

A P P R O P R I A T E  
T E C H N O L O G Y  
F O R  
A F R I C A N  
W O M E N



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The African Training and Research Centre for  
Women of the Economic Commission for Africa



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'I've been telling my own people, 'We've got to change, we must mechanise, we must have better tools. But what are better tools? Not the combine harvester. If I were given enough combine harvesters for every family in Tanzania, what would I do with them? No mechanics, no spare parts ....' But we still have to give the people better tools, tools they can handle, and can pay for. We are using hoes. If two million farmers in Tanzania could jump from the hoe to the oxen plough, it would be a revolution. It would double our living standard, triple our product!'

Dr. Julius Nyerere  
President  
United Republic of Tanzania.

'It is very important to remember that most of the problems we have been facing for years would not have become as serious as they have if, in tackling them, we had concerned ourselves more with the women of the developing world'.

Dr. A. Boerma  
Director-General, FAO.

## INTRODUCTION

The purpose of economic development is evident. It is to provide people, who currently do not have such things, with an adequate food supply, adequate clothing and housing, and access to basic services such as water, energy, schools and health services. It should also aim at providing a means for earning income which can be used to purchase any essential foods or services which cannot be provided by the individual household. These basic components of a decent human life, which are taken for granted in most of the developed countries, are still denied to the vast majority of people in the countries of the Third World.

Past development strategies have stressed maximization of output through emphasis on large-scale industries and mechanization of agriculture, and have emulated the standards of the West by providing, for instance, modern hospitals and individual water connections in the major cities while the needs for improving basic services in the vast rural areas have been neglected. Modern technology does, of course, have its place. In the overcrowded cities of the Third World highly complex water and sewerage systems are an absolute necessity. Modern technology can also play its part in developing the rural areas, but unfortunately it has not usually been used to the benefit of the majority of the people in greatest need. In most cases, it has simply increased the standard of living of an already better-off minority.

It is now generally agreed that a large proportion of the problems currently being experienced in developing countries have been caused, or at least aggravated, by a concentration on modern 'Western' technologies which have been used to develop the 'modern' industrial and agricultural sectors. Any solution to these problems must be based on a correction of past trends. In particular, there is a need for increased emphasis on the development and dissemination of new types of technology which are appropriate to existing conditions in rural areas and which can be used by the majority of people to further their own development and that of their communities and nations.

Modern, complex technologies are, for the moment, out of the economic reach of most rural communities in the Third World. At the same time, the traditional technologies used in these communities are usually characterized by low capital and labour productivities which do not generate the surplus needed for economic growth. There is, however, a whole range of possible

technologies which can be developed to fill the technological 'gap' between these two extremes. Rural communities could never jump straight from step one to step ten on the technological ladder -- the human, technical and financial resources are simply not available. They can, however, progress through the intermediate steps in the ladder if the intermediate technologies which are appropriate to their needs and financial means are made available.

An increased emphasis on 'intermediate' technologies promises to do much to lessen the inequalities between the urban and rural areas, and between rich and poor families. Its effect, however, will be limited unless increased emphasis is also given to the women who, especially in the rural areas, have the major responsibility for lifting their families out of poverty. Agricultural, rural and national development will be a slow and difficult process if the women, who form half of the population and, in some countries, represent up to 80 per cent of the agricultural labour force, continue to be denied access to knowledge, credit, agricultural extension services, consumer and producer co-operatives, labour-saving devices and income-generating activities.

It is unfortunate that many of those who make a case for appropriate technology neglect the importance of women in development. It is equally unfortunate that many of those who seek the increased integration of women in development neglect the important role of appropriate technologies. Together, these long neglected, but increasingly popular areas of development theory could well represent a realistic way of meeting the needs of the poor of the Third World.

This document is divided into three chapters. The first briefly looks at the reasoning behind, the relevance and application of appropriate technology in countries in Africa. The second looks at the role of African women in the development effort and attempts to show how important it is that improved technologies reach them as well as the men. The third describes some of the village-level technologies which are currently available to help African women and looks at the work being done by various organizations in Africa in respect of approaching development through both appropriate technology and women.

## CHAPTER ONE

### APPROPRIATE TECHNOLOGY AND DEVELOPMENT

'What the poor need most of all is ..... building materials, clothing, household goods, agricultural implements -- and a better return for their agricultural products. They also most urgently need in many places: trees, water and crop storage facilities. Most agricultural populations would be helped immensely if they could themselves do the first stages of processing their products. All these are ideal fields for intermediate technology'.

Dr. E.F. Schumacher  
Small is Beautiful

## I. Historical Perspective

Unemployment has now become chronic and intractable in nearly every developing country. Whereas the industrial countries have mostly reduced open unemployment to about 2 to 6 per cent of their labour force, the comparable figure for other parts of the world is frequently over 20 per cent, <sup>1/</sup> and on top of this there are various forms of underemployment. Rapid population growth leading to pressure on the land, high wages offered by modern industry; and a lack of non-farm employment opportunities in rural areas have led to a high rate of rural-urban migration. Almost without exception, the 'modern' industrial sector has proved itself unable to absorb all of those seeking employment. Many find work in the 'informal' sector at wages which, although below those offered in modern industry, are often adequate enough to represent a rise in living standards to a worker previously able to obtain only seasonal agricultural work. Many others who make up the increase in the urban population, however, cannot find any work.

The pattern is identical in almost every country in Africa. Approximately 80 per cent of the population lives in rural areas where poor returns from agricultural work and a lack of non-farm employment opportunities offer little in the way of a brighter future. This results in a massive migration of people (especially younger people) from the countryside <sup>2/</sup> and in a growth of urban population with which urban industry has simply been unable to keep pace. The amenities which attracted people to the city in the first place are only available to the relatively few who can find steady well-paid employment. Others scrape a living by shoe-shining, brewing, selling lottery tickets and so on - jobs which circulated money, but do not create wealth. Meanwhile, from the point of view of food, the cities are parasites demanding bigger and bigger surpluses from the countryside - surplus which the countryside is increasingly unable to provide.

The situation is one which Schumacher has appropriately described as a 'process of mutual poisoning', whereby industrial development in the cities destroys the economic structure of the hinterland and the hinterland takes its revenge by mass migration into the cities, poisoning them and making

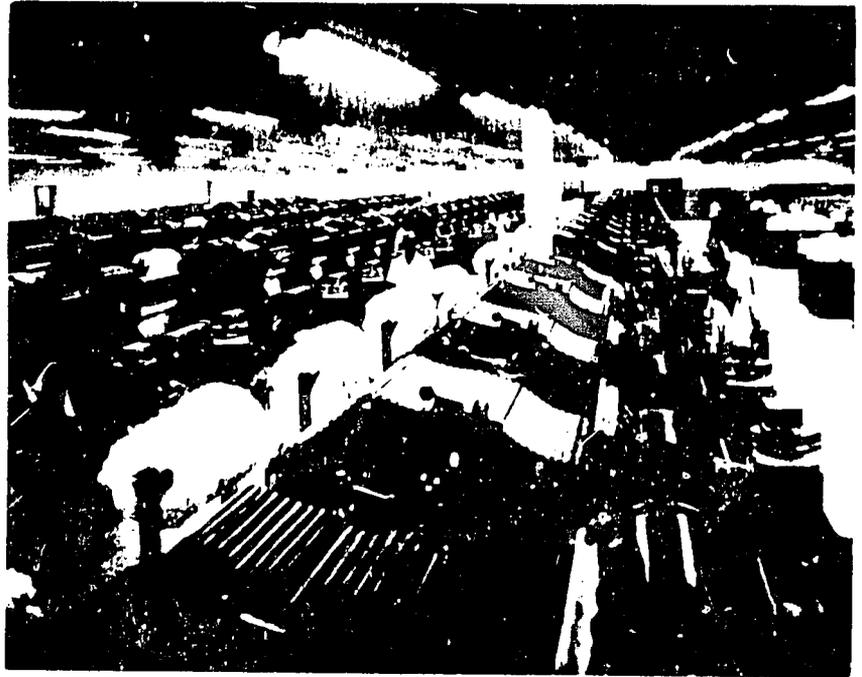
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<sup>1/</sup> Based on available data, Professor Hans Singer of the Institute of Development Studies, Sussex, has estimated that more than 200 million people in Africa, Asia and Latin America are unemployed, an unemployment rate of 25 - 30 per cent in the developing countries as a whole.

<sup>2/</sup> During the 1960's, about 200 million people moved into the cities of Asia, Africa and Latin America and some of the larger cities grew by more than 8 per cent compared with an overall birth rate of 2.6 to 2.8 per cent per annum.

Capital-intensive  
versus labour-  
intensive production

*This modern textile  
plant in the Sudan  
employs very few  
people....*



*Ministry of Culture and  
Information Photo*

*...but much needed  
jobs and incomes can  
be created if labour-  
intensive techniques  
are used as in this  
coffee-cleaning works  
in Addis Ababa*



*ECA Photo*

them utterly unmanageable. 1/ There is obviously a pressing need to reduce the urban/rural imbalance and thus relieve the pressure on African and other Third World cities.

The solution to any problem must lie in its cause. Undeniably, a major cause of the most pressing problems of the Third World has been the transfer and use of technologies which are totally inappropriate to prevailing conditions. A famous case study from one African country illustrated this point perfectly. Two plastic-injection moulding machines costing US \$ 100,000 each were imported to produce plastic shoes and sandals. Working three shifts and with a total labour force of only 40 workers, the machines produced 1.5 million pairs of shoes and sandals a year. At US \$ 2 per pair, these were better value and had a longer life than cheap leather footwear at the same price. Thus, 5,000 artisan shoemakers lost their livelihood which, in turn, reduced the markets for the suppliers and makers of leather, hand tools, cotton thread, tacks, glues, wax and polish, fabric linings, laces wooden lasts and carton boxes, none of which was required for plastic footwear. As all the machinery and the material (PVC) for the plastic footwear had to be imported, while the leather footwear was based largely on indigenous materials and industries, the net result was a decline in both employment and real income within the country. 2/

Strategies such as this, even if they have produced the desired rate of economic growth, have very obviously contributed to an inability to create full employment, to a loss of employment opportunities in the traditional sector and to the increasing rate of migration from rural areas to the cities. The problem has been compounded by a relative lack of policy measures aimed at increasing agricultural productivity, at generating rural employment opportunities and at generally improving living standards in the rural areas. Agricultural development plans, for instance, have often emphasized the increased use of imported tractors and other types of expensive engine-driven agricultural implements which are now to be found lying around, in various states of disrepair, all over Africa. These machines may be appropriate in Europe and North America, where capital and skills are plentiful and where labour is scarce, but in Africa, where exactly the opposite holds true, they are (except in a few special circumstances) far from being appropriate. Imposing imported technologies on the African farming system is unlikely to achieve the major objective of increasing food output when the skills necessary to maintain and repair complicated machines, and often the fuel and spare parts necessary to keep them running, are lacking.

1/ Schumacher E.F., Small is Beautiful: A Study of Economics As If People Mattered. (Abacus, 1974).

2/ Marsden K., 'Progressive Technologies for Developing Countries', International Labour Review Vol. 101 (4). May 1970.

In addition, the introduction of highly mechanized equipment, which was designed under conditions of labour shortages, may not just reduce the effort involved in farming, but may actually put people out of work altogether or deny them of some source of supplementary income which is essential to the well-being of the family. For example, in many parts of East Africa, women earn additional income by hand-shelling maize for large farmers. This may be a labourious and time-consuming task, but the introduction of a machine to shell the maize would cause large numbers of women to lose a source of income which is needed to help to feed and clothe their families, to pay for their children's school fees and to buy certain essential items such as salt and soap.

Similarly, in the area of provision of basic services such as water and health facilities, there have again been attempts to emulate the standards of the West by providing, for instance, modern hospitals and individual water connections in the town. These, however, simply increase the standard of living of an already better-off minority while the majority of people in greatest need receive no benefits at all. For example, a study in one African country estimated that it costs between US \$ 4,000 and 25,000 to provide one bed in a new modern hospital, while operational costs vary between US \$ 1,000 and 4,000 per bed per year. For the same expenditure, a small rural health centre could be built, equipped and maintained. Such a centre could provide at least some medical assistance for up to 6,000 people. <sup>1/</sup> Of course, modern hospitals are still needed, but millions of rural people need medical assistance and this is something they will never get if planners think only in terms of modern hospitals.

The problems to be faced are to help millions of small farmers in Africa to be more productive; to create millions of new jobs - both in farming, but even more in non-farm work - in the rural areas; and to provide millions of families with at least reasonably adequate basic services. The crucial questions which stem from these are: first, what kind of technologies are needed and, secondly, how can poor people in poor communities be furnished with the technologies of self-help?

## II. Definition of Appropriate Technology

The solution to many of the problems being faced in Africa will rest largely on the development and dissemination of new types of technologies which are appropriate to existing conditions. Such technologies will not be as complex as those which have so far been transferred from the West. Nor will they be as unsophisticated as the traditional techniques which are currently employed by millions of people in Africa. The latter, although having a high labour requirement, are usually characterized by low capital and labour productivities and do not generate the surplus needed for rapid growth in capital stock. Similarly, traditional water supplies, sanitation

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<sup>1/</sup> Gisin O., 'The Way Forward', World Health, April 1975.

systems and health services, while having little or no direct cost to the community, can have an enormous indirect cost in terms of ill-health and diversion of time and effort from productive work. The technologies which are most likely to be appropriate to the prevailing conditions and needs of the masses of people in Africa, and which are within economic reach, are those which are 'intermediate' between these two extremes.

The concept of 'intermediate' technology is best described as follows. In agriculture, an ex-drawn plough would represent a technology which is 'intermediate' between the high-level technology of the tractor and the traditional technology of the hoe or other hand-held implement. The plough will cost US \$ 80 as opposed to US \$ 800 for the tractor and US \$ 8 for the hoe. Production will be more labour-intensive than if a tractor is used and more efficient and less effort and time-consuming than if the technique of using the hoe is maintained. In addition, it is highly likely that the plough can be made by local artisans, using locally available materials, and that any necessary maintenance and repairs can be easily done by the village carpenter or blacksmith, thus creating additional employment opportunities in the rural areas.

Similar examples can easily be given in the manufacturing and services sector. Simple hand-operated tools and equipment, if made available to local carpenters, blacksmiths, tanners, shoemakers, potters and other artisans would help them to improve the quality of their product. The end product may not be of as high a quality as if modern factories had been installed, but local employment opportunities will be maintained or increased and quality, if not perfect, will be more acceptable to the consumer than if traditional techniques had been maintained. As far as services are concerned, the issue of provision of health facilities has already been discussed. Obviously, the building of a rural health clinic is 'intermediate' between the building of a modern hospital and continued reliance on traditional medical services. The health clinic may not be able to provide the ultimate in health care, but it can offer at least some assistance to hundreds of people who might have had no services whatsoever and thus suffered unnecessarily if a modern hospital had been built instead.

In essence, the technologies we are talking about are small, simple and cheap enough to harmonise with local human and material resources and lend themselves to widespread reproduction with the minimum of outside help. In Schumacher's words, these technologies should have the following characteristics:

They must provide new and improved workplaces as near as possible to where people live now - in the rural areas

- They should be cheap enough to be created in large numbers, without making impossible demands on savings or imports: that is, investment per workplace should be related to income per head;
- Production methods should be simple, place the least possible reliance on imported materials, skills and organization; and
- Production should be directed mainly to meeting local needs and using local and indigenous raw materials.

Perhaps the key phrase in this is 'meeting local needs' for if we look no further than some of the technologies required to produce the basic necessities of life - food, clothing, shelter, and community services such as health and education- the list might look something like this:

Agricultural production - tools and equipment for ground preparation, planting weeding, and harvesting, along with the basic tools and techniques required for their manufacture - blacksmithing, welding and woodworking.

Water supply (horticultural) - equipment for storing, lifting and moving water.

Crop processing - shellers, winnowers, mills, oil-extractors, decorticators, fertilizers and feedstuff manufacture and by-products.

Storage - storage equipment appropriate for different crops using local materials.

Food preservation- metal and glass containers, cooking utensils, equipment for smoking, sun-drying, packaging for different foods.

Clothing - equipment for ginning, spinning, weaving - for cotton and wool; manufacture of dyes and finishing materials; tailoring equipment; leather tanning and manufacture of footwear and animal harnesses.

Shelter - brick and tile making, lime burning, cement substitutes, small-scale cement production; soil-stabilisation; timber production and by-products; cast and forged metal fittings.

Consumer goods (not included above) - household utensils, equipment for making pottery and ceramics and manufacturing furniture, soap and sugar; cooking stoves, toys and equipment for water purification.

Community goods and services - school and medical clinic equipment, equipment for road-making, bridge-building, water supply, power sources and transport.

What we should be aiming at doing is to provide at least two or three levels of technology for each of these activities, to cater not only for people who are already within a market system, but especially for those who are wholly or partly outside the conventional market economy. The following cost figures from Tanzania show quite clearly what is meant by the need for the development of low cost technologies to fill the technology 'gap'.

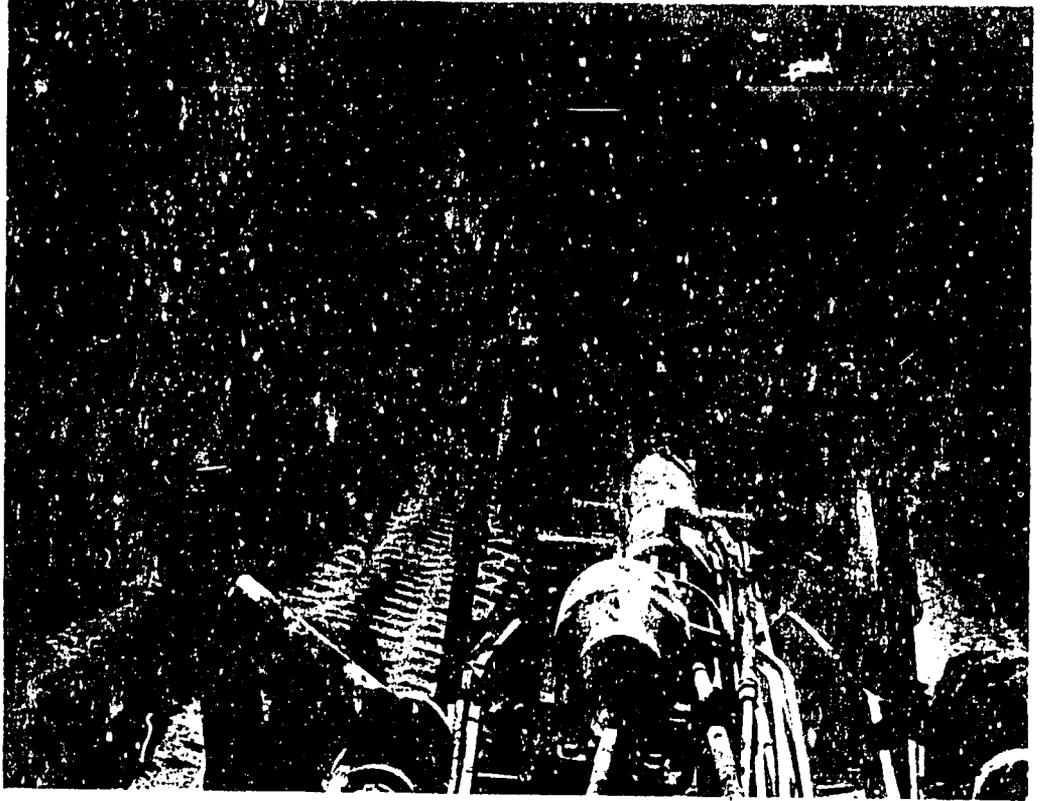
	Imported mechanized (list price)	Locally manufac- tured for sale (list price)	Village level self-help (unit cost)
(Tanzanian shillings)			
Ox-cart/trailer	5,800	710	335
Handcart	--	400	150
Cultivator	9,000	192	52
Harrow	7,250	175	60
Wheelbarrow	--	175	57
Maize sheller	--	96	53

Source: Macpherson G. and Jackson D., 'Village Technology for Rural Development: Agricultural Innovation in Tanzania', International Labour Review, Vol. 111 (2). February 1975.

The point being made in the Table is that equipment that is locally manufactured for sale meets part of the need, but a high proportion of peasant farmers cannot afford to buy it, and their need is for tools and equipment which they can mostly make themselves, out of materials to hand. The point becomes even clearer if we look at the cost of equipment in relation to income. The cheapest form of imported machinery shown in the Table would represent about five years total income of a poor family, and even that locally manufactured on a commercial basis represents a level of saving quite beyond them. For many people in a village, therefore, only the equipment prices shown in the last column would be within reach.

Choice of Technique

Roads can be built  
by machines...



*Sudanese Ministry of  
Culture and Information Photo*

...or by people who  
need extra work and  
income



It is obvious that if we continue to think in terms of high cost imported equipment, the majority of people in rural Africa will be forever denied access to the tools and equipment which they need to help them raise their incomes and generally improve the quality of life. If the people cannot adapt themselves to the methods which currently exist, then the methods must be adapted to the people. This is the whole point of 'intermediate' village-level technology.

### III. Appropriate Technology in Practice

Old habits die hard and although the crucial importance of technological choice, and especially the need for intermediate technologies, has become widely acknowledged there is still a great need to prove to development planners and other government officials, as well as to aid donors, that intermediate technology works in practice. Fortunately, there is now a growing collection of case studies which prove this only too well. The following examples, drawn from Africa and other parts of the Third World, and based on those basic necessities of life listed in the previous section, give some indication of the breakthroughs which are being made.

#### Agricultural Production

In respect of ground preparation, the step from human to animal power represents a major improvement in technique. so does the step from traditional animal-drawn equipment to improved designs. The capital and maintenance costs of such equipment are low in comparison to those of tractors. It is also more labour-intensive in production and use. In addition, well-designed animal-drawn equipment can result in marked improvements in agricultural productivity. For example, a study of farmers in Uganda showed that over 70 per cent of them significantly increased their output and their incomes by using improved animal-drawn equipment. 1/ Work in South Asia has shown very marked improvements in performance using new designs of animal-drawn equipment; in one instance the time taken to prepare an acre of land was reduced from 94 to 13 hours. 2/ If increased agricultural yields are the objective of the exercise, then expensive, employment-destructive tractors are obviously not the only solution to the problem.

