2. AGRICULTURAL TECHNOLOGY IN EAST, CENTRAL AND SOUTHERN AFRICA

Introduction

Historically, poor communications and imperfect markets have obstructed the free transfer of appropriate agricultural technologies in sub-Saharan Africa. Traditional hand tools, of which in the 19th century there was a wide range well suited to local conditions, disappeared in most parts of the continent as mass produced alternatives were imported from the West. But few of the imported tools were designed for African conditions, and most have proved physically, ecologically or economically inappropriate. Only in recent years have serious attempts been made to produce in Africa tools designed specifically for local conditions, building on both imported and indigenous experience. However, few of these tools have yet become widely available.

In Eastern Africa during the colonial period local manufacture of handtools by village blacksmiths was discouraged in order to secure a colonial market for the limited, and now familiar range of hoes, forks and cutlasses made and designed in Europe. Traditional designs of handtools survive in West Africa: in East and Central Africa they are a lost technology. In order to accelerate the output of industrial crops, the colonial powers then introduced animal-drawn agricultural tools, and this was accompanied by the spread northwards of designs brought to Africa by the Boer settlers of South Africa. Hence most animal-drawn implements used in ECS Africa (1) today are derived from European models, dominated by the single furrow mould-board plough.

In the immediate post-independence period of the 1960s there was a widespread introduction of tractors to ECS Africa, to raise the productivity of agriculture, and a similarly extensive adoption of diesel powered water-lifting, generating and milling machinery. During this time, the use of animal-drawn tools also increased, but their design was seldom questioned and most were imported from established European and South African sources.

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(1) ECS Africa is used throughout to refer to East, Central and Southern Africa, the region with which this guide is concerned. The countries included, from north to south, are Kenya, Uganda, Tanzania, Malawi, Zambia, Zimbabwe, Botswana, Swaziland and Lesotho. The guide should also be of use to Mozambique and Angola, members of the newly formed grouping of Southern African States.

Finding the Appropriate Design

Many of the low-cost implements suitable for agriculture in ECS Africa can now be found within the region, and are simple enough for local manufacture. Imported models can be made more appropriate by adaptive research and development, and indeed agricultural research centres in ECS Africa have paid increasing attention to the design or development of new tools which are particularly appropriate to local conditions.

Attention has to be paid not only to engineering aspects, but also to the availability of animal and other forms of power, to the peak periods of labour demand in peasant agriculture, and to the maintenance skills found in rural areas. Increasingly such research is done in collaboration with research centres in other countries of the region, which greatly reduces its cost and increases its effectiveness.

Moving to Local Manufacture

The surest way in which countries can obtain agricultural equipment appropriate to their needs is to make it themselves. There has indeed been a considerable expansion of local manufacture of agricultural implements in the region in recent years.

In the 1960s there were less than ten factories in ECS Africa manufacturing a restricted range of agricultural implements: today, as this catalogue shows, there is a wide range of tools produced in some thirty factories spread through every country of the region, and these are all tools appropriate to low-cost, small farm operation.

Initially the designs used were derivatives of the models previously imported: seven local factories now manufacture single-furrow mould-board ploughs based on the original South African designs. But some smaller workshops are now producing more original designs, based on local research and better suited to local conditions. Manufacturing in the region is thus at a transitional stage between the use of imported and locally developed designs.

Constraints to Local Manufacture: Patents

Local manufacture or assembly of imported designs of complex equipment is generally arranged under licence or in agreement with the original producers. But with simpler low-cost agricultural tools, 'pirating' - manufacture in defiance of, or in the absence of, design patents - is much more commonly practised.

Although pirating is the simplest way of gaining access to a design, it frequently leads to an unsatisfactory end-product, the copy being markedly inferior to the design it copies. The lack of co-operation between the 'pirate' and the original manufacturer usually results in ignorance of important information on specifications and manufacturing technique.

In fact pirating in this context is generally unnecessary. While it attempts to side-step apparently expensive licensing arrangements, such arrangements may not prove to be expensive at all when applied to low-cost designs of agricultural equipment. For defensible patents for such agricultural implements are generally either technically impossible to secure, or their cost is out of all proportion to the value of the implement. It is also difficult for the manufacturers to prove that their design is in fact original. Thus few designs of agricultural implements are truly patentable.

From recent experience in the region, the development of quite open exchange agreements is recommended. If there is any cost in such an agreement it should be more than adequately covered by the insurance that the copy will perform as well as the original. Furthermore, with the transitional stage in manufacturing existing in most countries of the region, it is also likely that the exchange of designs will bring valuable feedback to the original designer, from modifications and observations made on use of the implements in a different environment by a different group of specialised users and testers(2).

