OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as "developed", "industrialized" and "developing" are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

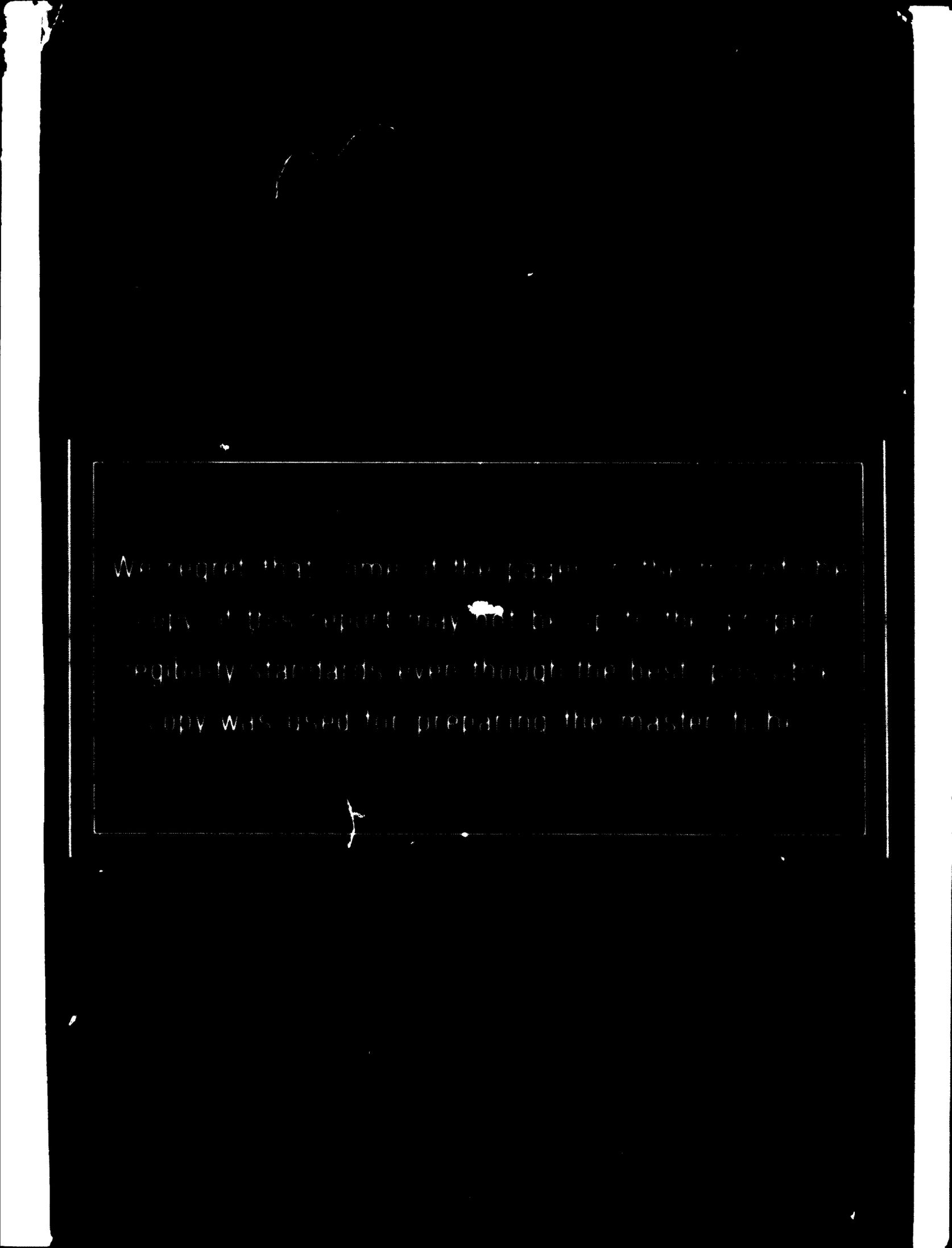
Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org



08625

Distr.
LIMITED

UNIDO/EX.62
29 November 1978

ENGLISH

UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

Global Preparatory Meeting for a Consultation
on the Food-Processing Industry

Vienna, 8 - 12 January 1979

REPORT ON
FOOD PROCESSING IN ETHIOPIA, KENYA, GHANA, AND SENEGAL[1/]

by

Francis Aylward and G. R. Howat
UNIDO Consultants

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

id.78-8377

CONTENTS

SECTION A

INTRODUCTORY

1. INTRODUCTION

1.1 Origin of Report This Report on the African Region has been prepared at the request of, and with the co-operation of, UNIDO, but the authors accept responsibility for the views expressed. Because of the circumstances under which the Report has been written there will, no doubt, be some errors of fact as well as errors of omission and emphasis. The authors will welcome comments and criticisms, so that any necessary corrections can be made. 1/

1.2 Sources of Information Reports, documentation and other information have been collected from a variety of organisations including:

(i) UNIDO on the agro-based food industries and related topics, in particular draft global and related topics

(ii) UNDP, FAO, UNICEF, UNESCO, ILO, WHO and the World Bank and other UN Agencies and associated bodies.

(iii) Other organizations concerned with technical assistance and co-operation on a bilateral or multilateral basis (e.g. OECD, EEC)

(iv) Governmental, semi-governmental and other bodies (e.g. universities and research centres) in selected developing countries (in part through UNDP offices).

(v) Commercial enterprises concerned with food processing or with the supply of engineering, packaging and other equipment.

In addition, the authors have drawn on their experience gained through

1/ The senior author, Dr. Francis Aylward, Emeritus Professor of the University of Reading, England, who compiled the first five chapters, died suddenly on 28 September 1978.

residence or visits to different African countries and on published scientific, technical, economic and statistical reports, prepared by individuals or by groups. In connection with (iv) above, one of us (GRH) paid short visits in September 1978 to Ethiopia, Kenya, Ghana and Senegal. Supplementary notes on these visits have been prepared for UNIDO and they form the second part of this Report.

1.3 References: Bibliography

In this Report we have included relatively few references to the scientific and technical literature and to the very large numbers of reports and documents which are relevant to our study. We suggest that a separate bibliography be prepared; this could provide a background for future studies.

In spite of the extensive 'literature' there are few, if any, recent publications which cover in any detail the ground surveyed in this Report; most studies are national or sub-regional (e.g. West African) in approach or confined to a single or limited range of commodities. Two monographs of the Food Research Institute of Stanford University, the Staple Food Economics of Western Tropical Africa (Bruce Johnston 1958) and Manioc in Africa (William Jones 1959) have proved of special value both in providing a picture of the ("pre-independence") situation in the 1950's and in providing a large number of references to publications in French as well as in English and other languages.

In preparing this Report we have drawn extensively on two background reviews prepared by one of us (FA): (i) Food and Nutrition in Ghana (1961 - for FAO); (ii) Requirements for the establishment of a tropical fruit industry (1971 Symposium organised by the Tropical Products Institute, London).

1.4 Definitions - Terminology

In the preparation of this Report we have become aware of the problems of terminology and of definitions, both in the English language, and in translations from one language to another. There are areas with special difficulties related to the definitions of (i) food storage, preservation, processing, conservation and (ii) food trades, food industries, agro-industries. We have therefore provided in the following chapter some notes on terminology.

1.5 Movement of Agricultural Commodities and Foodstuffs in International Trade

In most international discussions on world food problems attention is focussed on the movement of commodities in international trade. It is true that international trades in various types of cereal grasses, oil seeds and sugar are extremely important and that the economies of a number of developing countries are extremely sensitive to changes in demand and in price of various industrial commod'ties (e.g. beverage and related crops - tea, coffee and cacao products). But the UNIDO Draft Global Food Report suggests that only a small proportion of the agricultural produce produced on a global basis does, in fact, move in international trade; a tentative figure of 10% is suggested. This question will be referred to later in this Report but it is clear that in any survey of the food trades and industries we must examine carefully the food production and utilisation for home consumption as well as requirements for export.

2. DEFINITION: NOTES ON TERMINOLOGY

2.1 Food Storage

There is over-lapping between the terms food storage, preservation, processing and food conservation.

Food Storage may include (a) the storage of the plant or animal material in its original form immediately after harvesting, or after some simple mechanical or other operation (b) the storage of materials which have already bee subject to some type of operation at some point in the food chain. The first category is illustrated by the storage of maize of other cereal grain immediately after separation from the plant; in the second category is the storage of dried, frozen or canned goods.

Category (a) often involves storage on or near the farm or the site of food production and some countries use the term food storage in agricultural journals in this limited sense and consider it as primarily a task for the farmer or agricultural engineer. In future a high proportion of crops may be stored after transport from the farm e.g. to silos or warehouses in sea and river ports or to urban centres.

In practice there are relatively few examples of food storage, without some element of preservation and processing e.g. in on-farm storage, pesticides may be used to reduce the deterioration of grain by insects.

2.2 Food Preservation This term covers any techniques used to protect food and to enable it to last longer in good condition, or to use current phraseology to extend its shelf-life. The techniques may include: methods of physical protection with or without agents to protect against pests, control of the gaseous environment through ventilation and air-conditioning, control of temperature, heat treatment, dehydration and various miscellaneous methods (such as treatment by chemicals, or by fermentations). The objective of preservation is to reduce the rate of spoilage by biological agents

(e.g. by pests or by micro-organisms) and by other agents (e.g. the enzymes naturally present in the tissues).

2.3 Food Processing Many of the traditional methods of food preservation (such as drying or salting) had as their primary objective the short term or long term storage of foods that were known to be unstable. Thus it was recognised that while cereals could often be stored under appropriate conditions for relatively long periods, other crops such as fruits, and all animal produce are more sensitive to change, and have to be treated or processed in some way - unless cold storage or similar facilities are available.

Food processing may, however, have quite a different objective - to transform agricultural raw materials into different types of foodstuffs and in this way to increase the variety of the diet. Under this heading we can include old procedures such as the transformation of wheat to wheat flour and wheat flour to bread, with corresponding changes in maize (corn) and other cereals to give different types of cereal foods. Often a characteristic feature of the final product is that it is more palatable as human food than the original grain. And this fact may be the raison d'être for processing.

Some methods of processing (such as the preparation of cheese from milk) may have a double objective; cheese may have been prepared originally as a relatively stable milk product; nevertheless it became an established food in its own right. In West Africa, the drying of fish is a traditional method of preservation, dried fish is now established as an important and welcome item in the diet.

2.4 Food Conservation Of the three terms referred to above food

processing is the widest and is often used as a matter of convenience to cover any form of storage or treatment of food during the history of the commodity at any point in the food chain from farm, in a food factory or store, or in the kitchen of the home or catering establishment.

We shall in this Report often use the term food processing in this wide sense, and also as an alternative term food conservation. This term translates easily into French, but in English it is sometimes used in a restricted sense e.g. for jams or sugar preserves.

