasites, personal, environmental, and food hygiene are among the factors important for achieving good growth and health in children. Simple technologies needed to keep food clean, such as building adequate food storage facilities, scraping the eggs of cockroaches from corners of furniture, constructing home-made fly-traps, racks for drying dishes in the sun, and introducing proper latrines, can all help to prevent infection.

Having enough food to prepare and enough time to prepare it depends, in part, on good management. Such management includes planning family size to correspond to family resources; spacing children so that a mother has more time to spend with them and can care more efficiently for her home and family; ar-



Home environment.

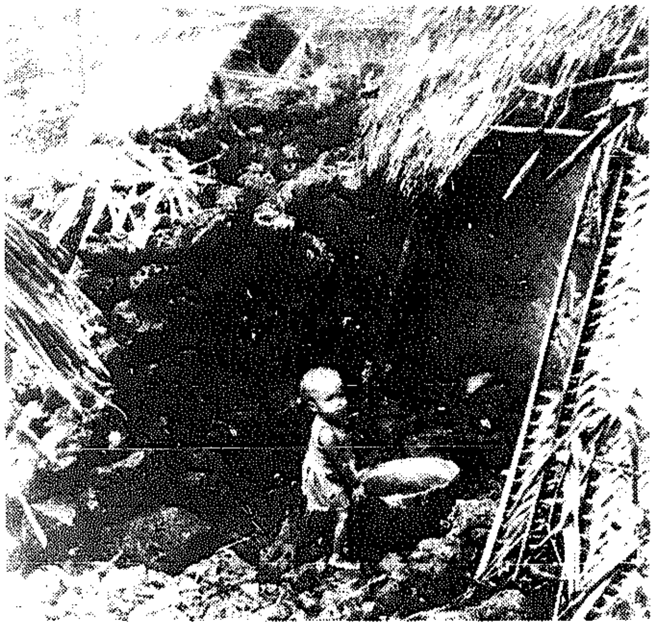
ranging the home and kitchen to conserve time and physical energy; and making the best use of money by budgeting and skilful buying. Quality of home management reflects on family nutrition.

Acceptance of new technologies depends largely on whether the target population can see any clear benefit for themselves in the change. Many good ideas have nor been accepted because their connection with the actual problems and needs of families was not made obvious.

New technologies are not popularised by leaflets distributed to farm families or even to field extension assistants. In addition to local applied research to make sure the technology is tailored to needs, very practical training at universities and colleges, as well as in-service training for field staff, will be needed. Fortunately in recent years, both training and extension programmes are being increasingly based on the findings of community studies on living patterns, needs, and attitudes. Teaching related to actual problems and to the involvement of people in the community is slowly replacing more out-moded and irrelevant activities in home economics and family life twining and education.

3.5 WATER SUPPLIES

(This section is based on the presentation and discussion of Roger Stapleton's paper "Simple ***Technologies for the*** Development ***of Water Supplies".***



3.5.1 The **Water** Problem

Obtaining water, improving the quantity and quality of existing water, and making it more readily available for irrigation and domestic use, is **recognised** as one of the fundamental and major problems of rural development in Africa.

The degree of hardship arising from the quantitative and qualitative inadequacy of water supplies is impossible to assess. Often the major clement of physical **labour** imposed upon women and children is the task of carrying water over long distances and, almost invariably, uphill. As will be noted from section 3.1 this task can take an average of 4 to 6 hours per day. Estimates made in East Africa show that some 15 per cent of all energy expended by women is used in carrying water. The problem of management of water quality and of contamination of water supplies, which is closely linked with the related problems of environmental sanitation, creates, perhaps, the major dominant health hazard for African peoples and their children. Problems of typhoid, **cholera,** hepatitis, dysentery and gastro-enteritis, and water-borne infestations contribute to the malnutrition/illness syndrome which kills so many children. Lack of **sufficient** water to **maintain** personal hygiene and do adequate laundering contributes to problems of skin diseases, trachoma and louse-borne infection. Throughout the Seminar here reported, the need for application of appropriate technologies in the field of water supply was seen as one of the most important priority areas.

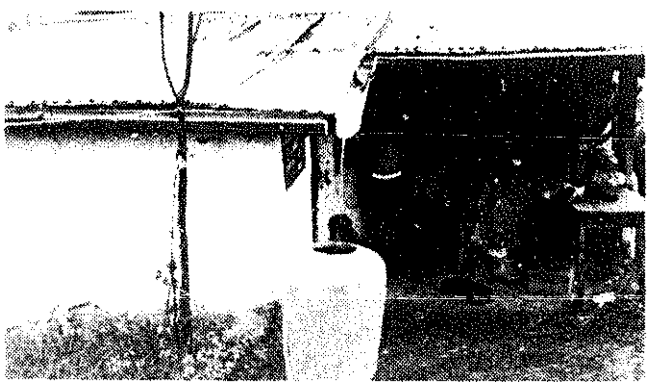
3.5.2 **Localising** Water Supply

The problem of reducing the distances **travelled** and the **labour** element in water collection looms large. Whilst **the** provision of carts, or wheelbarrows, or the use of animals for transporting water may bring about a reduction in energy expenditure, these approaches may not necessarily reduce the time expenditure involved. Also, in very hilly or broken country, where paths are narrow, steep, winding, and of rough uneven surface, use of transport devices would not be feasible. In these situations, use of pack animals seems to offer the only appropriate solution so far as **transport** is concerned.

The use of animals.

The alternative approach is through attempts to develop water reserves close to the home by catchment from roofs or artificially created ground catchment areas. By this means, water would be made available for at least some months of the year near to homes, and some element of labour expenditure would be eliminated. It is also likely that water collected from roofs would be of better hygienic quality than many of the surface water supplies currently in use.

It is noticed that, in many areas, houses will have a short length of roughly fashioned guttering fixed under the eaves just above the door, and that water from this will be collected in an old oil drum or other container. It seems that this type of device is used more for the purpose of preventing water from running in through the doorway of the hut than as a serious approach to water collection. However, the existence of this "technology" could provide the link point for development of simple but effective roof catchment systems.



Catcbment from roof:

The major practical barrier to development of such systems has been the high cost and general unavailability of adequate storage containers. New developments in this field such as the simple cement pot (see page 43) which can provide storage for 300 litres at a cost of $1.00 or for 3,000 litres at a cost of $10.00 brings water storage within the reach of poor families and communities. Also, the underground water storage tank which consists of a large polythene bag suspended in a pit in the ground and which can provide storage for 4,000 litres at a cost of $5.00 has great potential. It should be noted that a conventional corrugated metal storage tank of 4,000 litres capacity can cost 5 100.00.

Collection of water from grass roofs; even on circular huts, is possible by using a polythene film guttering or by simple guttering made from split bamboo or from two planks joined to give a "V" section. This can if necessary be combined with a simple sediment trap, or the first runnings from each shower can be aliowed to run to waste.

In areas where soil is porous and ground catchment is not normally possible, the lining of a natural or artificially made depression with polythene sheet and the covering of this with sand, gravel, and stones (to provide protection from damage and weathering) can provide an effective catchment pond from which water can be transferred to home storage tanks once the rainstorm has passed.

The expenditures likely to be involved in these approaches should be within the resources of many families and certainly within the resources of small communities.

3.5.3 Improving Water Quality and Accessibility of Sources

Many existing water sources are capable of improvement. Seepage springs on the slopes of hills frequently create a morass where the water becomes heavily polluted. These can often be improved out of all recognition by digging back to the source of the spring and constructing stone retaining walls on either side to funnel the water to one take off point. The excavation between the walls is then filled with stones, sand and gravel, thus ensuring that ***water*** is filtered, and the face of the spring is capped with a cement slab into which an outlet pipe is inserted. This type of improvement is highly labour intensive and expenditure is limited to the cement needed to construct the retaining walls. Projects of this nature are well within the capabilities of even very small communities.

The rim of ***the well is brought*** *above ground.*

Many other springs which often consist of a very deep hole with a small seepage of water and which are ***constantly*** coataminared by run-off from the surrounding ground surface, can be cleanly excavated, lined with stone walls or with concrete liners cast on the spot, so that the ***rim*** of the well is brought above ground surface. This is also a community participation labour-intensive task, where actual cost of inputs is very low.

In many areas, open ponds, which are often used indiscriminately by animals and people, provide the main sources of water. Water in these ponds is generally heavily polluted and, because of their large surface area and shallow nature, loss of water by evaporation probably represents a greater quantity than that actually used by the people. These sources are also susceptible to improvement. It is possible, for example, to dig a filtration trench linking the pond to a small well dug some distance from the pond, This trench (lined with a polythene sheet where the area through which it passes is porous) is then filled with stones, gravel and sand, and water percolates through the trench, being filtered in the process, and becomes available to the people in a much purified condition, in the well. The well can be easily protected from animals by a thorn fence. Prevention of much of the evaporation from the pond is also possible by constructing a “roof” over the pond to give partial shade. This roof can be made of local materials-reeds, split bamboo, split sisal poles etc., laid over a simple pole framework.

3.5.4 Improving Hygienic Quality in the Home
The constantly recommended method of boiling drinking water in the home to destroy harmful contamination is, regrettably but understand ably, rarely applied, especially in situations where fuel is scarce or expensive. People may ***know*** that water should be boiled, but the difference between imparting knowledge and inspiring action in this particular aspect of health education provides a salutary lesson to those who may be overoptimistic as to the efficacy of imparted knowledge.

Boiling of water may perhaps be enforceable in situations where a serious epidemic of water-borne disease must be controlled, but in the ordinary situation it seems to represent an ideal worth striving for but rarely attainable.

Thus, in situations where the attainment of rigidly specified high standards of water quality is simply not possible it seems that the pragmatic approach which seeks to achieve maximum improvement within the constraints of local resources should be adopted. It may not always be possible to ensure perfectly pure water but it is at least possible to minimise health risks by seeking some degree of improvement.

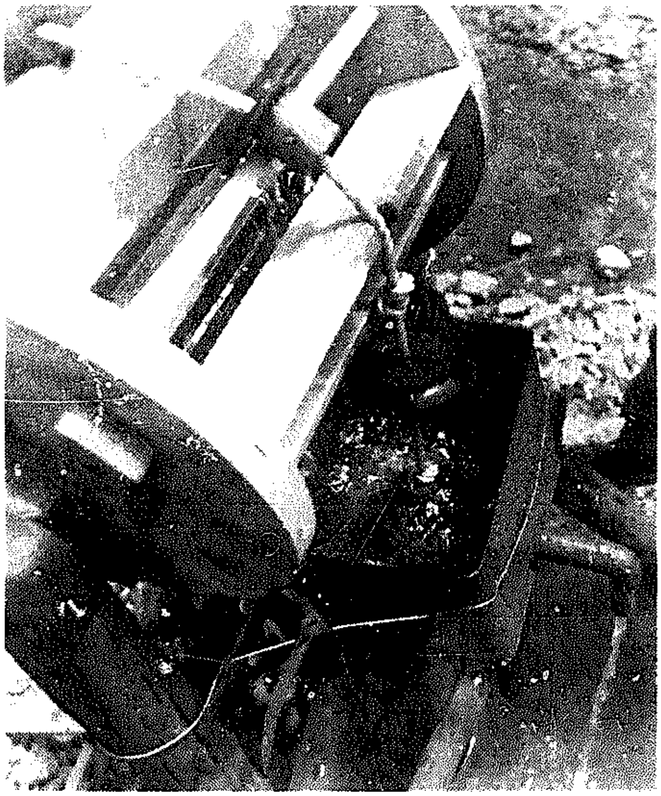
Chlorination of rural supplies is not easily possible because of the unavailability of chlorine compounds or of suitable means to apply them. The effect of chlorination upon the taste of water, especially of water which contains con taminants which greatly accentuate the chlorine taste, may, in fact, be counter-productive, in that people may reject the hygienic chlorinated water in favour of a polluted, but, to them, more palatable source.