Technical & Economic Constraints To Local Manufacture

Of the several constraints to local manufacture, two are worthy of mention here: one is technical, the other is economic. A major technical constraint is the need for high quality materials in some important components. Cultivation equipment (handtools and ox-ploughs alike) needs high quality steel for soil-contacting parts, and local steel mills cannot yet fully meet this demand. Milling and pumping equipment needs durable sealed bearings, for which demand in the region is still insufficient to justify local manufacture. Thus some components still have to be imported, and this affects the potential for manufacture of otherwise good local designs, since manufacturers of the imported components are unlikely to be able to produce parts to the exact specifications of a factory in the region.

A major economic constraint is the size of the market. Within the region as a whole, and even within different countries, the market for agricultural implements may not be smaller than that served by some successful European manufacturers. With local manufacture leading to greater specialization of designs - for different crops, different soil types, different resources of animal power - the market that an individual factory can penetrate without assistance could be too small to justify mass manufacture.

There is, therefore, a pressing need for assistance and initial protection of local industries, though the risk of subsidising inefficiency and of inhibiting regional specialization must be guarded against. At the same time there is a need to increase the size of the market, both internally and through export leading to regional trade. As an indication that this can be done, the catalogue includes the products of a West African factory which has already embarked on large-scale manufacture of tools designed specifically for West African markets and appropriate also for many countries of ECS Africa.

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(2) Further information on patents and trademarks, and their use and abuse in technology transfer, can be obtained from the:

East & Southern African Intellectual Property Organization,
World Intellectual Property Organization,
United Nations,
Palais des Nations,
GENEVA,
Switzerland

Regional Trade in Agricultural Equipment

Awareness of the potential benefits of regional trade in this part of Africa is not new. In the colonial and the immediate post-colonial period two regional groupings functioned: the Central African Federation and the East African Community. These groupings each gave markets of three countries to factories in one of the countries. They also used a road and rail infrastructure that linked the countries effectively and played a big part in serving the regional markets.

The countries did, however, have common currencies and, initially, common political control. As independent economic and political control developed in each country, so the groupings collapsed. In each case one country came to dominate the group economically, and the other countries suffered from the inequality. Today there is only one established regional trading agreement in ECS Africa, the South African Customs Union, but that is dominated by the dependence of three land-locked countries - Botswana, Lesotho and Swaziland - on South Africa.

The countries of the region, with the exception of Lesotho, all share land borders one with the other. Across these borders, linking Uganda in the north with Botswana in the south, there is a network of roads and railways that could carry a substantial volume of regional trade. However, at the present time this transport network is still used overwhemingly for the import and export trade of individual countries with the world beyond the region. Even in agricultural equipment, each country's major trading partners are outside the region.

The existing constraints on regional trade are logistical, financial and political. Publication of this guide may directly contribute only to the solution of one of the logistical constraints - poor market intelligence. Although most countries of the region have a common language and common borders, the extent of product knowledge between them is quite imperfect. Hopefully the catalogue will improve this knowledge. The country guides may also give some guidance to manufacturers, concerning other countries of the region in which there might be a market for their products.

Indirectly, however, it is hoped that the guide will indicate the potential benefits to be gained form resolving the more critical obstacles to regional trade. Communication between buyer and seller is still very difficult. At least two telecommunications systems operate in the region, co-ordination between them relying on relay with Europe. Air-mail facilities are still dominated by a north-south pattern between each country and Europe. Although the transport infrastructure exists, the co-ordinated use of it for regional trade still relies on a handful of private agents whose main business is import and export between the country in which they operate and the outside world (3).

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(3) Some agents have branches in a number of countries: these are listed in the country guides.

The financial constraints are crucial. In the absence of special agreements trade between countries of the region is still financed by using third-country currencies. Hence the willingness to participate in regional trade is still as severely conditioned by foreign exchange reserves as is trade with countries outside the region. Associated with this, the financial institutions that could be used to co-ordinate regional trade are dominated by their links with metropolitan Europe; their regional links are secondary. Thus there are few special regional credit facilities operating, for example, between branches of the major trading banks in one country of the region and another.

There are also political constraints. The border between Kenya and Tanzania remains closed, making trade between Kenya and the rest of the region dependent on expensive trans-shipment by sea. In effect, also, trade between East and Southern Africa is politically constrained by the land-lockedness of Botswana, Lesotho and Swaziland in relation to South Africa.

The influence of South Africa, combined with the achievement of independence at last in Zimbabwe has, however, led to the institution of a new regional agreement that should resolve many of these constraints on regional trade. Heads of State of nine Southern African countries, meeting in Lusaka, made a historic Declaration on Development Co-operation on the 1st of April 1980 - the 'Lusaka Declaration'. This was a declaration by Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe of 'a strategy for a closer integration of their economies ..... so as to accelerate their development and reduce their dependence on the Republic of South Africa.'

These nine countries are now linked through the Southern Africa Development Co-ordination Conference, whose programme of action will include the creation of a Regional Transport and Communications Commission, and plans for the harmonization of industrialization and energy policies leading ultimately to a great expansion in local manufacture of industrial products and regional trade.

