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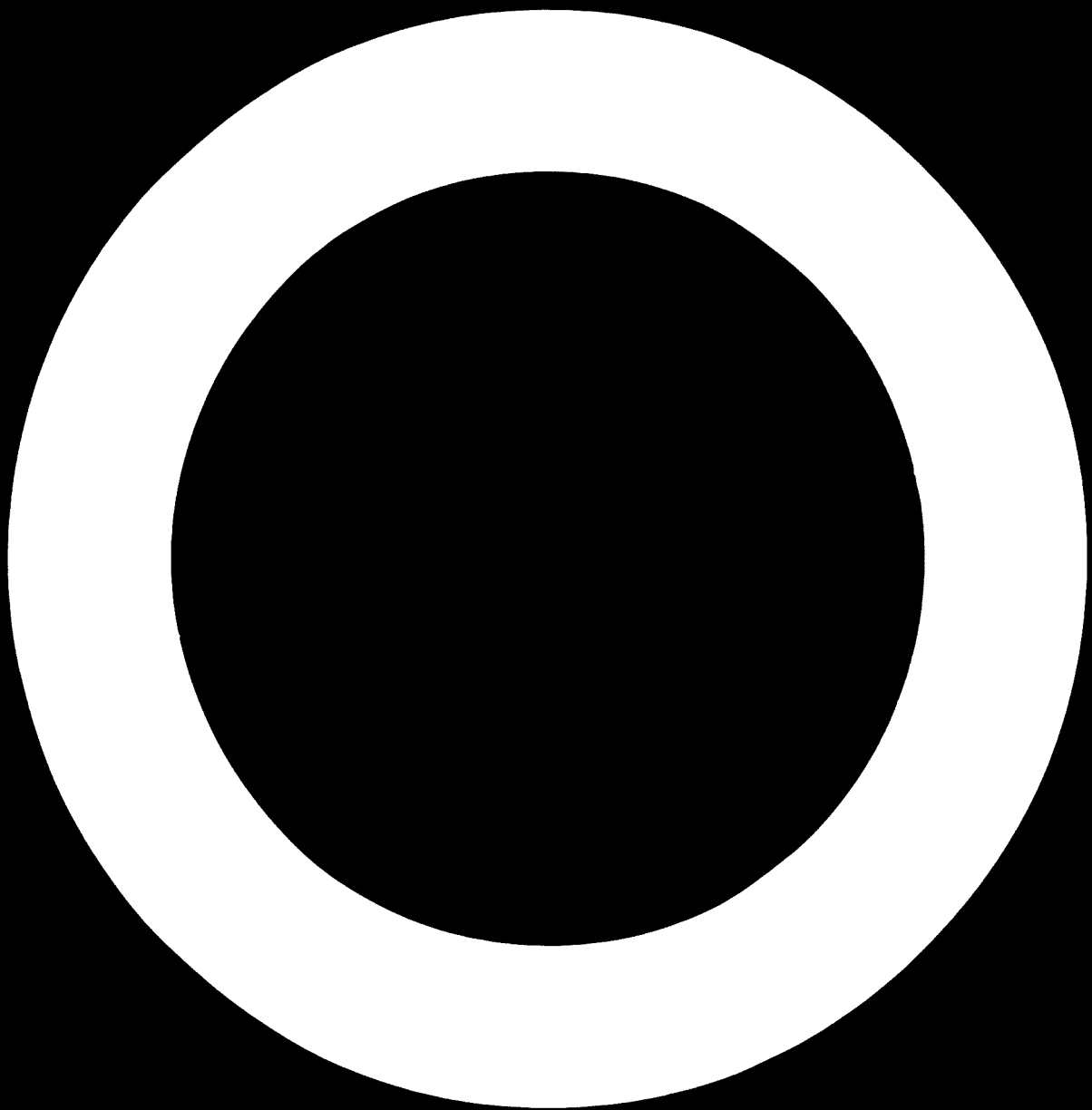

[illegible] the Government decided to undertake a new programme [illegible] For this purpose [illegible] a long-term project in [illegible] United Nations Industrial Development [illegible] are the executing agency.

Basically, the Government desired to ensure a fuller utilization of the human and material resources of the country. By stimulating investment in industry, it sought to create more opportunities for gainful employment, and to provide more goods and services of national origin which would contribute to raising of the standards of living. It wished also to be able to deal effectively with new industrial problems emerging from its relations with the common market structures in East Africa and the European Common Market.

With these broad objectives in view, three consultants of UNIDO made an industrial survey in Kenya from June to December 1969.* Called the Industrial Survey Mission to Kenya, they have summarized their findings and recommendations in this report. UNIDO has a programme of the industrial survey of individual countries. Upon the receipt of the government's request a survey team is being sent. This Kenya mission is one of these teams. Further, in the case of Kenya, a Special Fund project of the Industrial Survey and Promotion Centre is to continue and expand the activities initiated by the Industrial Survey Mission. The organization and the plan of operation of this Centre are being planned in the light of the experiences of the Industrial Survey Mission during the past six months. It is gratifying to say that the Government, UNDP and UNIDO are already in substantial agreement, and that the work which has been started will be carried on.

At the outset, the Mission was confronted with the general problem of establishing (and maintaining) a comprehensive store of statistical, economic and business data, not only in relation to its own needs for industrial development purposes, but also the broader needs of the Ministry of Commerce and Industry.

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* See Terms of Reference

[illegible] arising
the [illegible].

[illegible] order of industrial
establishments [illegible] and [illegible]. It
has also collected [illegible] for [illegible] basis in
such form as to form [illegible] a great variety [illegible].

[illegible] industry, and its prospects
for future growth, the Mission has had to rely largely upon data which had
previously been published. Significant portions of this information are
included in this report with an examination of existing industry and its
performance in recent years.

The Mission's recommendation of industrial development based on sectoral analysis is not in conflict with the Development Plan for [illegible]-1974. This takes into account the socio-economic aims of the Government, and its desire to facilitate the industrialization of rural areas. It suggests an order of priority of sectors selected for development wherein benefits to the economy as a whole may be anticipated, and it outlines specific projects for immediate development, as well as for later study.

Throughout its stay in Kenya, the Mission was conscious of the desire of the Government to emphasize the development of information at the project level, and its practical implementation.

The Mission did not have sufficient opportunity to study in detail the Government's policies on industrial incentives and protection. These are critical matters requiring intensive study over a period of time. Initially, a study is recommended of protective tariffs.

Similarly, the Mission does not attempt to report in detail on the various problems which have arisen in the East African Community as a result of the development policies and practices of the Partner States. These problems have a definite bearing on the prospects for industrial development in Kenya. Although they are not susceptable to quick or easy solutions, the Mission is recommending an approach which might have practical benefits.

[illegible] ... the Mission ... and [illegible] organizations; ... private institutions ... and [illegible], met conferred with the ... industrial concerns.

... report ... an interim report since ... with the initial phase of a long-term programme of industria[illegible] ... the efforts of the Government will be added by UNIDO ... the United Nations ... the Ministry of Commerce and Industry of an ... and Promotion Centre financed by the Special Fund of ... .

Respectfully Submitted

Industrial Survey Mission to Kenya

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

1. [illegible]

[illegible]

[illegible]

[illegible]

2. [illegible]

[illegible]

[illegible]

due regard to [illegible]

3. As a means of facilitating [illegible] the East African Community, the government should explore the possibilities of effecting closer co-operation among the Partner States at technical level.

4. A study should be made of the incentives and the institutional set-up which might be offered to induce more rapid expansion of exports of manufactured goods.

5. The value of rural industrialization should not be impaired by locating industries in areas where costs outweigh economic benefits.

6. Industrial development in rural areas should be actively supported by the Ministry of Commerce and Industry by use of an

effective extension and improvement of these services.

7. A study should be made of the feasibility of the economic effects of [illegible] with particular reference to tariffs on imported machinery and equipment used in manufacturing.

8. Collection of [illegible] should be undertaken with respect to the selection of industrial development projects. The Ministry of Commerce and Industry should [illegible] the form of the data required, and it should be processed and evaluated jointly by the Ministry of Economic Planning and Development.

II. Industrial [illegible] Centre

9. Special procedures should be used by the Ministry of Commerce and Industry to recruit promptly qualified local personnel required to staff the Centre in accordance with the staffing schedule in the project's Plan of Operations.

10. Effectiveness of the project already requested by the government may be further assured by making the proposed Industrial Survey and Promotion Centre an autonomous entity within the Ministry of Commerce and Industry under the direction of a Governing Board representative of the Ministries and parastatal organizations directly concerned with industrial development.

11. Activities of the Ministry of Commerce and Industry in the promotion of industrial development industries should be a primary function of the proposed Centre under the direction of the Governing Board.

III. Priority Industrial Development Projects

12. Building materials: Further studies should be made to

deter[illegible]

for

(a) [illegible]

(b) fi[illegible]

(c) [illegible]

(d) lime

(e) [illegible]

(f) [illegible]

Spec[illegible] standardi[illegible] fabricat[illegible].

13. Agro-based Industries:

(a) Studies should be made of methods to assist the processing and marketing of cocoa, edible vegetable products.

(b) UNIDO should be requested to undertake studies of natural gas and maize should be undertaken as soon as facilities permit.

(c) Studies should be made of the milling and refining facilities which may be needed because of increased production of oil bearing crops.

14. Chemical Industries:

(a) Further study should be made of the feasibility of manufacturing alcohol and various derivatives from molasses;

(b) Further studies should be made to facilitate the production of charcoal by such means as will yield valuable chemical byproducts of such production;

(c) [illegible]
on the [illegible]
with a view [illegible]
[illegible]
tive;

(d) [illegible]
[illegible].