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1/ Okai M., 'The Development of Ox Cultivation Practices in Uganda', Best Africa Journal of Rural Development, Vol. 8 (1 & 2) 1975.

2/ Giles G.W., Towards a more powerful agriculture. Lahore Planning Cell, Agricultural Department, Government of Pakistan, 1967.

### Irrigation Water Supply

There are numerous instances of efficient methods of pumping and storing water which use easily available materials. The water catchment tank developed in Botswana by the Intermediate Technology Development Group is a good instance of this. Using only polythene sheeting, mud or clay, and sand and cement, efficient water storage tanks ranging from 10,000 gallons to 3/4 million gallons have been successfully tested out. Nearly 90 per cent of the cost is labour cost, the rest materials cost: a demonstration of the fact that if technology is brought within the reach of the majority, labour creates capital. 1/

### Crop Processing

Pounding of cereals and extraction of oil from palm fruits or coconuts is a tedious, time-consuming and/or wasteful operation when traditional techniques are used. There are, however, several types of simple, low cost, hand-operated machines which can be introduced to help with these tasks. Several studies in Africa have shown that such equipment is more economically efficient than more sophisticated imported machines. This was true, for instance, for a study comparing four types of maize-grinding mills in Kenya 2/ and for another comparing four types of palm-oil presses in Nigeria. 3/

Another study in Nigeria compared two techniques for processing gari from cassava. This found that a locally-generated 'intermediate' technique was far superior to a fully-mechanized foreign machine. Among other things, unit costs of production were about 20 per cent lower with the 'intermediate' technique. 4/

### Storage

It is estimated that as much as 40 per cent of Africa's crops are lost to pests and insects and due to rotting during storage. Given this situation, there is obviously a pressing need to improve on traditional methods of 'on-farm' storage. This need not necessarily involve a large

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1/ ITDG, The Introduction of Rainwater Catchment Tanks and Micro-Irrigation in Botswana. (IT Publications Ltd., London, 1969).

2/ Stewart F.J., 'Employment and the Choice of Technique: Two Case Studies in Kenya Essays on Employment in Kenya (Ed) Ghai D.P. and Godfrey M. (East African Literature Bureau, 1974).

3/ Kilby P., Industrialization in an Open Economy: Nigeria 1945-66. (Cambridge University Press, 1969).

4/ Kaplinsky R., Innovation in Gari Production: The Case for Intermediate Technology. (Institute of Development Studies, Sussex, Discussion Paper No. 34, 1974).

cash outlay on modern steel or concrete silos. There are many ways in which villagers can improve on their traditional storage cribs at very little expense but with very good results. One study in the Ibadan Area of Nigeria compared the storage of maize in an improved crib (modified to allow better ventilation) and in a silo made of mud bricks with the use of a dryer to reduce moisture content to 13 per cent. Tests showed that storage in the improved crib was as efficient as in the silo and that costs were much less. 1/ Another study in Senegal also found that improved traditional storage cribs were much cheaper and equally as efficient as modern silos. 2/

### Food Preservation

Many fruits and vegetables which are abundant during certain times of the year are wasted because of a lack of knowledge on how to preserve these. Large canning factories are not the only way to solve this problem. They are not in fact usually the best way because of the problems involved in collecting and transporting the fruits and vegetables from where they are grown to the factory. A more satisfactory method would be to provide villagers with a simple, low-cost means of preserving their surplus fruits and vegetables. One such technology which has been developed is a simple solar dryer, the simplest of which can be built from mud and bamboo and covered with a double polythene sleeve. Several types of solar dryers have been built at the Village Technology Unit in Nairobi and successfully used to preserve large quantities of all types of foodstuffs.

### Household Fabrics, Clothing and Footwear

Men and women in villages all over Africa are involved in spinning, weaving, tanning and leatherworking. Small businesses and one-person enterprises based on these crafts could easily be developed to provide more employment and income in rural areas.

One successful example of this was the development and dissemination of an improved broadloom for weaving by the Technology Consultancy Centre, Kumasi, Ghana. Training in the use of the new looms was provided and a loan scheme was introduced so that weavers could pay for their looms over a period of 20 months. The first of the broadlooms purchased through the scheme yielded a good return and loans were repaid ahead of time. The resulting increase in demand for broadlooms led to the establishment of a local enterprise to manufacture these. 3/

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1/ Patel A.V. and Adesuy S.A., Crib Storage of Maize under Tropical Village Conditions in the Ibadan Area of Nigeria (Tropical Stored Products Information No. 29, 1975).

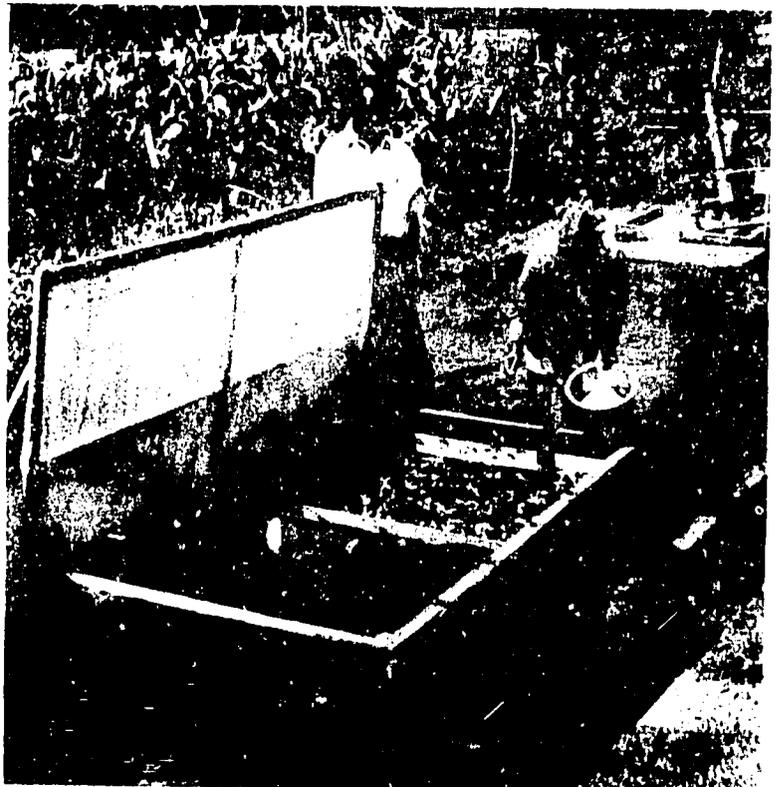
2/ Yaciuk G., Discussions des Résultats de l'Equête sur la Technologie Post-Récolte en Milieu Paysan au Sénégal (Institut Sénégalais de Recherches Agronomiques, Dakar, 1977).

3/ Powell J.W., 'A Review of Experience gained from 3 Projects at the Technology Consultancy Centre', paper presented at the University of Edinburgh Appropriate Technology Conference, September 1973.

*Improved storage  
methods do not  
have to cost  
much money*



*Surplus fruits  
and vegetables  
can be preserved  
with the use of  
a low-cost solar  
dryer*



The fact that large-scale factories are not necessarily the best way of producing footwear was proved by a study done in Ethiopia. This showed that to produce a given number of 1.8 million shoes for export, it would be more efficient to do this in 1,200 small workshops using labour-intensive techniques than in one large factory. 1/

### Shelter

Perhaps one of the most basic necessities of life after that of food is shelter. Traditional mud and thatch houses in the villages have their advantages. They are made from locally available materials and cost almost nothing to construct. The interiors are also usually fairly cool. They have the disadvantage, however, of needing frequent repair or complete re-building. They are also usually cramped, dark and difficult to keep dry and clean.

Much work is now being done on developing cheap, more durable building materials so that millions of people in the rural areas and the urban poor can afford to live in more comfortable surroundings and can be relieved of the burden of frequent repair work. There are now several small-scale brick building factories operating successfully in Africa which were set up by the Consultancy Service of the Intermediate Technology Development Group. Such plants have been located in fairly remote areas of Southern Sudan, Tanzania and The Gambia and produce hand-made bricks at a cost which is within the reach of the local communities. The Consultancy Service has also been working on development of low-cost roofing materials made from local materials. Roofing sheets made from cement, sand and reinforced with fibres of local trees were recently developed in The Gambia at a tenth of the cost of a conventional roofing sheet. 2/

### Consumer Goods

Increasingly, the production of consumer goods such as sugar, pottery and household utensils has become the monopoly of large modern factories in the cities. In the belief that such goods can only be produced efficiently on a large-scale and with modern expensive equipment, little or no attention or assistance has been given to small businesses and individual artisans in the rural areas. Small-scale technologies do exist, however, which would allow small units to produce a whole variety of these items, thus providing employment in the areas it is most needed.

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1/ McEain N. and Pickett J., 'Low-cost Technology in Ethiopian Footwear Production', paper presented at OECD, Development Centre Conference on Low-cost Technology (OECD, Paris, 1975).

2/ For more details, write to Intermediate Technology Development Group, 9 King Street, London WC2.

One famous success story comes from India. During the 1950's, small rural firms which produced traditional sweetening agents like gur were badly affected by the introduction of modern factories which produced white crystal sugar which consumers increasingly preferred to gur. This situation led to the development of a small-scale plant for manufacturing white crystal sugar. A comparison made in 1973 with the large-scale vacuum pan technology showed that for the same initial investments, small-scale plants using the open pan sulphitation technology could produce  $2\frac{1}{2}$  times as much sugar and provide employment for 11 times as many people. The competitiveness of the small-scale technology can be gauged from the fact that plants using this process now account for 8 per cent of India's crystal sugar production and have created more than 100,000 new seasonal jobs in the rural areas. These plants, which are set up in the cane-growing areas, allow for substantial savings in transport costs and can be built entirely with local equipment and raw materials. 1/

Similarly, the supply of 'traditional' domestic and kitchen utensils manufactured by village potters in India was being replaced by white-ware porcelain articles manufactured by large-scale enterprises in the cities. As a result, more than one million potters were facing the prospect of being thrown out of employment. Again, a new technology was developed to enable small businesses to produce white-ware pottery for villages. As a consequence, hundreds of units employing thousands of people have sprung up. 2/

#### Community Goods and Services

The prospect of providing the millions of villagers in Africa with adequate basic services such as clean drinking water, health facilities, power sources, roads and transport is a somewhat daunting one. It is so mainly because people have tended to think of these things in terms of elaborate piping systems, modern hospitals, electricity generating stations and heavy earth moving equipment. These may be appropriate in terms of city development, but are much less so when it comes to developing the rural areas. There are, however, numerous ways in which some basic services can be provided in villages at a realistic cost.

The spread of rural health clinics and the training of more medical auxiliaries is one way of ensuring that health services reach more people in the rural areas. In Kenya, it costs only US \$ 2,000 to train an auxiliary

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1/ Garg M.K., 'The Development and Extension of an Appropriate Technology for the Manufacture of Crystal Sugar', paper presented at OECD, Development Centre Conference on Low-cost Technology (OECD, Paris, 1975).

2/ Garg M.K., 'Problems of Developing Appropriate Technologies in India', Appropriate Technology Vol 1 (1) Spring 1974.

as opposed to US \$ 20,000 for a medical graduate. Similarly, in Uganda, it has been estimated that 20 auxiliaries can be trained for the same cost as one graduate. 1/

Power in villages does not have to be provided by electricity, Solar energy, wind and water power and methane gas are all alternatives. One study in India showed that in a village of 500 persons, 250 cattle and 100 houses, a bio-gas plant produced enough energy output for 10 pump-sets, 5 industries, one light in every house, energy for cooking in every home, and a variety of miscellaneous purposes. It also produced about 295 tonnes per year of organic manure. 2/

Roads do not have to be built by machines. Studies have shown that it is technically feasible to substitute labour for equipment in all but 10 to 20 per cent of total construction costs, and for all but 2 to 15 per cent of costs if an 'intermediate' quality is acceptable. 3/ Labour-intensive rural road building is also an ideal way of providing much needed work for a relatively large number of people.

#### IV. Implications of Appropriate Technology.<sup>4/</sup>

The choice of technology determines who gets work (and, therefore, the income, skill and self-reliance that go with it) and where work is done (that is, the geographical distribution of industry and capital formation). It has a considerable influence on the kind of infrastructure required, patterns of education and training, and the extent of economic self-reliance or dependence upon foreign countries. A great deal turns on whether or not a country has real technological choices open to it.

To mobilize and make widely known appropriate, adaptable technologies is one part of the task and one to which the aid-giving countries and UN agencies can make a major contribution. But the widespread adoption of new and improved technologies, especially in the rural areas, also demands unconventional approaches. This applies especially to the creation or

1/ Elliot K., 'Using Medical Auxiliaries: Some Ideas and Examples', Contact (Christian Medical Commission, World Council of Churches, October 1972).

2/ Prasad C.R., Prasad K.K. and Reddy A.K.N., 'Bio-gas Plants: Prospects, Problems and Tasks', Economic and Political Weekly, Vol IX Nos 32-34. August 1974.

3/ International Bank for Reconstruction and Development/IDA, Study of the Substitution of Labour for Equipment in Road Construction. (Mimeo, October 1971).

4/ This section is largely extracted from McRobie G. and Carr M., Mass Production or Production by the Masses? Technology: A Critical Choice for Developing Countries. (ITDG, London, 1975).



*United Nations Photo*

*At least some health care can reach the rural poor by training more medical auxiliaries*

strengthening of facilities through which new technologies can be brought within the reach of rural population. Decentralized 'production by the masses' requires a different system from that dictated by highly centralized mass production.

Today there are signs of a growing awareness among the countries which supply the industrialized part of the world with much of its raw materials, that their best interests are not served by continuing to export raw materials in their natural state; and that they should progressively secure the benefits of 'value added' by processing and manufacturing within their own boundaries.

What is less (as yet) widely recognized is that the same holds good within a country. The rural areas will remain the poor relations of the cities, and life in the rural areas will continue to deteriorate, unless new work and new income opportunities are made available to rural communities. The production of agricultural surpluses can only be made more attractive to producers if they are given a share of the value added by means of local processing and manufacture; this also makes sense at a time when transport costs are rising rapidly. But the highly centralized capital and energy-intensive technology of the industrialized countries stands in direct opposition to this pattern of development. A policy of bringing industry to the rural areas, and maintaining a balanced structure within a country, requires virtually a complete reversal of the forces that have shaped the present structures of the main industrialized countries. Decentralized, relatively small-scale production units, which enable very large numbers of people to get more productive jobs, can maximize local (and national) self-sufficiency, and open the way for further development of local skills. This is exemplified in the Tanzanian approach, based on the Ujaama village and the internal Region. There is obviously no rule of thumb as to what constitutes the 'right' size unit for creating a balanced structure within different countries. The main point in the present context, however, is that the supporting structures and facilities required to build up and service integrated rural communities are likely to differ very considerably from those developed in the rich countries.

There will be far more emphasis, for example, on work-oriented primary and secondary education; on the development of an industrial, as well as an agricultural, rural extension service; on credit facilities that actually reach and help small farmers and local manufacturing units; on training facilities that are based on locally available technologies, raw materials and local management requirements; on rural health services; and on other facilities such as for transport, marketing and recreation, all aimed at maximizing local activity and minimizing imports. Such developments go far beyond 'technology', but in every case technology is one of the critical inputs, and it is quite certain that a much greater, deliberate and systematic effort is now required: first to mobilize knowledge about practical technological alternatives and then to get them into the hands of people who can use them.

CHAPTER TWO

WOMEN AND TECHNOLOGY

'Woman of Africa  
 Sweeper  
 Smearing floors and walls  
 With cow dung and black soil  
 Cook, ayah, the baby on your back  
 Washer of dishes,  
 Planting weeding, harvesting  
 Store-keeper, builder  
 Runner of errands,  
 Cart, lorry, donkey...  
 Woman of Africa  
 What are you not?'

Okot p'Bitek  
 Song of Ocol

'Rural women do most of the agricultural work ..... but the  
 modernization programmes are all addressed to men'

Mae Jeanne Zongo  
 President, Fédération  
 des Femmes Voltaïques.

## I. A Myriad of Tasks

If intermediate technology holds out the promise of a release from unproductive back-breaking labour, of increased agricultural yields, increased employment opportunities, better provision of rural services and a slowing down of the rate of rural-urban migration, then there can be little doubt that those who stand to gain most from such changes are the rural women, who are the drawers of water, the hewers of wood, the food-producers and often the overall providers for the families of Africa.

In most of rural Africa, the women rise at 5 o'clock in the morning and go to bed at 9 o'clock in the evening or later. They work in the fields for 9 to 10 hours a day - often more in the busy agricultural seasons. They do most of the seeding and harvesting and often do the clearing, preparation of the fields and planting. They fetch water, at some seasons 2 or 3 times daily, walking 2 kilometers or more each way on each occasion. They collect and carry wood home. In addition, they look after children and old people, clean, wash, cook and preserve food for the family and frequently help with the storing and marketing of the produce on the farm. In all, these tasks can amount to as much as 16 hours a day at some times of the year. 1/ Despite this, they are still often obliged to find at least some time during the day to spend on vegetable growing, soap making or some other activity which can supplement their income in order to pay school fees or purchases items such as sugar and salt. They also often participate fully in community projects such as building roads, schools, clinics, community centres and wells. In Lesotho, for example, women are estimated to build ninety per cent of the roads and in Kenya, they are responsible for about eighty per cent of all self-help labour. 2/

Evidence shows that life for the rural woman has been getting harder over recent years. Worsening drought conditions in many African countries mean that women have to walk further distance and for more months during the year to collect water. A recent study in Ethiopia revealed that in 75 per cent of the households under survey, the women spent 3 hours or more on a single journey to collect water. 3/ Women in many villages in Upper Volta set out to collect water at dawn and rarely return with their daily supply before noon. 4/

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1/ ECA/ATRCW African Women: Today and Tomorrow (UNECA, Addis Ababa, 1975).

2/ ECA/ATRCW, 'Women and National Development in African Countries' The African Studies Review, Vol XVIII No. 3. Dec. 1975. p. 65.

3/ ECA/UNICEF, Improving Village Water Supplies in Ethiopia. (ECA, Addis Ababa, 1978). Table 2.9.

4/ Carr, M., Report on a Visit to Upper Volta, Nov. 1976. (ECA/ATRCW, 1976)



*Women in Africa form 60 to 80 per cent of the agricultural labour force. They are also almost totally responsible for collecting and carrying water, wood and other commodities*

In most countries, the land area under forest or woodland savanna has fallen drastically during the last two decades as more and more trees have been cut down without being replaced. In The Gambia, for example, the land area under forest has dropped from 28 per cent in 1946 to only 3.4 per cent, while the area under woodland savanna has dropped from 31 per cent to 4.6 per cent. 1/ This means that the women have to walk further and further distances to collect firewood.

As soil on rainfed fields becomes depleted through overuse and a lack of fertilizers to restore nutrients, women have to cultivate larger and larger areas of land so as to produce the basic amount of food which is necessary to keep their families at subsistence level. In one country in West Africa the fact that the average life expectancy of women has been falling over recent years (it is now 35 years as opposed to 52 years for men) is widely attributed to the extra strain involved in cultivating an increased acreage of land.

In addition, as the rate of rural-urban migration increases with the 'pull' of possibilities of high wages and modern amenities in the cities, and the 'push' of lack of income and basic facilities in the rural areas, the women are often faced with the added burden of having to manage and operate the entire farm and household without any help at all from their husbands and eldest children. The 1969 Kenya census indicated that one third of rural households are headed by women; estimates for Lesotho are even higher. 2/ A survey in Mali showed that 16 per cent of families depend solely on a woman, and a study among Yoruba families in Nigeria showed that one fifth of women received no support from their husbands. 3/

In a situation where women are having to spend more and more time in performing their traditional tasks and are also given additional tasks as their men are drawn away into the 'modern' sector in the towns, it is not surprising that agricultural productivity in the subsistence sector declines. The women also have less time left to engage in supplementary income-generating and self-help activities, so family members left in the rural areas have fewer consumer goods and fewer of the basic community facilities such as roads and schools which, along with more food, are the necessary first steps in slowing down the rural-urban flow.

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1/ Department of Agriculture, The Gambia, Land and Vegetation Degradation Survey: the Need for Land Reclamation by Comprehensive Ecological Methods. (Department of Agriculture, Yundum, 1975).

2/ Tinker I., 'The Adverse Impact of Development on Women', Peace Corps Program and Training Journal, Vol 1V No. 6, 1977. p. 4.

3/ ECA/ATRCW. Women of Africa: Today and Tomorrow (ECA, Addis Ababa, 1975), p. 30.

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WFP Photo



*When men migrate to the cities, women take on additional responsibilities such as building and repairing houses*

## II. The Forgotten Workers

The main problem in all of this is that the economic contribution of the women to the household, the community and the nation as a whole is always undervalued and quite often overlooked altogether.

Delivery of water and fuel to the house (whether by pipes, van or cart) is a service which has to be paid for in the towns. It is also a service which obeys the normal laws of supply and demand and becomes more expensive if the commodity becomes scarcer, further distances have to be travelled to collect it and more time spent in acquiring it. For instance, the increasing shortage of firewood in the Sahelian Zone has caused prices to rise to such an extent that many families in towns and cities such as Niamey, Niger, spend up to 20 per cent of their income on wood. A common saying in this part of Africa is that 'Il coute aussi cher de chauffeur la marmite que la remplir' (It costs as much to heat the pot as to fill it). 1/

Thus, when put in terms of cost, labour has its value, and because a worsening situation can be easily defined in terms of cost, it becomes a subject of immediate concern. In the rural areas, however, it is the women who perform the service of bringing water and fuel to the home. There is no question of payment involved in this. In fact, it is not usually even considered as work, but merely part of the women's household tasks. When water and fuel becomes scarcer, as they have been doing in many African countries, the women have to walk further distances and spend more time on these activities. Just as the original burden was overlooked, however, so is the additional one.