PART 3 : THE CATALOGUE

Geographical Coverage

With one exception, all the implements shown are made and/or designed in the Commonwealth countries of ECS Africa: Botswana, Kenya, Lesotho, Malawi, Swaziland, Tanzania, Zambia and Zimbabwe. The one exception is the range of products from the Siscoma factory in Senegal. This factory is unique in Africa for its mass-production of implements designed specifically for African conditions. Its products have been included because we consider information about them can fill important gaps in the demand for tools in ECS Africa.

Range of Implements Included

It is not easy to define objectively the range of equipment that classes as being useful for agricultural development. On the one hand a strict limitation to agricultural tools would be too narrow; on the other hand inclusion of all equipment used in rural areas would make compilation of the Guide unwieldy.

The range of equipment covered by this catalogue includes: implements for cultivation, harrowing, weeding, planting, harvesting, winnowing, threshing, milling and storage of crops, and irrigation, power, transport, poultry, spinning and beekeeping equipment. Tractors over 30HP, and all tractor-drawn implements have been omitted, as this is a catalogue of small-scale machinery. Other categories of equipment may be included in a later edition if there is sufficient demand.

We hope that we have uncovered, in the course of our research, all relevant implements that are being developed and manufactured in Commonwealth East, Central and Southern Africa. Undoubtedly some have been omitted: that is inevitable with this kind of research. Therefore we rely heavily on the publication of the catalogue, its dissemination, and the reaction of readers to help us perfect the coverage for a subsequent edition.

Furthermore, designs proceed from the laboratory stage through field testing, modification and prototype production, to limited and ultimately large scale manufacture. We have endeavoured to draw a line between those designs in the developmental stage and those that can be or are being manufactured. We have not limited coverage purely to commercial factories. Some factories only produce to order, and some research establishments are able to engage in limited manufacture. We have therefore included both these groups, while excluding designs that, to our knowledge, are still at the prototype stage.

Availability of Equipment

The main constraint on availability, especially of items manufactured in another country, is market facilities. Even where these exist, it may be found that some items are not available for export because the manufacturer is working at full capacity to fulfil local orders.

Direct communication with the manufacturer is essential in this regard. To facilitate this the full postal address, telephone and telex numbers of manufacturers have been included wherever possible.

Descriptions & Illustrations

As far as possible individual drawings and descriptions of each implement have been included, even where some designs are remarkably similar. We have tried to focus, therefore, on distinguishing features between designs, however slight.

Prices

Some reference to price has to be made in a catalogue, to enable users to make an estimate of the initial cost of obtaining an implement. The up-to-date price for all implements for the nearest date to 1st May 1980 has been obtained, and in each case the relevant date is quoted. Prices are given in local currency and US$ equivalents at 1st May 1980 exchange rates. Prices change constantly and the prices quoted should not be be taken as the basis for any contract. They were supplied by manufacturers on this understanding. ACTUAL PRICES MUST BE VERIFIED FROM THE MANUFACTURER.

PART 4 : THE COUNTRY GUIDES

A short guide to each country has been prepared and these are included in alphabetical order: Botswana, Kenya, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

Each country guide consists of the following sections:

Agriculture

A brief summary is included which indicates the main features of land types, distribution of land-holding, and principal crops grown. Though the information is not complete in every case, it should show the types of equipment which may be in greatest demand, and the approximate size of potential market.

Technology

The relative importance of hand-labour, animal power and mechanical power is shown, and an indication is given of government policy towards agricultural mechanization.

Mention is also made of national institutions responsible for the promotion of agricultural technology, and a brief summary is given of the type of industry engaged in the manufacture of agricultural tools and implements.

Freight Agents & Transport Companies

We have listed the principal agents and transporters in each country. Identification of a competent agent is generally a prerequisite to the successful fulfilment of an order or delivery. Importers or exporters contemplating the use of one of the named agents in their own country, should show the list of agents in the country they intend dealing with to that agent. Agents usually have special working relationships with counterparts in other countries.

Agents should also be aware of customs and trade regulations that may not be included in this guide.

Trade Regulations & Customs Tariffs

These are included as much for the guidance of importers as for exporters. Customs tariffs quoted are for agricultural implements only, and all information given here should be checked for accuracy with:

(a) Departments of Customs and Excise

(b) High Commissions, Embassies and Trade Commissions

(c) Departments of Trade in Ministries of Commerce and Ministries of Finance.

With this information, the guides can be used by manufacturers to assess the potential market for their products in neighbouring countries and to assess the facilities available for reaching these markets. The guide should also be of use to those wishing to order machinery from other countries, by providing them with information on the import regulations and availability of transport facilities.

We are fully aware that the country guides could include more detailed information, which would be of value to manufacturer and user alike. It would have been satisfying to have been able to prepare a more thorough analysis of markets and to have included more information about the actual costs of using various transport alternatives. However that would have demanded more time and resources than were available. It is our hope that this publication may encourage organizations within the region to attempt to fill these gaps in the future.