15. [illegible]

(a) [illegible]
of estab[illegible] [illegible]
an com[illegible] [illegible] [illegible] [illegible] [illegible] States,

(b) A feas[illegible] [illegible] [illegible] of [illegible] sanitary
towels should be undertaken.

(c) Production [illegible] heaters should be considered.

[illegible]

[illegible]

[illegible]

With such [illegible], [illegible] average annual growth rate [illegible] per cent [illegible] prices during the next five years, [illegible] rate of 7.5 per cent achieved in [illegible]. New [illegible] including replacement [illegible], would be required in the amount of [illegible] millions.

Considering the size of the industrial base at present, development of such magnitude presents a formidable task. It cannot be left entirely to the opportune workings of the private enterprise system.

Industrialization Policy

The policy of industrialization is based on African Socialism. Avoiding the nationalization of industry, the government offers to participate with private interests in developing new industries.

New industries have been [illegible] the

[illegible] "[illegible]" [illegible] or 20%)

[illegible] of "social" [illegible],

[illegible] still [illegible] government

[illegible] private industries.

[illegible] owners [illegible] by the government.

The responsibility for carrying out this policy of industrialisation rest largely upon the Ministry of Commerce and Industry although other agencies are directly concerned such as the Ministry of Economic Planning and Development, the Ministry of Finance, and such organizations as the Industrial and Commercial Development Corporation and the Development Finance Corporation of Kenya.

Privately Sponsored Projects

The above mentioned agencies, jointly and with others, have in the past reviewed the industrial projects submitted by private sponsors seeking government assistance and approval.

They have appraised them from the standpoint of their commercial viability and their eligibility for various forms of incentives and protection. This will continue to be done, but it would appear essential, certainly in the case of the larger projects, that the broader considerations of their contribution to the development of the economy as a whole should be carefully weighed before they are finally approved.

- Recommendation No. 1

It is the recommendation of the Industrial Survey Mission that procedures should be strengthened within the government for evaluating and appraising the larger industrial projects submitted for government approval from the standpoint of their national economic profitability.

Such procedures might well include timely reference of projects to the proposed Industrial Survey and Promotion Center whenever its staff and facilities could be used advantageously.

National Industrialisation

The new role of the government can be executed in the first instance through careful planning and promotion of industrial projects

which will satisfy the domestic market and utilize efficiently available raw materials and labor. To the extent that such industries supply goods at prices competitive with similar imported goods their economic value will be enhanced.

A review of the structure and organization of existing industry shows that conventional processing and consumer goods industries have already been established. Together with a number of key heavy industries, they constitute a relative broad industrial base. But it is evident that all sectors are not fully developed in that they are still supplied excessively by imports or suffer from obsolete technology.

They offer opportunities for establishing facilities for the manufacture of important intermediate goods, and their derivatives, from which it might be feasible to produce a variety of marketable products. Examples may be cited in the chemical sector.

Of correlative interest is the possibility of finding new uses for materials now in excess supply, including agricultural wastes, and new markets for products which return cash benefits to primary producers. These possibilities exist with respect to building materials and agro-based industries.

It is the experience of the Industrial Survey Mission that studies of new industrial prospects can best be made on the sectoral level; it aids specifically the development of industrial complexes as shown in the project section of this report.

- Recommendation No. 2

Accordingly, the Industrial Survey Mission recommends that to effectuate the role of the government in industrial development, the Ministry of Commerce and Industry should initiate the planning

and development of projects on a sectoral basis with due regard to their commercial and national economic profitability.

East African Common Market

The existence of this market invites consideration of relatively large industries in which economies of scale might be applied to the benefit of consumers throughout the Community. But the inherent difficulties of such enterprises are aggravated by the practice of the Partner States of setting up rival industries.

Their effort to achieve industrial comparability with Kenya entitles them for a period of time to discourage imports of similar Kenya products by the imposition of transfer taxes.

In the case of Tanzania in particular, competition between similar industries in Kenya for a share of Common Market is likely to be unequal in the future; Tanzanian industries are said to be established according to different economic criteria in which commercial profitability is not considered vital. Therefore, they are in a position to compete on the basis of price with important products regardless of the effects on their earnings.

From available evidence, new methods must be devised to provide for a rational development of industry to serve the Common Market. One formula discussed would involve the planning of groups of industries, perhaps under the leadership of the Secretariat in Arusha. Presumably, the industries in each group could be located in one or the other of the countries, and they would be jointly decided on the location among the Partner States on some basis considered equitable.

The practicability of such a scheme has not been tested; but it is interesting in that it pre-supposes a degree of cooperation among the Partner States at technical levels. At least, there would have to be an exchange of statistical information of an agreed type and form. The scheme might have a practical purpose.

[illegible] Treaty or Industrial
Pr[illegible] under the
Sp[illegible] need for re-
dustrial [illegible] to the appropriate-
ne[illegible] step in the
de[illegible] planning and re-
la[illegible].

[illegible] better understanding of the
relative [illegible] of the Partner States in
re[illegible] could best be developed for
the [illegible] and other studies required to
identify [illegible].

It seems evident that cooperation at technical levels would greatly assist the governing bodies of EAC and the East African Development Bank to reach sound decisions on a variety of important questions concerning regional industrial development and its financing.

- Recommendation No. 3

The Industrial Survey Mission accordingly recommends that the government of Kenya explore all possible means of cooperation at technical levels with the Partner States as an indispensable aid to the rational industrialization of the East African Common Market.

In this connexion, it should be noted that UNIDO has or soon will have qualified industrial development advisors in each Partner State, in the Secretariat at Arusha, and in the East African Development Bank. While serving fully to their assigned countries, they are in a position to give experienced, objective advice on technical matters which may be considered by representatives of their respective governments in the interest of regional development.

Export Markets

Kenya enjoys substantial foreign exchange earnings largely because of its exports of agricultural products such as tea, coffee, sisal, hides and skins, and others. Manufactured articles are becoming increasingly important in export trade, and it is highly desirable that industry be developed in the future be capable of marketing their products abroad.

It is noteworthy that there are firms now in nearly every industrial sector which are actively engaged in export trade. In 1967, manufactured articles valued at K£ 15.6 millions were exported, or about 7½ per cent of industry's sales of goods and services.

In terms of value half of these products went into the East African Common Market, and the rest to other countries. During the past two years there has been a noticeable improvement in the volume of exports to such countries as Ethiopia, Somalia, Zambia, Rwanda, the Sudan and the United Arab Republic, which has partly offset the effects of diminishing exports to Uganda and Tanzania.

To expand this trade, the government with private industry has carried on numerous promotional activities the effects of which the Mission was unable to evaluate. Constant attention is being given in the Ministry of Commerce and Industry to changes in the terms of trade with other countries.

But the rapid expansion of exports of manufactured goods may involve risks which private companies are unwilling to assume. This is likely to occur in the case of new industries promoted in connexion with the government's program of industrial development particularly with regard to their exporting to the East African Common Market, and institutional set-ups for the promotion of exports.

- Recommendation No. 4

Considering [illegible] and others that may be involved, the Industrial Survey Mission recommends that a thorough study be made by the Ministry of Commerce and Industry of the incentives and indirect [illegible] to stimulate the export of manufactured goods.

Rural Development in Fiji

An integral part of the government's program of economic development involves industrialization of the rural areas of the country. While the reasons for such a policy are meritorious, there is no denying the complexity and difficulties of the problems involved.

Industries processing agricultural products can be readily located near centers of primary production. Often they are large enough to be able to construct and maintain the infrastructure necessary to their operation which is otherwise lacking.

Handicraft industries such as wood carving and basket weaving, spring up in remote communities based on the native talents of the people rather than the strategy of location. Handicrafts and other types of artisanal activity should, of course, be encouraged.

However, the Industrial Survey Mission was not so much concerned with such development; it is concerned with the problems of designing, organizing, financing and promoting small industries to be located in growth centers where essential infrastructure exists or could be readily installed.

In this connexion, the Mission is mindful of the desire of the government to support industrial development activities in the six rural areas which have been selected for intensive overall development.

A preliminary study of these areas reveals varying conditions; but it is evident in most cases that the local markets are thin, that natural resources are limited, and that there is an absence of entrepreneurial and managerial skills, and trained labor.

In these circumstances it would be desirable to encourage the development of rural industries as adjuncts of industries already established in the metropolitan centers of Nairobi and Mombasa. Such industries conceivably could operate on a sub-contract basis or be established as branch plants. In either case, they would have the benefit of an assured market for their output, and technical, financial and managerial assistance.

Generally speaking, it is the view of the Industrial Survey Mission, that rural industrialization will require large inputs over an extended period of time of technical assistance, capital and training as well as the incentives otherwise available to new industries. Additional subsidies might be required in the form of free land, preferential rates foe water or electric power, or tax remission. Studies should be made before decision in regard to such subsidies is taken.

- Recommendation No. 5

Considering the public interest which has been generated in rural development, the Industrial Survey Mission fea s that the establishment of new industries may be forced in communities where they do not belong. The Mission, therefore, recommends that the value of rural industrialization not be impaired by locating industries where costs outweigh economic benefits.

It is fortunate that the government is willing that new projects planned for the selected rural areas be attempted on an experimental or pilot plant basis. Much can be learned in this way which can be applied in other areas.

The planning for rural industrial development will have to be done centrally by the Ministry of Commerce and Industry. This work will be hampered, at least at the start, by the lack of reliable information about the areas under consideration. This condition may be remedied if the Ministry were to initiate special studies and surveys in cooperation with the Statistics Division of the Ministry of Economic Planning and Development.