Similarly, most families in the rural areas would starve to death if the women did not work for much of the day in the fields to grow the food to feed them. It seems inconceivable that a contribution of this nature could be overlooked and yet this is precisely what has happened. All the modern tools and techniques, the fertilizers and credit have been steered into plantation agriculture and large irrigated rice schemes, while the women have been left to struggle in their rainfed fields without any of the new techniques and training which are needed to raise yields. As with water and fuel collection, agricultural work done by family members is not recorded as 'work' by statisticians, and since statistics do not show women working, planners do not plan for women to work.

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1/ The IDRC Reports, Vol. 4. No. 4. December 1975. (IDRC, Ottawa).

Even when attempts have been made to increase productivity in the subsistence sector, Western-oriented stereotyped ideas about the sex of the farmer have led to a lack of positive results. In 1974, for instance, Liberia decided to try to encourage wet-rice cultivation and brought to the country a team of Taiwanese farmers. To assure attendance at the demonstration planting, the government offered wages to the observers. Many unemployed men participated in the experiment while the women continued their work in the fields. 1/

Failure to study the division of labour between the sexes can also have far-reaching effects in the 'modern' agricultural sector. Cash crops are usually the responsibility of the men because the element of money has been introduced, but it is often the women who do most of the work on these farms in addition to maintaining their own. Thus, in one West African country, although extension workers had shown the men the correct depth to dig the holes, coffee continued to die due to bent tap-roots because it was the women who were doing the digging. 2/

The same sort of thing happens when it comes to the weeding, harvesting, storing and processing of crops. Again, these highly tedious and time consuming tasks, which are almost totally the responsibility of the women, are considered as household duties rather than 'work'. The major technological thrust towards increasing supplies of staple food crops in Africa has been the introduction of tractors and improved animal-drawn equipment to allow greater acreages of land to be ploughed. When such equipment is introduced, the men (attracted by the novelty of the machinery and the promise of more money with a minimum of effort) usually take over the task of land preparation from the women. One wonders, however, if any thought at all was given to who would weed and harvest the extra acreages of land and thresh and winnow the extra yields, and to how this would be done. Very little progress has been made in respect of introducing equipment to allow these tasks to be performed more quickly and efficiently and even African women have only one pair of hands and only 24 hours in their day.

When new improved technologies to help with these tasks have been developed, it is usually men who have developed and introduced them without even a glimmer of understanding of the needs of the women or the likely impact of the innovation. Schemes to introduce hand-operated weeders have

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1/ Tinker I., 'The Adverse Impact of Development on Women', Peace Corps Program and Training Journal, Vol. IV. No. 6, 1977.

2/ O'Kelly E., 'Appropriate Technology Relevant to the Rural Home and Rural Women's Work', paper prepared for FAO round-table discussion, Dec. 1977.

failed because for these to be efficient, crops must be planted in straight rows. Usually, however, it is the men who have been taught this technique, while it is the women who do the actual planting. Schemes to introduce scythes to speed up the harvesting of crops have also had a negative impact. Women traditionally perform this task using a small pen-knife which they use to cut each stalk of the crop one by one. Their reluctance to adopt the faster method of using scythes is not without reason. The scythe necessitates cutting further down the stalk and this in its turn involves a much heavier load (mainly dead weight) to be carried from the farm to the home. It also results in nasty cuts when the women thresh the crop with their bare feet. Plans to introduce scythes would have more success if the trouble was taken to find out what implications are involved and if complimentary measures such as introducing transport facilities and pedal-operated threshers were taken. In the meantime, women refuse to accept and use scythes or, in some cases, men take over the harvesting operation with the benefit of improved tools, and the women suffer the consequences in terms of heavy loads and cut feet.

Similar examples can be found in respect of new technologies developed to help with tasks such as the grinding of cereals and shelling of maize. Pedal-operated grinding machines and hand-held maize shellers may be appropriate in terms of low cost, ease of maintenance and repair and use of local materials. They may not, however, be at all appropriate in terms of the needs of the people who traditionally perform the tasks for which they are supposed to substitute. In many African societies, it is considered improper for a woman to sit astride, and where this is the case, women will not use a pedal-drive grinding mill, however useful it might be to them. Of course, men may take over the operation of such a mill, but this will remove control of, and income derived from, the operation out of the hands of the women. Under the circumstances, hand-operated grinding mills, which the women themselves can operate, would seem much more appropriate.

An innovation with a somewhat different handicap is that of the hand-held maize sheller. Several types of these have been designed - all by men who, unlike rural African women, have not spent even a day let alone a life-time in shelling maize with their bare hands. Since women find they can shell the maize much more quickly with their own hands than with a sheller, they see no point in buying one of these (however little it costs) and the money and time which went into the development and production of such devices is wasted.

While the fact that women perform most of the work in the rural areas continues to be ignored, there will be little head-way made in respect of increasing food yields and generally improving the quality of life in rural areas. The burden of this falls mainly on the women and they



*Over 90 per cent of all processing of crops is done by women*

cannot and should not be expected to make any progress without the benefit of access to modern equipment, training and credit facilities.

One area in which women desperately need help is that of new water technologies to ease the burden of the daily carrying of water for drinking, cooking, washing and irrigation purposes. It has been estimated that the task of providing clean, conveniently placed water supplies for everybody in the world would take only an investment of US \$ 3 to 4 billion per year over the next 10 years. This is not an enormous sum when it is realized that the developed nations of the world spend over US \$ 100 billion per year on alcoholic beverages. <sup>1/</sup> Women also need to be given training in respect of maintenance and repair of pumps and water systems. At present, if training is given at all, it is given to the men who see no great urgency in looking after water supply equipment when women are always available to collect water from further afield if the pump or piping system breaks down. Under such circumstances, it is no great surprise that an estimated 80 per cent of all pumps installed in Third World villages are now out of order.

Women also need help in respect of measures which can relieve them of the burden of walking long distances each day in search of firewood. Re-afforestation programmes might have more success if they were aimed at women rather than men. It makes little difference to the men whether the source of cooking fuel is 3 yards or 3 miles away! Similarly, attempts to gain acceptance of the use of solar energy and methane gas for cooking might have more success if the trouble was taken to explain such technologies to the women as well as the men. Technology may still be thought of as a subject for men, but one wonders just how many men would take over the task of preparing food for the family once solar cookers are introduced!

Food production, storage and processing are areas in which women need help. A whole range of improved technologies is available for performing all these tasks more efficiently, but a variety of obstacles often stand between these and the rural women.

If women had improved hoes, with long handles, to replace their short-handled hoes, much of the hard work involved in tilling would be eliminated. The introduction of this improvement has been prevented in many African countries, however, because rain-fed land has not been properly cleared and is scattered with tree stumps which hinder the free-flowing motion of a hoe with a long handle. Little can be done to alleviate the task of tilling the land (either by means of improved hoes or animal-drawn ploughs) until the fields are properly cleared.

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<sup>1/</sup> Ward B., 'A promise: clean water for all by 1990', UNICEF News, Issue 91/1977/1.

If women had access to equipment to help with the shelling of maize, the grinding of cereals, the shelling of groundnuts and the pressing of oil from palm fruits, they could perform these tasks more quickly, with less effort and more efficiently. Usually, however, they have no money and no access to credit and cannot, therefore, purchase such equipment themselves. Men do usually have surplus cash or access to credit but either see no need to spend money on equipment to help with such tasks or they set up small businesses and make substantial profits from the women who come to take advantage of their mill or other item of equipment. Oil-presses in West Africa and corn and rice mills through Africa are nearly always owned and operated by men. The needs of the women and the community as a whole would be better met if women were given the means to purchase their own equipment on a co-operative basis and if they were also taught how to operate and maintain the equipment themselves.

With the introduction of labour-saving devices, women will have more time to spend on income-generating activities. Here too, however, a change of emphasis is needed. When training is available to women, it is usually in the supposedly 'female' areas of sewing and cooking. Training in improved methods of making pottery, bricks and household and farm utensils is nearly always restricted to men, even though these are areas in which rural women are traditionally engaged. As a result of this bias in training, women sometimes find they can earn less money than before rather than more since they lose markets to the men who now have greater skill and better equipment.

The introduction of labour-saving equipment will also give women more time to spend on improving their homes and participating in self-help activities. The combination of labour-saving devices and a diversion of time into profitable income-generating activities will also give the women more money to spend on these activities - and extra money to spend on more labour-saving devices and equipment to help with expansion of small-scale businesses. The process will be self-generating and the end result can only be that of a vast improvement in living conditions in the rural areas.

The dissemination of appropriate technologies to rural women, combined with the fostering of rural industries to provide non-farm employment for both men and women, will go a long way towards solving the problems of low agricultural productivity, an increasing rural-urban drift and mass-unemployment in the cities of Africa.

The following chapter looks at a few of the many improved technologies which can be utilized by African women to further rural and national development. Throughout, it should be borne in mind that these technologies will stand a better chance of benefiting rural communities if the effort is first taken to explain them fully to the women, to see if they are what the women really want and need, to train the women in their use and maintenance, and to make credit more readily available to women so that they continue to control their own pace of work.

## CHAPTER THREE

## APPROPRIATE TECHNOLOGY FOR AFRICAN WOMEN

'I cannot think of an area of development that would be more profitable to the woman in the rural areas of the poorest countries than providing her with adequate tools to increase production. I do hope that imaginative ingenuity coupled with experience can produce the type of simple intermediate technology that will suit the circumstances of hard working rural women'.

Mrs. Justice A.R. Jiagge,  
Ghana

I. How Appropriate Technology can Help Women

There are basically three important ways in which 'appropriate' or 'intermediate' technology can help women. These are:

- (a) Labour-saving devices to cut down the time and effort spent on non-productive tasks such as carrying water and fuel and pounding grains;
- (b) Equipment to assist women in income-generating activities such as weaving, soap making and food processing; and
- (c) Devices to help women make the home environment healthier and more comfortable. These include soap pits, pit latrines, wash-stands and food containers.

A. Labour-saving Devices

African women themselves, in training workshops, conferences and meetings, have identified several areas in which appropriate technologies could make a significant difference to the lives of the rural women. These include:

- (a) Provision of water supplies in rural areas;
- (b) Introduction of light transport facilities for the portage of water, wood, farm produce and other loads;
- (c) Adoption of efficient agricultural tools; and
- (d) Introduction of grinding mills and other crop processing equipment.

Water Supplies

There is little doubt that the carrying of water imposes the most strenuous physical burden of all the tasks performed by African women. It is estimated that on the average, one sixth of all the energy expended by the women in the rural areas is used in carrying water. 1/ Individual studies show that in many areas, women may spend as long as four hours or more on a single journey to collect water. 2/

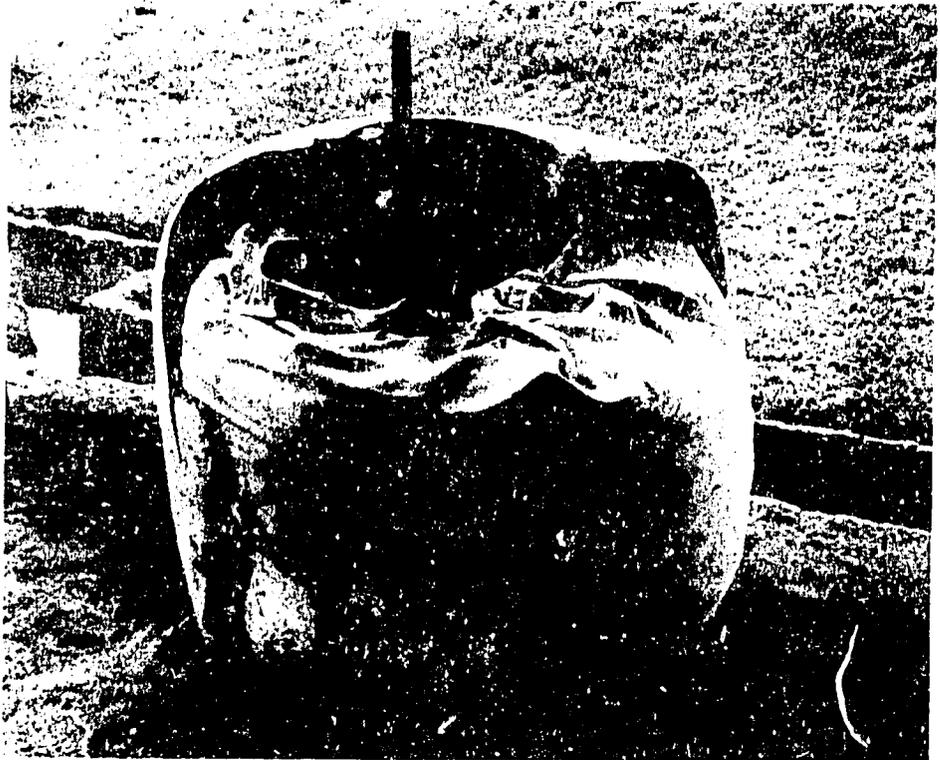
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1/ McDowell J. and Hazzard V., 'Village Technology and Women's Work in Easter Africa', Assignment Children No. 36, October - December 1976.

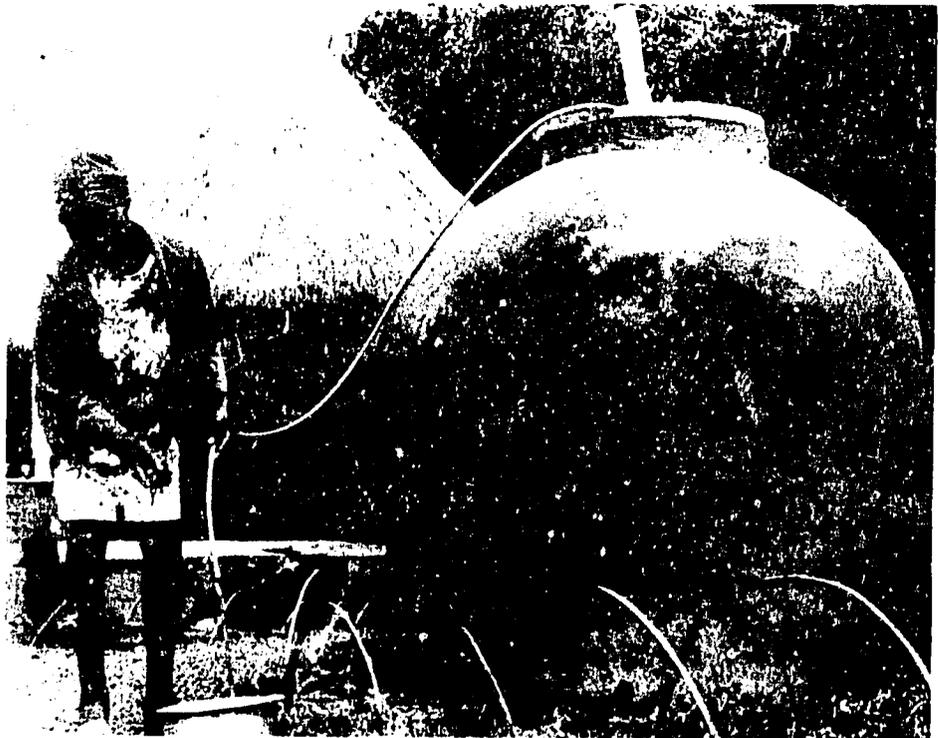
2/ ECA/UNICEF, Improving Village Water Supplies in Ethiopia: A Study of the Socio-Economic Implications. (ECA, Addis Ababa, 1978).

Water storage

*Thin wall cement jars can be built very cheaply on a mould made from a stuffed bag*



*These can be used for storing rainwater collected from roofs*



### Rain-water Catchment

One answer to this problem is to provide water catchment nearer to the house. Catchment from roofs is possible and, even in areas of fairly low rainfall, it is a practical proposition. There is, of course, a problem of cost, given the low income of the average rural family. The problem is not usually one of collection of water. Contrary to popular belief, it is not essential to invest in a galvanized tin roof for the purpose of water collection - a thatched roof covered with polythene will serve just as well. It is also possible to use freely available local resources such as bamboo to construct guttering. The real cost problem occurs with the storage of the water once it has been collected. Conventional storage containers, usually made out of metal, are beyond the means of the average family. Work is being done, however, on the development of cheaper storage containers. One of the more promising technologies is a thin-walled cement jar which was originally developed in Thailand and which is now in use in almost every household in that country. The cost of the cement used in making a jar with a capacity of 3000 litres is about US \$ 10. This compares favourably with the conventional galvanized iron container of the same size which costs US \$ 100. This new technology has now been introduced in Africa through the Village Technology Unit in Kenya and is already gaining popularity in the rural areas. This is because it is easy to construct, it is low cost and it meets a well-recognized need. The Village Technology Unit in Nairobi has now trained artisans from Kenya, Ethiopia, Botswana, Lesotho and other countries in East and Southern Africa how to construct these jars.

### Hydraulic Ram Pumps

In many parts of Africa, there are streams providing an ample supply of water in the valleys, but owing to climatic conditions, the villages are located in the hills, high above the water sources. This means that the women have the back-breaking task of climbing up and down difficult terrain to collect water. This is a problem which can be easily overcome with a remarkable device known as a hydraulic ram pump which needs only the pressure of the stream flowing through it to lift water through a piping system to a higher elevation. Commercially made pumps are, of course, expensive. Prices range from US \$ 300 to US \$ 2,600 depending on pumping capacity. 1/ However, advances have been made in respect of developing an adequate pump which can be made locally (in areas where iron and pipe fittings are available) at a fraction of the cost of the commercial varieties. 2/ Such a pump was constructed at the Village Technology Unit in Nairobi and has been operating

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1/ National Academy of Sciences, Energy for Rural Development, (NAS, Washington, 1976) p. 160.

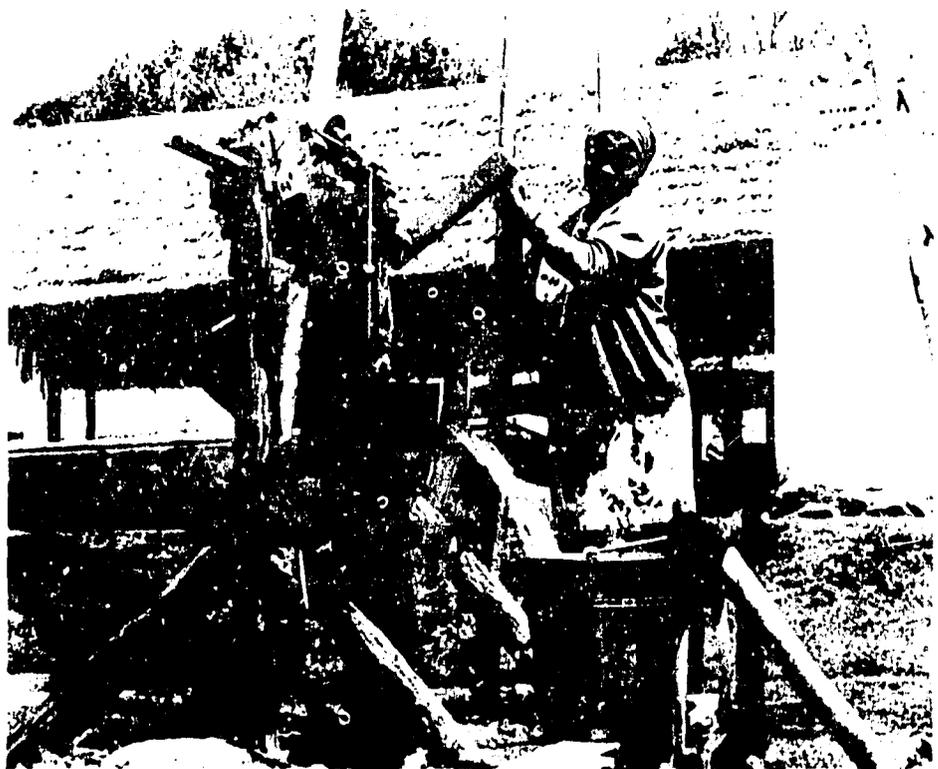
2/ See for example Watt S.B., A Manual on the Hydraulic Ram for Pumping Water, (IT Publications Ltd., London, 1975).

Water Pumps

*A home-made hydram pump (far right) can be manufactured locally for a fraction of the cost of commercial varieties (right)*



*A 'chain and washer' pump can be made in a rural workshop for as little as US\$ 10*



successfully for the last 2 years showing no noticeable difference in performance from the commercial pump which stands next to it. The pump requires a steady reliable supply of water with a flow of more than 5 litres per minute at the source. From a one metre head, it can pump water to a height of about 150 metres. The advantages of this locally made pump, over and above its low cost, are that it has only 2 moving parts (the valves) which are cheap and easy to maintain, and that once installed, it has no running costs.

#### Chinese 'Chain and Washer' Pumps

In some cases, although a water source may be close to a village, it may be difficult to actually collect the water. This, for example, would be the case in a village which is located close to a river which has very steep banks. Climbing up and down such banks with water containers can prove tedious if not hazardous and can often be fatal if young children are sent for water.

One way to combat this problem is to dig a shallow well close to the river and to use a very simple pump, known as a 'chain and washer' pump, to lift the water to the surface. These pumps, which originated in China, can be made from locally available materials such as rubber washers, chains or strong rope, and wood, and can and have been easily made in rural workshops in many countries in Africa for as little as US \$ 10. These pumps can raise water at 80 litres per minute from a shallow well. <sup>1/</sup>

#### Other Water-lifting Devices<sup>2/</sup>

There are a whole variety of other types of water lifting devices which are either hand-operated or use the wind or some other no-cost energy source instead of expensive and scarce fuel. Besides saving the energy of women involved in lifting water out of wells with buckets or other containers, the use of a pump also allows the well to be covered and thus keeps drinking water free from surface pollution. Many of the hand-operated pumps cost between US \$ 20 and US \$ 70 and are within the financial means of a small community. An effective windmill for pumping is likely to cost between US \$ 500 and US \$ 70 and is therefore, better suited to a larger community.