Home filtration, using a simple no-cost filter which effectively removes suspended matter and colour, and which may also reduce bacterial contamination to some extent, does seem to offer more possibility of acceptance. The simple gravel/charcoal filter described on page 40 may have potential in this approach.

3.5.5 Water Lifting Devices

The use of simple pumps, which not only reduce work but which also help to avoid the contamination resulting from the dipping of dirty buckets or other containers into wells, can represent a very necessary element in water procurement. A number of simple pumps costing from $20 to 570 are available, and these are obviously appropriate for fairly small communities.

Very simple pumps costing of the order of $10.00 can be made by village artisans. The "chain-pump" which draws water up through a pipe by means of rubber washers fitted at intervals to a continuous loop of rope or chain, and which is operated by a hand-turned spindle, falls into this category.



The chain pump.

Windmills, of which there are many simple versions, offer many possibilities for water raising for home use and, particularly, for irrigation without the expenditure of human energy. The cost of an effective windmill is likely to be of the order of $500 to $700, and this places them beyond the reach of small communities but well within the resources of a large community. It isunlikely that an average community would possess the resources or skills needed to construct or maintain windmills, but where demand existed local entrepreneurship might well be developed in this field.

3.5.6 Maintenance of Water Supply Systems

Even the simplest water supply system needs some maintenance if its efficiency and the purity of the water is to be guaranteed. There are, unfortunately, many examples of potentially good water supply projects which have fallen into disrepair and disuse because the motivation and simple skills needed for maintenance had not been built-in to the project.

This emphasises the need for organised involvement of the people in water projects, whether the need for maintenance consists of simply cleaning out a water tank or the more complicated task of replacing a pump washer. Projects in which people participate and where they have been involved in construction are likely to give the participants the feeling of responsibility which is necessary for care and maintenance. A cement jar made by a family is their achievement for which they are likely to accept responsibility. A similar jar given to the family by an outside donor may not be viewed in the same light. Thus, an essential part of appropriate water supply projects must be the full participation of the beneficiaries, and an intelligent understanding, on the part of at least some of the people, as to how the system works, what may go wrong with it, and, either, how to repair it themselves, or where the required skills or experience may easily be tapped.

The orientation training of the people involved should also attempt to create awareness of environmental sanitation factors associated with the water supply-the need to guard against pollution, the need to be aware of hazards in the disposal of waste water or spilled water so far as the breeding of mosquitoes and other parasites is concerned, i.e. what might generally be termed "good housekeeping" so far as the water supply is concerned.

3.5.7 The Social Aspects of Water Supply

As in all other appropriate terhnology "interventions" the need for full awareness of the social background of the people, their attitudes to water, and the possible social changes which may result from any particular innovation, must be taken into consideration.

It has to be recognised that the daily trek to a distant. water source may not always be thought of as "drudgery". It may allow the women to escape from the limited home environment, to meet and gossip with neighbours along the way, and to meet other women from more distant areas at the focal point provided by the water source.

There is the need for the "view from the inside" (see Chapter 2). Before deciding upon any particular innovation it can be very necessary to try to determrne the attitudes of the people to their existing situation, for example, why some women may presently by-pass a nearer source and walk an extra mile or so to another source which, for some reason best known to themselves, they prefer.

In developing water supplies or in apparently "tampering" with existing supplies, the would-be innovator is dealing with a socially fundamental institution and may be treading upon sociallysensitive ground and may be hazarding strongly held proprietorial interests. Awareness of the social milieu is essential.

3.5.8 The Potentials

There is no doubt that appropriate technologies can provide the foundations for development of that most basic of all basic services— water supply. The potentials for simple appropriate community based development in this field in Eastern Africa seem to be enormous. The basic techniques are available and must be applied.

Awareness of the social milieu is essential.

CHAPTER FOUR

The Village Technology Unit

4.1 Introduction

This unit, believed to be the first of its type in Africa and, possibly, in the developing world, has been established by UNICEF in conjunction with the Youth Development Division of the Kenya Ministry of Housing and Social Services. Covering a half-acre plot in the grounds of the Ministry's Centre for Research and Training at Mbgathi Ridge, Karen, Nairobi, it provides practical exemplification of a wide range of potentially appropriate village-level technologies.

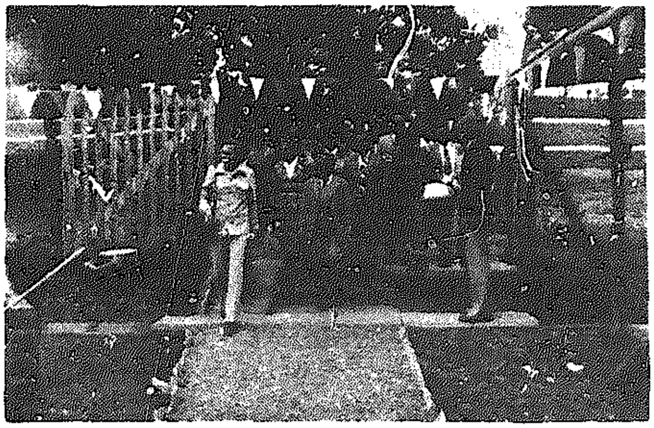
The unit was established in recognition of the fact that whilst much had been written and said about village technology, many of the devices involved were not readily accessible to interested people, and there was need for a demonstration centre where people could see, handle, operate and make their own assessment of the potential advantages and disadvantages of different items.

It was also recognised that, whilst many concepts had been proposed and whilst the practicality of some of these had been proved and acceptance demonstrated in specific localities, many others required proving so far as functional efficiency was concerned, and also required field testing to determine their acceptability and practical value in the rural milieu.

This area of development was also of deep concern to the Village Polytechnic Programme of the Youth Development Division. This programme is based on the extension of training in practical skills in the rural areas. The mutual interest shared with UNICEF led naturally to the joint venture in establishing the unit, and to its availability as a practical reference point for the UNICEF Seminar.

In this latter respect, the unit was an invaluable adjunct to the Seminar since discussions could be related to practical examples rather than to abstract concepts.

The unit was opened by the Hon. Taitta Toweett, Kenya's Minister for Housing and Social Services, on 16 June 1976.



4.2 General Description and Functions

An outline plan of the unit is given in Fig. 1, from which it will be seen that the overall content is related specifically to means of improving the quality of family life. The main areas of emphasis are:

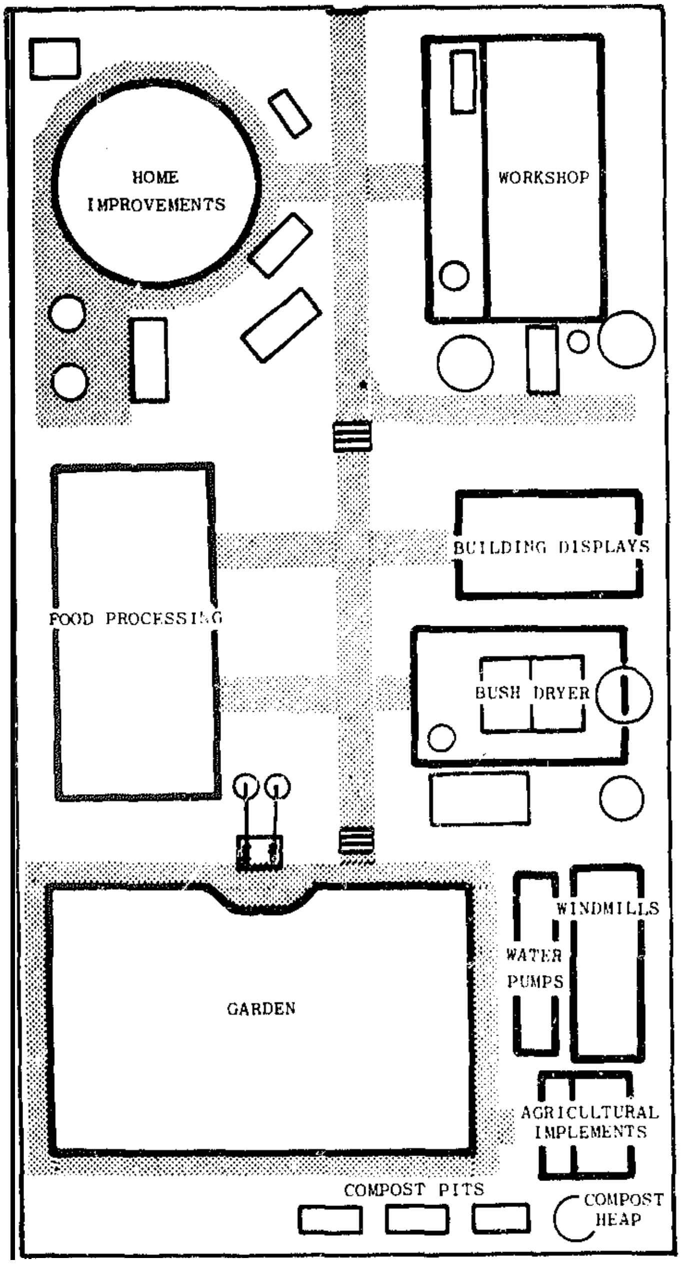
i) Home improvement and means of reducing the work load on mothers.

ii) Food production, conservation, preparation and use.

iii) Improvement of water supplies.

The unit also embodies a simple workshop of the type used in Village Polytechnics in Kenya. This is equipped only with simple manual woodworking and metalworking tools. In addition, the workshop also has a simple "laboratory" section, equipped with instruments for conduct of evaluation testing of appropriate technology devices. As will be seen from the accompanying photographs, all constructions used are related to the materials and resources likely to be available to the average rural community.

Fig. 1 **V.T.U. SITE PLAN**



The unit is intended to fulfil a number of inter-related functions which have, more or less, equivalent priority. These are:

i) To provide a practical introduction to the concepts and principles of village technologies, and to stimulate interest and awareness in the topic at all levels, from the highest level decision-maker to the leaders and members of village communities.

ii) To provide practical training regarding the construction and use of village technology devices to instructors from the Village Polytechnic Programme, 2nd to students from a wide range of disciplines undergoing training for work in the rural areas.

iii) To carry out evaluation testing of the functional efficiency of the various devices, and to accumulate information and data on construction, performance and costs.

iv) To assist in the conduct of field testing and acceptance trials of items which have been evaluated in the unit.

v) To assist in the introduction in the rural areas of items of proven performance and acceptability.

vi) To constantly review the "state of the art", to construct and evaluate new devices coming to the attention of the unit, and to modify existing items on the basis of practical testing.

vii) To prepare detailed "how-to-do-it" instruction leaflets. Such leaflets will not be issued until they can include accurate performance data.

viii) To become involved in outreach and in working, either through the established extension services, or directly with organised groups of rural people, to assist and encourage the introduction and adoption of proven items.

ix) To collaborate with universities, training colleges and other similar institutions in Eastern Africa in evaluating and fostering the further development of appropriate items.