In any event, firsthand studies of available raw materials and markets must be made in each of the selected rural areas before industrial prospects can be identified. This will require careful research of trained men able to see business opportunities when they are presented. Where areas appear to have real industrial potentials, studies will also have to be made of all the usual plant location factors.

Work of this character will need to be done in the areas. Similarly, the task of designing, organizing, financing and promoting new industries will largely take place in the field. The training of managerial and technical personnel will likewise be conducted in the field.

- Recommendation No. 6

These circumstances argue strongly for active support of the Ministry of Commerce and Industry of rural industrialization through efficient extension and promotional services. The organization of such services is urgently recommended by the Industrial Survey Mission.

The government has already recognized the need for such services including in its request for the proposed Industrial Survey and Promotion Center two positions for Regional Development Officers. Their work will be doubly effective if they can have the assistance of qualified counterparts furnished by the Ministry.

Africanization

A settled policy of the government calls for the progressive Africanization of industry. It is to be carried out mainly by providing training for Kenyan citizens which will help them prepare for positions of authority in industry, and loans which will enable them to invest in the ownership of industrial enterprises.

Obviously, the training of managerial personnel, skilled and semi-skilled workers for new industrial plants will be an important element in their planning and organization. It is fortunate that good facilities exist to provide such training although experience shows that much of it will have to be done on the job, in some instances, with the assistance of outside experts employed temporarily for the purpose.

The Industrial Survey Mission has been fully aware of the importance of this policy, and feels that it can be effectively applied in the development of new industries.

Protection and Incentives for Industry

Government practice of granting various incentives and protection to industry is of primary importance in the development of new industries. Consequently, the Industrial Survey Mission has given thought to some of the problems involved and how they may effect prospects for industrial expansion.

One prevalent form of protection which is of immediate interest is the tariffs imposed to exclude or impede the importation of goods of foreign origin competing with similar goods of domestic manufacture. It is believed that the government has been quite liberal in granting such protection which has been extended to a substantial number of industries.

Basic Statistical Pre-requisites.

Having access to reliable, up-to-date statistical information is a pre-requisite to the preparation and evaluation of any industrial project, and thorough analysis of economic conditions affecting [illegible] development. At present, suitable data is not available to the Ministry of Commerce and Industry, and the Industrial Survey Mission feels that steps should be taken promptly to correct this deficiency.

The Statistics Division of the Ministry of Economic Planning and Development is charged with the exclusive responsibility for collecting and processing statistics; it is obliged to try to satisfy a variety of requirements of the government and the public. Lack of staff and financial limitations apparently prevent the Division from satisfying all requirements in the way expected of the Division.

In addition, the Statistics Division is estopped from publishing information on identifiable industrial concerns with regard to their capital assets, production costs and profits.* To prevent disclosure of such information, the Division will either not make it public, or it will aggregate figures. The result is a distortion of information about particular industrial sectors, and a notable absence of information about particular firms.

After some delays, the Industrial Survey Mission was fortunate in being able to make special arrangements with the Statistics Division by which a considerable amount of raw data, hitherto unpublished, was legally made available to it. Outlines of this material appear in Appendix _ and Appendix _. The volume of information alone is impressive.

With the aid of a computer, it would be possible to process this data rapidly for a great variety of uses which are outlined below:

1. Assessment of apparent consumption trends by time-series regression analysis with a view to establishing inter-alia growth rates of the consumption of industrial goods.

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* Statistical Ordinance

Policy Bearings: Long and short term policies for sectoral development with policy ramifications pertaining e.g. to investment requirements and supply balance of industrial goods.

2. Assessment of income elasticity of demand of industrial goods on a sectoral level by means of regression analysis of consumption on income.

Policy Bearings: In addition to the policy connections set forth under 1) this information will bear on fiscal policies concerning e.g. custom tariffs and excise duties.

3. Projections of demand for industrial goods on a sectoral level.

Policy Bearings: Long and short term policies for sectoral development.

4. Analysis of market destination of industrial goods produced in Kenya with respect to the domestic market, East African Common Market, and other export markets.

Policy Bearings: Export promotion policies, tariffs and transfer-tax policies.

5. Supply analysis of the Kenyan market for industrial goods on a sectoral level with respect to locally produced goods, goods originating from the East African member states and ex-community imports.

Policy Bearings: Fiscal policies concerning external tariffs, transfer-taxes and subsidies, import substitution policies.

6. Analysis of effective tariff protection on a sectoral level and its development over time.

Policy Bearings: The same as under 4) and 5).

7. Analysis of excise duties.

Policy Bearings: Fiscal policies.

8. Cost structure analysis on a sectoral level concerning raw

materials and other physical inputs, power costs, labour costs, transport costs, sales promotion costs, depreciation costs and interest costs.

Policy Bearings: Incentive and protection policies, pricing policies pertaining to agricultural and other domestic raw materials, agricultural development policies, sales promotion policies, industrial location policies and industry financing policies.

9. Profit analysis with a view to indicating among other things industrial sectors with excessive or sub-normal profits.

Policy Bearings: Policies for sectoral development planning, fiscal policies, protection and incentive policies.

10. Wages and productivity analysis.

Policy Bearings: Wage policies, industrial training policies, policies relating to the choice between capital or labour intensive modes of production.

11. Calculation of output-input ratio on a sectoral level.

Policy Bearings: Policies for sectoral development planning especially with reference to investment priority policies.

12. Location analysis of existing industry on a town, district and province basis.

Policy Bearings: General industrial location policies and rural industrialisation policies.

13. Systematic listing of physical inputs and outputs with a view to producing an index of raw materials and intermediate goods consumed by the Kenyan industry and an index of finished products manufactured in Kenya.

Policy Bearings: Sectoral and inter-sectoral development policies, promotion policies.

Undoubtedly, the information collected by the Statistics Division is valuable, and properly processed it could be used to good advantage in industrial development work. Even so, additional requirements could be mentioned.

There is no data, for example, to show capacity utilization of industrial plants which could be obtained easily enough. Attention has already been directed to the lack of statistical information on rural areas, such as the areas selected for intensive development. Other requirements are likely to arise from time to time as the Ministry of Commerce and Industry gets deeper into industrial development activities.

— Recommendation No. 8: The need for statistics, correctly processed, will become urgent with the establishment of the proposed Industrial Survey and Promotion Centre within the Ministry of Commerce and Industry which is scheduled for early 1970. Accordingly, the Industrial Survey Mission wishes to recommend that the collection and processing of statistics in the future be made with regard to its use for industrial development purposes; that the Ministry of Commerce and Industry should specify the type and form of data required, and that the resulting information should be provided freely to the Ministry by the Statistics Division.

II. [illegible]

The Ministry of Commerce and Industry [illegible] concern itself with the organization which is to carry out its industrial development activities. The [illegible] nature of this organization, its place within the Ministry, and its [illegible] will determine to a large extent the success of the [illegible] effort.

The government's request of the UNDP Special Fund for assistance makes reference to such questions. Observation and experience of the Industrial Survey Mission suggest certain modifications of the terms of the request.

It will be recalled that the government request called for a **permanent** [illegible] staff of seven experts, plus a number of short term consultants. This group [illegible] industrial economists, an industrial engineer, experts in marketing and finance, and two regional development officers. The government also expressed a wish to have the services of a food technologist and a chemical engineer.

Because of the emphasis placed on the development of the chemical sector in this report, it is considered advisable that the post of industrial engineer be filled by a chemical engineer, or a man who has had substantial training and experience in that field in addition to other enginering experience. Additional services in the chemical field can always be obtained on a short term basis, similar reasons do not appear with respect to the services of a food technologist. If such services are needed later on, they can be supplied by an expert recruited as a short term consultant.

The request contemplates that the government will supply local personnel to act as counterparts to the UNIDO experts, plus clerical and secretarial personnel. It may be difficult under present circumstances for the Ministry to carry out its intentions in hiring such personnel.

Admittedly there is an acute shortage of technical trained people in Kenya; it is said there are more economists than engineers available. Therefore it seems advisable that the Ministry resort to extraordinary methods to recruit qualified personnel for the posts which are to be established.

The Industrial Survey Mission is informed that technical assistance is recruited by the Ministry of Economic Planning and Development which has a preference for economists. Standards of selection are said to be relatively high.

It should be noted that two economists are to be hired; they do not have to have advanced degrees if their undergraduate work was performed at accredited universities. Business or professional experience would be desirable.

In the case of the industrial engineer, it would be desirable to have a chemical engineer, although the services of a mechanical engineer would be quite useful. Advanced degrees would be less essential than practical work experience if the undergraduate work has been satisfactory.

The counterparts to marketing and financial experts obviously should be trained in business administration, preferably in a university in the UK, or the United States. The regional development officers should have similar training, or they could be economists if they are in good supply. Five or more years experience as an administrator in an industrial plant would be a help to the development officers and make their services more valuable.

- Recommendation No. 9

Because of the special nature of these personnel requirements, the Industrial Survey Mission recommends that the Ministry of Commerce

and Industry assume responsibility for recruiting the technical personnel required for the proposed Industrial Survey and Promotion Center in accordance with the staffing schedule provided in the project's Plan of Operations.

At full strength the proposed Center will be larger than the technical Divisions of the Ministry. It will require extensive office facilities located conveniently where the offices will be readily accessible to the public.

The government's request states that the proposed Center is to be attached to the Development Division of the Ministry. The Industrial Survey Mission feels that this matter should be reconsidered.

As presently organized, the Development Division performs important functions for the Ministry; but in the main they are advisory in character. The Center will need the freedom to act on its own initiative.

While the Center must be involved in the day-to-day operations of the Ministry, it should not be disturbed by unrelated activities or be diverted unnecessarily from its main tasks. The Development Division is concerned with a multitude of problems which do not relate closely to industry surveys and promotion.