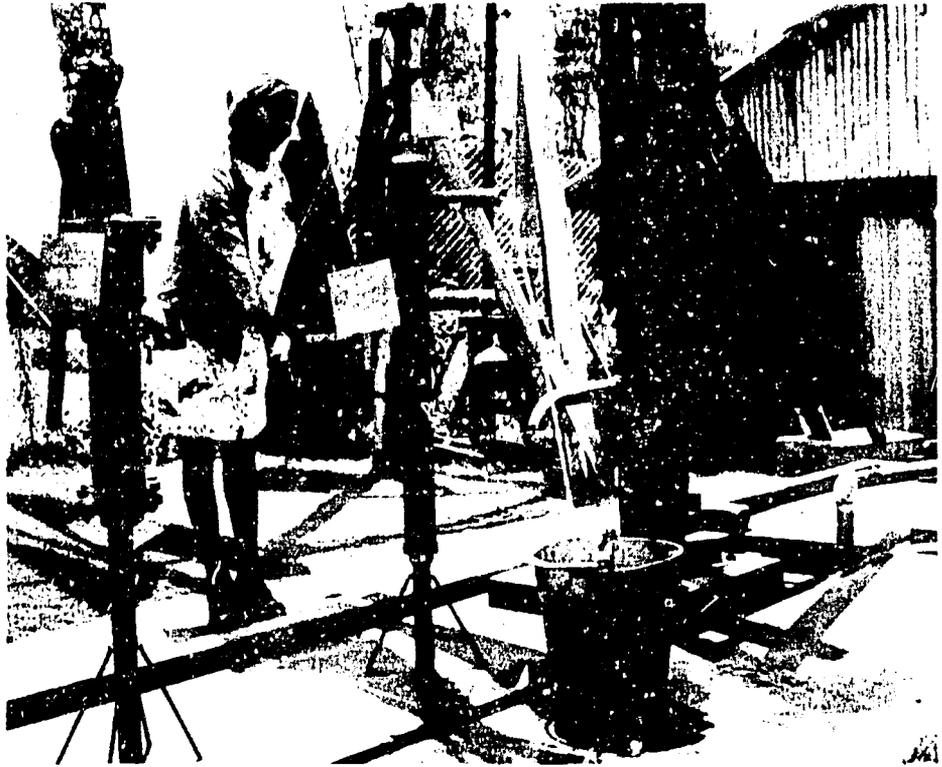
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<sup>1/</sup> For more information see Watt S., Chinese Chain and Washer Pumps (IT Publications Ltd. London, 1974).

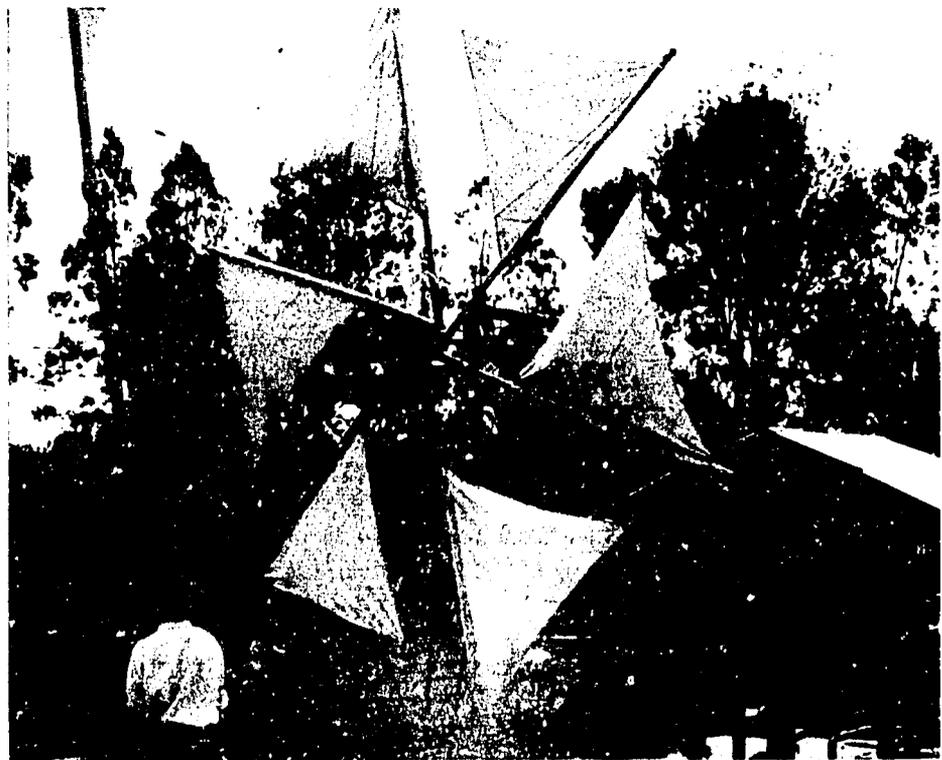
<sup>2/</sup> For more details see Tools for Agriculture: A Buyer's Guide To Low Cost Agricultural Implements (IT Publications Ltd., London, 1976).

Water Pumps

*Hand pumps are  
within the  
economic reach  
of most small  
communities*



*Windmills are  
suitable for  
pumping water  
in larger  
communities*



### Transport Facilities

Perhaps the most common sight in Africa is that of women carrying loads of water, firewood or other burdens on their heads or backs. The medical consequences of a lifetime of this activity have yet to be adequately recorded, but it is obvious to anyone who cares to ask that this is a burden that the rural woman is anxious to shed.

This is far from being an easy problem to solve. The most probable alternative to carrying water or wood on the head or back is to push it on a wheelbarrow or handcart. With this in mind, several types of low-cost carts have been developed in Kenya, Tanzania, Zambia and other African countries. One example is the simple water cart developed in Machakos in Kenya. Another is the inexpensive wooden wheelbarrow made at the Tanzanian Agricultural Machinery Testing Unit (TAMTU) in Arusha. In certain cases, these can help women by allowing them to carry more wood or water on each journey and thus less journeys are needed with less effort. In most cases, however, women find the use of carts or wheelbarrows even more strenuous than carrying the load in the traditional manner since their muscles are unused to the physical strain of pushing. In any case, the terrain over which they must carry their load is often too rugged to even contemplate the use of simple wheeled equipment.

The obvious solution, therefore, is to bring water and fuel nearer to the homestead, rather than helping the women to carry these over long distances. The new 'water' technologies which can help women in this respect have already been discussed. Similar developments are taking place in respect of fuel.

### Fuel Conservation

#### Solar Cooking

One popular approach to eliminating the need for firewood for cooking is the introduction of the use of solar heat for this purpose. To date, two types of cooker have been developed which use solar heat. One reflects the heat of the sun onto the bottom of a pot. The other uses the heat of the sun to boil the water and produce steam which is then used for cooking.

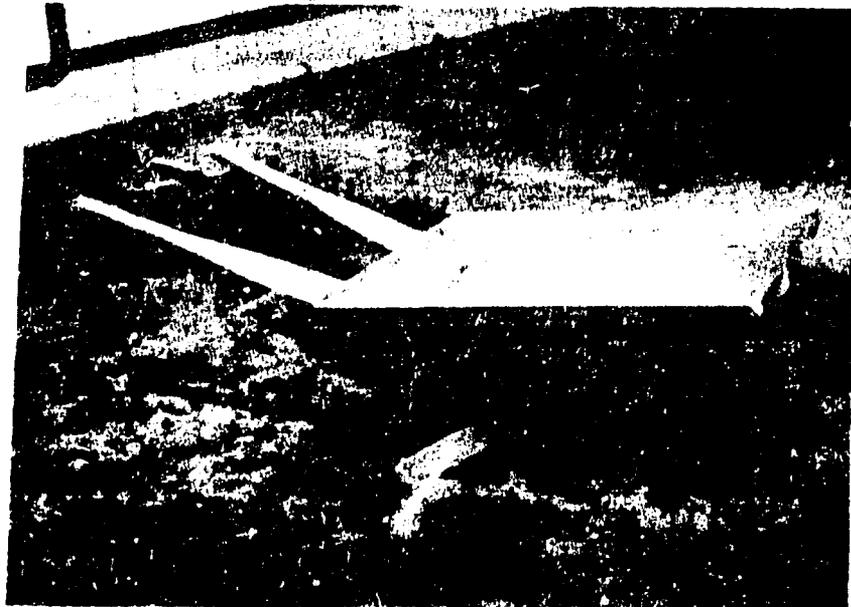
The solar reflector cooker works on the principle of using several reflecting surface to concentrate light and heat onto one point - the cooking point. Rings of hard-board covered with aluminium foil are cut out and mounted onto a wooden frame in such a way that all heat is reflected onto the point where the cooking pot is mounted. Using only

Transport Facilities

*The Machakos Water  
Cart from Kenya (right)*



*The TAMTU Wheelbarrow  
from Tanzania (below)*



the sun's heat, two points of water can be boiled in half an hour. 1/

One disadvantage of this cooker is that it must be placed facing directly into the sun and has, therefore, to be constantly adjusted throughout the day as the sun moves. It can also be easily tipped over by children or goats. An additional disadvantage is that only one small pot can be used for cooking and so the meal for a large family cannot be cooked using only this device. Perhaps the most serious objection to these cookers is that the main meal of the day is usually cooked in the evening when the sun has either gone to rest or has lost most of its strength. In addition, most of the women in Africa are used to cooking inside the house and are hostile to the idea of moving their stove into the open. These are customs which are not easily overcome.

The solar steam cooker is more expensive and more difficult to construct, but it can more easily be adapted to overcome the disadvantages involved with the reflective cooker. For instance, since the cooker is designed to use the sun's heat to produce steam for cooking slow-cooking foods such as maize and beans, it works all day in the sun (while the woman is in the fields) to produce a cooked meal in the evening. This fits in much better with the daily routine of the family and in addition, the cooking container is large enough to produce a family-size meal. Further, the cooker does not have to be moved as the sun moves and it is much less likely to be upset or damaged. Women could also cook indoors with this type of device the solar collector could be built outside the house, while the cooking pot could be inside with the two being joined by a pipe through the outside wall of the house. This, however, makes construction and installation more complicated. 2/

#### Methane Gas Cookers

Another approach which has been tried is the use of methane gas for cooking. In its simplest form, methane gas can be produced by filling an oil drum with one third of human, animal or vegetable wastes, one third water and one third air. The drum is then sealed and fermentation takes place which produces gas. This is simple and cheap enough, but the problem arises in the storing of the gas, and in the transfer to the stoves in which it is to be used. Cost-wise, it is more efficient to produce, store and use methane gas in large quantities. This indicates that village women would have to forgo their individual kitchens and

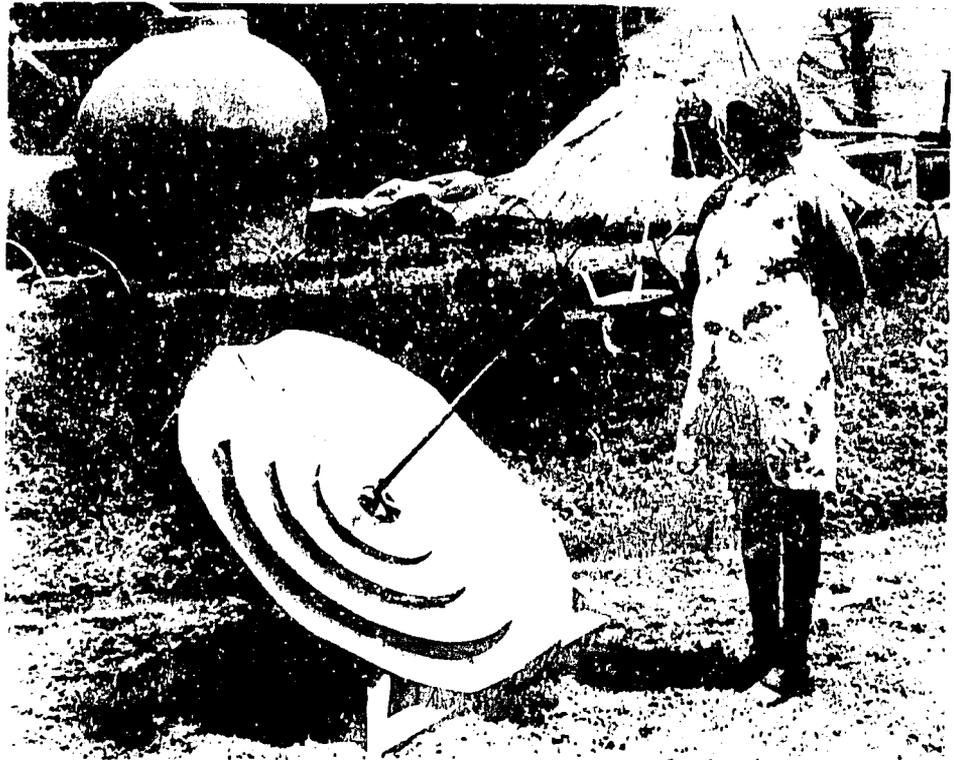
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1/ For details see Solar Cooker Construction Manual (VITA, Washington, 1976).

2/ For details contact Jim McDowell, UNICEF, Nairobi and Tom Lawand, Brace Research Institute, Quebec. (Full addresses given in Annex II).

Fuel Conservation

*Solar energy  
can be used  
for cooking  
instead of  
firewood*



*Improved mud  
stoves also  
reduce the  
amount of  
wood used in  
cooking*



adjust to a communal cooking place. This would not be an easy adjustment and the alternative of piping gas to each home would add to costs considerably. Methane gas might, however, have its uses in cooking communal meals in rural schools or day-care centres. 1/

#### Improved Mud Stoves

At the present time, one of the most feasible ways of solving the problem of collecting firewood is that of introducing stoves which use wood in a more efficient way. For instance, it is possible to use mud to build a stove on which three pots can be heated at one time and which uses only half the amount of firewood involved in cooking by the traditional 'three stones' method. If cooking is done indoors, then this type of stove can be fitted with a traditional chimney which unlike the traditional open fire, carries the smoke out of the home and allows for a more pleasant living environment. 2/

#### Efficient Agricultural Tools

Although women spend 9 to 10 hours every day in farming tasks such as digging, planting, weeding, harvesting, threshing and winnowing, the fruits of their labour are pitifully low. Technologies which can help to reduce the time needed for these operations and raise the productivity of women's labour would obviously make a significant contribution to agricultural, rural and national development.

#### Tools for Land Preparation<sup>3/</sup>

Most women in Africa till their rain-fed fields with short handled hoes. If they had improved hoes, with longer handles, this would eliminate much of the hard work which is involved in tilling since less bending is involved.

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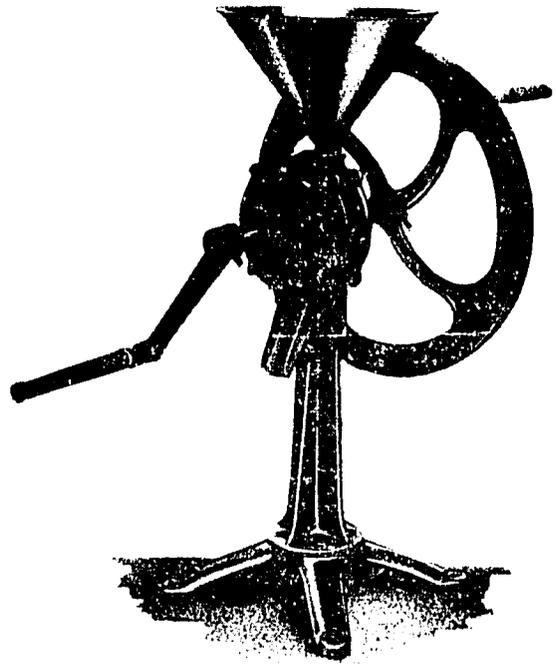
1/ A range of publications on methane gas are available from IT Publications Ltd., 9 King Street, London WC2.

2/ For more details contact Jim McDowell, UNICEF Nairobi and Barbara Punnis, FAO, Rome. (Full addresses given in Annex II).

3/ Details of the items described in the following few sections, complete with names and addresses of suppliers can be found in Tools for Agriculture: A Buyer's Guide to Low-Cost Agricultural Implements (IT Publications Ltd., London, 1976).

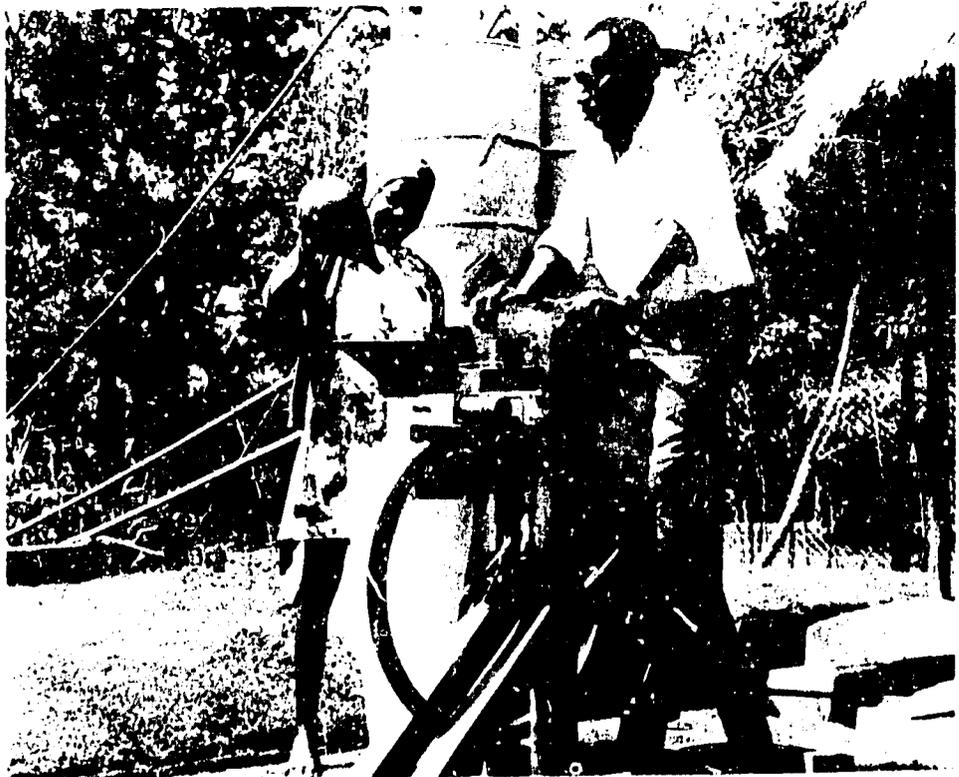
Processing of Crops

*This hand-operated grinding mill will produce 40 lbs of flour per hour*



*A hand-operated corn crusher*

*A pedal-drive grinding mill*



Planting and weeding are other operations which stooping and bending. In many areas of Africa, women must perform these arduous tasks, not only on their own rainfed land, but also on their husband's irrigated fields. There are, however, simple hand-operated seed planters and weeders, many of which can be made locally for under US \$ 20. One woman can plant about half an acre of land in a day with a seed-planter and can weed up to 2 acres a day with a simple weeder.

#### Equipment for Harvesting, Threshing and Winnowing

Harvesting of crops, which is usually done completely or partially by women, is mainly accomplished by means of a small knife. As a result, harvesting amounts to literally counting the blades of the crop one by one. Scythes and sickles perform the job more efficiently, but these are often too heavy to be used by women or are unsuited to their needs. There do exist, however, several types of small power reapers which can be and are easily used by women. These reapers consist of a small cutting blade which is operated off a very small deisel engine. The engine is carried on the back in knapsack fashion. One woman can harvest a whole acre in 25 to 30 hours using one of these devices. It takes days for an acre to be harvested in the traditional way.

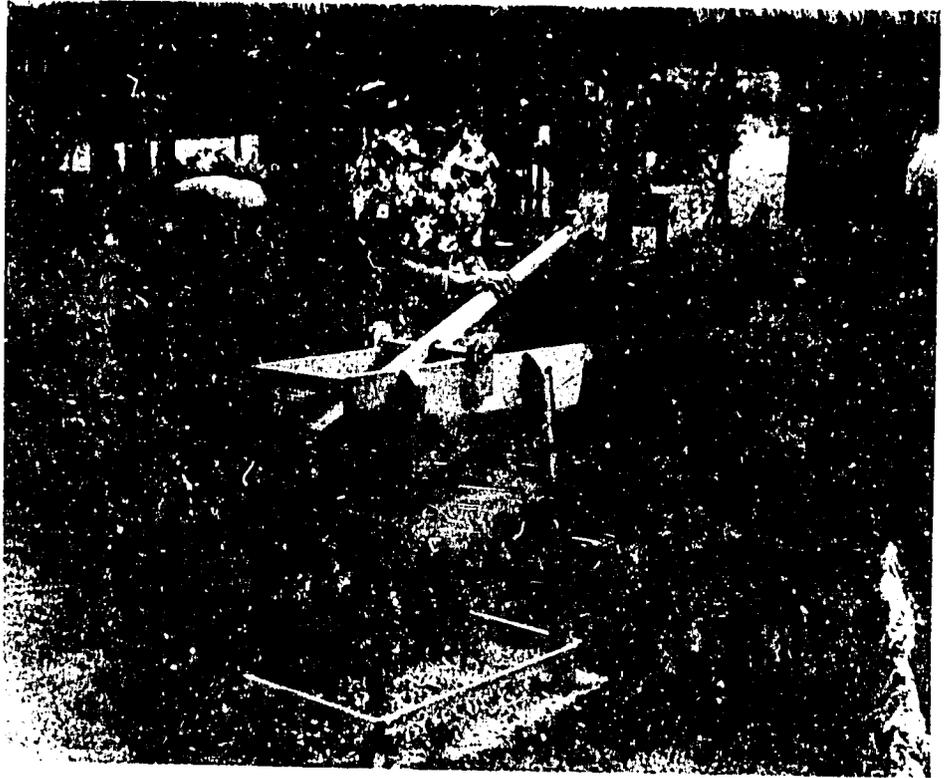
Developments have also been made in respect of hand-operated, pedal-operated and animal-powered threshing and winnowing machines which take much of the effort out of these tasks and result in a considerable saving of time.