2.5 Food Industries: Food Trades

Many authors (especially those writing from the United States or writing from the point of view of the professionally-trained food engineer) think of the food industries in terms of large, more or less automated factories, often capital-intensive in respect to equipment and frequently under the control of large multi-product, multi-national enterprises.

By contrast such authors reserve the term food trades for traditional sectors (such as bakery, butchery) carried out in whole or part by craftsmen in small enterprises, often family owned.

In practice, there is a wide spectrum between these two extremes. This is not always obvious from the scientific and technical literature which tends to describe large scale modern factories; and ignores (for example) the widespread use of machinery in smaller undertakings. Reports prepared by member countries of the European Economic Community show that in most countries small and medium scale industries (and especially those related to agriculture) play an important role in the national economics and are part of the social fabric of local and regional life.

We believe that in Africa and other developing regions of the world, the role of the small enterprise cannot be ignored and we propose, therefore,

in this Report to use the term food industry to include enterprises in any part of the spectrum - irrespective of scale or of ownership. We will include, in effect, the post-harvest aspects of the food chain.

2.6 Agro-industries The terms agro-industries, agro-based industries agro-based food industries have come into common use in recent years. The agro-based industry is essentially one in which the major raw materials come from agriculture (forestry, or fisheries) - as distinct from industries such as petroleum, coal or metals which are based on mining or similar operations. One important distinction between the two groups is that the agro-industries are based on potentially renewable resources; the second on finite resources.

Within the agro-based industries we can distinguish between (i) the different food sectors such as those based on cereals, vegetables, meats, and milk, and (ii) non-food sectors such as leather, textiles and soap. Some of the operations in (i) and (ii) are closely related (e.g. edible oils and fats; soap production).

Although the origin of the word agro-industry is clear, it would appear that the terms now conjure up in the minds of many readers the concept of an operation carried out on a large-scale, probably with plantation or ranch production of raw materials and often with multi-national and transnational financial control. This limited and incorrect meaning has come about in part because of the use of the further term agro-industrial complex and because of examples quoted in USA and related technical literature showing that (up to a very recent period) considerable growth in the size of individual units had taken place over the past few decades.

In this Report we propose to consider the family owned ground-nut mill in West Africa, like the olive-oil mill in an Italian village as part

of the agro-industries.

2.7 Domestic Methods of Food Processing

It is against the above background that many of the food processing operations in Africa must be viewed. Many of the traditional methods of preservation and processing have been carried out (often by women) in or near the home or compound. Their primary objectives were (and often are) to provide cooked or prepared foodstuffs for (i) the basic family (ii) the extended family and - in some cases at least - for sale outside in village or urban markets. In West Africa, in particular, the women trader is often responsible for both the processing of a food (such as 'kenke' from maize) and for its distribution and sale. These traders occupy much the same position as the baker in the traditional European society.

2.8 Evolution of the Food Industries

Several reports have demonstrated the very high proportion of time spent by the typical African women in traditional food preparation procedures such as the providing of grain and significant changes have taken place in recent years through the introduction of small mills, first hand-drawn, later power driven, for maize and other crops.

We can see in different parts of Africa all three stages of an evolutionary pattern: -

(a) in which all procedures are carried out in the kitchen or compound

(b) the gradual participation of a second or third party such as a local miller

(c) in which the producer is not concerned directly with the processing.

In stage (a) produce such as maize, either home grown or purchased at the local market, is pounded by the traditional 'pestle and mortar' method.

In stage (b) - to be noted in greater detail in a later chapter on cereals - the grain is carried to the village miller who, for a fee, (taken in cash or kind), grinds it on his small power-driven mill. It can then be taken back home to be used for a maize preparation. In stage (c) the miller purchases the grain from the producer or middleman, grinds it and sells the flour. This stage may mark the beginning of specialised trades concerned with different types of cereal products.

In Africa, as indeed in Europe, the local mill marks almost certainly the beginning of 'food industries' and of food operations outside the home.

3. THE AFRICAN BACKGROUND

3.1 Introduction

Statistical economic and political information about developing countries in Africa is available in statistical reference books and in a variety of UN and other publications. No attempt will be made to reproduce this here, but in this chapter reference will be made to a few points which are well known but which are not always taken into account in discussions on food problems.

3.2 Number of Countries

Omitting Southern Africa, we can make a broad distinction between the countries on the North African / Mediterranean Coast and the remainder of Africa. Further divisions are made by different authors e.g. West Africa, East Africa, Central Africa. The point to be noted is the large number of independent countries and political units; there are over 40 of them in all and they differ enormously in geographical areas, populations, in climatic conditions and in renewable and non-renewable natural resources. Africa includes a high proportion of the 'very poor' or "least developed" group of countries as defined in UN, EEC and other documents.

3.3 Populations; Population Density; Urbanisation

In continental terms the population density of Africa is not high but average figures conceal the very great variations from country to country and within any one country.

It is probably true to say that most authorities writing 50 years ago on Africa were not worried about 'pressure of food supplies on population' - apart from the recognition that poor communications and climatic

conditions and natural calamities led to occasional local famines which required emergency measures. However, over the past 50 years there has been a dramatic increase in population in many areas.

From this has arisen increasing migration of people from rural to urban areas and a spectacular growth in the size of capital and other cities. Some of the largest cities in the world with populations much in excess of 1 M are on the African Continent, and these produce problems very similar to, but more extensive than those recorded in the industrial and urban social revolutions in Europe in the 1800 - 1856 period. Apart from social and political problems, arising from poor housing, unemployment and inflation, there are special difficulties in providing effective means of food distribution.

3.4 Climatic Conditions; Water Supplies

The tropical climate of most parts of Africa involves extremes of weather conditions with droughts and floods, storms and heat, which make difficult the mastery over nature essential for so many types of development. The control of water supplies produces special difficulties in many areas.

3.5 Human Health; Nutrition

Malaria and a wide range of other tropical diseases are endemic in many parts of the Continent. Since the 1870s (with the recognition of the mosquito as the vector for the transmission of the malarial parasite) progress has been made in the control of tropical diseases. A 'new era in chemotherapy' began in the mid-1930's with the discovery of several new types of drugs (including antibiotics) and pesticides (e.g. DDT). The new preventative measures over the past 40 years have contributed

significantly to the rapid increases in population in many areas. Because of the prevalence of tropical diseases caused by micro-organisms or parasites, the potential importance of nutritional disorders arising from poor diets was largely obscured. It was at first recognised by relatively few medical authorities and it is only in the past 30 years that there has been any wide appreciation of the extent of malnutrition.

3.6 Animal Disease

The prevalence of tropical diseases in cattle and in other animals in many parts of Africa has had profound effects. In so far as food supplies are concerned, it has been impossible in many areas to build up dairy herds to provide milk and milk products. Moreover, it has reduced the possibility of using animals for transport and as a source of power in agriculture. There are, of course, striking exceptions to this generalisation, for example, the acceptability of the camel to desert conditions and the pastoral activities in Ethiopia, Kenya and other parts of East Africa.

3.7 Crop Diseases: Pests

Many types of disease can affect the crops of Africa and some of these have serious economic implications e.g. the swollen shoot disease affecting the cacao tree in West Africa. Over and above such virus and related diseases, we have the effects of animal pests - large and small. The destruction of crops by locusts is still a major problem in spite of concerted international efforts to achieve control.

3.8 Communications

Of the 30 million km^2 of land in Africa, it is calculated that some 9 million km^2 are desert, and in many areas these are barriers to communications -

especially from the Mediterranean coast southwards. In the past the patterns of communications in large measure followed the great rivers. Coastal, riverborne, and lake traffic is still of great importance. Only a relatively few areas in tropical Africa were affected by the introduction of railway systems which transformed European transport in the second half of the nineteenth century. Road and bridge building in many parts of the continent has often been (and still is) a difficult and expensive undertaking, because of storms and wide fluctuations in water levels between dry and rainy seasons.

Over the past 30 years considerable progress has been made in many countries in the building of trunk roads with inter-connections to those in neighbouring countries; the motor vehicle has produced a revolution in communications effecting all types of merchandise. Nevertheless, much remains to be done. Thus, in West Africa the communications between neighbouring states - especially those land-locked - is still poor; the routes between the Atlantic and Pacific coasts are few. Air transport has, of course, produced great changes and is widely used both for people and the more expensive goods.

For cheap goods - and those include most agriculture and food produce - there are major problems in most countries. Many years ago it was suggested in West Africa that the most effective method of improving nutrition would be through an internal effort to establish feeder roads - to reduce the loss of agricultural produce which deteriorates because it cannot be moved, to promote regional trade in foodstuffs, and to stimulate a cash economy.

3.9 Implications of tropical conditions on food supplies and the food industries

Some effects of tropical conditions have already been noted including:

(i) problems of communication leading to wastage of produce and restriction of trade

(ii) irregular supplies of agricultural produce because of droughts and extreme variations in climatic conditions, and because of virus diseases and pests

(iii) problems of animal production arising from diseases of many different types.

(iv) problems of water supplies and of the safety of water for human and/or animal use, accentuated by the parasitic infections often carried by rivers and irrigation canals in many areas from the Mediterranean to Southern Africa.

One of the most serious problems in Africa is the wastage of agricultural produce. No exact estimates are available; they will vary from one sub-region to another and from one commodity to another; some authors suggest figures as high as 30% to 40% for many important commodities. Many aspects of tropical conditions conspire together to produce deterioration in biological material. Heat and humidity speed up many types of reactions and encourage the growth of micro-organisms of different types. Thus mould growth may have disastrous affects on certain crops and can lead to the production of poisonous substances (e.g. aflotoxins) in the harvesting procedures and post-harvest storage.

Moist tropical conditions favour the multiplication of insects and other pests which attack agricultural produce and are responsible for serious food losses. Thus problems of food conservation become more difficult and special precautions have to be taken over and above those required in temperate zones. To take one example of extra difficulties - in the application of refrigeration we have to accept the extra energy costs of cooling from high environmental temperature down to the low temperature

required for successful conservation.

3.10 Some comments

In the above notes we have outlined some of the problems of development in tropical Africa. We believe that many of the obstacles can be overcome and that it is possible to present a much more optimistic picture of progress that has been taking place and is likely to take place over the next few decades. The application of medical, scientific and technical discoveries can lead to profound changes. Some authors writing in terms of major irrigation schemes can forecast that the Sudan could become, in terms of meat supplies, the Texas of Africa.

On a short term basis, it is however, necessary to consider carefully the problems and difficulties that we have outlined in order that projects can be realistically appraised and obstacles faced and overcome.