Besides the Development Division, there are two Divisions which are concerned with various aspects of industrial development: the Industry Division, and the Division of Trade and Supplies. The Center should be in a position to work effectively with both these Divisions, and direct communication would be essential.

- Recommendation No. 10

To give the Center maximum effectiveness, the Industrial Survey Mission recommends that it be made an autonomous entity within the Ministry of Commerce and Industry under the direction of a governing board representative of the Ministries of Economic Planning and Development, Agriculture, Finance, Housing, and the ICDC and DFCK. The Minister of Commerce and Industry should act as chairman of the governing board.

The governing board would lay down rules regulating the operations of the Center, review and act on staff studies and project proposals, as they are developed. It would select and appoint the Co-manager of the Center who in turn would select other counterpart personnel.

- Recommendation No. 11

Establishment of the Center in this fashion would give the Ministry of Commerce and Industry the opportunity to centralize its industrial development activities. Survey and promotion of industrial projects would in fact be the primary functions of the Center. This is the recommendation of the Industrial Survey Mission as it seems to be the best way to fix responsibility and assure the highest possible performance.

Provisions of this kind should be incorporated in the Plan of Operations of the project which will be submitted to the government for further consideration and final decision in the near future.

III. PRIORITY INDUSTRIAL DEVELOPMENT PROJECTS

The projects described in the later sections of this report are the most promising of a larger number of projects considered by the Industrial Survey Mission. Although some of them are presented

in greater detail than others, this should not be taken as an indication of their relative importance; all of them require additional study before their feasibility can be determined with certainty.

The grouping of the various projects on a sectoral basis indicates how they were selected and studied. The method is productive in that it discloses potential linkages among industries in the same or related classifications, and the possibility of developing industrial complexes.

It is obviously desirable to try to start two or three industries at a time instead of one: the benefits multiply and a section of the economy is strengthened. In the same way, a new product manufactured by an existing industry can be made to ramify in its own way.

With intermediate goods industries in which producers are also consumers, the marketing of their output should be relatively stable as long as general economic conditions are good. This presumes also that the markets for end products are strong.

- **Recommendation No. 12**

The development of a number of related industries in the chemical field which is recommended , may appear to present problems. It does, except for the fact that some of the individual units will at the start be small.

Careful analysis of the interrelated markets must still be made in which price and cost estimates must be realistic. This is particularly important where some part of the output must be sold abroad.

The organization and [illegible] present novel problems in which the [illegible] or interlocking ownership [illegible] The need for trained management [illegible] more arise in various [illegible]

- Recommendation No. 11

[illegible] with sawmilling operations. The Industrial Survey Mission is of the opinion that there are already too many sawmills in the country except for the fact that they provide a [illegible] activity and employment in remote areas.

Nevertheless, it must be emphasized that production in most, if not all of the plants now in operation is characterized by obsolete equipment and methods. Lumber is not graded in most instances, nor is it cut to standard dimensions; there are no kiln drying facilities. These conditions result in excessive waste of a valuable natural resource, and high costs which consumers must ultimately pay.

In recommending consideration of a number of building boards, the Industrial Survey Mission again calls attention to the need for close examination of markets. Each type of board has its own preferred uses; but, as a practical matter, some of them can be used interchangeably, depending on price and availability. Market analyses become more difficult when markets overlap. It should be noted also that both Tanzania and Uganda are developing new facilities in this field.

The interest of the government in low cost, wooden frame housing suggests that new facilities for the production of building materials should be planned with such use in view, as well as conventional construction. The potential market for low cost housing is, of course,

very large, and it is likely to be very active for some time to come.

If wooden frame houses are to be built to supply this market, their cost must be [illegible] to the cost of conventional concrete housing as well as the ability of buyers and renters to pay. This means that the delivered costs of each component of a house must be as low as [illegible] of course, the cost of the finished house is the controlling factor.

The need for lower cost, more efficient production of building materials is imperative if the housing shortage is to be relieved. It is for this reason that the Industrial Survey Mission is recommending for further study an integrated production scheme under common ownership and management with foreign participation. This seems to be one way to control costs as well as the quality of building materials, and achieve the degree of standardization which will permit maximum use of economical means of pre-fabricating the final product.

If further study proves the feasibility of this scheme, it could become in time an important factor in the troublesome housing situation, and provide for desirable utilization of the country's forest reserves.

- Recommendation No. 14

The development of the agro-based industries recommended by the Industrial Survey Mission is, with the exception of maize, dependent upon building up primary production of the crops to be processed. With respect to cassava and edible oil crops, which are referred to, the prospects for higher production are different.

Cassava is a familiar crop to most Kenyan farmers, and it grows readily in the coastal provinces, and elsewhere. The price offered by the Maize and Produce Board which controls the crop will determine how much of the present crop is offered for processing, and how much new production can be obtained. Decisions must be made on methods of collecting and processing.

Technical problems have slowed the production of oil bearing crops despite the urgency of reducing heavy imports of fats and oils. Climatic conditions are said to favour higher production of new strains of sunflower. The opposite is true in the case of soya beans; many varieties have been tested but the yields have been unsatisfactory although experimental work is still going on. There is some prospect of the groundnut, which is on the coast improving as it is being developed as a cash crop in connection with new settlement schemes. Safflower might be introduced because of the exellence of its oil and present high demand.

Maize is at present in over supply which is the reason why industrialization of this crop is a matter of continuing interest on the part of the government. One UNIDO expert has already made a report on maize and a second expert is now in the country studying ways and means of using maize as a source of oil, starch and cattle feed.

- Recommendation No. 1

The proposal to initiate the production of bicycles and bicycle parts in company with the Partner States with each country manufacturing components is admittedly an experimental idea. An adequate market undoubtedly exists and it must be supplied on a regional basis. It remains to be seen whether or not regional cooperation can be obtained to permit this proposal to be carried to a logical conclusion.

REVIEW OF EXISTING INDUSTRY

Any comprehensive effort to accelerate industrialization in Kenya must of necessity be based on existing industry. The structure and organization of industry, and its performance characteristics, are all indicative of the prospects for future growth.

Organization of Industry

The organization of Kenyan industries takes several forms. Enterprises may be organized under a business name with one or more individual owners, as limited partnerships, as private companies, or as public companies.

Individual owners are obliged to register with the Registrar-General* (Office of the Attorney General) if they operate under a business name. The law holds them financially liable to the full extent of their resources.

Limited liability partnerships must likewise register. The liability of the respective partners is determined by the amount of their interest in the enterprise.

Incorporated companies, private and public, must register and they are also subject to The Companies Act which specifies their form of organization, and their rights and duties.

Private companies have fewer than 50 shareholders, and their shares are usually held by members of the same family or their close friends. They are not required to make public disclosure of company affairs. Many of the largest industries are private companies, as are the wholly owned subsidiaries of such companies.

In the case of public companies, shares are sold to any buyer either privately or by traders operating on the Nairobi Stock Exchange. The shares of 65 public companies are presently listed and traded on the local exchange of which 21 are considered industrials. Public companies

*For 1968, the Registrar-General had records of 356 public and 5,934 private companies, and 707 foreign companies. No records are kept of the number of manufacturers in each classification.

must publish periodically certain basic facts about their affairs: assets, sales, profits and losses, [illegible] Being limited [illegible] they may be held liable in the event of bankruptcy to the amount of the value of their shares.

The legislation [illegible] to be modern, and in the [illegible] difficulties in certain [illegible] operation of industry [illegible]

At present, [illegible] either European or Asian. It is the policy of the Government to Africanize industry as rapidly as [illegible]

With regard to European ownership, the Mission noted that many of the companies are owned by large diversified corporations which exercise centralized control from headquarters in the U.K. or the capitals of Europe. Kenyan operations are, for the most part, in the hands of managers who had been sent there for limited periods of time.

The Mission was told recently that the quality of the managerial and technical personnel supplied by overseas corporations had deteriorated in recent years. The Mission had no basis of comparison by which to evaluate such an assertion. But the reason given was significant: it was said that the cost of sending top ranking officers to posts overseas had become prohibitive for foreign corporations. That being the case, the Mission feels that this factor will have a bearing upon foreign investment in the future; at the same time, it will place a premium on the services of qualified Kenyan managers and technicians.

The government is assisting Kenyan citizens to gain a more important part in the ownership and management of industry. Existing companies

to the country which can be expected to accrue

1/ See Recommendation c. 1.

from their act vities.

The Act, and the administrative regulations issued by the Treasury pursuant to it, favour joint ventures in which foreign investments are subordinate to local investment. That, an enterprise in which foreigners have a majority interest would be able to borrow from local lending institutions up to 10 per cent of the amount of the foreign investment. In cases where the majority interest is Kenyan, the company may borrow locally up to 40 per cent of the total investment.

These regulations would seem to inhibit local financing of new and expanding enterprises having a foreign interest; but it is understood that they are not rigidly applied.

The Act reaffirms constitutional guarantees relating to the compulsory acquisition of property or interests by the Government, and the prompt and full payment of compensation.

Other incentives are available to foreign investors as they are to local sponsors of new industrial ventures: a favourable tax structure, accelerated amortization of plant and equipment, remission of customs duties on raw materials and machinery and equipment, increased duties on competitive imports, or their outright prohibition2/.

Such incentives and protection are processed by the Ministry of Commerce and Industry in collaboration with other ministries on a showing of necessity or undue hardship.

2/ See Recommendation No. 7.

Thirty years [illegible]. Today, it constitutes [illegible].

To show the [illegible] the following [illegible] Division. [illegible] grouped according to the [illegible] 1967.