The value of the unit as a centre for the sharing and exchange of ideas is fully recognised, and it is hoped that many new ideas will arise through the interaction between the unit and those who visit it, so that it can become a focus for a two-way traffic in ideas 2nd practical developments.

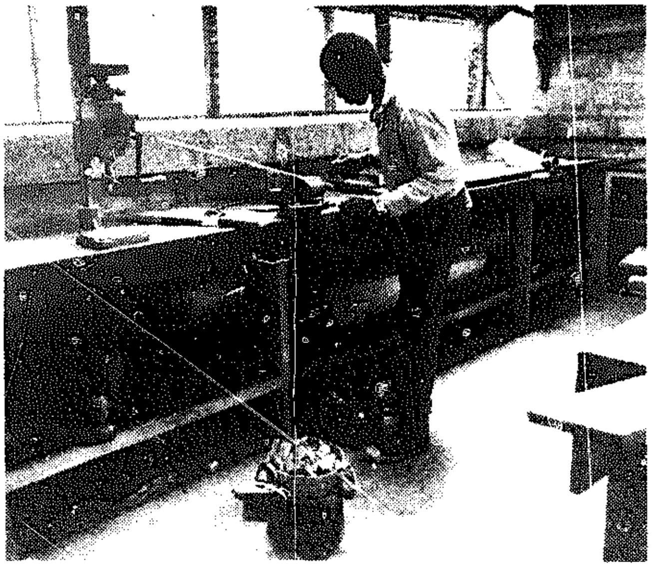
4.3 The Contents of the Unit

The following illustrated section is intended to provide a brief description of the various items demonstrated. Where the source of the idea a particular item is known, this is indicated.

i) ***The Workshop***

This is constructed of concrete blocks. Walls on two of the sides are half height and the upper portion of these walls is of weld mesh. The internal working area is 18 ft x 30 ft, and this is supplemented by a covered verandah 12 ft x 30 ft.

There is an integral lockable tool store, size 6 ft x 14 ft partitioned from the workshop by weld mesh and a WC and wash basin is provided. The double pitched roof is of corrugated iron.

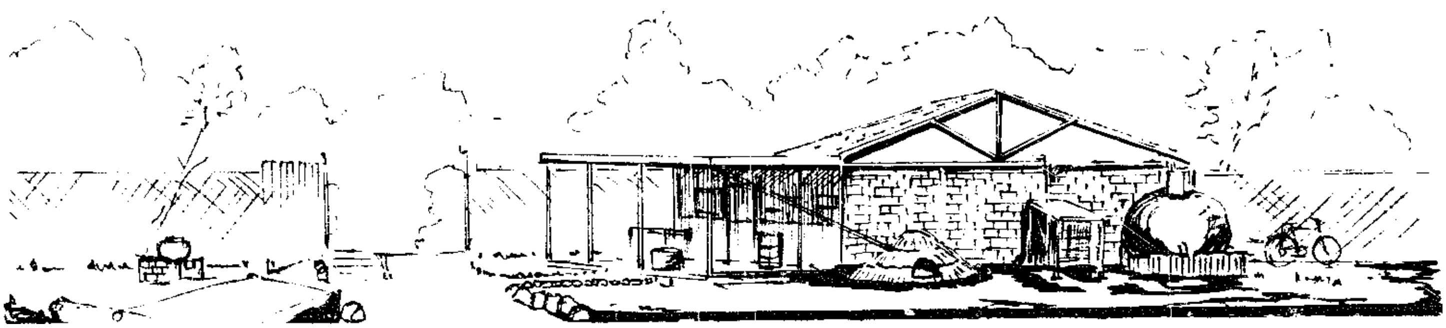


The workshop is equipped with a metal-working bench and two woodworking benches and with simple manual tools. One of the benches is fitted with a simple foot vice of wooden construction. An oil drum forge (foot operated bellows) is provided for simple blacksmithing.

An area of the workshop is set aside as a "laboratory" area and is equipped with weighing scales and equipment for moisture testing and temperature recording. This will be used for practical evaluation of drying, heating and storage items.

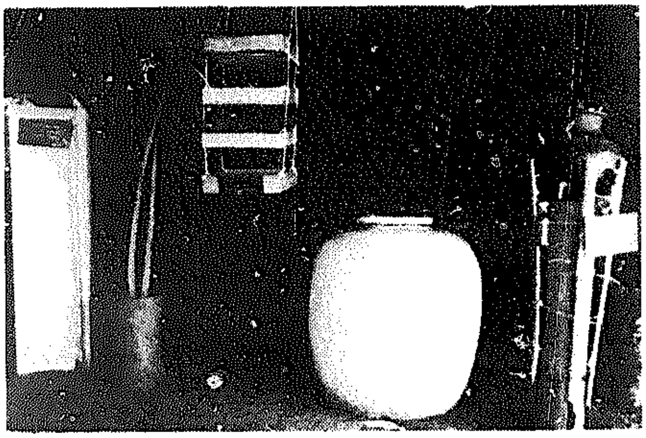
Hot water is supplied to the wash basin from a solar water heater. This consists of a "pouch" made by soldering together two sheets of corrugated iron which is painted matt black to promote heat absorption. This unit is connected to a hot water storage tank insulated with split sisal and is contained in a slightly sloping wooden box, insulated with wood shavings and covered with a "double glazing" of heavy-duty transparent polythene sheet. In areas of plentiful sunshine a unit of this nature would be very useful for clinics, MCH centres, day care centres, schools and other institutions. The use of water from such a unit preheated to 60°-70° for cooking would also allow considerable savings of fuel.

The unit provides demonstration of simple construction techniques including the moulding and making of mud bricks; the making of rammed earth/cement bricks using a Kenya-made Cinva-Ram press; the casting of cement staves for silo construction and roofing, and the use of sisal-pole pith as an insulating medium.



ii) ***The Home Improvement Unit***

This unit, built in the form of a typical mud and wattle grass thatched hut, demonstrates a range of simply achieved improvements including: aj the use of a wood ash/ cow dung "white" paint to lighten the internal walls and greatly improve the overall lighting; b) a simple raised smokeless cooking stove; c) a simple oven made of oil cans; d) a hot-box cooker; e) hanging shelves and a hanging fly-proof food store made of bent twigs and covered with cotton cloth.



Associated with this unit are an outdoor raised cooking platform built of Cinva-Ram bricks, a "sink unit", built of bamboo and twigs in which the "sink" is a local cooking pot and the "draining rack" is of twigs lashed to a framework.

The unit also incorporates a novel flow-through water cooler/filter contained in a clay pot where layers of local gravel interspersed with layers of charcoal allow efficient removal of suspended solids and colours from water.

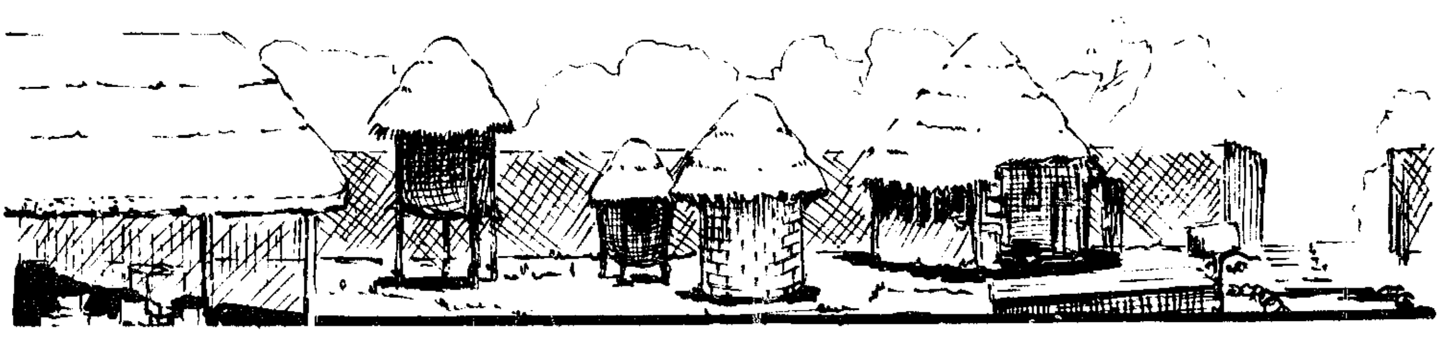
A most important feature of this unit is a pit latrine demonstrating the use of two sizes of cement top slabs for adults and children. This unit has ehe unique feature of a small stone-lined smokehox pit in the ground at the side of the latrine. The "chimney" of this smokebox is interconnected with the shaft of the latrine pit. Once-daily burning of grass in this "smoke-box" directs a flow of smoke through the latrine pit and the latrine itself, thus, discouraging flies, depositing smoke tar on the inside of the latrine pit, removing offensive odours, and greatly improving the overall hygiene of the area.

iii) ***Home-Scale Food Conservation***

Near to the Home Improvement Unit is a demonstration of a simple solar food drier and an improved mud and wattle traditional granary. Foods dried (and disinfested) in the solar dried can be completely sealed in the granary thus preventing access by insects. The granary is also protected against rodents by rat-buffles made of cones of local thorns fastened to its supporting legs. Removal of grains is achieved through an insect-proof emptying spout made from the neck of a calabash which is closed with a tight fitting wooden plug. This exhibit illustrates a complete low-cost "package" approach to home-scale food conservation.

iv) ***Community-Scale Food*** Conservation

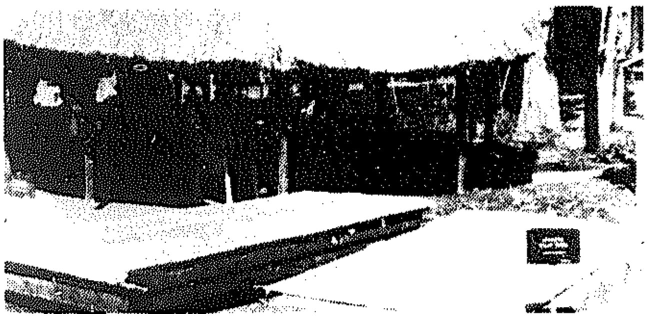
In addition to the home improvement Unit, food conservation devices suitable for use by a number of families or by a small village community are also demonstrated.



This demonstration incorporates a large size (75 kilo capacity) solar drier constructed of Cinva-Ram bricks, a concrete stave grain silo (2% tons capacity), and a fuel-fired crop drier (capacity about 150 kilos). These units are described below.

1. Large Solar ***Drier***

This is a box built directly onto the ground using Cinva-Ram bricks. Its dimensions are 6 ft x 12 ft x 1% ft. The cover, of dimensions 6 in greater overall than the drier, consists of a polythene sheet stretched over a bamboo frame. The total number of bricks needed is 108.



2. Fuel-Fired Drier

This consists of a pit of triangular section with a top area of 8 ft x 8 ft and with two of the sides sloping to the base. Three 44 gallon oil drums with tops and bottoms removed are laid along the "V" at the bottom of the pit and joined end-to-end to act as a firebox. A chimney is built at one end of this firebox.

A grid of weld mesh or of suitably supported rods or poles is fitted over the top of the pit to support the crop which is to be dried. The hot air from the firebox passes up through the crop giving rapid and effective drying.