4. FOOD SUPPLIES: FOOD HABITS AND FOOD PREFERENCES IN AFRICA

4.1 Sources of Foods

Table 1 summarises the major sources of plant and animal foods in Africa and notes some of the minor sources, including wild life. Some sections of this table will be examined in greater detail in subsequent chapters in terms of different types of commodities and processes.

In this chapter a few general points will be discussed.

4.2 The contribution of wild life and minor sources of foods

In the older communities in Africa (as indeed in Europe and elsewhere) wild life (in terms of plants, animals, birds, fish and other animal species, represented a major source of foods. In some parts of Africa this is still true today and it is probably true to say that in all parts, the wild life contribution is important - although often ignored by those responsible for the collection of information about food intake. Other reports provide evidence for the widespread acceptance of a very wide variety of minor foods (e.g. the fried grasshopper, the grass-cutter rat and the giant snail in parts of West Africa). Both the locust bean and the locust insect are consumed in various areas. Some of these minor sources of food are of importance in that they add variety to the diet and may supply nutrients lacking from the major staples.

Some of the wild life sources e.g. large wild animals, fish, birds may in some areas make a major contribution and in East Africa and elsewhere proposals for 'game farming' - the harvesting on a systematic basis of protected wild life - are now being implemented.

In terms of crops, it can be noted that in many areas, the typical European-type vegetables may be rare or almost unknown, but many reports from countries as far apart as Uganda and Ghana suggest that large quantities

Table 1

Source of Foods

Plants	Animals	
Cultivated - Agronomy*	Stock Raising	Wild Life
	Land animals	
Cereals	Beef cattle, dairy cattle, goats, sheep, pigs	Many species of large and small animals, e.g. grass-cutter rat & snails in West Africa
Starchy foods - root and related crops		
Sugar crops, including dates, locust bean	Birds	
Oil seeds (some leguminous crops)	Chicken, ducks, guinea-fowl	Many species
Non-fatty legumes	Fish	
	Fish farming	Many species in rivers, lakes and seas and lagoons
	Insects	
Other vegetables and fruits	—	Species such as locusts used for food
Beverage and related crops - tea, coffee - cacao Fermented beverages	Animal products	
	—	e.g. honey
Wild Life		
Many types of leaves		
Fungi		
Spirolina		

* Many items under this heading can in part be included in wild life.

of a wide range of green leaves are used in different ways e.g. in soups and purees. The leaves can supply various nutrients (as a source of carotenoids/vitamin A they are important in the protection against certain forms of blindness).

4.3 Origin of cultivated crops

The Jones and Johnston monographs to which reference has already been made provide a comprehensive account of the literature on the origins of different types of cultivated crops. Some of the crops are based on varieties indigenous to Africa; a great many have been introduced from elsewhere.

Some examples are shown in Table 2 from which it will be seen that a major contribution came from Central and Southern America. Their arrival followed the voyage of Colombus in the 15th Century and the subsequent activities of Portuguese, Spanish and other explorers. The crops were introduced by at least three routes; by direct sea connections with West Africa; by voyages from Europe and by overland routes across the Sahara or up the Nile valley.

The impact of Eastern Asia and South-Eastern Asia came to East Africa (and also to North Africa by sea and overland routes through the Middle East).

Although there may be many points of uncertainty in Table 2, it is evident that in recent recorded history (from 1500 onwards) African peoples have adapted themselves to new types of crops - some of which have become major staples.

4.4 Origin of Domesticated Animals

Many breeds of domesticated animals have been introduced at different times from Europe and elsewhere. Over the past century efforts have been

made (particularly in areas of European settlement) to introduce dairy cattle to provide sources of milk and dairy products; in other areas local cattle are used for this purpose (e.g. among the Masai and related ethnic groups in Kenya, the Fulani pastoral tribes in the Mali). In north Africa the camel was widely used as a source of milk. In Francophone (as distinct from Anglophone) West Africa, breeds of milch goats have been introduced from France and elsewhere.

4.5 Stability and Change in Food Habits : food preparation methods

Many writers have stressed conservatism and inflexibility in food habits - especially in respect to major staples, but Table 2 shows that important changes have taken place. The introduction of new crops has taken place at different times and at different rates in different areas of Africa; the coastal areas have had more direct contacts with other continents than the hinterlands. Thus the use of maize or manioc was well established in some parts of the Guinea coast 200 years ago; but became important in other parts of West Africa only in recent decades.

The introduction has often come about almost by accident. For example, the initiative of some local man or group who had travelled abroad and decided to experiment with new crops. Sometimes it has been the initiative of a settler group that wished to have their own types of foods. At other times it has been a definite policy to introduce a crop to be the basis of an export trade (e.g. coffee, cacao). Some food crops were deliberately introduced in order to contribute to food supplies in areas of high local population density. This is the background to the introduction of manioc in several parts of Africa, for this crop grows high yields of energy food; it is moreover resistant to drought and to various types of pests.

Table 2

ORIGIN OF CULTIVATED CROPS AND ANIMALS

Some examples

	CROPS	ANIMALS
From Africa	Varieties of rice Yams Plantains	
From the Americas	Manioc Potato Sweet potato Maize (Indian corn) Tomato Various leguminous beans Cacao bean	Turkey
From Eastern Asia and South Pacific	Tea Coffee Varieties of rice Soya (via USA)	
From Europe and the Middle East	Many crops	Many animals

It is noteworthy that with two of the crops, namely manioc and maize which were successfully introduced, there was a parallel introduction of processing methods (to be discussed later) to transform the crops into foods. Both manioc and maize form the basis of a variety of food products in different parts of Africa. There is a moral to be drawn from this - that current agricultural research on new crops should be accompanied by experimental work on the utilisation of the product.

4.6 . Food preferences; the importance of research

In industrial countries, it is recognised that enterprises concerned with food preservation and processing must take steps to discover the food preferences - likes and dislikes - of the individual consumer. It is known that these can vary widely even in a narrow geographical area. Much of the information in many parts of Africa is based on hearsay; there have been surprisingly few publications in scientific or technical journals on the subject, even though it may be basic to the growth of food industries of different types. It is said (for example) that in some areas the preferred taste of milk corresponds to evaporated milk (unsweetened condensed milk) because this product was introduced in the last century mainly for use in tea.

5. REQUIREMENTS FOR THE ESTABLISHMENT OF A FOOD PROCESSING INDUSTRY

5.1 Technical Requirements

These are summarised in Table 4 and the five sections of this table will be discussed briefly.

5.2 Raw Materials and Supplies

In Table 4, raw materials and supplies have been divided into four main headings. In the first place, there are the agricultural raw materials to be processed. The food processing industries, as they have grown in Europe and elsewhere, emphasise the importance of the chain of linked operations extending from the farmer or grower (the primary producer) to the consumers. In planning a factory, it is essential that arrangements can be made to secure raw materials of the right quality, in the right quantities and at the right time. This question of quality will be discussed later but at this stage we should note the importance of close working arrangements, financial and technical, between producer and processor.

A second raw material, frequently ignored in planning is water. Processing operations may use considerable amounts of water for a variety of operations (including steam raising, cooling and cleaning). In many industrialised countries water supplies have become limiting factors in food operations; in developing countries the water supply may be of special relevance, either because of arid conditions or because of great seasonal variations. Apart from quantity the quality of water is of importance in many operations. Precautions must be taken to carry out regular chemical and microbiological examinations and to ensure hygienic standards.

Depending on the processing method to be used, a range of auxiliary materials will be required, and for most processes, suitable packaging

Table 4

TECHNICAL REQUIREMENTS FOR THE FOOD INDUSTRIES

1. Raw Materials and Supplies

   (a) Agricultural raw materials

   (b) Water

   (c) Auxiliary chemicals

   (d) Packaging materials

2. Design and Equipment of Factory

   (a) Buildings

   (b) Major equipment

   (c) Auxiliary equipment

   (d) Storage facilities for raw materials and final products

3. Service and Supplies

   (a) Power

   (b) Water

   (c) Effluent disposal

   (d) Transport facilities for raw materials and final products

   (e) Repair and maintenance facilities

4. Labour, Technical Control and Management

   (a) Skilled and unskilled labour

   (b) Scientific, technical, quality control and management personnel

   (c) Access to consultants or consultancy services and laboratories

5. Availability of Markets

   For local or internal trade and/or exports

6. Location of Factory

   In terms of (1) to (5) and other considerations

materials. The auxiliary and packaging materials are unlikely to be available in a developing country and their import may be difficult because of currency restrictions. In some developing countries can-making plants have been established, but such plants often require the import of tin-plate and a variety of other supplementary materials, (e.g. lacquers), as well as the complex and expensive can forming machines.

Thus, in planning an enterprise, it is essential to conduct a technical-cum-economic appraisal of the cost of such materials and of their contribution to the cost of the final products. An analysis from a distance may be incorrect; thus in the United Kingdom glass-packing is usually more expensive than canning; the reverse may be true in another country where bottles can be made locally from indigenous materials and where the re-use of bottles (as in the milk industry) may be economically satisfactory. Newer heat-treatment techniques involving the use of synthetic packaging materials may become of special importance in developing countries.

5.3 Design and Equipment of Factory

Food processing factories in Europe and elsewhere are normally designed by individuals or groups with long experience in similar enterprises and in the use of equipment. In developing countries, such people may not be available and it is not always appreciated that in the design of a factory, or in the purchase of equipment no amount of theoretical scientific knowledge can be a substitute for practical industrial experience.

The problem is, of course, reduced when a new processing enterprise is affiliated to, or in partnership with, some expatriate firm, but this is not always possible - especially for small or medium-sized indigenous enterprises - and other methods have to be adopted.

Plans for tropical and subtropical countries must include a survey

of (a) the types of operations, (b) the special problems of equipment under tropical conditions, as well as the question of size and scale.

A large factory in Europe may confine its operations to one method of preservation, (e.g. canning or dehydration), or to a very limited range of products. In Africa, a factory for export may operate on more or less the same lines as in Europe but for the internal market it may be desirable to envisage, in the preliminary stages at least, flexibility in operations, and to take this into account in the design and layout of the factory and the choice of equipment.

In selecting equipment, special consideration must be given to the possible effects of tropical environmental and working conditions. Thus equipment should be designed to stand up to tropical heat; surface coatings should be chosen to withstand heat and humidity. Because tropical conditions favour the growth and activity of micro-organisms, insects and other pests, it is important to have equipment that can readily be dismantled for inspection and cleaning. Because of difficulties of maintenance and of replacement of items which need to be imported, many advisers favour less complicated equipment than is now fashionable in Europe. Current trends in automation do not necessarily produce better products; they are justified mainly in terms of the very high labour costs that would otherwise be necessary.

In the overall design of a factory, there is much to be said for the one-storey, simple type of construction; a point sometimes ignored is the necessity of adequate storage buildings for initial raw materials, auxiliary materials, and final products.