TABLE 1 Number of Industrial Firms in 1967

ISIC	Industry	Number of firms: Size of firm 50+	20-49	5-19	Total	Rank: 50+	20-49	5-19
20	Food manufacturing	7	35	95	137	3	1	3
21	Beverage Industries	6	5	12	23	14	11	11
22	Tobacco Manufactures	1	-	-	1	16	-	-
23	Textiles	14	7	9	30	6	9	12
24	Footwear, clothing and made-up textiles	13	18	113	149	4	5	1
25	Wood and cork products except furniture	29	11	27	67	2	7	9
26	Furniture and fixtures	6	10	75	91	9	6	3
27	Pulp and paper products	5	5	2	12	12	11	15
28	Printing and publishing	33	28	43	84	7	3	4
29	Leather and leather products	3	6	4	13	14	10	14
30	Rubber Manufactures	2	4	8	14	15	12	13
31	Chemicals	16	19	26	61	5	4	8
32	Petroleum Products	1	-	-	1	16	-	-
33	Manufactures of Non-Metallic Minerals	9	4	12	25	8	12	11
34	Metal Products	13	6	34	53	7	10	5
35	Non-electrical Machinery	7	0	32	9	10	8	6
37	Electrical Machinery and Appliances	4	4	14	22	13	12	10
38	Transport Equipment and Repair	32	31	109	172	1	2	2
39	Misc. Manufacturing Industries	5	7	25	37	12	9	7
Total		213	216	620	1,049			
Per cent		20.3	20.6	59.1	100.0			

Source: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

In this table, it appears that more than half of industry, 59.1 per cent, is made up of the smallest firms having 5-19 employees. The largest sector comprising the transport equipment and repair industries includes 172 companies; next in order comes the footwear, clothing and made-up textiles sector with 149 firms and then the food manufacturing sector with 137 firms.

TABLE 2 Number of Employees in Industry in 1967

ISIC	Activity	Number of Employees				Rank			
		Size of Establishment							
		20+	20-11	12-5	All	20+	20-11	12-5	All
20	Food Manufacturing	9,930	1,114	743	11,787	2	1	4	2
21	Beverage Industries	2,245	115	156	2,516	9	11	11	10
22	Tobacco Manufactures	968	-	-	968	12	-	-	16
23	Textiles	5,616	162	78	5,856	3	12	13	3
24	Footwear, Clothing and Made-up Textiles	2,518	651	818	3,987	6	5	2	5
25	Wood and Cork Products except Furniture	3,858	447	303	4,608	4	6	7	4
26	Furniture and Fixtures	549	389	777	1,715	15	7	3	14
27	Pulp and Paper Products	814	153	31	998	13	14	17	15
28	Printing and Publishing	1,735	856	513	3,104	11	3	5	6
29	Leather and Fur Products	266	146	53	465	17	16	16	17
30	Rubber Manufactures	161	151	66	378	19	15	14	18
31	Chemicals	2,116	656	170	2,942	9	4	10	8
32	Petroleum Products	232	-	-	232	18	-	-	19
33	Manufactures of Non-Metallic Minerals	1,823	154	59	2,036	10	13	15	11
35	Metal Products	2,611	196	281	3,038	5	9	8	7
36	Non-electrical Machinery	593	323	307	1,143	16	8	6	13
37	Electrical Machinery and Appliances	2,411	132	128	2,671	7	17	12	9
38	Transport Equipment and Repair	12,425	962	955	14,342	1	2	1	1
39	Misc. Manufacturing Industries	569	192	253	1,014	14	10	9	12
Total		51,360	6,889	5,671	63,920				
Per cent		80.3	10.8	8.9	100.0				

Sources: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

As might be expected, the largest companies employ the largest number of workers; they constitute more than 80 per cent of the total number of persons employed in industry. Interestingly enough, the medium and small industry absorb about the same proportion of workers - 10.8 per cent and 8.9 per cent respectively. The largest firms in terms of employment appear in the transport equipment and repair sector, followed by food manufacturing which employs 11,787 persons, and textiles which employs 5,857 workers.

T. [illegible] Industry Input in 1967

[illegible] Industry	Input (K£'000) 50+	20-49	1-19	All	Rank 50+	20-49	1-19
[illegible]	Food Manufacturing	39,355.4	[illegible]	[illegible]	44,144.7	1	1	1
[illegible]	Beverage [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7	10	[illegible]
22	Tobacco Manufactures	1,861.6	-	-	1,861.6	12	-	-
[illegible]	Textiles	[illegible]	[illegible]	[illegible]	[illegible]	6	7	6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9	4	[illegible]
[illegible]	[illegible]	1,061.4	[illegible]	171.0	1,748.8	13	6	11
[illegible]	[illegible]	660.0	406.[illegible]	471.4	1,537.5	15	9	[illegible]
[illegible]	[illegible]	[illegible]	172.2	30.6	2,304.1	11	14	16
[illegible]	[illegible]	2,114.1	[illegible]	295.4	2,977.7	10	5	9
[illegible]	[illegible]	571.6	97.5	[illegible]	704.4	16	16	15
[illegible]	[illegible]	262.6	194.3	143.9	600.8	18	13	12
[illegible]	[illegible]	7,553.8	1,870.7	475.4	9,899.9	3	2	4
[illegible]	Petroleum Products	9,950.0	-	-	9,950.0	2	-	-
[illegible]	[illegible] of Non-[illegible] Minerals	3,320.7	94.7	45.[illegible]	3,460.6	8	16	14
[illegible]	Metal Products	4,196.1	708.[illegible]	171.0	5,077.4	5	3	11
[illegible]	Non-electrical Machinery	697.2	154.7	109.7	961.6	14	15	13
[illegible]	Electrical Machinery and Appliances	1,042.5	248.1	252.2	1,542.8	14	11	10
38	Transport Equipment and Repair	4,687.4	437.0	427.9	5,552.3	4	8	7
[illegible]	Misc. Manufacturing Industries	452.9	203.4	519.3	1,175.6	17	12	3
[illegible]al		89,927.7	10,334.2	6,505.7	106,767.6			
Per [illegible]ent		84.3	9.6	6.1	100.0			

Source: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

Measured in terms of input, food manufacturing industries of all sizes rank highest. Chemicals and petroleum sectors follow in that order. The largest aggregate input, 84.3 per cent of the total, goes to the largest companies. Total value for all industry is K£ 106,767.6 million.

T.S.I.A. Industrial ...

S.I.C.	Activity	Output (£'000)				Rank		
		50+	20-49	1-19	All	50+	20-49	1-19
20	Food Manufacturing	44,40[illegible].1	[illegible]	[illegible]	[illegible].0	1	1	1
21	Beverage Industries	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	7
22	Tobacco Manufactures	3,[illegible].[illegible]	-	-	[illegible]	11	-	-
23	Textiles	5,24[illegible].2	[illegible]	[illegible]	[illegible].1	[illegible]	9	9
24	Footwear, Clothing and Made-up Textiles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Wood and Cork Products except Furniture	1,[illegible].4	[illegible]	[illegible]	[illegible].8	[illegible]	[illegible]	[illegible]
26	Furniture and Fixtures	848.9	[illegible]	[illegible]	[illegible]	16	[illegible]	[illegible]
27	Pulp and Paper Products	2,[illegible].8	[illegible]	[illegible]	[illegible]	13	15	17
28	Printing and Publishing	[illegible].3	[illegible]	[illegible]	[illegible]	10	3	[illegible]
29	Leather and Fur Products	685.9	[illegible]	[illegible]	897.7	18	17	[illegible]
30	Rubber Manufactures	407.3	[illegible]	179.7	[illegible]	19	14	14
31	Chemicals	9,5[illegible].[illegible]	[illegible]	[illegible]	[illegible]	4	2	6
32	Petroleum Products	12,414.7	-	-	12,414.7	[illegible]	-	-
33	Manufactures of Non-Metallic Minerals	[illegible]	[illegible]	[illegible]	[illegible]	7	16	15
35	Metal Products	6,20[illegible].9	[illegible]	[illegible]	[illegible]	5	[illegible]	[illegible]
36	Non-electrical Machinery	1,[illegible].[illegible]	[illegible]	[illegible]	1,785.7	15	13	13
37	Electrical Machinery and Appliances	[illegible]	[illegible]	341.6	3,460.6	12	11	10
38	Transport Equipment and Repair	11,182.4	[illegible]	[illegible]	12,952.2	3	5	3
39	Misc. Manufacturing Industries	707.6	337.3	718.0	1,762.9	17	12	5
Total		[illegible]	[illegible]	[illegible]	[illegible]			
Per cent		83.6	9.9	6.5	100.0			

Source: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

The ranking of the various sectors varies somewhat in respect to their output. Although food manufacturing, including all companies, is highest, the transport equipment industry comes second, and the chemical industries third. Looking at the figure for all industry, it appears that the largest industries with 50 or more employees accounts for 83.6 per cent of the output valued at K£ 148.5 millions.