3. ***Concrete Stave Silo***

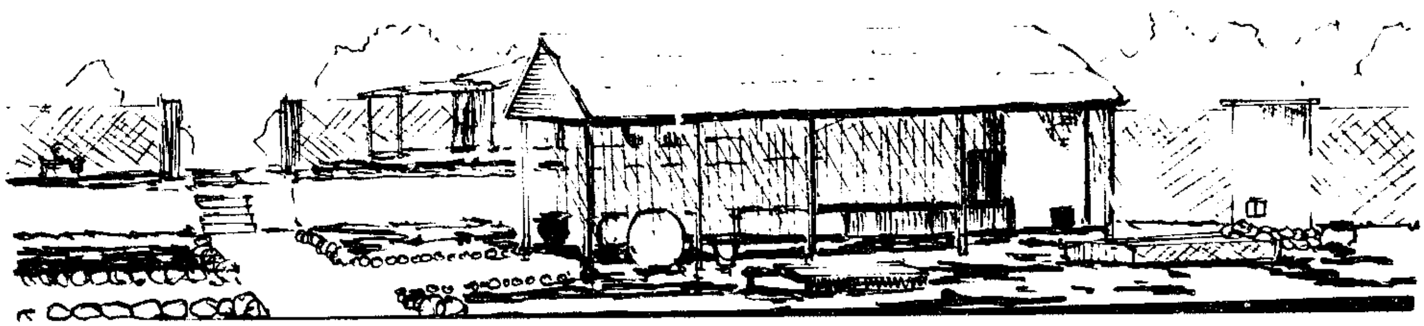
This is made of concrete staves 19% in x 9% in x 2 in thick, cast on site in a special mould which provides a slight taper on the thickness of the two long sides so that when placed together edge-to-edge these staves form a circle. The staves are built up on a cast concrete base to form a 6 ft diameter cylinder and are held in position by fencing wire tightened around each layer of staves using ordinary fencing turnbuckle strainers. The silo is capped with a cast concrete slab and capped filling manhole and is finished by plastering all over with cement plaster. A lockable emptying spout is provided by fitting a metal door with a rubber sealing gasket over one of the staves in the lowest layer, which is cast with a 6 in x 6 in opening for this purpose. This silo can store up to 2% tons of dried grain in moisture-free, insect-free, rodent-free condition.

4. The Mud-Brick Silo

This is a simple cylindrical, 4 ft 6 in diameter and 6 ft high, construction built of sun-dried mud bricks on a cemented rough stone base. It is capped with a cast concrete cover with sealable filling manhole, and is provided with a wooden emptying spout tightly sealed with a lockable insect-proof wooden plug.

v) Water Technology

The unit has exhibits of simple pumping mechanisms and of low cost methods for collection and storage of water.



Community-Scale Water Procurement

1. *Windmills*

The most striking examples of water pumping technology are the two windmills which dominate the unit. One is a locally designed cotton cloth sail windmill driving a simple pump in which the compression and relaxation of a used motor car tyre can be used to lift water from shallow wells. The second is a VITA design constructed mainly of standard galvanised iron water piping and which uses corrugated iron roofing sheets for sails. This windmill drives a reciprocating piston pump capable of use on deep wells.

2. *Hydrams*

The unit also provides an exhibit of two hydram pumps which, under the impetus of a large volume of water falling through a short distance, can pump a much smaller volume to a considerable height. The hydrams exhibited are the smallest available commercial model and a simply made type produced by a village polytechnic in Kenya. The latter has been found to give the same performance as the commercial pump at a fraction of the purchase cost.

An exhibit of simple low-cost hand pumps for shallow and deep wells includes pumps manufactured in Kenya, Bangladesh, Pakistan and the well tried and long-established "Uganda" pump.

3. *Irrigation*

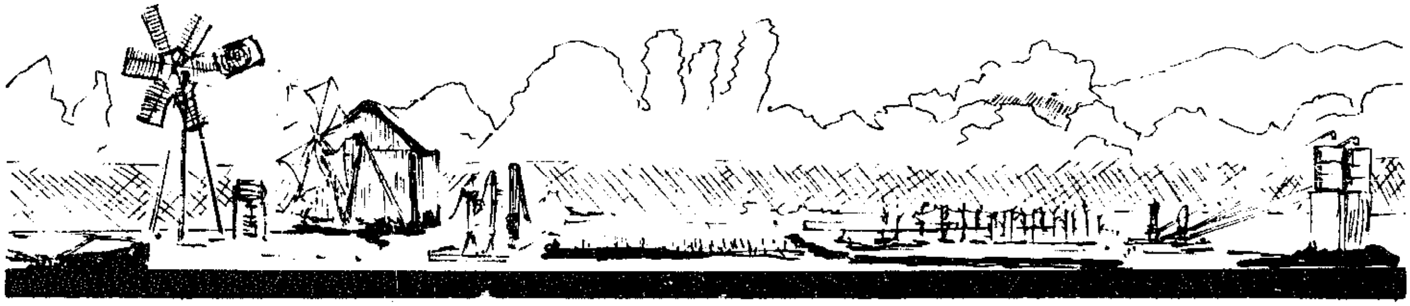
Whilst any of the pumping devices described above can be used to raise water for irrigation, a four-man bicycle-driven centrifugal pump specifically designed for this purpose at the University of Dar es Salaam and connected to a simple overhead rotating spray head is available to irrigate crops in the unit's garden.

4. Simple Chain Pump

The principle of the chain pump by which water is lifted up a vertical pipe by means of washers on an endless chain driven by a simple hard turned spindle is illustrated by a pump developed by a local resident. In this pump the chain is replaced by a rope knotted at suitable intervals. This greatly simplifies the construction and provides a simply-made low cost pump which can lift water from shallow wells at a rate of 10 gallons a minute.

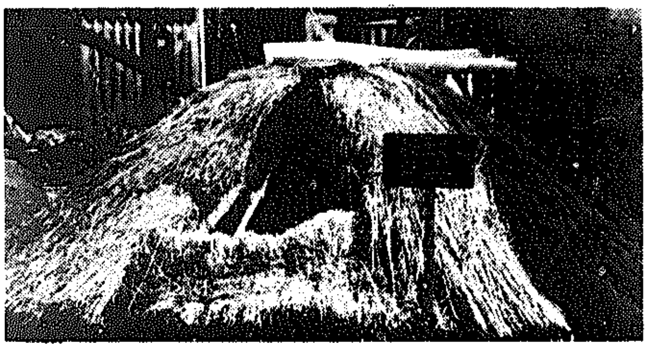
Domestic and Community *Water Storage*

One of the most time and energy consuming chores performed by the African woman is that of carrying water over long distances often from heavily polluted sources. The collection and storage of water from roofs provides one way of eliminating this chore entirely in areas of frequent rainfall and of restricting it to part of the year in areas where rain is seasonal. Water, which will generally be purer than that from surface sources, can be collected from any roof whether thatched or of corrugated iron but a major problem is storage, since purchased storage tanks are very expensive. Three exhibits in the unit provide an appropriate answer to this problem.



1. The Underground Polytbene Tank

This consists of a large bag made of 1000 gauge polythene sheet, 7 ft in diameter and 7 ft in length, suspended in a cylindrical pit in the ground which is 6 ft in diameter and 6 ft deep. The pit is lined with split bamboo (smooth sides facing into the pit) to prevent puncture by roots or burrowing animals. The plastic bag is oversize for the pit so that the weight of contained water will be supported by the bottom and sides of the pit and will not place strain on the seams of the bag.



Water is led into the tank by a bamboo guttering and the pit is covered by a conical grass thatch roof, which has an opening to allow the water to be removed by pumping or dipping.

2. The Cement Water Jar

This jar which can be made to any desired size (capacity 300 to 3,000 litres) is made by plastering a 1 cm thick (for the 300 litre size) layer of cement (2 parts sand, 1 part cement) on to a suitably shaped cotton bag mould which has been stuffed tightly to shape with grain husks, chopped grass or any suitable material. Once the cement has set (24 hours), the stuffing and the bag are removed and can be used repeatedly for making more jars. For the larger size jars, the thickness of cement should be at least 2 cm. The cost of making a 70 gallon jar in Kenya is only one-fifth of the cost of purchasing a used 44 gallon oil drum.

3. Wells and Springs

The unit exhibits a portable mould which can be used for casting cement rings metre diameter and 1 metre high) for lining wells. This mould allows the rings to be cast on the spot.

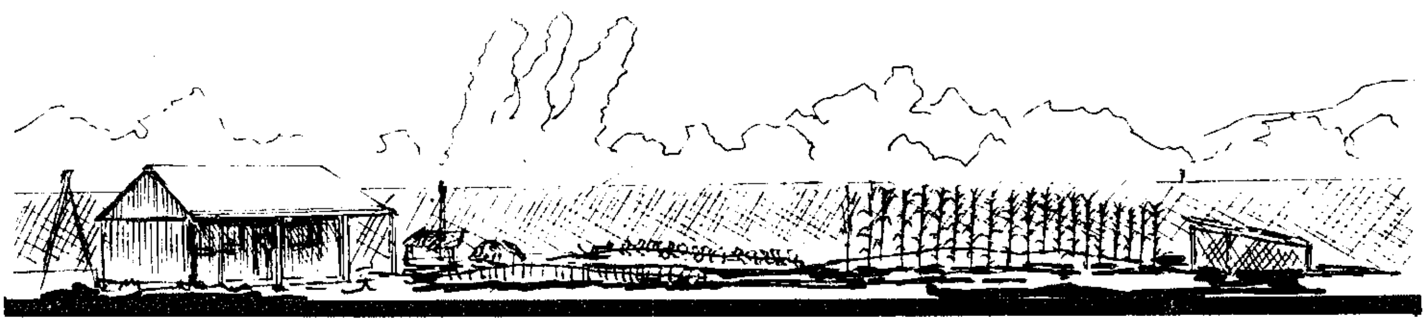
There is also an exhibit showing a protected spring.

vi) ***Food Production***

A small (1110 acre) plot is intensively farmed to demonstrate the value of intercropping and the use of compost for maintenance of soil fertility. Crop mixtures used are: beans and maize; groundnuts and maize; beans and cassava; beans and sweet potato; peas and carrots. These patterns also illustrate nutritionally useful combinations.

Compost for use on the plot is prepared in compost pits and compost heaps thus providing a demonstration of the methods of preparing compost from plant and household wastes.

A small eucalyptus plantation has also been established close to the plot. This productive and rapidly growing tree was chosen to demonstrate the possibiiity of home-growing of timber for firewood and for use in construction. It is hoped that this plantation will also demonstrate the need for and the simplicity of reforestation.



vii) ***Food*** *Processing and Preparation*

A wide range of possibilities for borne and community food processing and preparation is demonstrated. Items for cereal preparation include: a hand-driven rotary-disc maize sheller. made almost entirely of wood, and hand-held maize shellers; a simply made groundnut sheller which can also be used for shelling dried legumes; a pedal-operated thresher; a hand-operated winnower; and a hand-operated rice huller.

For the grinding of cereals and legumes into flour, the demonstration includes a simple locally manufactured band-powered plate mill and a bicycle driven hammer-mill. A locally manufactured community scale electric-powered hammer mill is also included. Two other grinding mills, a man hand-operated disc mill and an electrically-driven disc mill. both made ***in*** Canada, are also installed for development trials.