5.4 Services

The question of water supplies has already been mentioned. Its

importance, however, cannot be overstated. But also adequate electric power supplies for steam raising and other purposes are clearly a necessity. In many countries where existing electrical supply authorities face overloading problems with inevitable interuptions to supply the installation of a private generating plant may become necessary.

A major problem of factories in industrialised countries (and especially those in urban areas) is that of the disposal of waste materials and effluents; the cost of disposal becomes, in many cases, and appreciable percentage of the operating costs of a factory; there is much to be said for the examination of the possibilities of making the fullest use of factory by-products and for a survey of composting and other modern effluent treatment systems.

Transport facilities are especially important in developing countries where the main road and railway system may be inadequate and minor roads in rural areas deficient.

5.5 Labour, Technical Control and Management

In developing countries, unskilled labour may be readily available, but scientific, technical and management personnel is likely to be in short supply. Technical training facilities at all levels are an essential, but often neglected, component of plans for industrialization.

We shall discuss later the efforts made in Africa to remedy deficiencies.

5.6 Markets

In the past some of the main initiatives in respect to the African food industries have been concerned primarily with the export trade, although in North Africa and parts of East and West Africa there has been (especially over the past 30 years) an increasing stress on production for 'home'

consumption. In some countries (e.g. Senegal, Nigeria, Kenya) 'home' sales are becoming the central objective for many new enterprises; there is need therefore for a closer study (i) of what commodities are required and in what form and (ii) of products that are within a price range for purchase by low-income groups of a population. This second point is all-important if the food problems of the African continent are to be solved.

5.7 Location of Factories

Decisions regarding the location of factories and other production units should be made taking into account all the points noted in Table 4. Failure - or severe financial losses have resulted from the neglect of any one group of factors and some examples will be given later.

In industrialised countries, decisions on the siting of factories have normally concentrated on two key points (a) whether manufacturing operations should take place near the sites of production of the raw material (whether agricultural or from fisheries) or (b) whether the operations should take place in urban centres in proximity to the major centres of demand.

Other factors have also been important including (c) the availability of labour and (d) the availability of power supplies. Because of (d) many industrial centres in the first industrial revolution in Europe grew up in close proximity to coalfields. With the use of oil and electricity there has been in the past half century, a greater freedom of choice which has already led in Europe and elsewhere for a greater degree of choice, with greater decentralisation.

In Africa, there is a recognition in many countries that active steps must be taken to promote developments in rural areas to provide employment and to reduce migration to large towns. This may mean that decisions on location may be made in part in terms of national policies and plans and

that, in practice, political decisions may be made which can be in conflict with technical considerations.

5.8 Financial Investment, Management and other Requirements

Table 4 is concerned primarily with technical matters although the comments made above (e.g. in respect to 5.6 and 5.7) indicate the overlapping between technical and other considerations. Many reports and other publications survey economic aspects of the development and further references will be made later to such aspects. The technical questions have been stressed because, in general, they have often been neglected in publications concerned with finance and economics.

5.9 Examples of problems arising from neglect of technical factors

In subsequent chapters of this Report we will deal with specific commodity areas and note examples of successful developments in different types of food trades and industries. It may be useful however, at this stage to give some examples of failure or difficulties which have arisen in respect to the location of enterprises. The examples chosen have all come within the authors' experience over the past 20 years. They are recorded not for any purpose of historical record, but rather because there are good reasons to believe that similar mistakes are still being made and that the problems are rarely analyzed in any depth in general publications. (The problems may be discussed in the reports of consultants to individual firms or to governmental bodies, but usually these reports are of a confidential character.)

Case 1. East Africa Canning

A canning factory was sited, probably for political reasons, in an isolated semi-desert village. The location was suitable neither for the collection

of raw materials, nor for marketing of products. Little provision was made for protected (out of sun) storage of empty cans or canned products. The manager was familiar with some aspects of canning but not with the precautions necessary for peas and other sulphur-containing produce, for which cans with special lacquers are required (this has been known at least since 1918). Several internal and external corrosion of filled cans took place on storage. As a result products had to be destroyed with severe financial losses over a long period.

Case 2. East Africa Sugar

A factory was built on a site with poor communications. It was almost certainly 5 times the size required in terms of local possibilities of raw material supplies. For the first three years heavy financial losses because the throughput never exceeded 20% of capacity. No provision was made for use of by-products.

Case 3. West Africa Meat

Cattle were brought on the hoof or by truck from country A to the northern part of country B, and then had to travel a further 200 miles to a main market town in B. An entrepreneur established a small abbatoir near the frontier air strip in B and chartered an old plane, with the objective of killing cattle every alternate day and transporting the carcasses to the market town. The project failed because the cattle 'ceased to be available'; in effect the abattoir owner could not purchase cattle at a reasonable price or get any guarantees of continuous supplies. The situation was complicated by the different African ethnic groups involved and a resultant lack of communication.

Case 4. West Africa Tomato Preservation and Processing

A small well equipped factory was established for the production of tomato products. It was sited in an area where tomatoes could be grown only with

difficulty because of poor soil and other conditions. As a result throughput was only 10% of capacity with severe financial losses resulting to the factory.

Case 5. West Africa Tomato production

An agricultural project was promoted in an area where good quality tomatoes could be produced at certain times in the year. Those responsible did not take into account the long, dry season with acute water shortages and little possibility of irrigation. No provision was made for the preservation of the tomatoes or the manufacture of products such as tomato paste. Produce had to be taken 200 miles by road to the main market town for sale. At times there was deterioration of 90% of the crop on the journey and consequently financial failure for the project was inevitable.

Case 6. West Africa Ground nut based infants food

A well-equipped factory was established. After a few years it had to be closed in part because of the problems of securing adequate supplies of ground-nuts, which were free from contamination by aflotoxins.

Other examples could be quoted of projects that failed because of difficulty in recruiting technical staff with experience and/or auxiliary staff able to deal with maintenance and repairs of equipment.

6. Notes on Visits

SECTION B

The reports of the recent short-term visits by one of us (GRH) which comprise Section B of this Report should be read in the light of what has been incorporated into Chapters I to V.

The four countries selected for a visit - Ethiopia, Kenya, Ghana, and Senegal - show wide differences in geography and climate, cultural background, in political history and present political orientation. These differences are inevitably reflected to some extent in the way in which food processing is organised. In Ethiopia and Ghana the conditions are similar to those in a centrally-planned economy. In Kenya and Senegal, on the other hand, there is much more evidence of a capitalistic approach.

Nevertheless, there is a basic similarity in the types of problems presented to those engaged in the food industry. Perhaps, also inevitably, there were quite wide differences in the way by which solutions to problems were found.

For easier reading of the report a few introductory paragraphs giving basic data on each country are given at the start of each Chapter. These give the barest outlines only and those who require further information will need to have recourse to the standard works of reference.

During the visits information on the relevant industries was sought from UN agencies - ECA, UNIDO, UNDP, and FAO - Government departments, food corporations and commercial undertakings. Where possible, copies of published reports were obtained. It should be added, however, that really up-to-date information about the size of the different parts of

the food processing industry was not always easy to obtain.

This was not in any way due to discourtesy or lack of co-operation on the part of those whom the author met. Indeed almost always people were helpful although some of the countries especially Ghana, have been over-researched in the past and understandably there the local people wonder how many more people will visit them to ask the same kind of question.

The main difficulty about getting information appears rather to be that up-to-date statistics about the food processing industry have not been collected and published by the relevant Government departments. In the case of Ethiopia massive political changes in the past four years and resultant changes in senior personnel in Government departments and food corporations made the collection of up-to-date information specially difficult.

If more time had been available to the author many more visits to individual processing plants would have been possible and these would almost certainly have resulted in much more information. To obtain an up-to-date and comprehensive picture of the food processing industry in almost any country in black Africa it will be necessary to spend about four weeks in the country visiting both official organisations and those in the private sector. This is true also in relation to the extent of planned developments in the different parts of the food processing industry.

Four aspects of food processing were given special attention in each country. They were - cereal processing, meat and dairy products, sugar production, and edible oil extraction. Where other industries

were significant in meeting dietary needs of the countries or were specially important in the country's economy, e.g. fisheries in Senegal, notes on these are included. The so-called beverage crops, tea, coffee and cacao, grown primarily for export and although of much economic value to the countries concerned, were not included in the study.

It is worth noting in passing, however, that both with cacao and coffee there is now extensive food processing actually involved - production of cocoa butter and cocoa liquor in Ghana and of soluble 'instant' coffee in Kenya. Of these the former is by far the more important but further developments in both are likely in the future.

Special mention must be made of the brewing and soft drinks industries. In each of the four countries visited there is a sizeable brewing industry with modern equipment as well as a carbonated soft drinks industry (usually 'Pepsi' or 'Coke' made under licence).

Both these industries are the result of close financial and technical links with multinational companies from Western Europe or North America. As far as the breweries are concerned there is also frequently still some expatriate technical management involved.

At the breweries all the ingredients except water, - and some barley in the case of Kenya - are imported. So also is virtually all the equipment - brewing vessels, stainless steel pipework, bottling machines, and so on. Taken together these must represent a considerable drain on the foreign exchange of each country and it may be significant that, with the exception of Kenya, I obtained no information on large new breweries being planned. In Ghana especially beer is now in short supply and even in the large international hotels, 'No beer' signs are

frequently in evidence. It is difficult to know, of course, if this is a true shortage or is due to supplies no longer being channeled into the usual distribution network.

Nevertheless, in spite of the cost to the country and the difficulty in some countries of obtaining supplies, the consumption of beer is widespread among the male adult population who can afford it, even in Moslem areas. A continuation of brewing is likely to be the normal pattern in the countries visited.

The consumption of carbonated soft drinks appears to be limited mainly by supply and, to a lesser degree, by cost. In the case of the international companies the fully flavoured concentrates are imported as are also the mixing and bottling equipment using including a water-softening and purification plant to avoid cloudiness of the finished drink in the bottle.

As in the case of beer there appears to be only limited expansion planned in the future presumably because of the problem of foreign exchange for import.

As far as Kenya is concerned there are also a limited number of carbonated soft drinks of local origin available including at least one which is heavily advertised at the moment. Although there may be some savings of foreign currency on ingredient material all manufacturing and bottling equipment needs to be imported direct or through agents. Unless such local products can offer some considerable marketing advantage such as lower price, it is difficult to see them gaining a large part of the market at the expense of the internationally known brands.

7. Ethiopia

Background

Political After the Emperor was deposed in September 1974 Ethiopia became a Socialist Republic under military rule. The present Head of State is Lt. Col. Mengistu Haile Mariam. The Military Government rules by decree.