Table [illegible] Value Added in Industry in 1967

Isic	Activity	Value Added (K£'000)				Rank			
		50+	20-49	10-19	All	50+	20-49	10-19	All
20	Food Manufacturing	5,049.7	510.7	424.9	6,[illegible]7.3	2	2	3	
21	Beverage Industries	3,[illegible].4	[illegible].7	[illegible].8	4,[illegible].4	3	10	6	
22	Tobacco Manufactures	1,[illegible].0	-	-	1,[illegible].0	11	-	-	1
23	Textiles	1,0[illegible].5	[illegible].4	88.5	1,[illegible]16.4	10	16	13	[illegible]
24	Footwear, Clothing and Made-up Textiles	[illegible].7	[illegible].[illegible]	[illegible].[illegible]	1,[illegible].0	12	[illegible]	[illegible]	[illegible]
25	Wood and Cork Products except Furniture	[illegible].2	[illegible].[illegible]	10[illegible].[illegible]	1,1[illegible].0	13	7	11	[illegible]
26	Furniture and Fixtures	1[illegible].3	[illegible].[illegible]	[illegible].4	[illegible]13.6	18	6	8	[illegible]
27	Pulp and Paper Products	[illegible]73.5	11[illegible].[illegible]	[illegible].3	[illegible]26.1	14	12	17	[illegible]
28	Printing and Publishing	1,[illegible].2	1[illegible].[illegible]	[illegible].[illegible]	2,5[illegible]3.6	8	3	5	[illegible]
29	Leather and Fur Products	111.[illegible]	61.[illegible]	[illegible].[illegible]	193.3	19	17	16	[illegible]
30	Rubber Manufactures	196.7	[illegible].6	[illegible].5	341.1	17	14	14	[illegible]
31	Chemicals	2,[illegible]09.5	2[illegible].9	1[illegible].[illegible]	[illegible],9[illegible].9	7	1	10	[illegible]
32	Petroleum Products	[illegible],4[illegible].7	-	-	[illegible],464.7	4	-	-	[illegible]
33	Manufacture of Non-Metallic Minerals	[illegible],[illegible]0.5	[illegible]3.[illegible]	[illegible]1.[illegible]	2,442.1	5	15	15	[illegible]
35	Metal Products	[illegible],064.[illegible]	161.[illegible]	148.5	[illegible],374.5	6	9	9	[illegible]
36	Non-electrical Machinery	4[illegible].[illegible]	1[illegible].6	169.6	824.1	15	8	8	12
37	Electrical Machinery and Appliances	1,714.8	113.4	89.6	1,917.8	9	13	12	[illegible]
38	Transport Equipment and Repair	6,495.0	455.3	449.6	7,399.9	1	4	1	1
39	Misc. Manufacturing Industries	254.7	133.9	198.7	587.3	16	11	7	17
Total		34,182.8	4,372.3	2,134.0	41,756.1				
Per cent		81.9	10.5	7.6	100.0				

Source: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

This table which is derived from the previous two tables shows the difference between input and output, or value added, which for all industry was K£ 41,756 million in 1967. In other words, value added was 39.1 per cent of input. The largest companies predominate in this table showing value added of K£ 34,189.8 million.

Transport equipment and repair being a large sector as has been noted, ranks first in value added at K£ 7,399.9 million. Food manufacturers, rank second, showing value added of K£ 6.2 million. The beverage industries show to advantage in this analysis; they are in third place with a recorded value added of K£ 3.9 millio

Table 6 Value Added per Employee by Industry, 1967

ISIC	Activity	VALUE ADDED PER EMPLOYEE (KE)				RANK			
		20+	20-49	50-99	All	20+	20-49	50-99	All
20	Food Manufacturing	508.4	414.1	479.7	524.9	13	8	6	13
21	Beverage Industries	1,557.2	462.0	1,[illegible].4	1,[illegible].2	2	2	1	2
22	Tobacco Manufactures	1,[illegible].4	-	-	1,447.4	3	-	-	4
23	Textiles	291.9	566.7	1,[illegible].6	510.2	18	11	2	11
24	Footwear, Clothing and Made-up Textiles	377.1	444.1	5[illegible].1	4[illegible].6	16	10	7	12
25	Wood and Cork Products except Furniture	210.9	416.7	451.3	244.8	19	15	10	19
26	Furniture and Fixtures	344.1	402.9	5[illegible].3	374.4	17	16	14	17
27	Pulp and Paper Products	421.7	736.0	4[illegible].6	7[illegible].7	9	5	12	9
28	Printing and Publishing	1,[illegible].1	4[illegible].	5[illegible].1	5[illegible].4	6	11	11	7
29	Leather and Fur Products	4[illegible].3	4[illegible].	3[illegible].3	3[illegible].3	15	17	14	15
30	Rubber Manufactures	1,2[illegible].2	6[illegible]	5[illegible].4	6[illegible].9	5	7	3	6
31	Chemicals	949.8	1,[illegible].2	9[illegible].1	9[illegible].3	7	1	5	5
32	Petroleum Products	10,[illegible]23.7	-	-	10,623.7	1	-	-	1
33	Manufactures of Non-Metallic Mineral	1,[illegible]7.2	6[illegible].1	3[illegible].2	1,199.5	4	9	15	8
34	Metal Products	790.8	6[illegible].4	5[illegible].5	798.9	10	4	10	9
35	Non-electrical Machinery	94[illegible].9	5[illegible].3	5[illegible].8	721.0	8	13	8	10
36	Electrical Machinery and Appliances	71[illegible].2	8[illegible].1	7[illegible].0	718.0	11	3	4	11
37	Transport Equipment and Repair	522.7	473.3	470.8	516.0	12	14	13	14
39	Misc. Manufacturing Industries	447.0	697.4	785.4	579.2	14	6	3	12
All	Industry	665.7	634.7	563.2	653.3				

Source: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

This table gets at the productivity of labour. It shows that the average value added per employee was K£ 653.3. Interestingly enough, there is not much difference in the average value added per employee among the largest and the medium sized industries.

As between sectors, the fluctuation in value added per employee is quite marked: the extremes are illustrated by the petroleum industry in which value added per employee was K£ 10,623.7, and the wood and cork products industries where the value added per employee amounted to K£ 244.8.

Viewing the [illegible] sector as a whole, it is conceivable that productivity is relatively [illegible] the [illegible] plant. The claim of critics is that [illegible] would have achieved a value added [illegible] size or over Rs 1 lac.

The [illegible] the optimum size [illegible] composite with [illegible] that either the largest or the [illegible] enclosed for these [illegible] ways of the best companies [illegible] productivity [illegible] of 4 p.c. for the smallest.

[illegible] 1

[illegible] Productivity Ratios for Malaysia, 1971

[illegible]	Activity	50+	[illegible]	[illegible]	[illegible]	Rank 50+	Rank 20-49	Rank 0-19	Rank All
[illegible]	Food Manufacturing	1.13	1.[illegible]	1.27	1.[illegible]	19	16	11	15
[illegible]	Beverage Industries	.0[illegible]	1.[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]	7	[illegible]
[illegible]	Tobacco Manufactures	1.[illegible]	-	-	[illegible]	[illegible]	-	-	[illegible]
[illegible]	Textiles	1.45	1.[illegible]	[illegible]	1.[illegible]	[illegible]	17	13	1[illegible]
[illegible]	Footwear, Clothing and Made-up Textiles	1.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Wood and Cork Products except Furniture	1.[illegible]	1.[illegible]	[illegible]	[illegible]	[illegible]	14	6	[illegible]
[illegible]	Furniture and Fixtures	[illegible]	1.[illegible]	[illegible]	[illegible]	[illegible]	8	5	10
[illegible]	Pulp and Paper Products	1.[illegible]	[illegible]	[illegible]	[illegible]	13	5	1[illegible]	13
[illegible]	Printing and Publishing	1.[illegible]	1.84	[illegible]	[illegible]	[illegible]	[illegible]	3	[illegible]
[illegible]	Leather and Fur Products	1.19	1.[illegible]	[illegible]	[illegible]	18	[illegible]	6	[illegible]
[illegible]	Rubber Manufactures	1.[illegible]	1.51	1.[illegible]	1.[illegible]	[illegible]	[illegible]	1[illegible]	[illegible]
[illegible]	Chemicals	1.27	1.42	[illegible]	1.[illegible]	[illegible]	13	12	16
[illegible]	Petroleum Products	1.25	-	-	1.[illegible]	17	-	-	[illegible]
[illegible]	Manufactures of Non-Metallic Minerals	1.70	1.99	1.[illegible]	[illegible]	[illegible]	3	8	[illegible]
[illegible]	Metal Products	1.49	1.23	[illegible]	1.[illegible]	[illegible]	15	4	12
[illegible]	Non-electrical Machinery	1.[illegible]	2.11	[illegible]	1.[illegible]	9	1	1	5
[illegible]	Electrical Machinery and Appliances	[illegible]	1.[illegible]	[illegible]	[illegible]	[illegible]	11	10	[illegible]
[illegible]	Transport Equipment and Repair	2.39	[illegible]	[illegible]	[illegible]	[illegible]	2	2	1
[illegible]	Misc. Manufacturing Industries	1.56	1.66	1.38	1.50	10	6	9	11
[illegible]	Industry	1.38	1.4[illegible]	1.4[illegible]	1.39				

[illegible]urce: Derived from 1967 Industrial Census data supplied by the Statistics Division, Ministry of Economic Planning and Development.

This table shows ratios, which result from dividing output by input; the figures are taken from previous tables. The ratio for all industry means that for every $1 of input, industry achieved M$ 1.39 of output.

It will be noted that the highest ratio appears for the largest companies in the electrical machinery and appliances sector with a ratio of 2.61. Next in order are the transport equipment and repair sector with 2.33 ratio, followed by the average sector with a ratio of 1.94.

Surprisingly enough, the smallest firms in terms of number of employees are most efficient in that their ratio, output/input, was 1.49, above the ratio for all industries which was 1.39.

Work Force

The dominant characteristic of the Fiji work force is the large number of unemployed and part-time workers in urban centres, some of which are growing at the rate of 5 per cent a year, there are pools of unemployed people who have migrated there from the country-side seeking a better life.

Although [illegible] it is estimated that additions to the work force each year will be between 3% and 3.5% per annum.