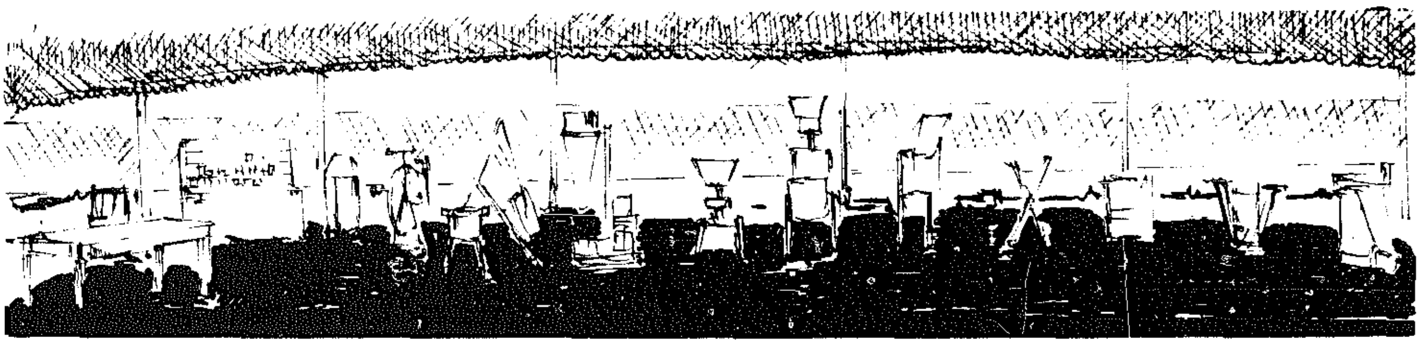
Before beans or soya beans can be processed into flour, they must be soaked and boiled to remove some anti-nutritional factors. A simple soaking/boiling unit, using galvanised dustbins is provided in the processing unit., This together with a solar dryer for drying the boiled beans and one of the simple grinding mills described above. provides a total legume processing capability.

1. *Oil Pressing*

A simple and inexpensive "ghani" oil press, made in Tanzania and based on a large mortar with rotary weight-loaded pestle demonstrates the village-level production of oil from local oil seeds such as sesame, sunflower and groundnut. For the expenditure of 300 calories human energy, this machine can produce a litre of oil with a calorie value of 9,000 in one hour. It is so easy to operate that it can he worked by children.

2. *Home Preparation of Nutritious* ***Foods***

Sun-dried vegetables, fish or meat can be combined with flours made from cereals, legumes or sun-dried roots and fruits to make a wide range of home-made weaning foods and other family foods of excellent nutritional value. The food processing unit includes exhibits of these products and a display unir shows steps in home-production of soya flour, soya milk, legume flours, groundnut milk and groundnut (peanut) butter Recipes for home-made high-nutrient foods are displayed along with recipes for home-made high-nutrient biscuits.



CHAPTER FIVE

Practical Application of Appropriate Technologies

(This Chapter is based on group reports prepared by participants from countries; on the presentation by Mr R. Tuluhungwa** on **Communications Strategies and by Mr G. Green on The Modular Approach–A Learning Package for Rural People.)

5.1 Promotion of the Appropriate Technology Concept

It is recognised that the concept of appropriate village-level technology can only become a reality when it receives the blessing of those in government who are concerned with overall policy planning and decision making. Many countries in Eastern Africa, have already adopted policies favouring development of village-level technology, but it is incumbent upon those who wish to promote the concept to be able to convince the decision makers of the economic and social advantages likely to accrue from adoption of such policies.

The possibilities outlined in this report speak for themselves in general terms so far as the potential social and economic advantages of adoption of appropriate technologies are concerned, and it is hoped that the report itself will form a useful source of information for the decision maker and policy planner who is interested in the potentials of this new approach for rural development.

Hard-headed, essentially pragmatic, arguments based on cost-benefit data will be the most effective tools for convincement. Indeed, it should be possible to use at national level the approach based on identifying the real problems facing the decision makers and suggesting appropriate solutions based on village technology.

However, the most convincing argument, so far as the policy makers are concerned, will be practical demonstration of advantages, not in a special demonstration unit, but in the real-life situation in the rural areas. The first steps in the introduction of the concept must involve the initiation of viable village-level activities.

5.2 Basic Principles

There is much evidence to suggest that the widespread application of appropriate village technologies represents the only way to bring about the first steps towards real progress in the development of many rural areas. It is, there*fore,* of vital importance that approaches *to* the dissemination of these technologies should be carefully planned and should be applied with great care and with the necessary sensitivity to the local situation.

All too often, there is a tendency to think of village technology . consisting of a virtual cornucopia of "gadgets" ready to be poured out into the rural areas. It is true that many of the concepts of this technology are expressed in *terms* of various devices, but it cannot be assumed that all or any of these in their present form will necessarily meet real needs or achieve ready and universal acceptance in any particular area. As indicated in earlier chapters, the essence of appropriate technology is really an attitude of mind which seeks to assess the local situation, to identify its inherent potentiais, and to suggest various options which may exist for technological improvement.

It is also most important to recognise the necessity for the appropriate technology to grow out of the existing needs and existing practices of a society, as something with which the people can be fully identified and involved, and which they are able to understand.

Thinking based on "introduction" of appropriate technology tends to foster an attitude that the technology is something brought in from outside. Whereas, it would probably be more useful to think in terms of the "generation" of the technology within the society. Such an approach would acknowledge the fact, that whilst the technology may arise as a result of introducing and applying a new principle or a new idea, the final result will be a synthesis between the introduced idea and the local materials, inputs, and skills used in its application.

5.3 Basic Guidelines

The following guidelines on application of appropriate technology are derived from the presentations and discussions in the Seminar.

For the successful introduction of a tool, device, or machine it must:

1. Help to meet a high priority need felt by the family.
2. Be proved to be practical and serviceable.
3. Be capable of being provided and installed without undue strain upon family or community resources of: cash; time; tools; materials and space.
4. Not need unavailable assistance or skills from outside for its installation.
5. Be readily used and maintained using only the resources and skills of the community or those readily available.
6. Meet the expectations of the people whilst creating a minimum of anxiety and relationship problems within the family, or with neighbours, trading partners, or local leaders.

To assist communities to adopt devices which meet their needs, the "change agents" must have:

1. Understanding of people and their culture when these are remote from their own.
2. Skills in meeting people and encouraging them to discuss their needs and problems.
3. Ability to adapt to changing circumstances as they arise, and to utilise existing leadership whenever possible.
4. Technica! competence in relation to the devices proposed and to the appraisal of the appropriateness of existing tools etc.
5. Language sensitivity, ability to work through an interpreter.
6. Understanding of his/her role and ability to plan a programme and adhere to the sequence chosen.
7. Ability to organise, to select collaborators, and to choose, initially, projects that will quickly show results.
8. Sound motivation, and ability to accept setbacks with equanimity.
9. Ability to perceive the political/institutional climate in which he/she is to work, and to respond appropriately to changes in that climate.

Agencies wishing to encourage the adoption of tools and devices embodying the principles of simple technology can assist by:

1. Recruiting, employing, training, and supporting, in the promotion of simple technology, either their own "change agents", field or extension workers. or aiding in the work of other agencies able to do this.
2. Providing or sponsoring demonstrations of simple technology items, and supporting these with publications.
3. Encouraging university departments, polytechnics and a wide range of other bodies to work on the development, modification, adaptation, trial, and utilisation of appropriate technology items, and the dissemination of needed skills.
4. Incorporating into all existing extension programmes, the promotion and dissemination of appropriate technology items.
5. Spreading information through appropriate media, drawing wider attention to developments in appropriate technology.
6. Organising workshops in which extension personnel and community leaders learn about and construct or assemble and install suitable and needed simple devices and machines, and test them for efficiency, durability, and maintenance costs.
7. Encouraging the incorporation in the curricula of educational and training institutions, development of skills and mental attitudes needed for making devices embodying the principles of village technology, or the use in courses of such items.
8. Encouraging their own staff to test and utilise village technology items.

9. Giving encouragement to new institutions which can transmit the skills and develop the artefacts of village technology.
10. Stimulating the ready availability of low cost materials not available in villages at present.
11. Working with other agencies and departments to share the field on agreed principles but also jointly to promote development and use of village technology.
12. Encouraging overseas donor agencies to incorporate the approach of village technology into their thinking, the training of their staff, and their programmes.

5.4 Disseminating the Ideas

The process of communication in development extension has often, in the past, consisted mainly in attempts to transfer information in one direction only – downwards, from the "experts" to the people. However, the emergence of a new orientation towards project support communications in development has, in recent years, focused attention on the nerd for a two way traffic which involves, not only a feedback of reaction to downwards-transmitted information, Out, also, a conscious planning of a dialogue in which the views of the people are sought as equal partners in the process.

It goes without saying so far as appropriate technology is concerned, that the "people-upwards" element is likely to be equally, and, in most instances, more important than the "experts-downwards" approach. As is pointed out in Chapter 2.2 ii is necessary to obtain the "inside" viewpoint as to the nature of the problems to be solved before an appropriate technology can be developed. Similarly, the "inside" view will be very necessary if we are to communicate the principles, ideas and concepts which are involved.

5.5 Use of the Extension Services

The normal channel of communications which first comes to mind for the extension of ideas in the rural areas is the extension cadre of field workers, and the question as to how this, often thinly spread, hard-worked but, usually, dedicated group could be involved is worthy of serious consideration. There is the perennial problem of deployment of extension workers, usually numbered in hundreds, to serve disperse populations comprising several millions, and the vast workload which constantly falls upon the extension services. The rural extension worker, whether in the field of health, agriculture, or community development, forms the front-line communications link with the people, and is most likely to provide an important link in the two-way communications process.

In the field of health.

Whether the extension worker will have the time, amongst many other pressing routine duties, to become effectively invoived in the generation of appropriate technologies, is, of course, another question. It may well be that a convinced department which sees the value of particular technologies in improving its service to the people, would be willing to divert some workers to this task or to incorporate the development of technologies of particular relevance amongst the normal duties of the extension worker. This is already happening in at least one country in Eastern Africa, where, in recognition of the importance of food and crop conservation, and the value of home conserved foods in child feeding, field extension workers of the Ministry of Agriculture, including home-economics personnel, are devoting part of their time to promoting the ideas of improved solar drying and improved crop storage and use.

Whatever the role of the existing extension service might be, it is clear that where it is to be involved, special orientation training would be needed. This would apply to the function of eliciting real needs as well as to that of providing information on appropriate technologies. It is probably important to recognise that many extension workers have been trained to promote "western" forms of technology, and the switch to localised technologies may not always be made easily.

The nature of the training to be given to extension workers also needs consideration. It would be unreasonable to expect that a particular extension worker whose main function lay in a specialised field could be converted overnight into a village technology "expert" with competence to advise on the appropriateness of a wide range of technologies, and also with the ability to guide and participate with the people in the construction of any particular item from the wide range available. Whether other duties would allow devotion of the amount of time needed for such activities also has to be considered. A further important factor in many countries is the fact that high cost and scarcity of fuel may restrict the mobility of the extension services. The possible role of the extension services will need to be defined in relation to the conditions pertaining in any particular country.

One possible approach would be through providing the extension workers with general orientation training which would help them to identify local problems and local resources of skills and materials, and which would also give them awareness of the range of options which might provide solutions. At the same time, a cadre of selected extension workers could be trained in specific skills, e.g. the construction of improved granaries, or water storage containers, or various home improvements, so that these people could be called upon to help in the initiation of specific projects.