Area This is estimated at 400 000 square miles with a population of c. 27 946 000. It is essentially a mountainous country with hot valleys and high well-watered plateaux of temperate climate.

Production and Industry Principally agriculture and cattle. In the hotter regions sugar-cane and cotton flourish; in the middle zone, maize, wheat, barley, coffee, citrus, tobacco and potatoes are cultivated; above 6000 feet there are excellent pastures.

Coffee provides about 64% of the country's exports (by value). Horses, mules, donkeys, cattle, oxen, goats and sheep together with camels in the lowlands form a large part of the wealth of the people.

Generally industry is limited, the main products being textiles, foodstuffs, beer, cement and tyres.

Hydro-electric power and telecommunications are expanding rapidly due to soft loans from the World Bank. The Bank also is assisting many agro-industrial enterprises.

		1973	1974
Trade	Total imports	$170 000 000	$232 000 000
	Total Exports	$244 000 000	$286 000 000

Capital Addis Ababa (2 400 m. above s.l.), pop. 912 000

As it is true in most parts of the industrial sector the food processing industries in Ethiopia are currently facing many problems. These spring, in part, from the fundamental political upheaval which the country has been experiencing in the past four years. There have been changes both in ownership and management in all sectors and until the new regime settles down in the new order there will be a measure of uncertainty about current production levels and new plans for development among those in senior Government positions.

Secondly, and this is largely the result of the political changes, there has been a large exodus of skilled enterpreneurs. Mainly these were expatriates and many of them were well-qualified or, at least thoroughly experienced, technical personnel on whom the successful operation of much industry depended. There are now few, if any, large scale private undertakings and most food factories are now part of one or other of the food corporations. This in turn has meant changes at management level in most factories and considerable loss of valuable technical expertise.

Third, there is a serious shortage of spare parts for much of the technical equipment currently in use in the food processing sector. This shortage arises mainly from the fact that until 1974 ordering of equipment and spares was done by the expatriate technical staff. They knew the original suppliers of the equipment and exactly which spare part to order and from which firm. Since this knowledge is no longer available serious and frustrating delays due to mechanical troubles in the factories are being experienced.

A final problem is that within the borders of the country as well as just over its borders there is armed conflict in several areas. In the history of mankind agriculture has always been an early casualty in a war situation. In today's situation it is therefore inevitable that in some areas arable agriculture has been suspended or drastically limited while the pastoral farmers take their herds and flocks (or what remains of them) out of the danger area.

Nevertheless on the part of those with whom discussions were held there was a clear willingness to answer questions put to them

about the state of the food processing industry. The following paragraphs deal with the four main sections of interest in this report.

Cereal Processing Until the 1940's wheat was not only grown in, but was also exported from, Ethiopia. That situation has changed over the years and since 1973 there have been considerable wheat imports. Part of this has been as grants from the international relief agencies and part has been purchased with the aid of soft loans from the World Bank and other international banking agencies.

The extent of the purchases has grown steadily from 14 377 tonnes in 1973 to 159 591 tonnes in 1977. The projected figure for 1980 is 160 090 tonnes. Part of this increase comes from the steadily growing popularity of bread as a convenience food especially in the urban areas. Another part comes from the shortage of teff (Eragrostis Abyssinaca) a less well known cereal but one which is popular in Ethiopia as the basis of the very widely used food 'injira' a fermented unleavened bread.

No dependable figures exist for the present production of wheat. One source estimated it in 1974-75 as 610 000 tonnes by peasant production. Some would also be grown on state farms but no estimate is available. The total grain production for that year was estimated at 4 570 000 tonnes so wheat amounts to about 14% of the total cereals. Much lower than it used to be.

Fortunately industrial milling capacity is, in theory, more than adequate to mill all the wheat available. A large part of the milling industry is situated in the Addis Ababa area and at Debre Zeit, 50 km. away. Other large mills situated near Asmara are in an area of political

disturbance and are currently not available for use. It appears, however, that there is adequate capacity to meet all likely requirements for wheat flour production. The one point that must be remembered is that two of the largest mills are 35 to 40 years old and cannot be expected to last much longer. But two new mills are likely to come on stream in the 1980's and could be looked upon as replacements in the pipeline.

No figures are available for the quantity of wheat flour produced each year from the mills but supply seems adequate to meet current demand. There are no figures either for the total quantity of bread produced from the flour. In all the large towns there are many small bakeries baking only bread. Some large bakeries exist in Addis Ababa producing flour confectionary items in small quantity as well as bread. There are also purpose-built biscuit factories producing a range of sweet and semi-sweet biscuits.

Most of the bakeries are labour intensive and do not need heavy capital investment. They are also easily extended are required to meet increased demand.

What is clearly required is some form of training programme at technical level for foremen and operatives and also management and marketing training for those in senior supervisory positions.

Meat and Dairy Products As would be expected in a country with a cattle population of about 28 millions there is a sizeable meat industry. For perfectly understandable reasons, however, arising from climatic considerations, absence of transport facilities, poor roads, and no proper distribution system there is no dairy industry except in Addis

Ababa. Meat, however, is big business. In the early part of this decade (around 1973) agriculture account for about 56% of the estimated GDP and of this one half came from livestock. Beef was the largest part of this with mutton, goat flesh, and poultry supplying the remainder. Only a little pork is consumed.

The Livestock and Meat Board published figures for 1972-73 giving the estimated consumption of beef, mutton, and poultry in the country as follows:-

	Urban population kg/head/annum	Rural population kg/head/annum
Beef	15.0	6.2
Mutton	4.0	5.0
Poultry	2.0	1.7

By local standards the prices of beef and mutton are high and so the animal protein intake is only about 10% of total protein, that is about the same as in Kenya or Sudan. But it must be noted that the fasting practices enjoined on the Coptic Christians (the majority faith) involves (for adults) refraining from meat and dairy products during fasts which in total amount to 136 days in the year including one period of 60 days and one of 15 days. This means that during the rest of the year meat consumption must be significantly higher than in Kenya or Sudan.

It is clear that with the natural resources available in the country there is considerable scope for the development of the meat industry. This would be mainly for home consumption but scope also exists for export. Indeed in the 1960's there was a considerable export of meat and meat products from Ethiopia. This was from purpose-built

abattoirs operated in the northern part of the country. The material exported was frozen carcass meat for the Middle East and Mediterranean countries. There was also for the same market a considerable export of canned meat and meat products.

Due to the tightening up of health regulations in these countries in the early 1970's the export of frozen carcass meat ceased but export of canned meat products continued till 1974. Since 1974 with very disturbed conditions in the northern part of the country all meat production has ceased.

The Meat Industries Corporation which has taken over most of the functions of the former Meat and Livestock Board has not been constituted long enough to be able to present a detailed policy for the future. Nevertheless, in discussion with the General Manager it was clear that a firm policy of expansion is planned.

This policy will include offering prices for stock that provide an adequate incentive to stock rearers, newer management techniques including the introduction of strains with high genetic potential, more preventive animal health care, and more suitable feeding-stuffs.

Although the present policy of land nationalisation is likely to make difficult the fulfilment of some of these aims by the large number of peasant farmers, it is possible that the state-owned farms or co-operatives will be able to take advantage of the new programme of development.

Side by side with the proposals for more cattle and other animals there is an adequate programme of building of new abbatoirs complete

with cold room accommodation in the larger ones and also the provision of a chain of cold stores to facilitate distribution of the meat to the urban centres.

As has been noted earlier it was only in the 1960's that any kind of formal dairy industry was set up in Ethiopia and even that was limited in scope. Farmers either consumer any milk which was surplus to the requirements of calves or had it converted into a cheese curd which was marketed by them.

It has to be remembered that yields of milk per animal are very low. The Zebu cattle have a potential of about 10 litres of milk per day but in practice due to endemic disease, poor management, and inadequate feeding, yields are normally only about half that figure.

In 1961 a UNICEF sponsored project was set up at Shola near Addis Ababa to collect, pasteurise, and market liquid milk. The project developed well and, partly aided by the World Bank, the daily milk supply was 10 000 litres in 1971 and it reached 30 000 litres in 1977. Plans have already been drawn up for an extension to an intake of 60 000 litres but these have not yet been formally approved by the Government.

Local entrepreneurs have set up similar, but much smaller, schemes during the past few years but these have met with only limited success. Various factors have contributed to this lack of success, one of them has been the short keeping life of the milk arising from poor hygienic conditions at the dairies.

It is clear that a large and potentially lucrative dairy industry could be developed in the country. It is also clear that the supply of

milk could be fairly quickly built up but any scheme for the future will need to take into account the marketing problems in a country where long periods of fasting involve abstention from all milk products by most of the adult population. Other products such as cheese, butter, or evaporated milk production would need to be manufactured during the fasting periods for later sale.

Sugar Production For some years now sugar production and consumption have been about in balance. Three factories produce it. Two are situated in close proximity with each other and together produce 75 000 tonnes per annum. A third, some distance away, produces 71 000 tonnes. This total of 146 000 tonnes is almost sufficient to meet local demand. One of the three sugar factories has a sugar confectionary factory for boiled sweets operating alongside it.

The Sugar Corporation is working on the assumption that with increased money income and increased population there will be an annual increase of 6 to 8% in consumption. To meet this greater demand a new factory is planned to come on stream about 1985 with a capacity of 75 000 tonnes. In addition, modifications are in hand to the existing factories which are expected to give an extra 35 000 tonnes in the next year or two. So when the new factory is in full production there will be a potential supply of 255 000 tonnes. That should meet likely comestic and industrial demands.

It must be added, of course, that the existing mills are progressively becoming older and problems of obsolescence will arise. So the production of sugar may not be as secure as might appear.

Industrially sugar is used mainly for brewing and soft drinks

but some is also used in sugar confectionary production and, to a lesser extent, in flour confectionary. Domestic use is mainly in tea and other beverages. Although some sugar is packaged in small packs for supermarkets the greater part is put into large bags which are then broken down by the retailers according to customers' requirements.

Edible Oil Production The Ethiopian Food Corporation is now responsible for all edible oil production. A recent report by one technological expert reported rather unfavourably on the condition of the oil mills. These industrial mills, mainly in the Addis Ababa area, have to deal with a variety of oil seeds. The main one is cottonseed but neug (niger) seed is also grown extensively in the country and used as a source of edible oil. Sunflower seed is also processed and so is groundnut.

Until 1976 there was also a very large quantity of sesame seed grown in the north-west of the country. This is now an area of serious civil strife and production of the seeds is currently very low. Most of the seed was exported in the past but there is no reason why in future most of it should not be retained in the country as a source of edible oil for the population.

Three new oil mills are now planned. These are of medium capacity, handling up to 50 tons of seeds per day and producing about 10 000 tonnes of oil each year. This should be sufficient to keep pace with existing growth in demand. Two of the mills are planned to be in production by 1980 and the third, which will be run with an expatriate company as agent, should be on stream by 1983.