A large percentage of these people are without training or special skills. Many of them are school leavers, young men and women who have been unable to complete their schooling simply because of a lack of school facilities and teachers. There is also a very small but growing group made up of young people with vocational training who have been unable to find jobs.

In recent years, workers have been absorbed more readily by the public sector. The following table gives employment by major sectors of the economy from 1965 - 1969.

Table 3

	1965	1966	1967	1969
Private				
Agriculture and Forestry	202.4	199.1	194.7	177.0
Industry and Commerce	199.	207.1	215.9	213.4
Public Sector	188.2	196.4	212.1	221.9

Although [illegible] has recorded a net gain of about 7 per cent in the four-year period, employment has not kept pace with increases in GDP and output.

The survey made by the Industrial Survey Mission of diversified industries indicates that there is very little over-staffing. Certain of the companies are voluntarily taking on apprentices under a proposed programme initiated by private industry requiring apprentices to be trained and employed for a minimum of five years. Except for the continuous process industries, such as cement and glass, the majority of companies are working one shift. Stronger demand for their products would undoubtedly require these companies to operate two or three shifts which would quickly change the rate of employment. No statistics showing capacity utilization of all industries, were available.

* Economic Survey 1969.

The presence of a large number of [illegible] undoubtedly [illegible] the [illegible]. Turn-over among workers, for example, [illegible]; absenteeism.

The [illegible] developed a [illegible] technical and [illegible] one of the [illegible] work is supported [illegible], a United Nations project of [illegible] conducts the [illegible] of Commerce and [illegible] basic engineering [illegible].

For training for [illegible] United Nations project entitled "[illegible] Centre" sponsored by the [illegible].

To develop the latent entrepreneurial [illegible], the I.C.D.C. offers [illegible] Industrial Estates [illegible] borrowers.

Despite these facilities [illegible], it is very clear that the need for more training is still very large. The Manager has already referred to the desirability of expanding the work of the Management Training and Advisory Center. Similarly, activities such as those conducted by the Kenya Industrial Training Institute at Nakuru should be duplicated in other parts of the country.

The Institute which is supported by the Japanese government has excellent facilities, and the Japanese instructors seem to be well-qualified. In addition to teaching the principal crafts, and appropriate shop practice, the Institute gives instruction in the management of small business. This is the kind of training which is most useful, particularly in relation to rural industrialization.

Most [illegible]

[illegible]

The [illegible]

It [illegible]

As of [illegible], it [illegible] in Kenya's industr[illegible] capital form[illegible] as follows:

Table [illegible]

1964	[illegible]	[illegible]	[illegible]	[illegible]
6.95	7.[illegible]	[illegible].51	[illegible]	[illegible]

Economic Survey, [illegible]

These figures show gross investment, a part of which [illegible] devoted to replacement of plant and equipment. Such pur[illegible], it is estimated, were on the average about [illegible] per cent of the gross investment.

Unlike many developing countries, Kenya has [illegible] to finance its industrial activities. In addition [illegible] private investors, there are financial institutions capable of providing short-term, intermediate, and long-term credit. Kenya, because of its political stability, also attracts foreign capital.

Of interest to [illegible] organization [illegible] the [illegible] a National Trading [illegible] which, among other functions, handle manufactured, as well as agricultural products, into the hands of African wholesalers and retailers.

ICA al[illegible] formed [illegible]
trucking operation[illegible]
in service [illegible]
over-the[illegible]

The [illegible]
would severe[illegible]
During the [illegible]
in [illegible]
I[illegible]

For [illegible]
the [illegible]
could be [illegible]

ICA has [illegible]
evaluation, [illegible]
would [illegible]
activities, [illegible]
various [illegible]

The development [illegible]
long-term finan[illegible]
Its origin[illegible]
Commonwealth Development [illegible]
Gesellschaft [illegible]
Finanzierungs-[illegible]
last year, the [illegible]
additional capital tota[illegible]

With adequate [illegible] our[illegible]
in sound development pro[illegible]
at 8 ½ per cent for extended per[illegible]
£ 20,000; the maximum £ [illegible]
waived during the first [illegible] years.

Industrial Promotion Service [illegible]
H.H. The Aga Khan, "to promote indust[illegible]
participating in new projects [illegible] or [illegible]
and managing new projects itself, and by assisting [illegible]

Initial capital of IPS was £ 900,000 plus a small equity held by the Kenya Government. This has been augmented from time to time by advances from the Diamond Jubilee Fund and other sources.

IPS is interested in making loans to sound, privately sponsored projects, and participating in equities; terms have to be arranged. It also maintains a consulting staff to aid firms which it finances, and others desiring such services.

The three largest banks in Kenya have formed development corporations in order to be able to offer longer term credit than banks normally extend. These institutions are:

Barclays Bank Overseas Development Corporation
National and Grindlays Finance and Development Corporation
The Standard Bank Development Corporation

Two of the institutions participating in the financing of the DFCK also make investments directly in industrial ventures. They are the Commonwealth Development Corporation and the German Development Bank. The latter institution will invest solely in equities provided there is a German sponsor who invests his own money and assumes some responsibilities for the management of the new enterprise.

There is also the International Finance Corporation, a subsidiary of the World Bank, which extends credit to privately sponsored industrial projects where the capital required is in excess of $ 500,000. IFC will participate in equity as well as loan financing.

Finally, there is the East African Development Bank formed by the three Partner States of the East African Community. This bank is obliged under its Charter to invest 22 ½ per cent of its resources in Kenya.

It is evident from the foregoing that the financial resources of the country are well-organized and able to provide any type of credit required by existing industry or by the sponsors of new industrial projects. While the terms of credit are, in the main, based on commercial criteria, public financing is available to further the socio-economic aims of the Government.

The Market

It is said that 70 [illegible]

concentrated within a radius of 100 miles of Nairobi. The rest may be found to exist in scattered communities such as Mombasa, Kisumu, Kitale and Eldoret.

The market for various goods and services may then be said to be limited geographically. This has its benefits in that it simplifies and minimises the costs of distribution and sales. But the market is also limited [illegible] to the amount and kind of goods which can be absorbed economically.

Accounting for this condition is the fact that about 60 per cent of the population of the country is not considered to be economically active. Out of a population of approximately 10 million people, 4.2 million are said to be employed, self-employed or family workers.

It appears, however, that the number of persons gainfully employed has been rising in the past few years. With the growth of the economy as a whole, the average earnings of workers have also been increasing during the same period. The changes which have occurred are showed in the following table:

Table 11 Percentage Changes in Employment and Average Earnings 1965 - 1968

	Employment				Average Earnings			
	1965-66	1966-67	1967-68	1965-68	1965-66	1966-67	1967-68	1965-68
The Private Sector -								
Agriculture and Forestry	- 7.1	- 8.2	0.2	-14.5	6.0	-1.3	5.0	9.9
Mining and Quarrying	-	4.3	20.8	26.1	25.0	34.2	-17.2	38.8
Manufacturing and Repairs	0.6	8.4	2.5	11.7	19.2	2.6	9.8	34.3
Building and Construction	18.4	68.9	4.0	108.0	34.2	-7.9	5.3	30.0
Electricity and Water	8.0	3.7	-3.6	8.0	1.0	-3.6	21.0	17.8
Commerce	-0.9	-5.6	-7.8	-13.8	6.1	12.3	6.4	26.9
Transport and Communicats.	23.3	22.3	-0.6	50.0	1.4	16.1	-10.8	5.0
Other Services	4.6	-5.2	-2.1	-2.9	1.7	28.9	6.4	39.5
Public Services	6.5	5.8	4.6	17.9	6.0	2.5	2.0	10.7
Total:	1.0	0.7	1.3	3.1	10.3	9.4	3.5	24.9

Economic Survey, 1969

• Figures given are not absolute; they show percentage changes which could have occurred, and probably did occur.

As of 1968, per capita income was about £ 41. On a per capita basis, money income increased by £ 4.49 from 1964 to 1968, real income rose by 3.42 £ in the same period.

Greater earnings on the part of a larger number of workers gives tangible evidence of an increase in purchasing power. The gains might have been higher except for the losses of employment, notably in agriculture and commerce.

The losses are temporary; they are attributable to the displacement of Asians and other non-citizens due to the Government's Africanisation policies, and they are likely to diminish rapidly from now on.

The increase in purchasing power has, to some extent, been offset by increases in the prices of consumer goods.

From 1965-1968, the cost of living for both the lower and the middle income groups rose 11 per cent and 9.7 per cent respectively. These changes are illustrated by the following table:

Table 12 Percentage Changes in Consumer Price Indices

	1964-5	1965-6	1966-7	1967-8	1968-9	1964-69
Lower Income Index	6.6	2.5	1.9	0.8	0.9	11.0
Middle Income Index	1.4	4.2	2.7	0.7	0.4	9.7

Source: Economic Survey, 1969.

Despite such adverse factors, the trends of employment earnings and prices are still favourable to the long-term development of the Kenya market. Government expenditure*, dispersed as they are in all parts of the country, will continue to be an important factor in sustaining purchasing power. Obviously, more people must be brought into the monetary economy, and as productivity rises, all workers should be better paid, if the domestic market is to expand more rapidly.

Progress in these directions will, to a considerable extent, depend upon the effects of the structural changes which are taking place as the result of more active intervention by the Government, and the emergence of new organisations in industry, commerce and transportation, owned and operated by Kenya citizens.

These changes are occurring principally in the wholesale and retail trades where the shift in ownership and operation is taking place from Asian to African hands. The Mission has observed that industry as well as commerce experiences a period of uncertainty and disorganisation while this transformation goes on.

* Economic Survey, 1969.

By altering the established channels of distribution, the flow of goods from factory to consumer is disrupted, and goods are sometimes diverted into what might be called grey markets or ratsnes.