5.6 Demonstrations

The value of practical demonstrations of specific items, i.e., as at the Karen Unit, should be stressed, and the existence in a country of this type of unit would provide a valuable focus for development. In addition, smaller demonstrations, possibly of items related to specific functions (e.g. food conservation or water conservation) could be provided at rural training centres, where they would receive a wide exposure to extension staff and to ***local*** farmers and others visiting these centres. For example, one country intends to build food drying and storage units at District Farm Institutes. These will not only be used as practical demonstrations, but also as working units to conserve the foods produced on the Institutes' farms which will be used to feed farmers and staff attending residential courses. Similar "working" demonstrations of many other possibilities would also be possible at such centres.

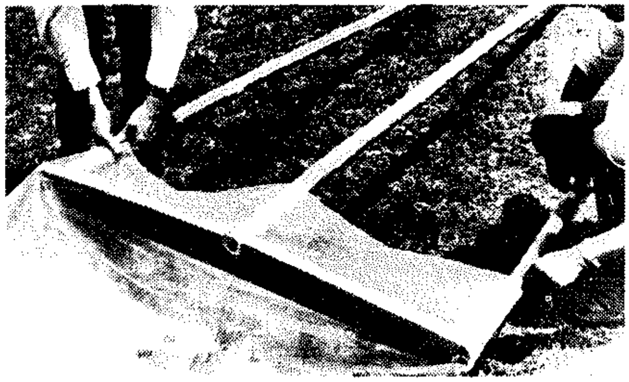
Demonstrations.

However, the most compelling demonstrations will be provided 'by adoption and use of various technologies by the people themselves. Adoption in a number of widely scattered areas should lead to rapid proliferation of technologies which are *really* appropriate since such technologies will "sell themselves". The "bush telegraph" is still one of the most effective communications media in Eastern Africa. An excellent example is the rapidity of the spread of the metal digging hoe in areas where wooden hoes were formerly used. Once the people discerned the advantages of this "appropriate technology" there was no need for an extensive promotion or extension campaign. Thus the "seeding" of various technologies in a number of scattered locations should lead to proliferation of the ideas which are truly appropriate.

This process should also help to identify the shortcomings and need for modification of the less acceptable approaches. This "seeding" approach can only work effectively in areas where the original innovators amongst the people have fully mastered the construction methods involved, and are able to pass on the necessary "how-to-do-it" information to their neighbours.

5.7 Generating the First Model

Before any process of replication can take place within the rural areas, some rural people, somewhere, will need to construct and use the first model of any item or device. Rural people and, indeed, many rural extension workers will find it difficult, if not impossible, to work from instruction leaflets or drawings. Experience in developing the Karen Unit indicated that even highly educated people with engineering and building skills sometimes found it difficult to interpret various concepts in terms of locally available materials. Thus, instruction leaflets or manuals, even if they are produced in a very painstaking and detailed manner, may be of limited value in the rural situation where people measure by eye and by rule of thumb, rather than in inches or centimetres, and where interpretation of a detailed drawing may prove to be well nigh impossible.



Generating the first model.

The production, by the people, of the first model, under the guidance of a skilled "interpreter" would seem to offer the best possibility for translation of concepts into practice. The main value of producing instruction leaflets or manuals would, thus, seem to be in relation to use by skilled interpreters rather than for use by the people or by the field-level extension workers.

5.8 The "Interpreters"

There is a very wide range of possibilities for the development of a cadre of skilled people who could provide the "know-how" inputs needed for generation of appropriate technology developments.

Extension workers from various ministries could be trained to deal with specific elements. For example; agriculture or home economics personnel could deal with food conservation and use, and some home improvements; community development or health personnel could deal with home sanitation and water supplies etc., etc.

The development of special village technology skills amongst the existing village artisans-the carpenter, the builder, the blacksmith or tinsmith, and the many other "specialist" members of rural communities also offers great potential. This particular approach also opens up the possibility of entrepreneurship in village technologies, and the opening up of employment opportunities in communities which can afford such services. This type of development is already in progress in Kenya through the Village

Polytechnic Programme for which the Karen Village Technology Unit forms a "technical" base. The use of existing artisans would possibly be more related to "consumer items" rather than the domestic "self-help" items such as improved granaries. There is also a need to be aware of the possibilities which such entrepreneurship holds so far as the development of a local "monopoly" on particular items might be concerned. If a profitable skill is restricted to a few individuals, there is a possibility that the "do-it-yourself" approach, which must form a large element of successful village technology, may be stultified to some extent. Obviously, more technically complex items which require the use of some special skill such as carpentry or soldering will require the artisan, but a careful approach, mindful of existing social authority structures, and the impact of particular technologies on these structures, may require careful consideration (see Chapter 2). One quotable example is that of a situation where a number of village women currently earn a small income by the hand-shelling of maize. The introduction of a hand-operated mechanical maize sheller into this situation could put these women out of work and transfer all of the profit to the one individual who possessed the maize sheller. Each situation needs to be considered on its own merits.

In addition to the "formal" sector of extension, the possibility of "sandwich" training of volunteers from local communities in village technology skills also needs to be considered. It may be possible to envisage a situation where people from a community could be trained in one particularly appropriate skill, and could return at appropriate intervals to be trained in additional skills appropriate to the needs of that community, thus building up, over time, a range of appropriate skills.

The existence in many countries of voluntary or nongovernmental agencies which are concerned with various practical aspects of rural development can also be regarded as a potentially valuable "extension service", particularly in so far as the widespread "seeding" of various developments is concerned. Units of these organisations. often associated with religious groups, can often provide skilled or semi-skilled manpower and could serve as the "interpreting" and training link in many cases. Establishment of contact with these organisations and achieving their awareness and motivation would seem to be an important factor. Since they normally operate in very close collaboration with existing government services, the establishment of coordination should be a relatively simple process.

5.9 The "Modular" Approach

Some *village* technologies require a certain minimum of artisana! skill but yet do not require a fully trained and experienced carpenter, pipe fitter, or tinsmith. The modular approach to skill training which teaches only the specific skills necessary for a defined task may have considcrahlc relevance in training for appropriate technology developments. This approach is described below.

In the modularapproach each "learningactivity" is considered as a totally separate entity. The approach seeks to establish self-contained *units of learning*, and a broad definition of a "modular unit" would thus be a self-contained series of learning activities which is restricted to a single concept of subject matter and leads to a well defined educational goal.

In applying this approach to skills training, it is necessary to be consistent in determining exactly what is "a single concept of subject matter". The ILO, who have been working on. the application of the modular approach to skills training for some years, decided that this should be related to a "task" and defined a task as being: the unit of a job which represents a complete piece of work (product, service or decision) which stands on its own and whose output can be described in measurable performance objectives.

A modular unit for skills training purposes could, therefore, be described as a limited training programme which is designed to develop in a learner the ability to perform a specified task. Ability in this context refers to the constituent, cognitive, psychomotor and effective skills.

Relating this to "appropriate technology", modular units can be developed to cover a range of "domestic items", home improvements, or more functional items such as solar driers, storage cribs, storage silos, etc. These modular units, if prepared with due consideration to the background of the learners, can then be used in a variety of training programmes.

If the programme is operating in a "formalised" system-i.e. the "Village Polytechnic" scheme or in "basic education"-then the units can be grouped relative to the respective aims and objectives of that training. However, by selecting units appropriate to the learners' environment, then training in the formal situation is "meaningful" while developing manipulative skills. If the training is aimed at "vocational preparation" then such units could be included to cover the aspect of "self reliance", while other units could be included to deal specifically with tasks related to employment opportunities.

Developing manipulative skills.

The modular approach could also have a significant impact on "non-formal" training programmes. Here, a person wishing to better his/her work techniques could take one or more modular units (as time or inclination decides), practise the skills involved, and then return for further training as the needs change. This training does not have to be continuous over a long period of time. Likewise, a person wishing to develop his/her way of life could take modular units dealing with one or more items of interest, fabricate these items with the aid of the learners' study guide, and then utilise the items produced.

These examples do tend to illustrare the aspect of flexibility of the modular approach relative to the aims and objectives of the training. In the former example the training could be considered as a part of a long-term progressive programme. In the latter case, the training is more directed towards the production of items on a "do-i:-yourself" basis.

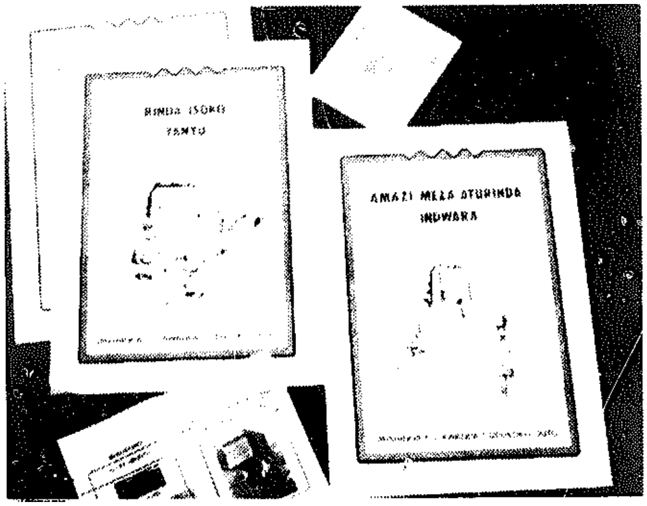
5.10 Communications Techniques and Media

Although the major content of this chapter deals with "communications" in the broadest sense there is also need to consider the particular communications techniques which may be useful in assisting the development of village-level technology projects. There should, in fact, be a specific communications element built-in to the design of *any* specific project, since its success will largely depend on awareness by the people of its existence, of what it can offer, and as to how it could affect their lives.

Awareness of potentials may be stimulated in many ways. One of the most important could be the use of radio, particularly if information programmed could be cast in an entertainment format. The use of the printed word could also be important since, although literacy rates are still low in many rural areas, illiterate adults could find school children to read to them. The use of local artists to produce posters or illustrated material in styles with which the local people were familiar could also be a good medium for presentation of simple messages.

For some aspects such as explaining the application of particular technologies to rural people the provision of simple slide sets with vernacular commentaries could be very valuable. For the more "technical" approaches of explaining the construction of particular items to trainees or "interpreters" the use of more detailed slide sets could be invaluable.

Use of radio



Local artists to produce posters.

It is possible that, in the initial stages, the rural people will be more interested in illustrations which show what the technology *does* as opposed to its principles or how it is constructed. Awakening of interest by slide sets showing the practical *use* of the technology might then lead to greater interest in the "how-to-do-it" material.

So far as the production of these visual aids is concerned, there could be great advantages in use of localised material which people can recognise as referring to their own area or their own particular culture. Simple kits which could enable local field workers to make their own film strips are currently under development, and could have an important role in achieving local identification of visual aids.

In addition to the "awareness" element of the communication process there will also be a need for simple how-to-do-it leaflets for use by the local "interpreters" and as the basis for transferring training information from one country or area to another.

However, it is felt, that where possible, the best visual aid is "the real thing" and that the practical demonstration and the learning-by-doing approach will have a primary role in village technology communications.

5.11 The Operational Base

It is recognised that the successful implementation of village technology programmes or projects requires an operational base which will serve the general functions outlined for the Karen unit in Chapter 4.2.