It was interesting to learn that training of technical personnel to operate the new mills is already well in hand both in Ethiopia and overseas.

8. Kenya

Background

Kenya In December 1963 Kenya became an independent state and a member country of the British Commonwealth.

Area 224 960 sq. miles

Capital Nairobi, pop. 509 000 in an area of 266 sq. miles.

Population 12 934 000 (estimated)

Production Agriculture provides about 35% of the national income. There is a wide range of crops owing to great variation of altitude and ecology.

Crops include wheat, barley, pyrethrum, coffee, tea, sisal, coconuts, cashews, cotton, maize together with most tropical and some temperate fruits.

Land with high potential for agriculture is only 12% of the total area. Remainder is arid and only suited to stock raising.

Prospecting and mining are carried out in many parts of the country with soda-ash, salt, and limestone being produced. Major deposits of flurite and galena are being worked.

Hydro-electric power has been developed including the Tana River and Owen Falls Schemes (The latter is jointly with Uganda). Further schemes are in course of construction.

Industrial development, including food products, has been considerable in the last fifteen years with a Foreign Investments Protection Act to protect such investments where appropriate.

A large part of Kenya's overseas trade is with U.K. The principal exports are coffee, tea, maize, meat products, pyrethrum products, hides and skins.

In most respects the food processing industry in Kenya is widely different from that in Ethiopia. In part this difference reflects the different political background especially the fact that Kenya has had a long period of stable government. But another reason is the long tradition in Kenya of large-scale farming, both arable and pastoral, with a history of investment in the land - use of fertilizers, insecticides, introduction of improved varieties of plants, and animals with high genetic potential for milk or beef production. There has also been the use of suitable

agricultural machinery and the setting up of adequate storage facilities for harvested crops and slaughtered animals.

There has also been a large home market for most agricultural products as well as an export market for certain traditional products such as tea and coffee.

The food processing industry reflects, therefore, this firm agricultural base producing food both for the home market and for export. While tea and coffee are by far the largest food exports, fresh and processed fruits and vegetables are also exported. So also, though to a less extent, are dairy and meat products.

Sugar Rather surprisingly Kenya is not self-sufficient in two important food commodities - sugar and edible oils. Sugar cane is now being grown and processed in several very large plantations and it is expected that by the early 1980's the country will be completely self-sufficient in sugar. It should be noted in passing that, as money incomes rise, there is an increase of about 8% per annum in the national sugar consumption. Sugar is used industrially in fruit canning, sugar confectionary, flour confectionary, and in the manufacture of soft drinks and in brewing. Domestic use in tea, and as a sweetening agent in porridge is also growing.

Currently the production of sugar is about 250 000 tonnes per annum with expected consumption in 1978 of 275 000 tonnes. The balance is being imported.

At present, production capacity is reckoned to be in the region of 285 000 tonnes but a major expansion at Mumias due to be completed

this year will produce a further capacity of 86 000 tonnes. In addition two further plants are already under construction which should increase the production capacity by 60 000 to 70 000 tonnes.

These planned increases should cope adequately with all likely increases in demand and also make some provision for replacement of the existing plant when it become obsolescent. The projects will be financed jointly by the Kenya Government and private investment, with the World Bank making available a large part of the necessary capital.

One interesting development currently planned is for mini-sugar plants. These will be established in areas suitable for the growing of cane but where transportation problems of the cut cane to large processing plants are serious. Outputs of between 15 and 20 tons of sugar per day from up to 400 tons of cane are envisaged. By their nature and size these mini-sugar plants will need to depend on less specialised technical and management skills than the large ones. In consequence both levels of output and quality may be less than expected. The idea is, however, interesting and certainly well worth following up. But there would be obvious wisdom in starting the scheme only in a small way.

Edible Oils The position regarding the processing and consumption of edible oils is complicated. Certainly to the reasonably informed observer it is surprising that a large quantity of palm oil has to be imported each year from Malaysia. An annual import of 27 000 tonnes has been recorded. The greater part of this is bleached, hardened, and incorporated into a very popular cooking fat sold under a proprietary name. A lesser quantity is used, after treatment, in the manufacture of high quality soaps.

The international trade in edible oils could be one factor influencing the rather slow speed at which attempts by the Kenya Government to be self sufficient in edible oils have been carried out. Increasing domestic demand is now, however, causing a considerable increase of interest in edible oil production in Kenya. This demand, arising mainly from improved living standards, is likely to rise from the present annual consumption of 2.8 kg per head to 3.3 kg. in 1984.

A rapid development in the subflower oil industry is now official government policy. This will be implemented by peasant producers for whom it would be a valuable addition or complement to maize growing.

Crushing capacity in the country is considerable, probably of the order of 45 000 tonnes but at present only a small part of this is in regular use. There are ten mills in all with one of these having also a solvent extraction plant. There is also one factory which deals only with press cake from the crushing mills as a solvent extraction plant. In the past cottonseed oil, corn oil and sunflower oil have been the three main edible oils but as the Government sponsored development in sunflower oil progresses the quantity of sunflower oil should increase very rapidly.

The main complication in the supply situation is that the current main domestic fat (which has certain fiscal advantages) is made mainly from the imported palm oil after hardening. It will be interesting to see how the public taste reacts to the introduction of large amounts of sunflower oil. It will also be interesting to see the reaction of the local importing agency to the change in raw material.

Cereal Products As in most other parts of Africa bread made from

wheat flour is a very popular item of diet in the urban areas. Its convenience, with no cooking necessary, plus its relative abundance make it much sought after although by local standards it is not a cheap food. In the rural areas this is not yet the case partly because it is not so readily available and partly because it is significantly dearer than maize or millet products which are used mainly as a porridge sweetened with sugar.

Overall, however, there is little doubt about the growth in consumption of bread made from wheat flour and the Government is aware of the probable need for two or even more flour mills in the near future. A modest increase in the amount of wheat grown is being planned. Production in 1976 was 187 000 tonnes and the target for 1983 is 200 000 tonnes. Wheat is grown mainly by large farmers using modern agricultural methods. The wheat mills are privately owned and no extension in grinding capacity is planned during the current Development Plan period, but, as has just been noted, further capacity will be needed before long.

But if the expected increase in wheat processing in the next ten or fifteen years is likely to be modest a different story is emerging for maize. Maize is the predominant cereal in Kenya and the current Development Plan expects maize to rise from its 1976 figure of 2 467 000 tonnes to around 3 139 000 tonnes by 1983. That is an increase of rather more than 25%.

As far as maize processing is concerned a significant change is taking place in milling methods. About 90% of the maize is grown by peasant farmers with acreages of less than 5 hectares. This maize does not go through the normal commercial channels but is ground in the

villages by the small 'posho' type mills driven by a one-cylinder petrol or diesel engine. This gives a whole meal flour not very finely ground.

Maize which does go through the normal commercial channels is usually ground on large mills by the urban processors. Such milling can either produce a whole meal flour or one with the bran and germ sifted off. In either case a much finer flour can be obtained. There are financial advantages to the processor in removing the germ as it is available for further processing mainly for producing maize oil. In addition the de-germed meal keeps better in storage.

There is a significant change of preference being shown especially by the urban dwellers for the fine milled product and the need for suitable processing facilities being made available for dealing with the extra tonnage will need to be borne in mind. In fact two large maize mills are expected to be built during the present Plan period. Each of these will have a capacity of 30 000 tonnes per annum and, in addition to these, existing milling capacity in Nairobi will be increased by development at the mills.

In addition to these developments one further change in milling practice in the rural areas is being considered. This is the possibility of introducing de-germing devices on to the existing 'posho' mills and other small-scale milling facilities in rural areas. This change will make available more maize germ for the production of corn oil which is already produced in quantity in the country. The disadvantage is that useful lipids will be removed from the diet of the rural population. Plans are already in hand to do a dietary survey to establish the significance of such a change.

Flour Confectionery and Pasta Products As is the case with bread there is a steadily increasing demand for semi-sweet biscuits in the urban areas where wage rates are relatively high. The demand, however, reaches out well beyond town limits and the national brand leaders are served by efficient distribution networks which make the goods available in towns over a wide area.

Pasta is still a minor cereal product but it is produced in a number of companies and is purchased mainly by different expatriate groups as an alternative to potatoes or rice. There is not likely to be any Government stimulus of the industry.

Meat and Dairy Products It is hardly possible in a brief report such as this to do other than highlight some of the work done by the Kenya meat and dairy farmers in their contribution to the food processing industry and to the nutritional status of the country. In the last year for which production figures are available, 1975, beef production was estimated at 141 000 tonnes. Of this quantity 13 000 tons were exported either in carcass form or as canned meat products. By 1983 production of meat should be 164 000 tonnes.

Meat, as far as the larger towns are concerned, is obtained in large well-equipped abattoirs and there is an adequate distribution network using insulated or refrigerated vans.

It must be added that a visitor tends to see mainly what is happening in the larger towns and also the best of that. Certainly it is true that the Kenya Meat Commission, which works closely with the Ministry of Agriculture, does not control all the slaughtering of animals. Even in 1973 only 22% of the total beef production was received by the Commission's

premises. The remainder were slaughtered by small local butchers and by the producers. In some cases, at least, hygienic conditions would leave much to be desired. In addition inspection of the dressed carcasses would not be made to ensure suitability for human consumption.

It is clear that even in the relatively advanced society in Kenya the whole question of animal inspection before slaughter, examination of carcasses after slaughter, and hygienic conditions of storage, transport, and sale of meat needs attention. There is much medical and scientific evidence that meat and meat products are responsible for most of the cases of poisoning or gastro-intestinal disturbances that are reported in the literature. It is right that, in meat processing developments, adequate attention is paid to this important aspect of food hygiene.

The total milk production in 1976 was 1.2 million tons. Most of this, 0.84 million, came from small holders; large farms produced 0.15 million; while in the pastoral areas the total was 0.196 million. Rather less than half was consumed by calves and 0.65 million tons was consumed by the population or exported as dairy products, mainly butter. Exports were, however, quite small.

9. Ghana

Political A Republic within the British Commonwealth. Since January 1972 the National Redemption Council has been the supreme governing body, assisted by an Executive Council. Rule is be decree with a Military Head of State and Chairman of the National Redemption Council.

Area 92 000 sq. miles

Population (1970) 8 545 561

Production Agriculture forms the basis of the country's economy employing 70% of the population. Cacao is the largest revenue producer. Maize, cassava, yam, rice, millet, and sorghum are the main staples. Groundnuts are extensively cultivated in the north. Cattle rearing is extensive in the north.

Fishing is very important with many deep-water vessels based on the ports. There is also much inshore sea fishing as well as in lakes, and rivers. The vast Volta lake is now an important fishery area.