#### Grinding Mills

Of all the tasks which rural women undertake daily the one which is mentioned most frequently as being a chore they seek to be rid of is that of grinding maize, millet, sorghum, rice or other staple crops. This could well be because this physically exhausting task (usually it takes 1 to 2 hours to produce enough flour to provide an evening meal for the family) comes at the end of what has already been a long and exhausting working day.

One solution to this problem is a small community mill which is cheap, reasonably efficient (in respect of speed and fineness of flour), easy to operate and easy to maintain and repair. Several hand-operated grinding mills which can cope with an output of about 35 to 40 lbs of flour per hour are currently available. Such mills enable a woman to grind enough flour for the week in about 30 minutes and can easily meet the needs of small communities without being overused. The price of such mills -- about US \$ 100 each -- is also well within the means of a small community. Developments are also taking place in respect of pedal-operated and animal-powered grinding mills.

Processing of Crops



*A groundnut  
decorticator*



*A maize sheller*

In cases where maize does not need to be ground into flour, but merely crushed, as in many parts of East Africa, there are also small hand-operated machines available to take the effort out of the operation.

#### Other Crop Processing Equipment

Over and above the labour-saving devices described above, there are many other simple, low-cost machines which can help women with processing of all types of crops. Hand-operated oil-presses can help with the extraction of oil palm fruit, coconuts, simsim, groundnuts and castor seeds. There is also equipment available to take the hard work out of cracking palm nuts. A simple piece of equipment made from wood and chicken mesh can greatly cut down the time spent on decorticating groundnuts. Machines are also available to help with the shelling of maize, hulling and polishing of rice, crushing of sugar cane, grating of cassava and many other tasks in which rural women are constantly engaged.

#### Improved Storage Methods<sup>1/</sup>

Although not directly a labour-saving device, improved storage methods should be mentioned in this section, for it is indeed a great waste of time and effort if, after spending 10 hours a day in the fields growing crops, the women lose nearly half of these during storage. It is essential that women should be helped to protect their crops against rats, insect and mould or rotting due to dampness. Often, quite simple improvements can make all the difference. For instance, by raising a storage crib off the ground on a platform with metal or thorn rat baffles attached to its legs, losses of food due to rat infestation can be reduced considerably. Such devices will only be effective if they are placed at least 3 feet off the ground since rats can jump as high as 2½ feet. The crib should also be placed well away from trees or walls to prevent rats jumping on to it from these vantage points.

Traditional cribs can also be made insect proof by coating the outside of the basket-work with mud and cow-dung. One such a structure is filled and sealed, there is no way insects will be able to penetrate the outside walls. For this to be effective, however, the crop should be insect free before it is put in the crib. This is unlikely to be the case if it has been taken straight from the fields, dried in the sun on the ground and put into the crib for storage. One way to overcome this problem is to dry the crop in a simple solar dryer before storage. Not only does this device keep the crop clean during the drying process, it also kills or drives away any insects since they cannot withstand the very high temperature which are created inside the dryer.

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<sup>1/</sup> Almost every possible aspect of this subject is covered in a huge manual produced jointly by ACTION/Peace Corps and VITA Lindblad Land Druber L., Small Farm Grain Storage (ACTION/Peace Corps/VITA, Washington, 1976).

Improved Storage



*Traditional storage cribs (right of picture) do not adequately protect crops from rats and insects. Simple improvements such as raising the crib off the ground, adding rat baffles to the legs and coating the basket with mud and cow-dung (as in the left of the picture) can be very effective in terms of reducing food losses during storage*

## B. Income-generating Activities

The rural woman is always in need of extra money for she has to buy food to supplement the inadequate diet provided by the family farm, buy clothes for her family, pay school fees for her children and buy commodities such as salt, soap and household and farm utensils and equipment which cannot be produced internally with the limited resources available to the household. Women in the 'slum' areas of the towns and cities also need access to a source of income because if there is not a wage earner in the family (which is often the case) such women, who no longer have the security of some land on which to grow food, are in even greater need than their rural sisters.

There are many ways in which appropriate technology can help to provide extra incomes for women in the rural and urban areas of Africa. In most cases, a certain amount of capital investment and skill is required and as the following examples show, it is often denial of access to credit and/or training which prevents women from becoming involved in activities which could benefit not only their families, but the economy as a whole. In other cases, women are simply not aware of the technologies which can help them to earn more money. There is still a great need to disseminate information to women as to how they can raise their standard of living. Sometimes, of course, the women do not involve themselves in what may seem to be obvious income-generating activities simply because they do not have the time either to learn the necessary skills or to indulge in the production of marketable commodities. In such cases, the introduction of labour-saving technologies will be the necessary first step in helping the women to utilize yet other technologies which can enable them to acquire a better standard of living for their families.

### Food Processing

Many income-generating activities are open to women by virtue of improved food processing technologies. For example, women farmers in West Africa often have a surplus of rice for sale. People in the cities have come to prefer imported rice, but would buy local rice from the rural women if it was of a comparable quality. Equipment is available which would enable the women to upgrade the quality of their rice. Usually, however, the women are unable to gain access to such equipment because they do not have collateral in the form of land or a house to put up against the loan. As a consequence, the women are denied an important source of income and precious foreign exchange continues to be spent on imported rice. This situation could be changed to the benefit of the women and the whole nation if women were given access to credit and loans, help in quality control, business advice and marketing assistance.

In East Africa, on the advice of government extension agents, many women have started growing vegetables in the belief that this will help them to provide a healthy diet for their families and provide an additional source of income through sale of surplus produce. Most have been disillusioned, since their entire crop is harvested all at once and it is impossible to eat or sell all of the vegetables before they perish. Simple solar dryers, which can be made at very little cost by the women themselves from mud, wood and polythene, would easily solve this problem by enabling surplus vegetables to be preserved for home consumption or for sale throughout the year.

### Crop Processing

In East Africa, many women are engaged in the production of pyrethrum which is an important natural insecticide. The women usually pluck the crop and sell it directly to processing factories in its 'wet' state. The factories will pay approximately twice as much for the pyrethrum if it comes to them already dried. The women could increase their income significantly, at very little extra cost, if they started drying their crop in solar dryers or other simple, low-cost drying equipment before they sold it to the factory.

Many countries in Africa which produce cotton spend valuable foreign exchange on importing cotton-based goods such as gauze and cotton wool pads. There is no apparent reason, however, to suggest that these could not be produced locally. The labour intensive techniques which can be used in the cotton producing countries might not result in the same degree of sterilization of the product, but for most uses, complete sterilization is not essential. The income which could be earned by the women working in a local cotton processing industry would represent an essential difference for a great many people in the developing countries.

In West Africa, women have been involved for decades in the making of soap from the oil of the palm fruit. Traditionally, the soap was made simply by mixing the palm oil with the ash of the wood of the palm tree or some other tree. This traditional 'black' soap doesn't look or smell very pleasant and doesn't last very long, but it does have certain advantages such as costing very little, being good for the complexion and (according to many people) being a protective against malaria. In recent years, however, people have come to prefer imported soap with its pretty colours and sweeter perfumes. The price of this imported soap has risen steeply in most West African countries and, in many, it is not available at all. Despite this price trend, most people still prefer to buy imported soap, rather than return to the use of local 'black' soap. If the women could be taught how to improve the quality of their soap with respect to colour, smell and shape would represent an excellent channel through which to earn extra income

In Ghana, much work has already been done by the National Council on Women and Development with respect to improving local soap. For instance, various perfumes have been extracted from local plants and added to the soap to improve its smell. To improve colour and produce a really pale soap, caustic soda or potash is needed instead of ash. Caustic soda is difficult to obtain in Ghana, but women in some parts of the country have been taught by the Women's Council how to burn dry cocoa pods and palm waste, which previously had been discarded, in order to produce potash. It is expected that the women will prepare large quantities of the powder which will then be packed and sold to other women who can use it to make soap. Simple instructions for soap making will be printed on the packages. Women are also being encouraged to grow sunflowers and castor seeds so as to augment the supply of oil available for making soap, and work is being done on finding a small-machine which will be suitable for extracting oil from the seeds on a small-scale basis. 1/

Along the coastal areas of East Africa, coconut palms abound. One important by-product of the coconut is coir which is the fibre on the inside of the nut. At the moment, the coir is dried, bundled and exported, while the end products such as rope are later imported. If women in these areas could gain access to a small machine which will help them to twine the coir into ropes of a reasonable good quality, extra incomes would result and foreign exchange would be saved. Similarly, women in some parts of the coastal areas of West Africa use a half coconut shell, with its attached fibres, as a scrubbing brush. This is a traditional technology which could be transferred to other coconut producing areas in Africa so as to save women the expense of buying scrubbing brushes, or developed into a small-scale industry to provide women with a much cheaper source of this essential household community.

#### Animal Husbandry

Realization is slowly dawning that the production of handicrafts which are geared to the tourist and export markets and a limited local market is not the way to solve the need of women in respect of supplementing incomes. More emphasis is now being placed on encouraging women to participate in activities which produce goods for which there is a permanent demand in the local market place. The keeping of chickens, pigs,

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1/ For more details contact Jane Cole, Executive Secretary, NCWD, Accra, (Full address given in Annex II).

Income-generating Activities



*ECA Photo*

*The trend is away from activities which cater for an already overcrowded tourist and export market...*



*...towards income-generating activities such as keeping goats, chickens and pigs, which cater for the local market*

rabbits and other animals is one of the increasingly more popular activities which rural women are encouraged to take up.

Village technology has its part to play here too by way of construction of low-cost animal pens and hutches. A simple, raised rabbit hutch can, for instance, make the difference between healthy rabbits and a profit and disease rabbits and a loss of capital outlay. One of the most striking examples of how improved technology has helped women to earn extra income is that of improved bee-keeping equipment. Traditionally, it is men who harvest the honey from wild bees in Africa. This is largely because the hives are located high up in trees and climbing up these to extract the contents of hives is an occupation which women do not care to undertake. In Kenya and other countries, however, improved hives have been designed <sup>1/</sup> which not only produce increased yields of honey, but which also stand approximately three feet off the ground and thus make extraction a relatively comfortable process which women are willing to undertake. Two years ago, it was unheard of for women in Kenya to keep bees. Now several women's groups in rural areas have taken advantage of government assistance in buying improved hives (these cost only about US \$ 10 each and can be made in village workshop) and are successfully processing and selling honey at a significant profit. The wax from the cones is also sold for use in softening leather and making cosmetics.

#### Production of Household Utensils

Traditionally, women in many African countries are engaged in production of clay pots which are used for a variety of things such as carrying and storing water, and storing and cooking food. Often, the quality of these pots is so poor that they crack and break very quickly. The process of moulding the pots is also a tedious business. If women are given access to improved equipment such as simple kick-wheels to help with moulding and improved kilns to give a better finish, then they are able to produce a much better quality article and expand their market and profits. They can also be taught how to make needed items such as water filters out of clay pots and thus expand into new areas of business.

#### Other Possibilities

There are numerous other examples of how simple technologies could help women to start or expand income-generating activities. The starting up of small businesses will not happen automatically, however. Three important factors have to be taken into consideration. These are:

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<sup>1/</sup> See Ministry of Agriculture, Kenya, Bee-keeping in Kenya (Ministry of Agriculture, Nairobi, 1974).



*UNESCO Photo*

*Women in Upper Volta learning to make water filters - possibly the start of a small-scale business*

(a) In some cases the women may have no idea what possibilities exist in respect of utilizing locally available resources so as to earn income. This suggests that there is a need to carry out careful studies of local resources, of available equipment and of market possibilities and to make this information available to women;

(b) In some cases, the women may be aware of a potential way of earning extra income, but they have no idea how to acquire the necessary equipment and may not be able to gain access to a loan which would enable them to buy such equipment. Again, information should be collected and made available to the women in respect of what sort of equipment can be purchased, at what cost and from which suppliers. Women also need help in respect of access to credit;

(c) The problems are difficult enough if the women are already formed into groups. If groups do not already exist, then the first step will need to be that of helping individual women to organize themselves into operative units.

### C. Home Improvements<sup>1/</sup>

Technologies which aim simply at improving the home environment are rarely greeted with the same enthusiasm as those which save labour or help to increase income. The majority of technologies in this category relate to hygiene and cleanliness, which are, of course, extremely important for the health and well-being of the family, but which are not usually identified by low-income families as a major need. This is probably because health problems are not automatically linked in people's minds with insanitary conditions and so the point of acquiring some piece of technology to improve these conditions is missed. For example, attempts to introduce simple water filters are unlikely to succeed unless the women who are expected to use them believe that unfiltered water is causing sickness in their families and that a water filter would reduce the incidence of sickness.

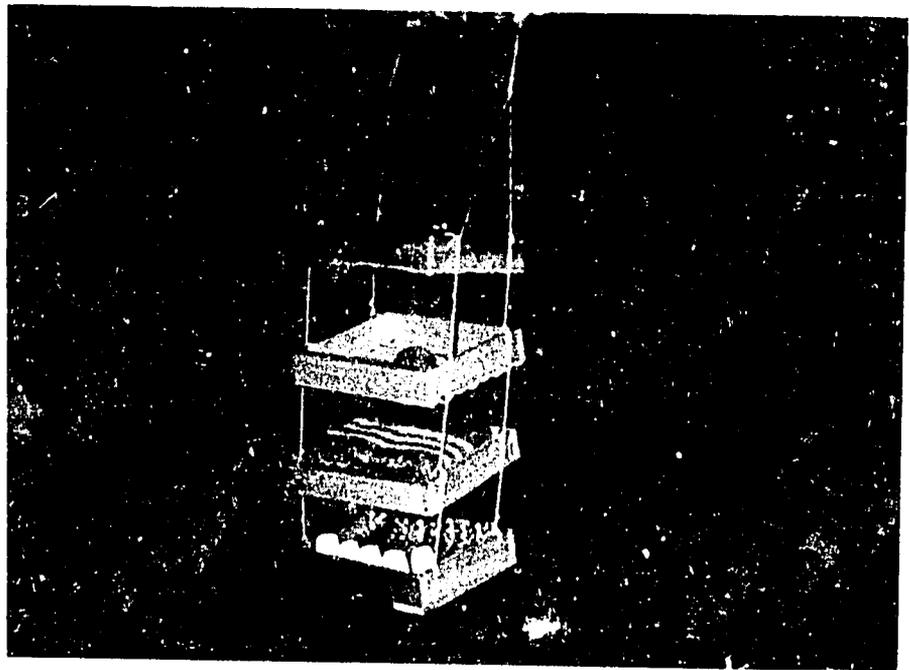
For those who wish, however, there are numerous simple, low-cost ways in which to improve the home. A very simple water filter can be made from clay-pots, stones, gravel, sand and charcoal, with the water being filtered of impurities as it passes through the various layers of material inside the pots. Charcoal can also be used to keep water cool and keep vegetables and other food stuffs fresh and free from insects and germs. The charcoal cooler

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<sup>1/</sup> For more details on equipment related to home-improvement contact Jim McDowell, UNICEF, Nairobi and Barbara Purvis) FAO, Rome (Full addresses given in Annex II).

Home Improvements

*Hanging shelves*



*A water filter*



*A charcoal cooler*



works on the principle that when water evaporates it takes heat from its surroundings, thus leaving the interior cool. The cooler consists of a container surrounded by a 3" layer of broken charcoal, kept moist by water dripping onto it from a tray placed on top of the container. When placed in an airy open space, wind makes the water evaporate from the charcoal. This cooler is extremely economic, using only 2" of charcoal every 3 months, but it is only efficient if kept small (i.e. below 8 cubic feet). One person, with no special skills, can make such a device in as little as two days.

Other improvements include pit latrines, soak pits, sun tables for drying dishes, clothes-lines for drying clothes, cupboards and shelves. A particularly useful device is a set of hanging shelves for use in houses with mud or thatch walls which cannot have shelves nailed to them.

The list can be continued to include fly-traps, food covers and many other utensils which improve the general health and comfort of the whole family. The important point, however, is that these are all devices which can be easily constructed by the woman herself at very little cost using locally available materials such as wood, clay, rope, chicken mesh and charcoal.

## II. Some Current Programmes in Africa

No single publication could possibly adequately cover the whole range of ways in which appropriate technologies can help the women of Africa, much less the ways in which these technologies can be put within their reach. It should be obvious from the preceding pages, however, that the question of ensuring that such technologies reach as many women as possible, in the quickest possible time, is one of major importance.

A start has been made in Africa in respect of disseminating information about technologies and in disseminating the technologies themselves. The Economic Commission for Africa and UNICEF have been particularly active in this respect on a Regional level and other UN and international agencies are now beginning to follow suit. At the national level, much work is being done by Governments themselves and by voluntary organizations. This section looks in depth at the work being done by ECA and UNICEF, and aims at giving some indication of the work being done by selected other agencies and institutions. Names and addresses of people to contact in all the agencies listed are given in Annex II.

A. Economic Commission for Africa

Since its establishment in 1958, as an instrument for economic and social progress, the United Nations Economic Commission for Africa (ECA) has been concerned that all available human resources for the development of African countries be fully utilized. To this end, ECA has increasingly recognized the great potential of women in Africa to accelerate the pace of national and African regional development. In March 1975, the African Training and Research Centre for Women (ATRCW) was formally inaugurated within the Human Resources Development Division of the Commission. The main objective of the Centre is to promote the full use of the combined human resources - male and female - for development by integrating African women more effectively into the development effort of their respective countries.

One of the major subject areas of interest to the Centre is that of appropriate village technology and its impact on women in respect of easing their work load, helping them with increasing income and with improving the home environment. The concept of village technology is introduced in most itinerant workshops. These workshops, which are organized in conjunction with governments, aim at bringing together planners and trainers concerned with improving rural life, to exchange knowledge and ideas, to identify needs of rural families and to plan to meet these needs through an integrated approach. Workshops have now taken place in 12 English-speaking and 10 French-speaking countries in Africa. 1/

In addition, specific assistance is available to governments in respect of identification and implementation of projects aimed at helping women through the introduction of village technologies. The following are the major areas within which the village technology programme has been operating:

- Socio-economic studies of existing projects aimed at introducing new technologies;
- Detailed studies of the role of women in agriculture aimed at identifying which village technologies could help in increasing the productivity of their work;
- Surveys of traditional technologies and existing technology projects at the national level;

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1/ Reports of all these workshops are available from the Women's Centre, ECA, Box 3001, Addis Ababa.

- Pilot projects aimed at introducing new equipment to selected villages and studying in depth the social, economic and technical problems and benefits involved;
- Study tours and workshops aimed at increasing the understanding of extension workers and other government officials in respect of village technology to help rural women; and specialized workshops aimed at training extension workers in particular areas of village technology such as storage and preservation of crops;
- Scholarships to help with the training of African women and engineers in the field of village technology.

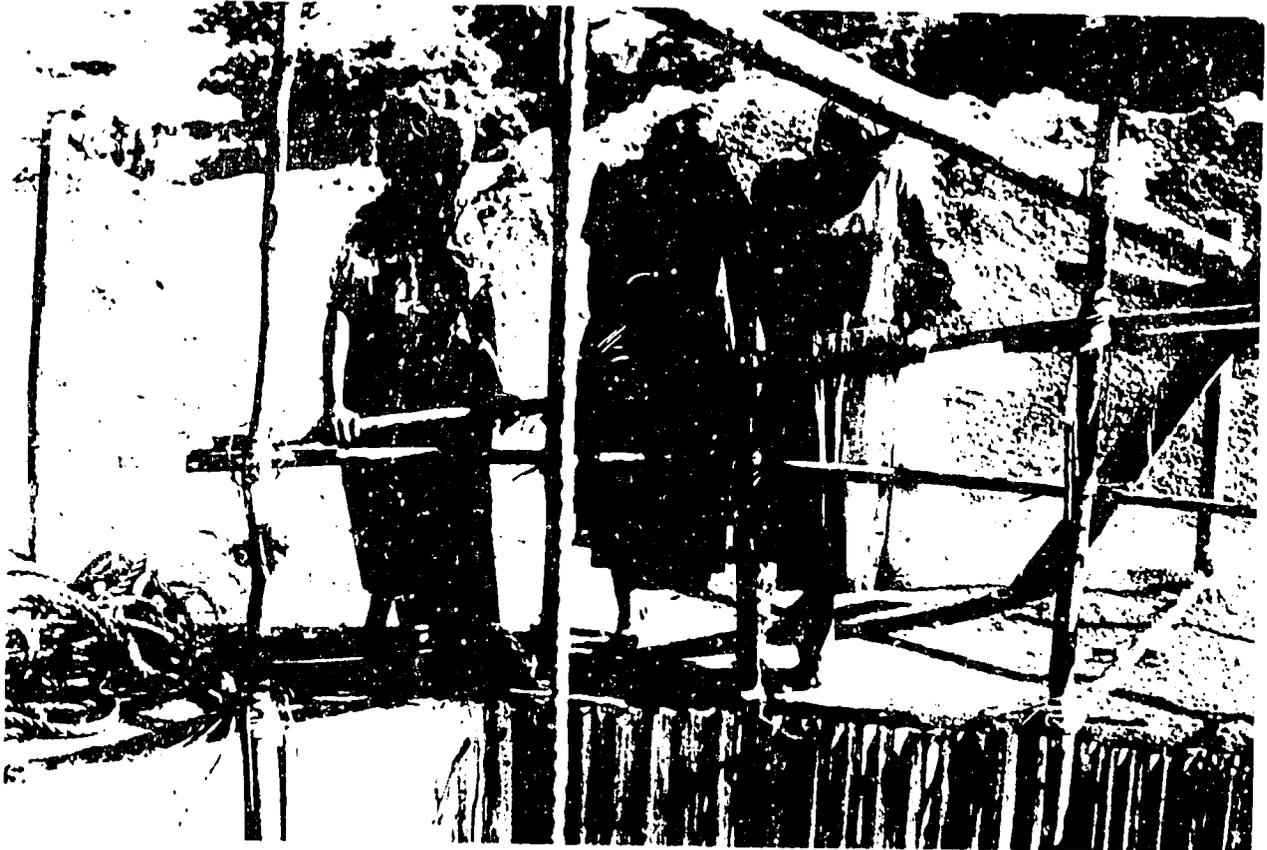
In all of these areas, the Centre works very closely with, and is financially and technically supported by UNICEF, the Intermediate Technology Development Group, British Christian Aid, FAO, the Ford Foundation and the Rockefeller Foundation.