The availability of a training centre or centres within a country will be a prerequisite for the training of extension or "interpreting" staff. Such units could be attached toexisting training institutions, and could form the nucleus for co-ordination of all village technology developments throughout a country or a region of a country. Their content might be general or might be specifically related to functions (e.g. food conservation or water supply development) which were of particularly high priority so far as the needs of the people were concerned.

It is obviously impossible to provide any "blueprint" which would be generally applicable in a number of different countries. Each country will have its own needs and priorities, and its own views on organisational structures and approaches. However, it is hoped that this general consideration will have served to provide some useful guidelines.

CHAPTER SIX

Inter-Agency Collaboration in Village Technology Activities

A constant and very real source of concern to agencies involved in various aspects of rural development arises from the need to achieve practical coordination of effort in fields where activities can overlap. Since village technology can embrace or infiltrate virtually the whole field of rural development activity, the need for coordination or for, at least, mutual awareness of activities of different agencies will be very necessary.

Four UN agencies in addition to UNICEF, FAO, WHO, ILO, and ECA are becoming increasingly involved in village level approaches, and representatives of these agencies provided useful statements as to current and possible future activities.

1. Current Activities

The close practical involvement of FAO over many years in the fields of practical agriculture, fisheries, home economics and nutrition gives this agency an acknowledged primacy in the field of appropriate technologies of food and agricultural developments. The examples are many and varied, including food conservation and home food preparation and use.

In addition to earlier publications in these fields the Economics and Social Programme Service has now initiated a project for production of instructional materials directed at trainers and supervisors on home techniques for use in rural development programmes. These will be in the torm of a series of single-subject pamphlets in English, French and Spanish. They are intended for global use and consequently the techniques described may need local adaption in some countries before application.

FAO also has an inter-departmental committee on Reduction of Post-Harvest Food Losses and is also working directly in this field through the DANIDA-funded African Rural Storage Centre in Nigeria.

The Economic Commission for Africa (ECA) is also deeply involved in small scale technology both at village level. through the African Training and Research Centre for Women (ATRCW) and through the Industries Division in small scale appropriate industrial development. Each of these programmes has a full-time specialist in appropriate technology provided through the Intermediate Technology Development Group.

Itinerant training workshops run by the ATRCW promote development of better food conservation and use and there is close liaison with UNICEF in this field. The ECA has also formed a Rural Technology Group to allow for discussions between different sections of the organisation. A UNICEF representative also attends these meetings. This group has initiated action on the production of a Directory of Appropriate Technology Units in Africa, and, in collaboration with FAO, UNICEF and other agencies, is organising inter-agency discussions on production of manuals for extension workers in Africa.

The World Health Organisation, in placing emphasis on primary care, is very much involved in the development of "appropriate" health technologies and the assessment of the applicability, cost effectiveness and acceptability of alternative techniques. There is already a very close working relationship with UNICEF in this field, So far as health technologies are concerned, the definition of "appropriate" or "acceptable" needs particular care. Dr H. Mahler, Director General of WHO put this problem in perspective in a recent statement to the World Health Assembly when he said, "The problem is how to reach a proper balance between the most essential health needs of populations as a whole, and the understandable desire of individuals to have what they consider to be the best health care for themselves."

The International Labour Organisation, with its concern for development of opportunities for gainful employment and a fair income distribution has been active for many years in Eastern Africa in the development of small scale "cottage" industries to encourage import substitution. Awareness of the widening economic disparities between rural and urban sectors in African countries has led in recent years to an increasing focus on the rural sector. The generation of appropriate rural developments which will lessen the urban/rural disparity and help stem the rural exodus to the towns, consequently, receives high priority,

With its primary emphasis on the motivation organisation and training of the labour force, not only in vocational skills but also in the fields of management and marketing, ILO has, over the years, gained valuable experience in the field of transference of appropriate technology in the rural areas. One example is provided by the successful development of animal-drawn equipment through the Tanzanian Agricultural Machinery Testing Unit in Arusha.

Two particularly important areas in which ILO is anxious to help are training and community participation. One facet of the ILO input in the training field is the modular approach to skills development described in Chapter 5.9-a field in which UNICEF and ILO already have a joint action programme in the Eastern African region through the ILO/UNICEF/UNESCO programme in the Introduction of Technology in Basic Education. So far as community participation in the development process is concerned, ILO is a strong advocate of the need for each community to be helped to determine its own priorities and levels of basic services. This is seen as a field where valuable collaboration with other agencies would be possible.

2. The Mechanism for Collaboration

Although most agencies are generally aware of the activities of other agencies, there is a recog nised need for more detailed awareness and for the planning of joint activity at the country level.

Country-level coordination and collaboration is seen as involving: firstly, the planning Ministry which has the overall responsibility for coordinating assistance projects, and, secondly a link-up between the assistance agencies themselves.

UNICEF, which, because of decentralisation, has on-thespot field staff in many countries, was seen as a potential focus for country level coordination. Also, the development of the UNICEF concept of a "package" of basic services for children will automatically involve a number of different agencies and will also involve consideration of the role of appropriate technologies in the development of these services. Coordination should be achieved right from the outset of project formulation discussions and UNICEF programme staff should be encouraged to take the initiative in involving other agencies in any case where it is felt that useful collaboration could be possible.

CHAPTER SEVEN

Guildelines and Conclusions

The essential property of an appropriate technology is that it should relate closely to the social and economic conditions under which it is to be applied. Thus, when one considers the wide range of technological possibilities which exist, together with the extent of social and economic diversity throughout the Eastern African countries, it becomes apparent that there can be no single formula which would be likely to embrace the needs of the region.

The necessity for the technology to respond to real needs and to the resources of the people and their environment could mean that an approach which is appropriate in one area might be totally inappropriate in another. Each situation will need to be considered on its own merits, and the decision as to what may or may not be appropriate, will generally lie with the people on the spot.

Various possibilities for practical action are discussed in this report and the following guidelines and conclusions, therefore, represent the general viewpoints emerging from the Seminar.

Guidelines

1. Improvement of the overall quality of life for the majority of the people in Eastern Africa requires technological innovation which can provide the basis for an immediate improvement in their life situation and which can also provide a foundation for further development.

2. It is clear from the experience of the past two "development decades" that the transfer of sophisticated technologies from the industrialised world has only been successful where a receptive economic infrastructure existed, and where demand for their products was adequate to meet the costs of their operation. There can be no doubt that the transfer of some sophisticated technologies is necessary for industrial and economic growth but, at the same time, there is a need for the complementary development of technologies at a level which will serve the majority of the people, mainly in the rural areas, who cannot as yet share in the benefits of the sophisticated technologies.

3. The term "appropriate" can have many connotations in relation to application of technology amongst the vast majority of the people of Eastern Africa. It implies affordable costs, use of locally available materials, and use and development of local skills. In addition, it implies approaches which are socially and culturally appropriate and which, through their full participation, can meet the needs and aspirations of the people, whilst meshing closely with their attitudes to life and their traditional social framework.

   The term "village" technology has much to commend it since it implies a form of technology which is appropriate to the lives of people whose stage of social and economic development is at the "village-level" whether they are nomadic, or live in an isolated farm, in a village, or in an urban or semi-urban setting.

4. A major difference between "village" and "transferred" technology is that the people themselves are involved as active participants rather than as passive recipients. Where at all possible, the village technology items should be constructed by the people or by those members of their community who have any special skills which may be needed. In this way, the people can achieve an insight into the practical principles involved and an understanding of the maintenance of the item, thus deriving a sense of involvement, achievement, and consequent proprietorial interest. They may also have the opportunity to modify the item so as to bring it into even closer harmony with their skills, resources and life style.

Once the people themselves, rather than the "outside experts", become the proprietors of the skills and knowledge needed to apply any particular technology, they can become the "change agents" for dissemination of the technology throughout their community and neighbouring communities.

It could, indeed, be said that the real test of the appropriateness of any technology and its ability to meet real needs, will be the rate at which it will spread once it has been carefully introduced to a community.

5. There can be a tendency to think of village technologies in terms of a range of stereotyped gadgets or devices awaiting application, somewhat in the nature of a collection of solutions in search of problems to solve. Whilst it is true that there are some standardised "solutions", such as particular types of granaries, water pumps, water storage jars, etc., etc., which have been shown, to work in particular situations, they may not necessarily be applicable in others. There is, thus, need to conceive village technology more as an attitude of mind which seeks to make the best and the most objective use of what is available, and which seeks to assess the local situation both from the practical and social aspects without fixed preconceptions, before reaching a decision as to what may provide an appropriate solution to a particular problem.
6. The technologies may be applied through the medium of constructions using "no-cost" materials such as mud and wattle, burnt bricks, stone, reeds, grass, undressed timber from trees, etc., or through the combination of these materials with "low cost" locally available materials such as dressed timber, cement, metal, water piping, iron roofing, wire netting, cloth or plastic sheeting. The basic requirement of a village technology is that it should be technically efficient and should perform adequately the task for which it is designed.
7. On the basis of affordability, the technologies will fall into two broad categories. The first will be the "family level" technologies such as cultivation implements or practices, food driers and stores, home improvement, water collection and storage, all of which are within the means, skills and capabilities of an average family. The second category would embrace the "community level" technologies, where resources of individual families would be combined to achieve developments which the individual family, by itself, could not afford; The community level technologies might include, for example, large scale crop drying and community storage, improvement of community water supplies through improving water sources, constructing wells, or providing pumps or windmills.
8. The dissemination of the concepts of village technology amongst the planners and decision makers and amongst the people themselves, is a task which requires careful consideration. The approach will vary from one country to another.

   It is agreed that a most potent tool in the process could be successful practical working examples of the type and range of technologies which may be appropriate to the particular country or the particular area, i.e. the type of examples which are provided by the Karen Village Technology Unit already established in Kenya. Such a general unit or a number of smaller units each dealing with separate fields of technology, e.g.. water technology, food conservation technology, home improvement technology etc., etc., could form useful national or regional foci for development. The establishment of such units at centralised training facilities, e.g. extension training colleges, teacher training colleges, or farmers training centres would provide a means for the automatic dissemination of the ideas through the rural areas.
9. The need for local facilities for evaluation of village technologies and for thorough field testing in the real life situation also has to be borne in mind. Widespread promotion of any particular idea before that idea has been shown to be practical and feasible in the local situation might well destroy the credibility of the whole concept of village technology in a particular area.

10. The use and the value of the printed word and various visual aids as media for dissemination of village technologies also needs careful consideration. Photographs, slides, film strips and films may have value in illustrating possibilities to decision makers both at national and community level. "How-to-do-it" leaflets may have value for use with extension workers or "fundis" at a medium technical level, but it is unlikely that they will be useful for use with people at village level. We are, thus, brought back to the conclusion that the most effective visual aid is a practical working example.

11. It is agreed that learning from the people and from the situation in which they live, must be an essential precursor to the identification or development of a village technology which will be truly appropriate to their needs. The would-be innovator must develop a sensitivity to the cultural background, attitudes and capabilities of the people, and must, so far as possible, attempt to achieve the "inside" viewpoint.

    Unfortunately, much of the training given to various categories of extension workers in the past was based on the "outside" viewpoint and on the premise that the African peasant was "ignorant" and must be taught by the "educated" field worker. The develop ment and extension of village technologies will require a different attitude of mind, whereby a dialogue is established between the field worker and the people, and where each can learn from the other. In this way, the age-old wisdom and the environmentally aware knowledge and skills of the peasant can be combined with modern technological principles to produce the synthesis of a truly appropriate technology.