Manganese, gold, industrial diamonds, and bauxite are mined and are revenue producing.

A State Farms Corporation was established in 1963 and has now more than 100 farms operated from 8 regional centres.

Capital Accra (on the sea coast) pop. 650 000 (estimated)

In the countries visited it was only in Ghana that something approaching reluctance by Government officers to answering questions was noted especially in relation to food production and food processing. Part of the reluctance seems to spring from the consciousness that such data as are available are well out-of-date by the time they are published. Another part, possibly the main part, is the knowledge that in Ghana food processing plants have not been successful in the past two decades.

There is also the probability that Ghana has been rather over-researched in recent years in the pursuit of data on agriculture and food matters.

The External Trade Statistics for 1975 show clearly that Ghana is heavily dependent on imports of several food commodities. About

10 million Cedis were spent on the import of cattle on the hoof, carcass meat, and corned beef in tins. Milk products amounted to 4 195 tonnes costing 5.5 million Cedis. Fresh fish imports were very high but this is mainly from deep-sea vessels based in Ghanaian ports and much of the catch is re-exported but 12 000 tonnes of canned fish were imported for local use.

For the ever expanding market for bread, wheat imports amounted to 81 000 tonnes while sugar imports - both granulated and lump - were 19 000 tonnes. Edible oil imports were low at under 4 000 tonnes.

Although large quantities of maize and rice are not normally imported substantial amounts, amounting probably to about 20 000 tonnes each, will be imported this year under the World Food Programme.

Various reports in the last decade have drawn attention to the poor performance of the food processing industry operating mainly under the general umbrella of GIHOC the main Government holding company for industry and it is clear that there has been little improvement in this situation recently.

It would be naive to suggest that there is one single answer to the question as to why this disappointing performance exists but several general factors can be identified. First, the inadequate supply of raw materials is one serious cause. In the case of factories established a number of years ago it is not now possible to determine whether or not the supply of raw material was given enough consideration in the first place. If it was then presumably inadequate attention has been given to the matter since the project started.

In the case of factories started in recent years attention has

certainly been given to the supply of raw material. If shortages should develop in the next few years then some other factors must be responsible.

Another factor could be a shortage of sufficiently trained technical skills on the different jobs. It is true that there has been only limited facilities for proper technical training in many skills in Ghana. But it must be added that there has been only a limited demand either by industry or individuals for such facilities.

A third factor is the supply of spare parts for all kinds of factory equipment. It appears that frequently the absence of necessary spare parts to replace those which have failed in use or need replacement can put a factory out of commission for weeks. (This point is taken up later in regard to one specific factory)

A final factor could be related to pricing policy for raw materials as the following example shows. The meat processing factories in northern Ghana has suffered badly from shortage of raw material. But this case, as has been pointed out by a World Bank report, the shortage arises not only because cattle are in short supply in the area. It arises because the prices offered to stock dealers are lower than the dealers can obtain in the local markets. At one time prices offered at the factory were about one-half of the price outside.

Certainly the large meat factory at Bolgatanga has almost ceased to slaughter and process local animals. Early in 1977 it was even using imported quarters of beef for manufacture of corned beef.

Although it is the Government's pricing policy which has been mainly responsible for the production from the Bolgatanga factory there

is no doubt that stocks of good animals are lower in the area than they might be. In consequence one or two reports have suggested that there should be a rapid increase planned in the livestock in the area.

What is less well understood, however, is that such an increase, although very desirable from the viewpoint of an increase in the amount of animal protein available, would certainly mean in the short term an increase in the amount of feedingstuffs, including maize, needed in the area for the extra animals.

Since there is normally no significant carry-over of maize stocks from season to season any large-scale diversion of maize for animal feeds would cause deprivation among some rural communities. In turn this shortage would at once force up prices to a level that would make animal - and human - feeding very expensive.. Any fairly sudden increase in the amount of meat processed at Bolgatanga is therefore unlikely.

Sugar But a real shortage of raw material has been the main cause operating in the poor performance record of the sugar processing factories. There are two such factories in Ghana with a combined capacity of 45 000 tonnes of sugar per annum. Their combined production has not yet reached 6 000 tonnes in any one year.

Financial responsibility for the factories is mainly vested in the Ghana Government through funding by the World Bank while private companies have been partners supplying technical and management skills. In the past ten years three different international companies have been partners both in sugar growing and processing.

The main difficulty has arisen in the field. There the yield

of cane has rarely been higher than 20 tonnes per acre or about one-fifth of the yield expected. It is difficult to say whether this is due to poor choice of growing area, periodic lack of water for irrigation or poor management. But yields of cane at this low level are likely to be crippling to the factories. In addition there have been some serious mechanical troubles in the extraction. This has resulted in extraction rates of sugar between 5 and 7% instead of the normal 10 or 11%. The plant is made by the well-known firm, Skoda, and is robust enough for the cane it treats. The troubles have been mainly at the crystallising end of the plant. These troubles have inevitably meant the need for spare parts and it is the difficulty of getting spare parts in a short time which has seriously affected production.

Part of the delay comes from the need to obtain financial approval from the Bank for the use of foreign currency and firm orders on suppliers for the spares cannot be given until financial approval in Ghana is obtained for the disbursement.

It seems strange that large undertakings which have cost the countries millions of Cedis should be held up in this way for administrative reasons. There are well-known ways for circumventing this difficulty.

Edible Oils These are produced mainly by small peasant producers especially in the central part of the country and in the north. But large crushing mills are operating in several towns and obtaining oils from groundnuts, palm kernels, palm nuts, and copra. The quality of the oil - and the quantity extracted - vary with the mill and how efficient and hygienic it is. No significant quantity is exported.

Milk Products The high level of imports of milk products has already

been noted. Most of this is used in the manufacture of evaporated milk using reconstituted separated milk powder homogenised with dehydrated butter (butter oil). The product is then canned and sterilised. This is done by an internationally known company as part of GIHOC activities. Some of the product is (unofficially) exported to neighbouring countries.

There is also a small but significant trade in ice-cream, yoghurt and other dairy products.

Mention has already been made of the imports of canned fish. It should be noted that at the port of Tema there are large cold storage chambers for fish and also a fully equipped factory for fish canning. Up to the present, technical difficulties have prevented any large scale use of the plant.

Flour milling facilities for imported wheat are available as well as innumerable posho mills for grinding corn and millet where these are the normal staple carbohydrate foods.

Special mention must be made of the extensive processing of cacao beans to obtain cocoa butter and cocao liquor. Very little of these products are used in the country. Almost all is exported to chocolate manufacturing companies in USA, Europe, and Japan. A few years ago some chocolate bars were manufactured in the GIHOC complex but this production has now ceased.

10. Senegal

Background

Political The country is an independent Republic in francophone West Africa. The President is Leopold Senghor elected in 1960 when the country became an independent territory. He is the longest serving Head of State in black Africa. The country has close economic links with France.

Area 77 814 sq. miles

Population (estimated 1976) 5 000 000

Trade and Industry The principal exports are groundnuts, groundnut oil and groundnut cake. Large quantities of phosphate ore are also exported.
Most of the country's trade is with the EEC countries.

Capital Dakar pop. 581 000

In contrast to the position in Ghana there appears to be relatively limited published information about the state of the food processing industry in Senegal. The main exception to that statement concerns the very large groundnut processing industry about which much is known. Some published information is also available on the large fishing industry especially in relation to the fish salting and drying which is done and also to the considerable canning of tuna fish. These products are largely exported.

There is, however, a wide variety of other food processing activities - flour (and other cereal) milling, sugar refining, dairy products using imported semi-processed materials, and a little processed meat production. There are also breweries and soft drink factories.

In the past the food industries were mainly private commercial ventures established by local or expatriate entrepreneurs. But in recent years the official policy has been for the Government to take

some financial interest in all large-scale new manufacturing enterprises.

Edible Oils The groundnut crushing industry is by far the largest food processing industry. In 1975 the amount of groundnut oil produced was about 250 000 tonnes. This amount, although very large, is much below the figure obtained in the early 1960's when quantities of the order of one million tonnes were produced annually. It appears that crushing capacity - at over one million tonnes per annum - is now well above what is required by current crops. There are five large crushing mills now in operation.

The quantity of oil exported varies from year to year depending on the size of the crop of groundnuts but is usually one third to one half of the total production. Facilities for full refining appear to exist but the quantity of oil described as 'refined' in the production statistics issued by the Government was only 85 000 tonnes in 1976. There are no facilities for hydrogenation as, in contrast to Kenya, the local domestic demand is for an oil not a solid fat.

The production of groundnut cake as a by-product of the production of the oil is of much economic value to Senegal. The cake could obviously have great nutritive value as a high protein component of locally produced feeding-stuff for cattle. In fact, however, only a small amount of feeding-stuffs is produced in Senegal. One of the reasons for this is the high economic value of the cake in the world market. As a result the price obtained by exporting the cake to North America as an ingredient in feeding-stuffs produced in that country is higher than the local cattle owners in Senegal can pay.

This is a regrettable situation but one which is bound up with

world prices of edible oils and oil cakes and is not readily corrected on a local basis.

Although groundnut oil is use almost exclusively for domestic cooking purposes it is worth noting that there is also an import of other edible oils. This usually amounts to only a few thousand tonnes per annum. Presumably some, or even all, of this is used in the production of canned sardines in oil.

Meat Products At present Senegal is not completely self-supporting in meat supply. Cattle in very large numbers, varying widely from year to year, are imported overland from Mali and Mauretania. After slaughter the carcasses are consumed fresh or, if transport from the point of slaughter to the point of consumption is necessary, after chilling.

Much of the meat consumed is obtained from animals which have not been slaughtered and inspected in the official abbatoirs. There are only about 12 official abbatoirs in the country and in one recent year it was estimated that only 80 000 of the total 250 000 cattle slaughtered had passed through the official abbatoirs. The risk of animal-borne diseases being passed to the human population is therefore quite high.

The population of Senegal is mainly Moslem (probably about 80%) so the consumption of pork in the country is small. Mutton and goats' flesh are both consumed but to a lesser extent than in many West Africa countries and recent figures suggest that it is only about 15% of the total meat consumed.

Dairy Products There is a substantial import of dairy products especially evaporated milk, milk powder, and butter oil. The following

figures are of interest:-

Table 10.1

Imports of Milk and Milk Products

Amounts in tonnes

Year	1972	1973	1974	1975
Quantity	14 170	8 853	8 013	8 505

Most of the milk powder and the butter oil are used in the manufacture of evaporated milk as has been described earlier in this Report.