#### Socio-economic Studies

The introduction of a new technology in a community usually means that the lives of the people involved will be significantly altered. In most cases, the full benefits of the innovation are unlikely to be realized unless a thorough socio-economic study of the community is conducted. For instance, if a well is dug in a village which previously collected its water from a river located 4 or 5 kilometres away, the lives of the villagers and especially of the women, can be expected to change considerably. The 3 or 4 hours which women used to spend daily on water collection will now be free for more productive work. To get the most from this time, however, some advice and training, based on detailed research, will probably be needed. Similarly, well water can be expected to be cleaner than water taken from a muddy river. The benefits of this in terms of better health are likely to be limited, however, unless the daily habits of the population are carefully researched and recommendations made relating to complimentary public health programmes and training.

Unfortunately, technologies are all too often treated in isolation, with new equipment simply being introduced into a village and the impact left to chance. As a consequence, the Women's Centre is anxious to encourage the inclusion of socio-economic research into on-going technology projects. For example, funds were recently provided for a national researcher to study the socio-economic implications of a self-help well digging programme in 10 villages in Ethiopia.

Improving Village Water Supplies



*ITDG Photo*

*Women in the Gurage District of Ethiopia inspect the progress being made on the self-help hand-dug well which will provide clean water in their village*

Socio-economic Study of Improving Village Water Supplies in Ethiopia<sup>1/</sup>

The project chosen for study was a self-help well-digging and spring protection scheme started in the Gurage area of Ethiopia in November 1975, with funding from OXFAM, Quebec.

The original terms of reference of the study had primarily considered the water development project exclusive of the economic status and agricultural production of the target population. However, after a brief preliminary survey done on sampled villages, it was felt essential to include items on agriculture, methods of production, marketing activities, wage labour, migration and all other related economic and social aspects of the farm households. The study was, therefore, broadened in scope and objectives mainly because the water development scheme could not be treated in isolation of the general living conditions of the Gurage people. As a consequence of the expanded coverage of the study, the objectives were also expanded with a view to inciting concern and initiative from various development agencies for an integrated rural development effort based on the recommendations of the study.

The study includes data on the division of labour, decision making within the household and time spent by women on various activities, including water collection. It also gives attitudes of villagers in respect of expected benefits from improved water supplies and the use to which any time diverted from water collection would be put. 2/

Studies of the Role of Women in Agriculture

Although women perform between 60 to 80 per cent of the agricultural work in the rural areas of most African countries, very little research has been directed at gaining a fuller understanding of the nature of this work, the bottlenecks experienced by women when trying to increase yields and output and the problems involved in processing their crops. Such data are, however, needed before new technologies and training in new techniques can be introduced to help the women farmers.

1/ Funding from UNICEF.

2/ ECA/UNICEF, Improving Village Water Supplies in Ethiopia: A Study of the Socio-Economic Implications. (ECA, Addis Ababa, 1978).

Rice Development Project in Sierra Leone<sup>1/</sup>

With this in mind, the Women's Centre is funding a project in Sierra Leone which will research in depth the role of women in rice production and attempt to identify and analyse the economic and social constraints in the production and distribution of rice. The major method of investigation will be a detailed farm management and labour use study in one area of the country. These data will be analysed so as to make recommendations on ways of overcoming the constraints met by the women in performing their work more productively.

The research is being conducted by a national researcher from the Institute of African Studies with the help of University students. Supervision of the project is being conducted jointly by the Women's Centre and the joint FAO/ECA Agriculture Division.

Women in Agriculture in Nigeria and Ghana<sup>2/</sup>

This research, which is to be conducted by a Nigerian researcher over a 6 month period is aimed at:

- Identifying crops and agricultural operations in which women constitute the major source of labour;
- Identifying areas where women could be helped, by training and access to credit and improved implements and inputs, to improve and increase production and processing of food crops;
- Leading to the organization of training workshops aimed at increasing the rural women's skills in respect of food production and processing;
- .. Initiating pilot projects in respect of credit schemes, co-operative schemes, improved implements, inputs and techniques and any other area identified as important.

Following the completion of this research, the Women's Centre will undertake to find funds for training workshops and pilot projects recommended by the study. It is also proposed that similar research should be conducted in other countries in Africa.

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1/ Funding from Ford Foundation.

2/ Funding from Rockefeller Foundation.

### Technology Surveys

In the rush to introduce new improved technologies, the fact is often overlooked that there already exist many appropriate technologies in villages all over Africa. In many cases, simple modifications can result in significant improvements in terms of time, energy and productivity and lead to a technology which is better than anything which can be imported. Sadly, many of these traditional technologies become forgotten over the generations as modern, imported products and equipment become more freely available. Instances can be found all over Africa of young village women who are not aware of the fact that their grandmothers used to dry vegetables in the sun to preserve them; who do not know the traditional art of making 'black' soap from palm oil and wood ash; and who do not know which herbs and plants used to be used for treating illness or making fabric dyes. As a result, when the imported soap, medicines and dyes they have become used to become unavailable or out of their price range, as is now happening in many African countries, there is nothing left to fall back on. Fortunately, most of the technologies mentioned above are still known and understood by some people and can be introduced again when necessary. However, many traditional technologies must have been lost over time, and even the examples quoted above could become lost forever if they are not adequately recorded.

### Survey of Rural Technology in Sierra Leone<sup>1/</sup>

With this in mind, the Women's Centre funded a nation-wide survey of indigenous technologies in Sierra Leone with the aim, not only of recording traditional technologies, but also of identifying technologies which could be developed to the level of providing more job opportunities in rural areas and increasing the self-sufficiency of the nation.

The survey, which was conducted by students of the Science Curriculum Development Unit of Njala University College under the supervision of staff of the University and the Ministry of Social Welfare and Rural Development, covered the distribution and application of indigenous technologies, the role played by women in the operation of rural technology and descriptions of the various operations, equipment and materials involved in the technologies identified. The technologies covered included palm oil processing, nut oil processing, coconut oil processing, gara processing, garri production, lubi production, laundry soap making, starch production, foofoo production, fish smoking, rice parboiling, local gin production, cassava, corn and onion preservation, tyre-slipper making and charcoal processing.

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<sup>1/</sup> Funding from UNICEF.

This survey was the first stage of a multi-purpose study. In the next phase, it is expected that more detailed studies will be attempted on some of the indigenous technologies identified. One of the objectives of this phase will be to have various technologies analyzed by the staff and students of the Science Curriculum Development Unit with the purpose of extracting the scientific principles involved and incorporating this information in science teaching in schools. Another objective of the detailed studies will be to come up with recommendations on how indigenous technologies can best be improved so as to provide more income and employment in rural areas.

It is hoped that similar surveys will be carried out in several other African countries.

### Pilot Projects

Of the multitude of tasks which they must perform daily, rural African women themselves have identified that they need help most in respect of collecting and carrying water and firewood and processing crops. There are many simple technologies which can be introduced to assist with these tasks and all possible efforts should be made to disseminate these on a widespread basis. First, however, it is important to make sure that the technology which is introduced is the one which is best suited to local conditions and is one which will bring concrete benefits to the women and their families rather than added problems. With this purpose in mind, the Women's Centre encourages pilot projects for the village-level testing of acceptability and utility of new technologies in selected villages. Projects assisted so far include the testing of hand-operated grinding mills in Upper Volta; hand-operated oil-presses in Sierra Leone; a variety of post-harvest and crop-processing equipment in the Gambia and a variety of 'intermediate technology' equipment in Senegal. Where possible, efforts are made to have the equipment developed and produced locally. If this is not possible, then equipment for the pilot projects is imported with the expectation that local manufacturers can copy the prototypes and produce more of the machines if they are found to be useful at village level.

### Hand-operated Grinding Mills in Upper Volta<sup>1/</sup>

A visit to Upper Volta in 1976 revealed that comprehensive socio-economic surveys carried out by the Ministry of Education in the villages of Upper Volta had shown that the rural women were anxious for help in respect of grinding sorghum and millet. At the time, this was usually done by grinding two stones or pounding, both of which are laborious and time consuming tasks at the end of an already long, hard working day.

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<sup>1/</sup> Funding from UNICEF.

The only attempt to have been made to help the women with this chore had been the importation and distribution of small-engine powered grinding mills. Unfortunately, due to lack of maintenance and repair facilities, only about half of the original 31 mills were still in operation. Most of the remainder were giving a much reduced performance in terms of output per hour, fuel consumption and fineness of flour. Although several types of less sophisticated mills exist, which could well have been better suited to the villagers' needs and to local production and maintenance capabilities, there had been no project aimed at introducing these into the country.

The project proposal presented to the Women's Centre was to test several 'intermediate' level hand-operated grinding mills in selected villages for acceptability and utility. Government and UN officials decided that the best machine to be used during the trial was one which is made in England. This machine costs only about US \$ 80 and is capable of dealing with the needs of about 70 families. Samples of both millet and sorghum, along with samples of the required fineness of flour, were sent to the Tropical Products Institute in England to assess the suitability of this machine for local varieties of cereal. Tests were found to be favourable and 32 of the mills were then purchased and sent to Ouagadougou.

The short term aim of this project is to establish villagers' acceptance of the mills and to eliminate any initial technical or socio-economic problems through detailed research, adaptation of equipment and changes in organization. The long-term aim of the project is to develop local production of the grinding mills, once they have been established as successful in the pilot villages, for distribution throughout the country.

Personnel involved in the project include head-quarters and extension staff of the Ministry of Education, Peace Corps Volunteers and technologists from local appropriate technology units and technical training institutions.

#### Hand-operated Oil-presses in Sierra Leone<sup>1/</sup>

Preliminary studies carried out by the Ministry of Social Welfare and Rural Development of Sierra Leone and the Women's Centre of ECA revealed that rural women are anxious for help in respect of extracting oil from palm fruits. Currently, this is done by hand or foot, which is a laborious and time-consuming task. In addition, the level of efficiency of extraction is extremely low with a high proportion of oil being wasted.

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<sup>1/</sup> Funding from UNICEF.

The project proposal presented to the Women's Centre for funding was for the testing of a locally manufactured hand-operated oil-press in selected villages for acceptability and utility. Specifications as to the type of press required were presented to the Engineering Department of the University of Sierra Leone and an oil-press was developed which met with the approval of the Ministry of Social Welfare and Rural Development. Funds have now been provided by the Women's Centre to produce 26 of these oil-presses for village-level testing.

The short term aim of this project is to establish villagers' acceptance of the presses and to eliminate any initial technical or socio-economic problems which arise during initial stages of introduction. The long-term aim is to develop local production of the oil-presses, not only by the University but by local manufacturers, for distribution and use throughout the country. It is also intended that training should be organized in activities such as improved soap making and better refining of oil so that women can make optimum use both of the time saved by the oil-press and of the extra oil made available by its use.

The sociological research and technical inputs required during the testing of the presses are being provided by the Sociology and Engineering Departments of the University in conjunction with the Ministry of Social Welfare and Rural Development.

#### Post-harvest and Crop Processing Equipment in the Gambia<sup>1/</sup>

The Mansakonko Community Development Training Area in The Gambia consists of a training centre and its surrounding villages. The village adjoining the training centre is expected to become a model village in which a variety of projects aimed at improving rural life will be running simultaneously under the careful, but gradually decreasing, supervision of the Centre's staff and trainees. Projects are to be started in other villages, with the degree of sophistication and need for supervision decreasing with distance from the training centre. In all, projects are to be run initially in about 25 villages in the neighbourhood. Projects are to cover many aspects of rural life including agriculture, health, home improvement, literacy and day-care.

Besides giving practical training to extension workers, this scheme is also aimed at developing a small number of villages through introduction of new ideas and schemes. These villages in their turn will act as 'demonstration units' with the people themselves explaining to villages more distant from the training centre how the new ideas and schemes work and what effect they have had on their lives.

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<sup>1/</sup> Funding from UNICEF.

The project proposed to the Women's Centre was to strengthen the work of the training centre by introducing both extension workers and villagers to new types of small-scale equipment which can help improve rural life by reducing the work load of women and increasing the productivity of their labour. It was proposed that concentration should be placed initially on the processing of food and cash crops since this is an area in which rural women spend a great deal of time. As a consequence, three types of equipment 'packages' are to be introduced. These are:

- (a) Processing of cereals - grinding mills, threshers, winnowers, rice hullers, rice polishers and animal-gears for driving some of this equipment;
- (b) Processing of groundnuts - decorticators;
- (c) Processing of palm fruits - oil-presses, palm-nut crackers.

It is intended that the pilot village will have all 3 'packages' while several neighbouring villages will have one type of package or another.

The short term aim of the project is to establish the utility and acceptability of the equipment at village level and to give trainee extension workers experience in respect of introducing new village technologies. The long term aim is to disseminate ideas on, and create an effective demand for, various items of 'intermediate' technology by way of people in the area observing a beneficial impact in the pilot villages. Eventually, it is hoped that as many as possible of those items which are proved useful and acceptable will be produced completely or partially by local firms or artisans. All equipment for the pilot projects is being imported from India, Pakistan, Japan and England.

Personnel involved in the project include staff of the Community Development Services of the Ministry of Planning and Peace Corps Volunteers.

#### 'Intermediate Technology' Equipment in Senegal<sup>1/</sup>

During a field trip made in Senegal by the Women's Centre's Village Technologist and the Head of the Centres d'Expansion Rural (C.E.R.) of the Ministère du Développement Rural et de l'Hydraulique, a number of needs were identified by village communities which can be met by low-cost technologies. These include:

<sup>1/</sup> Funding from UNICEF.

- (a) Hand-operated grinding mills which are cheaper and more reliable than the engine-powered varieties which are currently available;
- (b) Evaporative charcoal cookers to help women's groups have cool storage places for preserved foods such as jams;
- (c) Solar cookers to overcome the problem of the rising cost of charcoal and
- (d) Improved methods of storing and drying crops to prevent food losses.

As a result, a proposal was submitted to ECA for the funding of a project which enabled the importation and/or local manufacture of various types of equipment and demonstration and testing of this equipment at the village level. A request was also made that funds should be made available for a national workshop on improved methods of drying and storing foods.

The personnel to be included in the project are the headquarters and field-level staff of the C.E.R. Quotations are now being obtained in respect of imported equipment and blue-prints obtained for equipment which can be made locally.

#### Nomadic Food Preservation in Mauritania<sup>1/</sup>

Given the archaic methods of food preservation currently used by the nomadic families of the northern part of Mauritania, research on simple methods of food preservation is a matter of some importance. For instance, one important food for travelling is dates. These are harvested once a year, and at that time, hard work must be done by the women to preserve the dates for the rest of the year. The fruits are stoned one by one, then pressed in a 'gerba' (goatskin bag) which is hermetically sealed. The process is a long one, including the preparation of the gerba to avoid mildew.

It is proposed to send a village technology specialist to try out with the women possible methods of preservation which may make their work easier and more efficient. A return visit will be made to assess the women's readiness to adopt the new methods. A firm has been located in Switzerland which produces a simple piece of equipment which was designed for kitchen use for pitting cherries, etc. This inexpensive pitter can also be used for dates, and this is one of the new methods which will be introduced to the women.

The West Africa Office of UNICEF will probably carry out this consultancy for the Women's Centre.

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<sup>1/</sup> Funding from UNICEF.

Extraction of Salt in the Gaya Region of Niger<sup>1/</sup>

In the Region of Gaya in Niger, salt is extracted from numerous stagnant pools and ponds and is traditionally a women's activity. The women sell their produce to the neighbouring areas and across the border to Nigeria, North Benin and Upper Volta. However, the exploitation of the salt mud-banks and the final salt extraction are very primitive and the whole operation is both tedious and hazardous to health. As a result, the women have expressed the need and desire to improve the working conditions involved in this activity, which brings in a sizeable income.

The purpose of the project is to:

- (a) Make a preliminary survey of Bangou (one of the villages in the Region) and its surrounding area so as:
  - (i) to have a proper picture of the activity as regards actual conditions of exploitation and problems of technology, health and family welfare involved, and the scope and extension of this activity in Bangou as well as in other villages;
  - (ii) to identify possibilities for technological improvements and design of proper technical devices which would be well-adapted, labour-saving and cheap;
  - (iii) to explore market possibilities.
- (b) Help the women villagers and the Government of Niger to implement the measures proposed in the above mentioned fields.

It is expected that the project will take about 18 months and that a Project Director, 2 Sociologists, one Village Technology Consultant and one Technician will be involved as well as local field-research workers.

Workshops and Study Tours

Although the need for village technologies to improve the lives of rural families is becoming increasingly recognized, there is still a lack of knowledge as to what is available, how technologies can be introduced into villages and what is happening in each individual country. One way of filling this knowledge gap is to organize national level workshops for planners and/or extension workers. Another is to arrange study tours to allow government officials from one part of Africa to see projects and programmes which are being carried out elsewhere in the Continent.

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<sup>1/</sup> Funding from United Nations Voluntary Fund of the Decade for Women.

Training for Extension Workers



*ECA Photo*

*A Tanzanian woman inspects an improved storage crib which she helped to build at a training workshop*

Food Storage and Preservation Workshop in Tanzania<sup>1/</sup>

Although village technology is included in all the Centre's itinerant training workshops, a special workshop on one aspect of the subject is sometimes requested as a follow-up. For instance, following the itinerant training workshop in Tanzania in 1974, the government requested assistance in training extension workers in improved methods of storing and preserving foodstuffs. As a consequence, in 1975/76, a series of workshops was held, with ECA/FAO/UNICEF assistance, which aimed at equipping extension workers with the knowledge and skills needed to help villagers to conserve surplus foods, to prevent losses during storage and to allow good use to be made of vegetables and fruit plentiful during the peak season. Emphasis was placed on practical training, which in the case of simple technology, has many times the impact of traditional lecturing techniques. Participants built a solar dryer from wooden poles cut from the forest, plastered with mud reinforced with cow dung and lime and covered with a double polythene lid. They also built improved rat-protected maize cribs and rat-proofed, insect resistant mud graneries. Meat was smoked in dryers made from oil drums. These are all methods and equipment which are within the reach of rural families and communities.

Village Technology Workshops for Extension Workers in Kenya<sup>2/</sup>

In 1977, with financial and technical assistance from UNICEF, a series of workshops was held for extension workers in Kenya. These were organized through the Kenya Government's Women's Bureau and the Women's Centre of ECA, and aimed at widening the knowledge of the participants in respect of technologies available for use in rural areas. The workshops were also partly aimed at subjecting practicing technologists from the Government/UNICEF Village Technology Unit, the University and elsewhere, to the needs of rural communities which are currently not being met by existing technologies. As a result of these workshops, approximately 30 projects for the village level testing of new improved technologies throughout Kenya have been generated. In addition, local technologists have been presented with a list of community needs which existing technologies do not help to meet.

Study Tours: West to East<sup>3/</sup>

During visits made by the Women's Centre's Village Technologist to many countries in West Africa, much interest was expressed by government officials in the possibility of being able to travel to other countries in

1/ Funding from FAO and UNICEF: Report - Workshop on Food Preservation and Shortage; Kibaha, Tanzania (ECA, Addis Ababa, 1976).

2/ Funding from UNICEF.

3/ Funding from UNICEF.

Africa, and especially to Kenya, to see and study village technology programmes.

As a result, negotiations are well under way with UNICEF to send government technologists and community development workers from The Gambia and Sierra Leone to Kenya. The objectives of this study tour will be:

- To allow senior officials from The Gambia and Sierra Leone to see and discuss activities related to village technology;
- To enable the visiting officials to study developments in Kenya and to exchange information and experiences on the introduction of village technologies to improve the lives of rural families;
- To enable participants to identify new technologies which could be suitable in their own countries either with or without adaptation; and
- To give participants an opportunity to draw up suggestions for projects which might be suitable in their own countries.

The focus for the tour will be the Government/UNICEF Village Technology Unit, but visits will also be made to selected village polytechnics, agricultural training colleges, villages with technology projects and other places of relevance.

#### Scholarships in Village Technology

Owing to the importance of village technology for women in Africa and the increasing interest of governments in this subject, the Women's Centre is seeking to encourage several sub-regional posts for village technology within various UN agencies. The East Africa Regional Office (EARO) of UNICEF has already agreed to provide funding for the recruitment of a project officer within that region to look specifically into the field of village technology for women.

It is intended that the posts should be filled by women who are nationals of African countries and who will be able to assist governments on a long-term basis. Attempts to locate African women who have some experience in the field of 'intermediate' technology have not been rewarding. There are, however, several women who have a good background in development and/or community development work and who could become competent after short term training at African Technology Centres such as the Village Technology Unit in Nairobi and at world-wide centres such as the Intermediate Development Technology Group in London.

At the request of the Women's Centre, the Ford Foundation has agreed to provide the necessary funds to allow at least one of the women located to go on a one month scholarship to ITDG in London. During the visit, it is expected that the recipient would hold discussions with the technical and

planning staff of ITDG, attend ITDG panel meetings on all relevant aspects of 'intermediate' technology; and visit other institutions in England involved in 'intermediate' technology such as the Tropical Products Institute, the Science Policy Research Unit and the Institute of Development Studies.