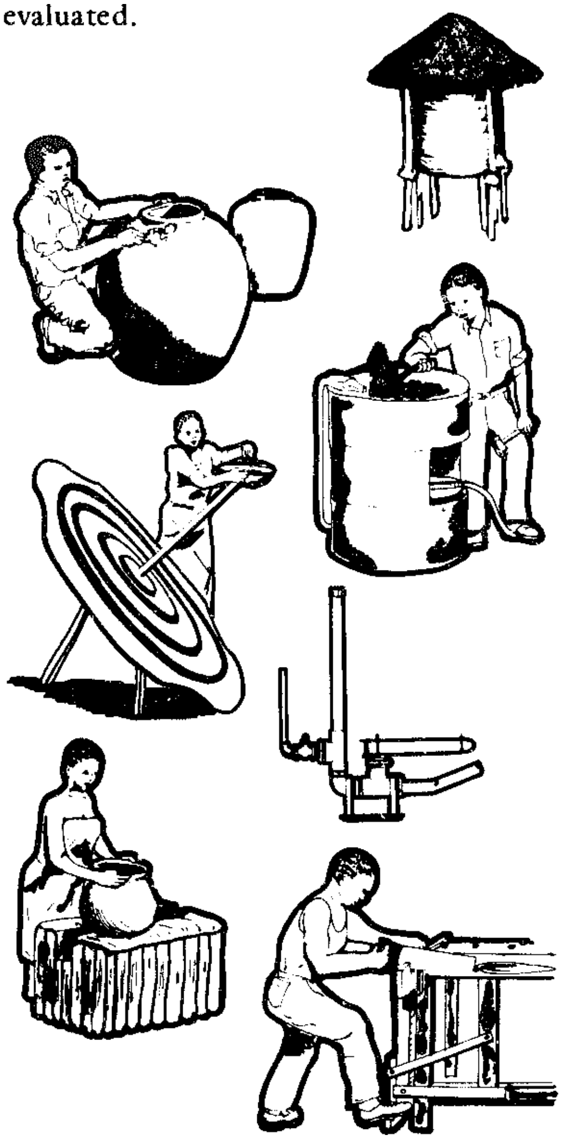
Conclusions

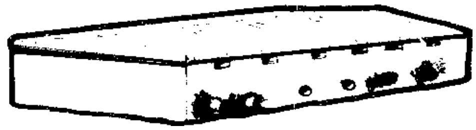
As indicated above, the Seminar did not feel able to recommend any specific technological approach as being generally applicable throughout the seventeen countries of the Eastern African Region. However, the following general conclusions became evident.

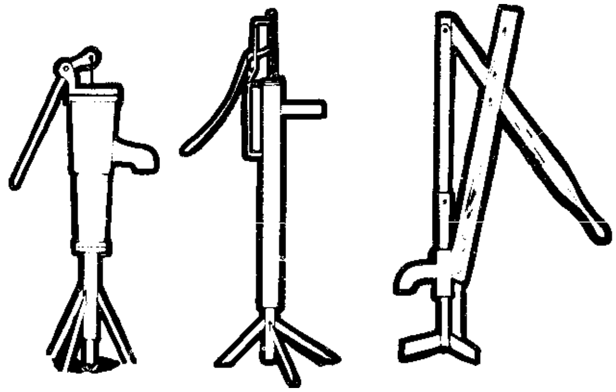
1. The outstanding characteristic of the Seminar has been the positive unanimity of acceptance of the need for action in the application of appropriate village level technologies as a necessary tool for human development in the Region. The question as to whether this form of approach was or was not necessary was never an issue. The main focus of debate centred, not on the validity of the concept, but on the means by which it could be applied.
2. The UNICEF concept of provision of basic services for children, particularly for those in the most disadvantaged and currently "unreached" situations will necessitate the application of many low-cost village technologies to improve quantity and seasonal adequacy of food supplies, to improve adequacy and quality of water supplies, and to bring about changes in environmental sanitation and improve the life situation of mothers.
3. The necessity for improvement in the quality and accessibility of water with all the related connotations of improved health and reduction of women's labour in water procurement is regarded as being the first basic services priority in many countries. Low-cost water procurement and conservation technology is seen as the only possible means to achieve these goals.
4. Current massive post harvest losses of food in many African countries result in a precarious food balance or borderline deficiency status. Apart from the fact that there is no known transferable "sophisticated" technology which can meet the food conservation needs of the subsistence farmer, the only means to abate this loss and turn deficiency into surplus is by application of conservation technologies which are within the limited means of poor families. The widespread application of currently available appropriate technologies could, it is believed, have a significant impact, not only on perennial or seasonal nutritional problems, but also on the economic status of many countries.
5. The impact of inappropriate farming techniques, and the ecological disaster threatened

by the denudation and destruction of woodlands points to a need for application of ecologically sound farming techniques and conservation of fuel sources. The application of appropriate technologies in these fields is seen to'be a necessity.-In addition, it is recognised that fuel conservation could have an important side effect in reducing the drudgery involved in collection of firewood.

6. So long as appropriate village level technologies remain in the realm of theoretical possibilities, there can be little hope of practical application. The Village Technology Unit at Karen, Nairobi provides a good example of the value of crystallising such concepts into practical form so that all the aspects of the "appropriateness" of any particular technology may be practically evaluated.







The establishment of similar units in other countries would provide a focus for the creation of awareness of practical possibilities amongst decision makers and those concerned with rural development, and amongst the people themselves. Such a unit, designed to include those technologies of particular relevance to the needs of the country concerned, is seen as a prerequisite for the development of trainingforextension of the new approaches.

7. It is essential that whatever technological approach is proposed should be thoroughly tested for functional efficiency, either in the country concerned or in a reliable institution elsewhere, before it is considered for application. Similarly, it is essential that any approach of proven functional efficiency be thoroughly field-tested for *acceptability* in the real life situation in the country concerned before there is any attempt to promote its widespread adoption.

8. There can sometimes be a tendency on the part of enthusiastic development workers to promote adoption of approaches which are designed to meet needs which the worker observes or believes to exist. Although such needs may exist and may be very real, they

may not be perceived as high priority needs by the people concerned, There is reason to believe that initial approaches which seek to meet needs which are seen as high priority needs by the people, can have an important role in establishing the credibility of the overall approach, and can lead to eventual successful approaches to the meeting of observed needs.

A preliminary assessment of the local attitudes to needs and problems is, therefore, recommended as a necessary precursor to recommendation of any particular "solution". Such an assessment should also attempt to determine whether there are any important social, cultural or economic contra-indications to the introduction of any particular technology. For example, the introduction of an innovation which may give a monopoly to an individual or a small group and which simultaneously reduces the prospects for gainful employment of a larger number of people, needs to be approached with caution.

9. In the initial selection of potentially appropriate technologies for application in any particular country or area of a country, the most useful starting point will frequently be based on the existing traditional technologres. These are, by definition, appropriate to local attitudes, skills and resources, although they may not always have adequate functional efficiency. The possibility of improvement of the functional efficiency of existing technologies should always be considered before seeking to introduce any new technological concept. The potentials which crest for improving existing grain storage facilities in many areas provides a good example as to how progress can be made in this type of approach. Recognition of the value of building upon the existing technologies reinforces the need for a careful assessment of the local situation before taking any precipitate or over-enthusiastic action.

10. Although the deliberations of the Seminar place strong and necessary emphasis on the need for culturally, socially and technically sensitive assessment of local situations, such assessments need not create undue delays. Fairly rapid identification of the people's felt needs and aspirations is in many cases possible. Immediate and effective action to meet the first of these needs should be initiated at the earliest possible opportunity.

11. Each country has its own special and unique characteristics, although the general problems of development may be common to all. Decisions as to whether the village technology approach may be useful in any particular country, and as to how such an approach might best be applied can only be taken within the country.

The organisation of a national conference or seminar may offer the best approach to development of awareness of potentials and crystallisation of viewpoints on the topic. UNICEF prngramme staff will be anxious to discuss with their Government counterparts the possibilities for UNICEF assistance towards the organisation of such conferences and the provision of any necessary resource personnel.

12. One difficulty faced by many countries will be the lack of trained personnel for village technology extension work. The training of existing staff and the incorporation of practical village technology topics in training curricula for field extension workers is seen as a high priority. The facilities available at the Karen Village Technology Unit should, ideally, be made available for initial training of personnel from other countries. Also, as soon as a nucleus of skills is developed in any country, the establishment of local demonstration and development units at extension colleges and farmers training centres should receive high priority.

13. it is evident that, in addition to UNICEF, many UN and bilateral organisations are deeply. interested in development of appropriate and village technologies. There is seen to be need for consultation, close collaboration and, where possible and desirable, active coordination of activities, in this field.

This need should be borne in mind in all cases where project or programme development is under consideration. UNICEF priorities must necessarily be sharply focused on approaches which will most directly meet the need of mothers and children, and may not be able to encompass the very wide range of "possible developments. Collaboration with other agencies in relation to specialist approaches will be necessary in the development of any fully comprehensive approach.

14. The approach to development and dissemination of village technology is possibly best summed up in the following poem whose origins are lost in the mists of history

"Go in search of your people
Love them
Learn from them
Plan with them
Serve them
Begin with what they know
Build on what they have."

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Mr A. Mensah	Community Development Officer [invited by WHO] , Ghana
Dr S. Street	WHO Representative, Addis Ababa

LIST OF PAPERS PRESENTED

1. Welcome Address by Ms A, Gindy, Regional Director, UNICEF EARO
2. Introductory briefing by Mr Alan Robinson, Chief, Food Engineering and Technology Section, UNICEF New York
3. "Social Aspects of the Introduction of Simple Technologies" by Mr N. Scotney Consultant
4. "Simple Technology-West African Experience", by Ms J. Asare, Consultant
5. "Appropriate Technologies in Food Production" by Mr A. Manyindo, UNICEF Regional Food Programme Officer, EARO
6. "The Principles and Practice of Food Conservation at Village Level in Africa" by Mr J. McDowell, Chief, Food Technology and Nutrition Section, EARO
7. "Simple Technologies for Food Preparation and Use with Special Reference to Foods for Children" by Ms J. Ritchie, FAO/PBFL Adviser, ECA
8. "Simple Energy Technologies for Rural Families" by Professor A.K. Reddy, UNEP Consultant on Appropriate Technology
9. "Simple Technologies for Development of Water Supplies" by Mr C.K. Stapleton, Regional Water Supply Officer, UNICEF EARO
10. "A Learning Package for Rural People-The Modular Approach" by Mr G. Green, ILO/UNICEF Regional Adviser on Technology in Basic Education
11. "Communications Strategies for Promotion and Introduction of Simple Technologies" by Mr R. Tuluhungwa, UNICEF Regional Project Support Communications Officer

Panel of Rapporteurs

Mr D. Shields, UNICEF Programme Officer — (Convenor)

Mr C.K. Stapleton, Regional Water Supply Officer

Mr A. Robinson, Chief, Food Engineering and Technology Section, UNICEF HQ, New York

Mr J. Matthai, Food Conservation Engineer, UNICEF HQ, New York

Mr J. Balcomb, Chief, Communications and Information Services