In the towns, only small quantities of fresh milk from local cows are consumed. One attempt was made some years ago to collect, pasteurise, and market milk from local animals but it was only indifferently successful due to irregular supplies and poor keeping quality of the local milk. Untreated local milk is much cheaper than the reconstituted product and, outside the large towns, is consumed extensively. The possibility of transmission of disease, including bovine tuberculosis, cannot be ignored.

Sugar Production Production of granulated sugar from locally grown cane has begun only recently in Senegal although the production of cube sugar from imported granulated sugar has been extensively done for many years. The following Table shows the most recent figures for the import of granulated and cube sugar. The decrease in the four-year period cited is due presumably to the increasing importance of the locally produced sugar.

Table 10.2

Imports of sugar (Amounts in tonnes)

Year	1972	1973	1974	1975
Quantity	80 144	76 764	56 634	59 096

The reduction in imports between 1972 and 1975 is significant but it is clear that Senegal still has some way to go before it is completely self-sufficient in sugar production.

Cereal Processing One important point of contrast between Senegal and Ghana (and also other anglophone West African countries) is that the import of wheat has not increased significantly over the past four years. The figures are given in Table 10.3. The Table also shows, for interest, the increase in rice imports and rice production.

Table 10.3

Imports of Wheat and Rice (and local Production of rice)
(Amounts in tonnes)

Year	1973	1974	1975	1976
Quantity	105			
(i) Wheat	105 422	86 723	101 901	109 517
(ii) Rice	191 967	207 180	101 715	244 996
(iii) Rice production	36 687	64 340	116 975	115 707

The increased importance of rice in the local diet is very evident.

The staple food in the country is, however, millet. Almost 3.5 million tonnes were produced in 1976. This is milled almost entirely

in the villages on posho-type mills. The millet flour so obtained is rather coarse but is used satisfactorily for baked products for wet dishes such as porridge and couscous. In the towns some millet is ground on large mills but this is only a small part of the total production of millet flour. There are also industrial mills for grinding maize and for de-husking rice.

The imported wheat is ground in the Dakar area on large modern flour mills. There are three mills in production and they have a total capacity of over 300 000 tonnes of wheat per annum. There are many bakeries in the country most of which are quite small but one or two are large with automatic ovens and up-to-date equipment. There is also some biscuit production and some pasta making but both these are quite small in size.

For some years work has been in progress at the Institute de Technologie Alimentaire near Dakar on the production of bread from composite flours, mainly wheat and millet mixtures. This is in line with similar work done elsewhere in Africa and, especially, in Latin America. Breads made from 70/30 wheat/millet flours have been found to be acceptable in large trials and, it is claimed, keeping quality is enhanced. This latter claim is not, however, in line with results of similar work elsewhere.

Mention must also be made of two other food processing activities. The first of these is fish processing including the canning of sardines and tuna. Full details of the industry are given in the appropriate FAO publications but it is of special interest to this Report that there is an annual production of about 20 000 tonnes of canned tuna and smaller

amounts of canned sardines and shrimps. It is clear that this food processing industry is capable of much further expansion on its present firm base.

The other food processing activity that requires mention is tomato paste production. This is concentrated tomato juice at 28 to 32% solids sterilized after canning in small (about 50 g.) cans. This material is imported in very large quantities as it is used extensively as a flavour in fish and meat stews. In 1972 the quantity imported was over 8 000 tonnes but it fell fairly sharply to 3 500 tonnes in 1974. In part this fall probably reflects an increase in the amount produced locally.

Attempts to build up a tomato paste industry have been made many times since the early 1960's but many attempts were unsuccessful. Causes of failure were the familiar one of inadequate raw materials and also of too high prices for what raw material was available. Almost invariably the fruits could be sold at a much higher price to dealers supplying the fresh fruit and vegetable market than the factory could afford to pay. There is now a clear realisation that those wishing to enter this type of processing must grow the greater part, indeed almost all, of their own raw material. This requirement inevitably increases the cost of the undertaking and sometimes takes it beyond the means of would-be processors.

The processing of tomato juice into tomato paste is a relatively simple operation and meets a well-established demand. It would be unfortunate if past mistakes and misfortunes prevented its continuing development in Senegal.

Summary and Conclusions

1. In all four countries visited there is considerable activity in a wide range of food processing operations. Many difficulties are experienced but the quality of the products seems generally adequate to meet consumers' needs.

In the Report special attention is given to operations at factory level but it must be stressed that the great bulk of foodstuffs are given primary processing at village or household level and do not move into trade channels. Although no hard data are offered to support the view it appears that there are wide variations both in product quality and hygienic standards in production at village level. But unless consumer reaction demands it or commercial competitive pressure forces it no major changes in standards are probable.

2. Particularly at village and household level there are two areas of activity which could present some health hazard to the population. First, there is danger of bovine TB especially to children from the use of unpasteurised and otherwise untreated milk from diseased cattle. Second, there is the possibility of animal-borne diseases being transmitted to humans from infected carcasses used in food preparation. This would be mainly by cross-contamination during storage and cooking in catering establishments and private households.

3. If, as seems probable, the current trend towards urbanisation continues, there will be a demand for factory processed foods at the expense of those processed at village and household level.

4. Although it is virtually impossible (and possibly even undesirable

on economic grounds) for countries to be completely self-sufficient in food supply it is surprising to find in the countries visited a heavy dependence on imports of important foods which on prima facie grounds could be grown within their own borders. Edible oils in Kenya and sugar in Ghana and Senegal are obvious examples.

5. There are large imports of wheat for conversion into flour for bread making in all the countries visited. These imports are mainly from the North American continent and constitute a heavy drain on foreign currency. These underline the fact that bread is now a popular item of food which is firmly established especially in the urban areas. Its use is likely to increase.

Since much scientific information is now available showing that composite flours with up to 30% of non-wheat flour can be successfully baked into bread and are acceptable to local consumers it would be appropriate for Government action to be taken into making the use of such composite flours normal practice. Such additions are already established practice in some countries while other additions, e.g. calcium and iron, are statutory requirements in many Western European countries.

One result of such a policy would be the need to examine whether or not milling facilities for grains other than wheat, especially millet and maize, are adequate.

6. Fish canning in Senegal provides a good example of what can be done where raw materials are available in quantity and can be handled by those with the necessary processing and management skills.

The experience at Dakar and elsewhere in Senegal could provide a

useful guide to those responsible for fish processing in Ghana.

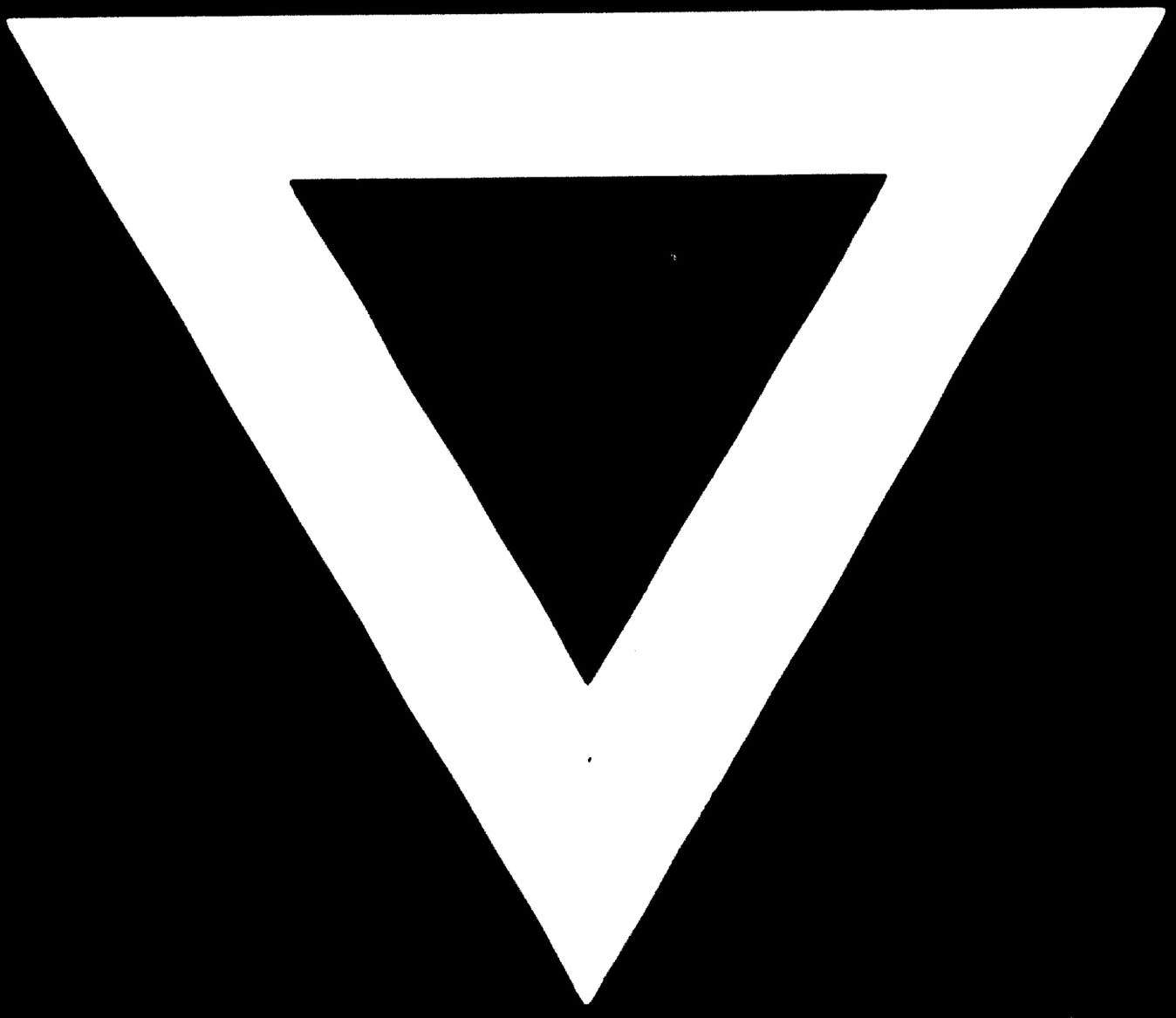
7. The brewing and soft drinks industries provided success stories in the four countries visited. Yet brewing, even using semi-processed ingredients, is a fairly sophisticated process. How far the success is due to good technical management, well-installed equipment, commercial pressures within the organizations, or public demand for what many people consider a highly necessary part of life is difficult to say.

The fact remains and it is worthwhile putting the matter on record.

8. In the two countries which had the best record of success in food processing, Kenya and Senegal, it was clear that one factor was the availability of technical and management skills at all levels coming from a variety of widely different ethnic groups. The importance of this is difficult to over-estimate.

It is clear that a programme of instruction in the different branches of food technology, especially for middle management, should be a top priority in the technical education programmes in the African countries.

G - 7



79.11.12