In several African countries, there are now appearing small functional units within Universities or Government Departments which are concerned with intermediate technology. One such unit is the Agricultural Engineering Section within the Ministry of Agriculture in The Gambia which is very much involved in developing and adapting low-cost equipment which can greatly ease the burden of women farmers. The work of a section such as this could be made much more efficient if there was greater access to new ideas and to information or equipment being used and/or developed in other countries. At the request of the Women's Centre, the Ministry of Overseas Development of the British Government, through ITDG, has agreed in principle to provide funds to allow the Head of this Section to visit the Technology Consultancy Centre at the University of Kumasi in Ghana, for a period of 3 months.

B. UNICEF

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 then, UNICEF has been increasingly involved in giving assistance to governments in respect of appropriate village technologies to help the rural woman and her family.

Apart from its generous support to the Women's Centre of ECA in this field, the areas within which the village technology programme of UNICEF has been operating are:

- (a) Construction of demonstration and testing units which contain all types of village technology equipment;
- (b) Study tours to enable government officials and artisans from various countries in Africa to study and/or make items of village technology being used in other countries;
- (c) National and local level seminars and workshops to increase understanding of village technology and awaken interest in its dissemination; and

- (d) Studies and surveys of existing technology projects and programmes with a view to identifying areas for expansion.

Village Technology Demonstration and Testing Units

The Village Technology Unit, Karen, Nairobi

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 Karen, Nairobi, it provides practical exemplification of a wide range of potentially appropriate village technologies.

The unit was established in recognition of the fact that whilst much has been written and said about village technology, many of the devices involved were not readily accessible to interested people, and there was a 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 recognized 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 which 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 which was opened by Kenya's Minister for Housing and Social Services on 16 June, 1976.

The overall content of the unit is related specifically to means of improving the quality of family life, with the main areas of emphasis being:

- (a) Home improvement and means of reducing the work load on mothers;
- (b) Food production, conservation, preparation and use; and
- (c) 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 wood-working and metalworking tools. In addition, the workshop also has a simple 'laboratory' section, equipped with instruments for testing of appropriate technology devices. All constructions used are related to the materials and resources likely to be available to the average rural community.

The Unit is intended to fulfil a number of inter-related functions. These are:

- (a) To provide a practical introduction to the concepts and principles of village technology 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;
- (b) To provide practical training regarding the construction and use of village technology devices to instructors from the Village Polytechnic Programme, and to students from a wide range of disciplines under-going training for work in the rural areas;
- (c) To carry out evaluation testing of the functional efficiency of the various devices, and to accumulate information and data on construction, performance and cost;
- (d) To assist in the conduct of field testing and acceptance trials of items which have been evaluated in the Unit;
- (e) To assist in the introduction in the rural areas of items of proven performance and acceptability;
- (f) To constantly review the 'state' of the arts', to construct and evaluate new devices coming to the attention of the Unit, and to modify existing items on the basis of practical testing;
- (g) To prepare detailed 'how-to-do-it' instruction leaflets. Such leaflets will not be issued until they can include accurate performance data;
- (h) To become involved in outreach and in working, whether through the established extension services, or directly with organized groups of people, to assist and encourage the introduction and adoption of proven items;
- (i) To collaborate with universities, training colleges and other similar institutions in East rn Africa in evaluating and fostering the further development of appropriate items.

Since the establishment of the Unit in 1976, the East Africa Regional Office (EARO) of UNICEF has been asked for assistance in establishing similar VT Units both within Kenya and in other countries in the Region. Units which UNICEF has helped to establish, or is proposing to help, include:

- (a) A VT Training Unit at the Bukura Institute of Agriculture in Kenya - for training extension workers;
- (b) A VT Training Centre at the Ahero Family Life Training Centre in Kenya - for training mothers and women's groups;

(c) A National Village Technology Demonstration Development and Training Unit at the National Teacher Training College in Lesotho - for training village school teachers;

(d) A National Centre for Demonstration and Development of Village Technology in Swaziland - for extension workers and rural women;

(e) A Central Demonstration Development and Training Unit and 5 sub-units in Uganda - for senior government personnel and extension workers;

(f) A Central and Satellite Demonstration and Training Facilities in Ethiopia - for extension workers.

The Ghana Office of UNICEF is also proposing to assist the establishment of a Village Technology Unit near Accra. UNICEF (EARO) will provide technical support in setting up this Unit.

#### Study Tours

Depending on specific requests from the countries concerned, UNICEF (EARO) has arranged for government officials and/or artisans from many countries in the Region, including Ethiopia, Botswana and Swaziland to visit the Village Technology Unit in Nairobi. This has led to a broadening of ideas on the subject and to the training of a core of people who can return to their own countries and make any appropriate items of equipment identified.

Through the Ghana and Nigeria Office of UNICEF, several government officials from these two countries have also been able to visit the Nairobi VT Unit. Following the visit of the Ghana group, one of the women participants was appointed by the Ghana Office as a Consultant and she has been working closely with the other staff on promotion of village technology activities, including the proposed VT Unit in Ghana.

Negotiations are now underway with the Dakar Office of UNICEF to send a group of officials from The Gambia and Sierra Leone to Nairobi to study village technology programmes and projects.

#### National and Local Seminars and Workshops

In order to disseminate knowledge about, and awaken interest in, improved village technologies, UNICEF (EARO) has been actively engaged in organizing and supporting seminars and workshops in Kenya and in other countries in the Region. Such activities in Kenya have ranged from national seminars for government extension workers from all Provinces in the country to financial and technical support of training of Village Polytechnic Instructors and rural artisans. Plans for other countries include: a national workshop on food-conservation by low-cost means in Botswana; a national village technology workshop for government and aid personnel staff of the UNOTC Women in Development Project in Swaziland; and a national village technology workshop

for government personnel in Uganda. Assistance has already been given in Tanzania, in conjunction with ECA and FAO in the organization of workshops for improved methods of food preservation and storage. 1/

#### Studies and Surveys of Village Technology Projects

UNICEF (EARO) has recently established a post for a project officer who will be responsible, along with national personnel, for the conduct of initial surveys to identify needs and possibilities for village technology projects among women's groups. Technical assistance and resource personnel in the development of identified projects will be provided initially by the Nairobi VT Unit, and eventually by the national units to be established in various other countries in the Region. This Office has also developed a questionnaire which will be used by extension workers and village polytechnic instructors in Kenya to survey needs of women in respect of improved village technologies with the aim of matching these needs to local production capabilities.

The West Africa Regional Office of UNICEF has been supporting a survey of rural/village technologies in several of the French-speaking countries in the Region including Benin, Ivory Coast, Senegal, Cameroon, Guinea Bissau, Upper Volta, Mali, Tchad and Niger. This survey is being carried out by a two-person team. The aim of the survey is to identify what technologies already exist to help women, what needs are not being met, what production facilities exist for making equipment, etc. This survey will form the basis of expanded UNICEF involvement in the field of village technology for women in the countries concerned. 2/

The West Africa Office was also recently involved in a study of the conditions of life and work of women in rural areas in Upper Volta as a result of which recommendations were made for a programme aimed at lightening the work of women in the Region. Among the technologies recommended for introduction and dissemination were groundnut decorticators, grinding mills and donkey carts. 3/ Other work in which UNICEF has been involved in West Africa includes a socio-economic study of the introduction and use of small

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1/ See page 72.

2/ For details contact Mme Marie Touré N'Gom, UNICEF, Abidjan. (Full address given in Annex II).

3/ The Report of the study is entitled 'Etude sur les Conditions de Vie et de Travail des Femmes en Milieu Rural et Proposition d'un Programme d'Intervention Régional pour l'Allègement du Travail des Femmes' (Société Africaine d'études et de Développement, Ouagadougou, 1976).

power-operated grinding mills in villages in Senegal, and a project in Mali which included the digging of wells, the introduction of millet grinders and the provision of hulling, shelling and threshing tools. 1/

C. Other International Agencies

International Labour Office (ILO)

Research on Technology and Women

The World Employment Programme of ILO is proposing a major two year research project on 'Technological Change, Basic Needs and the Condition of Rural Women in Africa. The justification for this project is that the major weakness of current development efforts is that hardly any attention is paid to the role and working conditions of women under changing technology.

The objectives of the project are:

(a) To examine and assess the actual participation of women prior to a change in technology with that following technology change (associated with the implementation of development programmes);

(b) To identify technologies which lead to replacement of many non-mentioned types of current activities pursued by women (such as growing of subsistence crops and gathering of water and fuel) so that such technological change can liberate considerable female labour for possible money-earning activities;

(c) To identify technologies which would create new possibilities for earning money incomes for women;

(d) To identify priorities and trade-offs between technologies which:

(i) relieve the women of the burden of the heaviest and most difficult tasks; or

(ii) will enable her to work fewer hours per day; and

(iii) will liberate women from the drudgery and painstaking domestic household work; or

(iv) would raise their present food output through greater efficiency; or

(v) would provide them with income earning opportunities to supplement the family income.

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1/ Sene M., 'Un projet d'allègement du travail des femmes au Mali', Assignment Children No. 36. October-December 1976.

The project will also attempt to identify or discover female activities which have been left out or over-looked or incompletely recorded in existing studies and statistics so that the impact of technological change in women's activities can be accurately assessed.

The results obtained out of this project are expected to assist in the formulation and design of technical assistance programmes which would help improve the lot of women.

It is expected that the work will be carried out by a full-time economist/agricultural economist and a full-time rural sociologist and that field work will be carried out in a few of the least developed countries in Africa, possibly including Sudan, Somalia and Lesotho.

The ILO is also proposing a joint project with the OAS Inter-American Commission for Women on 'Technological Change and the Condition of Rural Women in Latin America'.

#### ILO/UNDP Project in Ghana

An Integrated Vocational Training and Development Project for Women and Girls which aims at providing leadership and vocational training to women and girls through functional vocational training courses has been operating in the Tarkwa District of Ghana for the last 2 or 3 years. Immediate objectives are:

- (a) To encourage the participation of women and girls in village development, through the improvement of their standards of living and the increase of family income in their own natural environment;
- (b) To promote the circulation of money within the village concerned, through small-scale industries and likewise attracting town money into the villages in order to create employment there;
- (c) To undertake profit sharing incentives and banking facilities through credit unions and savings banks.

The activities being encouraged include bamboocraft, cosmetics and soap, ceramics and pottery, food processing and sewing of school uniforms. The project ends in December 1978, at which time it will be repeated in a new area in the country.

### Food and Agriculture Organization (FAO)

The Programme for Better Family Living (PBFL) of FAO has given generous support to the ECA Women's Centre in respect of funding study tours and itinerant training workshops which include a substantial element of village technology, especially in the areas of food production, storage, processing and preservation. FAO also partially financed the special technology workshops on food storage and preservation held in Tanzania in 1975/76.

The Home Economics Section of the Human Resources, Institutions and Agrarian Reform Division has also been recently engaged in the production of a series of manuals for use by extension workers covering various types of intermediate technology equipment of use to the rural women. (See Annex I).

### Environment Training Programme (ENDA)

The Environment Training Programme is a joint project of the African Institute for Economic Development and Planning (IDEP-Dakar), the United Nations Environment Programme (UNEP-Nairobi) and the Swedish International Development Authority (SIDA-Stockholm).

Recently, ENDA provided a Consultant to the West Africa Office of UNICEF to assist with a survey of technology projects in the Region and to make recommendations as to further projects and programmes needed to help rural women. In addition, ENDA held a workshop on 'Women and Environment' in Niamey in December 1976. This workshop included several proposals for the use of appropriate technologies which respond to the specific conditions of African women in the rural milieu.

ENDA has also started a 'Technology Relay', the aims of which are:

- (a) To set up and run an exchange network on experiences in the use of environmentally sound technologies controlled by users so as to encourage the inclusion of popular initiatives in project design and implementation processes;
- (b) To reply to requests for information with help from a referral system to corresponding experts;
- (c) To encourage and undertake case studies, draft and publish documents and other teaching aids.

### Intermediate Technology Development Group (ITDG)

The Intermediate Technology Development Group has been directly involved with women and technology projects in Africa by way of seconding one of its staff members to the Economic Commission for Africa to fill the position of Village Technologist within the Women's Centre. The Group was given financial support for this assignment by British Christian Aid.

In addition, a Homestead Technology Panel was formed in 1975 to look into the whole question of intermediate technologies for women in the home and on the farm. This has recently been replaced by the more efficient system of having one member on all other relevant panels (e.g. agriculture, water, co-operatives, health and solar energy) who will consider proposed technologies in respect of their effect upon women.

The Group's journal 'Appropriate Technology' has recently included articles on women and technology. (See Annex I).

### USAID

#### Women's Roles in Development Project, Upper Volta

This project will enable rural women to engage in self-sustaining income-generating/labour saving activities such as collective soy/peanut cultivation, purchase and use of grain mills, animal-drawn carts, etc., with the goal of improving the economic and social well-being of rural villagers as a whole. Before commencing the project, extensive research was carried out on the environmental, financial and technical appropriateness of possible activities, but it will be the responsibility of female project participants and extension agents in the selected pilot villages, along with AID's project advisor, to determine during the implementation of the project what micro-projects are most feasible, given each community's particular circumstances. Aquisition of credit by female villagers, distribution of implements and extension of technologies, are all built into the project implementation process.

#### Intermediate Technology and Village Industry for Women in Ghana

The National Council on Women and Development in Ghana is being given funds by USAID to conduct research into 'intermediate' technologies for women. Research will take the form of:

(a) A survey of improved tools, methods and technologies presently in use so as to compile a description of the time-saving and productivity raising techniques which are currently being used by women (and men) in agriculture, water collection, food processing and preparation, house construction, production of household utensils and other items, and other small-scale manufacturing activities. The conditions which led to the development and adoption of these technologies will be analysed and the possibilities of producing equipment locally investigated;

(b) Experimental projects to introduce new equipment or techniques (local or imported) into a community through extension workers or voluntary organizations and research on the attitudes and receptivity of the community towards these. The objectives of this research are to test out ideas for raising productivity or standards of living and to test the hypothesis that introduction of intermediate technology relating to women's chores will free them to engage more fully in income-earning activities.

The Council is also being given support in respect of small-scale industries for women. Within this programme, eight Council members and regional staff were recently provided with funds to visit India for one month to study 'intermediate' technology as applied to cottage and small-scale industry in rural areas.

#### Small Machinery and Garden Tools for Village Women in Mali

This USAID funded project has been started with the help of Peace Corps and the National Women's Organization in recognition of the fact that, to date, few projects in Mali have been geared specifically for women. The project will include training programmes which will adequately prepare the women to operate and maintain the machinery, organization of lending systems for the tools and equipment, and development of beneficial activities into which new-found free time can be diverted.

#### Appropriate Technology International (ATI)

The newly formed Appropriate Technology International, which operates out of Washington D.C., seeks to increase the capacity of the developing countries to choose effectively both the development strategy and the means to pursue that strategy most appropriate to their needs and goals; and to encourage the utilization or development of indigenous technological knowledge and equipment within the developing countries.

ATI International recognizes that women do most of the day's work of preindustrial technology and bear the heavy burden of poverty in underdeveloped countries. Their status, health and general well-being will be a principal consideration in the definition of technology that is 'appropriate' and in the design of the socio-economic arrangements for putting it to work. Women will be recruited, therefore, to responsible policy-making positions in all ATI projects.

### Volunteers in Technical Assistance (VITA)

VITA is a private, non-profit association of 6000 volunteer businessmen, educators, engineers and scientists dedicated to technical assistance of a practical nature in response to requests from people in the developing areas of the world. Through the International Inquiry Service, more than 1200 requests per year are answered - many of these relate directly to village technologies which will be used by or will help rural African women.

VITA also produces many excellent publications which relate to village technology for women. These include a manual on small farm food storage, a construction manual for a solar cooker, and manuals on low-cost windmills, water wheels and hand-pumps for village use.

### Peace Corps

To even try to cover all of the African projects relating to women and appropriate technology in which Peace Corps Volunteers are involved would be an impossible task. As was stated in an article in a recent issue of the Peace Corps Journal, 'Peace Corps has been a vast field workshop in intermediate technology'. 1/ The emphasis on rural women is also increasing as is reflected by the fact that a 1977 edition of the journal was devoted entirely to appropriate technology and its impact on women. 2/

### The American Friends Service Committee (Service Quaker)

The American Friends Service Committee Women and Development Program was begun in 1976 and is designed to provide technical and financial assistance to women's groups in Mali, Senegal, The Gambia and Guinea-Bissau. Projects organized so far included sending twelve community development workers from Mali to The Gambia to improve tie-dying and batik skills. Programmes planned by the Service include assistance to women's co-operatives in Mali in respect of purchase and management of millet mills; and the establishment of a soap production project based on palm oil in Guinea-Bissau.

### CARE

#### CARE - Kenya

In Kenya, CARE has been assisting self-help water projects, first on a small scale and since 1975 in increasingly larger numbers. The Water Development Program's main purpose is to provide rural households with an

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1/ Luzzatto F.A., 'Intermediate Technology: The Peace Corps Contribution', Action Peace Corps Program and Training Journal Vol. IV No. 1 1976.

2/ Action Peace Corps Program and Training Journal Vol. IV No. 6 1977.

acceptable piped water supply which will in effect save the rural women a large amount of time each day. Realizing that the obtaining of water is one of the rural woman's major tasks, CARE has collected information on rural women and the time they spend in various activities before a piped water supply is installed. This information will eventually be compared with the women's time usage after they have a piped water supply installed. If a piped water system enables a rural woman to have more time for leisure or other productive activities then the piped water system has made a direct improvement on her life. At present it is too early to say what kinds of direct benefits may accrue to the rural women who do use piped water. However, CARE is beginning to see some of the initial changes made by a piped water system on the rural woman. These initial changes reflect that once the rural woman does have an adequate and steady supply of water near her home, she will be able to do many more productive things for herself and her family.

#### CARE -- Lesotho

In Lesotho, CARE is involved with promotion of women's cooperatives based on spinning and weaving of mohair in the rural areas.

#### International Development Research Council (IDRC)

##### Post-harvest Technology Needs in Senegal

This research, which was conducted through the Centre National de Recherches Agronomiques de Bambey, consisted of a survey of 800 families in 8 different regions of the country. It covered nearly all existing ethnic groups, climatic conditions, and different types of crops. In the survey, a detailed study was made of the way the woman spends her time, how she spends her money, and several other economic factors which could help to determine what type of improvements can be introduced and whether or not the woman can afford them. The survey also looked at how the women intended to pay for any improvements.

The Report of this survey 'Discussions des Résultats de l'Enquête sur la Technologie Post-Récolte en Milieu Paysan au Sénégal' by G. Yaciuk and A.D. Yaciuk was published in November 1977 through the Institut Sénégalais de Recherches Agronomiques.

The same team is also doing research on how the women's time can be diverted by means of dehulling machines, grinding machines, etc. from non-productive tasks into more productive work.

### Gari Processing in Nigeria

Support was given to the University of Ife to study the supply and demand, and the processing and distribution structure, for gari (a staple West African food made by the women from cassava) in order to advise planners on appropriate forms of processing equipment.

### Brace Research Institute

### Fuel Conservation in Senegal

A joint research project undertaken with UNEP found that solar cooking if utilized by the women could provide 60 per cent of the cooking. This combined with improved mud stoves should reduce the collection of wood, leaving more time for women, and allowing revegetation programs to take place.

## D. African Institutions

### Botswana

#### Botswana Enterprises Development Unit (BEDU)

This Unit is presently involved in the establishment of the Appropriate Technology Centre of Botswana, in collaboration with the Botswana Development Corporation. The AT Centre will research and develop many technologies which will be of use to rural women including low cost methods of water supply and storage, and the use of solar, methane and wind-power for the pumping and heating of water and for milling and other post-harvest processes.

#### Rural Industries Innovation Centre

This Centre is active in the adaptation, development and application of technologies appropriate to rural development such as windmills, cooking stove, ovens and methane digestors.

### Ethiopia

#### Department of Engineering, National University, Addis Ababa

A great deal of work has been done by this department with respect to development of technologies which will help women in rural Ethiopia, particularly in the field of water-lifting devices.

## Ghana

### Technology Consultancy Centre, Kumasi (TCC)

The Centre provides technical and commercial consultancy services for small-scale industries; develops and tests new products and processes; and implements pilot production units to prove new processes. Women entrepreneurs have been given assistance in respect of improving and expanding production of textiles, glass beads and animal-feedstuffs.

### National Council on Women and Development (NCWD)

The Council places a great deal of emphasis on village technologies and cottage industries for women. Workshops have been held for training women in appropriate income-generating skills and technical and financial support is given to rural and urban women in respect of developing projects involving the use of 'intermediate' technology equipment. The Council has a Technical Unit which advises on improved techniques and equipment.

### Food Research Institute

The Institute has been engaged in several projects relating to village technology for women. These include (a) socio-economic testing of improved ovens for smoking fish; (b) development of a simple hand-operated oil-press costing Cedis 300; and (c) improvements on a hand-operated cassava grater developed by the people in a village close to Accra.

### Agricultural Engineers Ltd.

A private Accra-based firm which is doing much valuable work on the development and production of low-cost agricultural equipment such as improved hand-tools, crop dryers, oil-presses, and cassava graters.

## Kenya

### Kenya Industrial Estates (KIE)

This institution promotes small-scale industry development through technical assistance and provides subsidized working premises with common facility workshops. The Product Development Centre at Machakos supports the Rural Industrial Development Centres with research and development in fields of benefit to the rural women such as windmill pumps and threshing equipment.

### Women's Bureau

The Women's Bureau, which is located within the Ministry of Housing and Social Services is actively engaged in transferring improved technologies to rural women, mainly through organized women's groups. The Bureau works closely in respect of such activities with UNICEF, ECA/ATRCW and the Youth Development Department of the Ministry.

### Village Polytechnics

Kenya's Village Polytechnics are the responsibility of the Youth Development Department of the Ministry of Housing and Social Services. There are now polytechnics in over 200 communities in the rural areas which aim at providing employment to young people and producing low-cost goods such as agricultural implements, wheelbarrows, stoves and other household items which are needed by the community. The polytechnics relate directly to the needs of rural women and technology and headquarters staff work closely with UNICEF and the Women's Bureau in respect of transferring, adapting and producing devices which save women time and effort.

### Nigeria

#### Department of Food Science and Technology, University of Ife

This department has been actively engaged in research and development of food processing and preservation techniques which are of benefit to both rural and urban women.

#### International Institute of Tropical Agriculture (IITA)

Has been involved in developing techniques and tools such as maize planters which can benefit women farmers. A great deal of work has also been done in respect of developing improved methods of storing crops.

### Sierra Leone

#### Department of Agricultural Engineering, Njala University College

The Department has developed many times of low-cost equipment of use to rural and urban women. These include hand-operated threshing machines, winnowers, rice-parboilers and improved storage cribs.

Department of Engineering, Fourah Bay College

This Department works closely with the Ministry of Social Welfare and Rural Development and other Government Ministries in developing low-cost technologies for use by rural communities and rural women. Equipment developed has included hand-operated oil-presses, solar water heaters and solar dryers.

Tikonko Agricultural Extension Service

This service has a production unit in Bo Town which is actively engaged in development and production of pedal threshers, winnowers, pulleys and cassava graters. Development plans include hand-weeders, oil-presses, ground nut shellers and rope-making machines. Support is given by Canadian, American and British volunteers who are training local craftsmen to produce the equipment which is developed.

Tanzania

Tanzania Agricultural Machinery Testing Unit (TAMTU)

This Unit designs, tests and manufactures simple farm equipment including animal-drawn carts, harrows, planters, weeders and winnowers.

Community Development Trust Fund (CDTF)

A voluntary agency which is very involved in disseminating appropriate technologies to rural women and rural communities. Pilot projects have included improving small-scale grain storage at village level.

Upper Volta

Société Africaine d'Etude et de Développement (SAED)

A private company which is very much involved with small-scale technology. It has designed and produced equipment of use to rural women such as simple hand-operated groundnut decorticators and was recently involved in a UNICEF study on how small technologies can help women. (See page 78).

Zambia

Family Farms Ltd.

This organization established a rural intermediate technology programme in 1973 and since then has produced over 40 AT devices including solar cookers and many types of low-cost agricultural equipment. The AT items are included in training programmes which are offered to women and men farmers.

A SELECT ANNOTATED BIBLIOGRAPHY ON WOMEN AND TECHNOLOGY IN AFRICA

1. Asare J., 'Making life easier for Africa's rural woman', UNICEF News, Issue 90/1976/4.

Looks at the most burdensome tasks of African women - fetching water, growing food, pounding grains, fetching firewood and preserving foods. Makes suggestions on how these burdens could be eased.

2. Boserup E., Women's Role in Economic Development, (London, Allen and Unwin, 1970).

Describes the sexual division of labour, the traditional roles of women, the impact of modernization on their workload, and for each of the major regions of the Third World, the widening gap between men and women in their levels of knowledge, training and occupations, both in rural areas and in the cities.

3. Boulding E., Women, Bread and Babies: Directing Aid for Fifth World Farmers. International Women's Year Studies on Women, Paper No.4. University of Colorado, Institute of Behavioural Sciences, Program of Research on General Social and Economic Dynamics. 1975.

Women's labour, which is actually increased by many development schemes is often unmeasured by planners and unremunerated by society. Discusses ways in which the overall situation could be improved, including transfer of intermediate technologies for daily tasks.

4. Carr M.N., 'Rural Women, Rural Technology, Rural Development', Populi Vol 3. No.4. 1976 pp. 44-50.

Looks at how the right technology, correctly applied, can help free rural women in Africa from drudgery and establish their position in a growing society. Covers technologies aimed at reducing the time spent by rural women on tasks such as carrying water and fuel and processing food and suggests methods of introducing such technologies into villages.

5. Carr M.N., 'Simple Technologies for Villages in Africa: A Review of the Village Technology Programme of the Training and Research Centre for Women'. Paper presented at the Conference on the Effective Use of Appropriate Technologies, Indianapolis, April 24 - 27, 1977. (Available from ITDG, London).

Major subject areas of interest to the Centre include: food production, storage, preservation and distribution; nutritional policy and programmes; handicrafts and other small-scale industries; labour saving devices and home improvement. In its widest definition, 'intermediate' technology is an essential part of all these major subject areas.....'. The paper describes how the African Training and Research Centre for Women of the United Nations Economic Commission for Africa seeks to assist governments with programmes and projects aimed at introducing village technologies to rural women and describes some of the difficulties involved.

6. Carr M.H., 'Appropriate Technology: Its Importance for African Women' paper prepared for the ACWW Workshop on 'Women of Africa Today', Nairobi, 1 - 10 October 1977.

Looks at what is meant by 'appropriate' technology and then shows the ways in which appropriate technology can help women in rural areas of Africa and in the poorer areas of the towns. Gives examples of how appropriate technology can help by saving time and effort in non-productive tasks; by helping to increase incomes; and by improving the home environment. (Available from ATRCW/ECA)

7. Centre Panafricain de Recherche et de Formation pour les femmes, 'Taches Excessives des Femmes et Accès aux Techniques', Assignment Children, No.36. October-December 1976. pp. 38-52. (English summary 'The Myriad Tasks of Women and their Access to Technology', pp 119-120).

Although recent increased emphasis on appropriate technology may help to eliminate inequalities between urban and rural areas, and between rich and poor families, there is still another bias which must be corrected: the exclusion of women from rural development programmes, from educational and training possibilities and from agricultural extension. The article looks at how appropriate technology could be used to help women in the rural areas and how the technologies could be disseminated to women in all areas.

8. Cole J., 'Providing access to new skills and modern techniques: The Ghana National Council on Women and Development', Assignment Children, Vol. 38. April-June 1977. pp 71-79.

Describes the structure, Plan of Action and research priorities of the Ghana Council. Priorities include the identification of appropriate technologies with regard to labour and time-saving devices for use at home and on the farm. Of interest is the Council's programme to revive old skills and teach new ones, to meet the demand for items such as soap and cooking oil, which are in short supply.

9. Dalton G.E. and Parker R.H., 'Agriculture in Southeast Ghana, Vol II. Special Studies', Development Study No. 13, Department of Agricultural Economics and Marketing, University of Reading 1973.

Two of the five chapters in this study contain information pertaining to women, technology and development. Of particular interest is the chapter on 'Catchment Systems for Rural Water Supplies' which describes the time-consuming nature to women of their responsibility for providing water and the economic cost of this inefficient system which is above and beyond its cost in terms of poor public health. The researchers found that women were spending an average of 46 minutes a day carrying water. The women indicated that they would spend 57 per cent of any time saved from water collection on directly productive labour so that the family income would be significantly increased if roof catchment systems were developed. Most of the houses in the village in the study had corrugated roofs which the women used to collect rainwater by putting gutters under the eaves. However, a major reason why catchment

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systems had not been developed was that it was the responsibility of men to put up bamboo-gathering and purchase the barrels for storing water. The chapter on the 'Charcoal Burning Industry' describes the inputs of the women into the industry and the benefits they received from it.

10. Fagley R.M., 'Easing the burden of rural women', Assignment Children No. 36. October-December 1976. pp. 9-23.

Describes how, although rural women are responsible for growing most of the food and do most of the work, they have been neglected by development planners. Concludes that this period of neglect is drawing to a close and cites examples of the work being done in respect of helping to alleviate the burden of rural women by ECA, UNICEF, FAO and ITDG.

11. Famille et Developpement, published quarterly Dakar, Senegal.

Often features articles on improved technologies which can help the rural woman and her family. For example, April 1975 - Solar cookers; October 1976 - pit latrines.

12. Food and Agriculture Organization, Equipment related to the domestic functions of food preparation, handling and storage. (Rome, 1974, FAO).

A folder of illustrated pamphlets assembled to serve as a reference for teachers, home economists and extension workers. It covers various types of equipment for home improvement and saving of effort on the part of women. These include various types of ovens, tables, screened shelves, storage facilities, and water catchment, storage and purification equipment.

13. Food and Agriculture Organization, Home Techniques (Rome, 1976, FAO). Series 1. Labour Saving Ideas.

A folder of illustrated pamphlets covering transport, protection of water supply and lifting of water, making soap, etc.

14. Goode P.M., 'Village Technology for African Women', Appropriate Technology Vol 2. No. 3., November 1975. pp. 16-17.

Concentrates on the introduction and impact of improved stoves and in particular on the Debe oven which can be made from two 4 gallon tin drums.

15. Government of the United Republic of Tanzania/ECA/FAO/UNICEF, Workshop on Food Preservation and Storage, Kibaha, Tanzania, 1975. (New York, UNECA, 1975).

Describes a workshop with 43 participants (mainly women) which concentrated on practical work. Participants built a solar dryer from wooden poles cut from the forest, plastered with mud reinforced with cow dung and lime, and covered with a double polythene lid. They also built an improved rat-protected maize crib and a rat-proofed, insect-resistant mud granary, and smoked meat in a dryer made from an oil drum. The equipment and methods were within the reach of the rural families and communities to whom the participants were intended to pass

on their newly acquired knowledge. Complete with illustrations and technical drawings.

16. Jedlicka A., Diffusion of Technical Innovation: A Case for the Non-Sexist Approach Among Rural Villages. Paper prepared for the Seminar on Women in Development, jointly sponsored by the AAAS, UNDP and the U.N. Institute for Training and Research. (Mexico City, 1975). Mimeo.

Ways of introducing new 'female' technologies, based on inclusion of women in the formation and functioning of rural participant groups.

17. Kilby P., Industrialization in an open economy: Nigeria 1945-1966. (Cambridge University Press, 1969). pp.159-165.

An interesting case study of how women in Nigeria boycotted and demonstrated against newly introduced commercial oil-pressing mills in the 1950's. This was a consequence of the intra-family income re-distribution effect of selling the palm fruit rather than its processed constituent. Traditionally, the woman received the kernel-containing nut as payment for her labour in processing the palm fruit. This labour, which amounted to one or two hours a day, fitted in between household and farming chores and was counted as 'free time' in the sense that it did not involve the sacrifice of remunerative employment.

18. McDowell J., (Ed), Village Technology in Eastern Africa. (Nairobi, UNICEF, 1976). A Report of a UNICEF sponsored Regional Seminar on 'Appropriate Technology for the Rural Family', 14-19 June 1976.

Report of an interesting meeting, which looked at the implications of introducing village technologies for the rural woman and her family in Africa. Covers food production, food conservation, food preparation, water supplies, practical application of appropriate technologies and inter-agency collaboration in village technology activities. Also describes the Village Technology Unit which was established by the Ministry of Housing and Social Services, Kenya with UNICEF funding and which was officially opened during the Seminar.

19. McDowell J., and Hazzard V., 'Village Technology and Women's Work in Eastern Africa', Assignment Children, No. 36. October-December 1976. pp. 53-65.

Looks at the heavy workload of the rural women in Africa and asks whether her life need be so hard. Describes some of the simple technologies related to water, fuel and crop processing which could help.

20. O'Kelly E., Aid and self-help. (London, Charles Knight, 1973). Chapter 16.

Describes the introduction of small corn mills in the Cameroons during the 1950's, a process which required the women to form societies to purchase the mills. As the societies became established, women used the saving in time to organize classes in such subjects as cooking, child-welfare and hygiene.

21. O'Kelly E., 'The Use of Appropriate Technology to Help Rural Women', Appropriate Technology, Vol.4. No.2. August 1977. pp 20-21..

Administrators of rural development programmes are either Westerners or were educated in the West and think in terms of transfer of sophisticated technologies rather than looking for simple, low-cost technologies which are suited to local conditions. Describes some appropriate technologies which would help rural women, and discusses ways in which these could be introduced to the women.

22. O'Kelly E., 'Appropriate Technology relevant to the rural home and rural women's work', prepared for presentation at a round-table discussion, FAO, Rome, 13 December 1977. (Available from Home Economics and Social Programmes Service, FAO, Rome).

Looks at the way in which appropriate technologies could help women and looks at how new technologies have often put women out of work rather than relieving them of non-productive tasks.

23. Pala A.O., The Role of African Women in Rural Development: Research Priorities. (University of Nairobi, 1975) Institute of Development Studies Discussion Paper No 203.

Argues that the role of women in rural development must be equal and complementary to that of men. Includes an interesting outline of the research priorities to correct the evaluation of women's potential role in rural development. These include labour-saving devices for rural women.

24. Rogers B., 'Women Farmers in Zambia', Spare Rib February 1978.

The first of a series of articles on Africa based on visits aimed at talking with village women, learning something about their lives and work, and discussing their problems when faced with male-centred development projects. Stresses that women are asking for training in new techniques of food production.

25. Rogers B., 'African women in agriculture', Africa, No 78 February 1978.

Argues that there is an urgent need for labour-saving technology to be applied to women's work. In particular, a year-round village water supply could boost food production by saving hours of women's time and energy that would otherwise be devoted to fetching water.

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26. Sene M., 'Un projet d'allègement du travail des femmes au Mali', Assignment Children No. 36. October-December 1976. pp. 66-86. (English summary 'Alleviating women's workload in Mali', pp 120-121).

The introduction of cash crops in Mali has primarily benefited the men, while substantially increasing the already heavy burden of work carried by the women. Thus most efforts directed at improving the living conditions of the rural population have not noticeably improved the lives of women and children. The excessive workload of women contributes to the number of miscarriages and premature births, to a lower female life expectancy, and reduces their possibilities for any type of education and its application. For these reasons, any rural development programme which wishes to meet the real needs of women should include a project to alleviate their work. The article describes such a project which was launched by the government of Mali, with UNICEF assistance.

27. Seward S.B., Technology, Non-Market Activities and Household Productivity. (Ottawa, International Development Research Centre, 1977).

Interest in new technologies for development has stressed production of goods for the market, generally by men. This paper argues that the definition of 'productive' effort should be broadened to include other activities of households. In this view, technical inventiveness should also be applied to domestic tasks (child-care, food preparation, provision of fuel and water, making of clothes) and 'informal income-generating activities' (primarily handicrafts and other goods made by women). Changes in these areas could have significant effects on human capital formation (through improvements in nutrition and education), fertility (through increased incomes and access to jobs), and so on. The author reviews papers and development projects concerned with technological impact on household productivity.

28. Tinker I. and Bramsen M.B., 'Workshop 1: Food Production and the Introduction of Small-Scale Technology into Rural Life', in Women and World Development Tinker I. and Bramsen M.B. (eds).

Participants in this workshop noted that development often adds to the work of rural women. They must do more of the farming when men take on 'modern' jobs; where men stay home but expand cultivation with new machinery, women have a larger area to weed by hand; shifting of land from subsistence to cash crops makes proper nutrition more difficult to maintain, etc. A first need is for governments to view women's work as true 'economic activity'. Support for such activity might then come through encouragement of women's organizations, provision of credit, and transfer of technologies appropriate to women's needs.

29. Tinker I., 'Development and the disintegration of the family', Assignment Children No. 36. October-December 1976. pp 29-37.

Looks at ways in which development, including the introduction of improved technologies, can have an adverse effect on the rural women. Cites examples of new technologies relieving women of extra income rather than their burden.

30. United Nations Development Programme, 'Small Technology: New Tools for Women', one of a series of eight seminar programmes jointly entitled Women in Development: Courses for Action. (New York, UNDP)
- This is a slide and sound package (ten minutes) which discusses the importance of small-scale technologies to women in the Third World. Suggestions are offered on ways to improve accessibility to better tools.
31. United Nations Economic Commission for Africa, Human Resources Development Division, Women's Programme, The Role of Women in Population Dynamics Related to Food and Agriculture and Rural Development in Africa. (Addis Ababa, UNECA, 1974).
- Women have a predominant role in food production and other activities, but so far have received little development aid. Recommends technologies to help women on the farm and at home.
32. United Nations Economic Commission for Africa/Women's Programme, Women of Africa: Today and Tomorrow. (Addis Ababa, UNECA, 1975).
- A useful summary of the position and needs of women in Africa. Part II entitled 'Breaking down the barriers to a fuller life for women', has a section on village technology including water supplies, fuel supplies and food storage and preservation..
33. United Nations Economic Commission for Africa, 'The Role of Women in African Development', Economic Bulletin for Africa, Vol XI. No.1. 1975.
- One need only recall the rural division of labour to realize that a water supply and a village grinding mill are great boons to women, and save them hours of back-breaking labour. But not all improvements have such a positive effect on the lives of women. The article gives examples of both positive and negative effects of modernization on the rural woman in Africa.
34. United Nations Centre for Social Development and Humanitarian Affairs, 'Water, Women and Development', Paper prepared for the UN Water Conference 14-25 March 1977 Mar del Plata, Argentina. (E. Conf. 703A. 19).
- Has examples of appropriate water technology to assist women. Includes the application of solar energy for rural and industrial development in developing countries.
35. UNICEF, Regional Office for West and Central Africa, The Lomé Conference: Children, Youth, women and development plans in West and Central Africa. (UNICEF, 1972). Report of the Conference of Ministers held in Lomé, Togo, May 1972.

Three years of research, hundreds of pages of documents, and two weeks of discussions during the Conference culminated in proposals for an alternative development which would take full account of the real needs of the population concerned. For the first time, eight governments of West and Central Africa recognized as a priority need the alleviation of women's work, on the basis of the results of their own research carried out with UNICEF assistance.

A Select List of Useful Names and Addresses

The following list is by no means comprehensive, but gives some indication of people and organizations which are working in the field of appropriate technology for women and who are likely to be able to provide relevant information.

1. Marilyn Carr, Expert in Village Technology, African Training and Research Centre for Women, ECA, Box 3001, Addis Ababa, Ethiopia.
2. Jim McDowell, Chief, Village Technology Section, UNICEF, East Africa Regional Office, Box 44145, Nairobi, Kenya.
3. Marie Toure N'Gom, UNICEF, Box 4443, Abidjan Plateau, Ivory Coast.
4. Selina Taylor, UNICEF, c/o UNDP Office, Box 1423, Accra, Ghana.
5. Iftikhar Ahmed, World Employment Programme, Employment and Development Department, ILO, CH 1211, Geneva 22, Switzerland.
6. Barbara Purvis, Home Economics Officer, Home Economics and Social Programmes Service, Human Resources, Institutions and Agrarian Reform Division, FAO, Rome, Italy.
7. Philip Langley, ENDA, Box 3370, Dakar, Senegal.
8. Elizabeth O'Kelly, Chairman, Homestead Technology Panel, ITDG, 9 King Street, London WC2, England.
9. Arvonne Frazer, Coordinator, Women in Development, Department of State, Agency for International Development, Washington D.C. 20523, USA.
10. Jordan Louis, Director, Appropriate Technology International, Department of State, Washington D.C. 20523, USA.
11. Tom Fox, Director, Volunteers in Technical Assistance, 3706, Rhode Island Avenue, Mt. Ranier, Maryland, 20822, USA.
12. Brenda Gates, Director, Information Collection and Exchange, Peace Corps, Washington D.C. 20525, USA.
13. Susan Caughman, Service Quaker, Programme 'Femmes et Développement,' Box 3221, Dakar, Senegal.
14. Martha Wilding, CARE-KENYA, Gill House, Box 30276, Nairobi, Kenya.
15. Brice Atkinson, CARE-LESOTHO, Box 682, Maseru, Lesotho.

16. Shirley Seward, Assistant Director, Social Sciences and Human Resources Division, IDRC, Box 8500, Ottawa, Canada, K1G 3H9.
17. Tom Lawand, Director, Field Operations, Brace Research Institute, Macdonald College of McGill University, Ste. Anne de Bellevue, Quebec, Canada, HOA 1C0.
18. Marcy Kelly, Program Assistant for Appropriate Technology, Women in Development Inc., Suite 203, 1302 18th Street, NW., Washington D.C. 20036, USA.
19. M. Mbaakanye, Botswana Enterprises Development Unit, Box 438, Gaborone, Botswana.
20. Ulrich Dehler-Grimm, Rural Industries Innovation Centre, Box 18, Gaborone, Botswana.
21. The Department Head, Department of Engineering, Faculty of Technology, National University, Addis Ababa, Ethiopia.
22. Ben Ntim, Technology Consultancy Centre, University of Science and Technology, University Post Office, Kumasi, Ghana.
23. Jane Cole, Executive Secretary, National Council on Women and Development, Box M 53, Accra, Ghana.
24. Florence Dovlo, Food Research Institute, Accra, Ghana.
25. Bo Kikivi, Kenya Industrial Estates, Box 18282, Nairobi, Kenya.
26. Terry Kantai, Head, Women's Bureau, Ministry of Housing and Social Services, Gill House, Box 30276, Nairobi, Kenya.
27. Betty Beauttah, Women's Training Officer, Youth Development Division, Ministry of Housing and Social Services, Gill House, Box 30276, Nairobi, Kenya.
28. P. Ngoddy, Department of Food Science and Technology, University of Ife, Ile-Ife, Nigeria.
29. Ray Wijewardene, International Institute of Tropical Agriculture, P.M.B. 5320, Ibadan, Nigeria.

30. N.G. Kuyambeh, Department of Agricultural Engineering, Njala University College, P.M.B. Freetown, Sierra Leone.
31. Michael Bassey, Department of Engineering, Fourah Bay College, Freetown Sierra Leone.
32. F.K. Mujemala, Tanzania Agricultural Machinery Testing Unit, Box 1389, Arusha, Tanzania.
33. Martha Bulengo, Community Development Trust Fund, Box 9421, Dar-es-Salaam, Tanzania.
34. Amadou Traore, SAED, B.P. 593, Ouagadougou, Upper Volta.
35. Lee Holland, Family Farms Ltd., Box RW 285, Lusaka, Zambia.

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Women's Centre, ECA, Box 3001, Addis Ababa, Ethiopia.

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