So far, the manufacturers do not seem to have suffered irrecoverable loss. The goods which reach the market are eventually disposed of. Until this is for an [illegible], stocks, established outlets under responsible management, the manufacturers may experience sudden accumulations of inventories which immediately affect production, employment and prices.

Manufacturers should be given as much advance notice as possible of impending changes, particularly when the Kenya National Trading Corporation is about to rechannel the distribution of their goods. The Corporation should make certain that the number of new distributors will be sufficient to cover effectively the former areas of distribution.

Market for Intermediate Goods

It is evident that the national market for consumer goods is growing in size and changing in structure. There are also markets for intermediate goods.

A large volume of such goods are imported. They include petroleum products, medical and pharmaceutical supplies, chemicals, fertilizers, cotton piece goods, synthetic fibre materials, iron and steel products, railway equipment, paper and paper products, glass and glass-ware, and many others. In 1967, it is reported, intermediate goods accounted for 58 per cent of total imports of the country and were valued at about £ 60 millions.

Conceivably some of these products could be manufactured in Kenya. The governing factor in most cases will be the ability of the market to absorb quantities which could be produced economically. The Mission has studied a number of these products. See Priority Industrial Development Projects. Pap

Export Markets

Limited as it is by the size of the domestic market, industry in Kenya has displayed great vitality by its success in finding foreign markets. In

nearly every industrial sector, there are firms which are actively engaged in export trade. In 1967, about 3[illegible]' of the output of manufactured articles valued at £ 45.[illegible] million was sold abroad.

The products exported included canned meat, petroleum products, chemicals, hides and skins, cement, tinned fruits and vegetables, soda ash, and others. About half of these products went to the East African Common Market, and the rest to other countries.

For the near term, there is considerable uncertainty about the course of trade within the East African Common Market. As Uganda and Tanzania gain new industries, which are competitive with Kenya industries, they will continue to impose restraints on Kenya exports of such industries in the form of transfer taxes. At the same time, they will seek to penetrate the Kenya market with their own goods without risk of similar taxation.

Whatever may be the losses sustained by Kenya industry through these circumstances, they will have to be made up in exports to other countries, particularly the industrializing countries of Africa. During the past two years, there has been a noticeable improvement in the volume of exports to such countries as Ethiopia, Somalia, Zambia, Rwanda, the Sudan and the United Arab Republic.

A formal agreement with the European Economic Community for reciprocal trade privileges has been signed recently which should open new markets for Kenya products in the countries of Central Europe. Trade with the United Kingdom should likewise continue to rise, consistent with past trends.

So urgent is the need to maintain and expand exports of manufactured products that the Mission feels all new industrial projects of any size should be planned with that object in view. The question of incentives to induce larger exports by existing as well as new industries, should be investigated in this connection. See Recommendation No. 4, Page.....

Growth Industries

Since industry developed out of an agrarian economy it is to be expected that the food processing industries should be among the leading industries of the country. The indications are that they will continue to maintain that position.

for the period 1963 - 1967, food processing industries grew at an average rate of 6.5 per cent. The prospects are that they will grow at a higher rate during the next few years.

Specific projects are under way to expand meat production with additions to the facilities of the Kenya Meat Commission, and the Uplands Bacon Factory (Kenya) Limited. A new plant to process milk has recently been opened by the Kenya Co-operative Creameries Limited which is expected to increase dairy production. Sugar production is expanding steadily with completion of plant additions, principally at Muhoroni, and improvement in transport, which has hampered operations in the past. A new mill is projected for the near future to complete the facilities required to make Kenya self-sufficient in sugar. The leading canning firm, Kenya Canners Limited, now owned by the Del Monte Corporation, is modernizing and enlarging its facilities to handle a larger output from its pineapple plantations, and the processing of raw passion fruit.

Rubber manufacturing which showed a 23.8 per cent average growth rate from 1963 - 1967 will be further expanded with the new automobile tire factory which is to be built and operated by the Firestone Tire and Rubber Company. Capacity production, it is reported, will be 200,000 tires per year.

Two new, integrated textile mills are projectd, one of which will be established at Nakuru (Flamingo Textile Industries) and the other at Eldoret (Eldoret Textile Mill). These plants will give further impetus to the textile sector where spinning and weaving facilities have been expanding at the average annual rate of 50 per cent since 1963.

The largest single addition to Kenya industry is the 50,000 ton per year pulp and paper mill which is to be situated at Broderick Falls. The plant will produce a line of fine papers as well as wrapping papers. Total investment, it is said, will be approximately £ 12.5 million.

The chemical and petroleum industries which have showed an average annual growth rate of 27 per cent since 1963 will make a substantial gain in the near future. The refinery of East African Refineries Limited will be extended, and new plant will be erected for the manufacture of greases and lubricating oils.

Despite the depression which struck the wood products industries in 1963, and for several years thereafter, they are responding now to increased demand from the construction, packaging and furniture industries.

As a result, expansion is taking place with small sawmills becoming larger and new sawmillers being licensed. There are plans underway also to establish new plants for the manufacture of wood pulp, particle board, fibre board, and exterior plywood.

The breweries which have enjoyed steady growth in the past are preparing to expand their present facilities, while a new brewery, Kenbrew Limited, is to be built to produce pombe beer.

The growth of the metal products industries has been greater than that for industry as a whole, averaging 12.3 per cent per year from 1963-67. New stimulus to this sector will be provided by the new steel rolling mill which is now under construction in Mombasa.

The foregoing shows that there will soon be eighteen important additions to the country's manufacturing plant, some being expansions to existing facilities, the others, new enterprises requiring the organization of new companies and the construction of new factories. Both occur in sectors of the industrial economy which have been most dynamic and provide opportunities for further development in the future.

According to projections in the Five Year Plan of gains in Value Added and Gross Value, better than average growth may be expected in such sectors as miscellaneous foods, furniture and fixtures, leather and fur. The Mission did not have sufficient time to study these sectors in detail.

The following table shows all projections calculated for the Five Year Plan. Projections of this kind have validity in that they are based on past performance which indicates trends, modified to some extent by observation of changes actually occurring in industry. They do not attempt to anticipate results of planned industrial development by government or private industry for the next five years such as is contemplated in this report.

* Table 13 [illegible]

Industry	[illegible] Added	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Meat Processing	219	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dairy Products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Canning of Fruit & Veg.	242	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grain Milling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bakery Products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sugar	[illegible]	[illegible]	1,550	[illegible]	[illegible]	[illegible]
Confectionary	72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous Food	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL FOOD PROCESSING	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Beverages & Tobacco	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cotton Ginning	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Knitting Mills	248	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cordage, Rope & Twine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Spinning & Weaving	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL TEXTILES	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Footwear	511	7.0	822	2,148	7.0	[illegible]
Clothing & Made up Textiles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FOOTWEAR & CLOTHING	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wood Products	1,177	8.2	2,048	3,023	8.3	5,270
Furniture & Fixtures	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5,180
Pulp & Paper	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Publishing & Printing	2,635	7.5	4,375	5,649	7.5	9,378
Leather & Fur	155	9.0	[illegible]	906	9.0	1,559
Rubber	335	36.0	2,048	944	29.0	5,570
Chemicals & Petroleum	5,463	8.0	9,337	25,470	8.0	43,738
Non-Metallic Minerals	2,446	6.0	3,669	5,911	7.5	9,812
Metal Products	2,395	7.5	3,976	[illegible]	7.5	12,466
Machinery	2,774	8.3	4,854	5,320	8.3	9,310
Transport & Equipment	7,489	7.0	12,058	13,111	7.0	21,108
Miscellaneous	602	7.5	1,000	1,807	7.5	3,000
TOTAL MANUFACTURING **	42,372	8.9	76,803	136,555	8.4	239,[illegible]

* Development Plan 1969 - 1974

** Excluding small rural establishments, the total product of which was estimated at K£2.8 million and is projected at K£5.3 million for 1974.

[illegible]

Since 90 per cent of the [illegible] of Kenya, constitute 80 per cent of the people, [illegible] are concentrated [illegible] ment. In a country [illegible], rural [illegible] development, and, therefore, [illegible].

Rural development [illegible] the Kenyatta [illegible], [illegible] together with [illegible] had a powerful effect.

In 1964, there were 16,[illegible] self-help projects by 1967, this number had grown to 39,[illegible] projects valued at £1.9 million. The various projects took many different forms too numerous to list; but concrete results were obtained.

In addition to projects initiated by the people themselves, the Government instituted agricultural extension service on a large scale, community development services and adult education, including literacy training.

Since 1968, the Government has been trying to guide and direct the rural development programme, and at the same time, increase the amount of aid given to rural areas. Central to this plan was the formation of a strong inter-ministerial committee under the Office of the President called the National Rural Development Committee.

Integrated Programme

The main concern of this Committee is the development of an integrated programme, in which public and private resources will be mobilized to accomplish agreed objectives. Basic to the Government's plan is an increase in agricultural output through a higher use of land, crop

diversification [illegible] and industry.

Government [illegible] will [illegible] the levels, [illegible]

Kℓ 40 million [illegible] and minor roads;

Kℓ 1-/ million [illegible] country;

Kℓ [illegible] Housing Corporation.

In addition, the Government proposes to expand its [illegible] services, its field extension services in agriculture, trade, and industry, and in a wide variety of training programmes. The resources of private charitable and religious institutions will be used in some of these programmes.

To avoid dispersion of efforts and resources, and to permit experimentation, 6 areas of the country have been selected for special attention for the time being.

Each of these divisions has its own distinctive characteristics in terms of resources and people; each presents different problems and opportunities for development as previously noted.

Probably, the least developed of these Divisions is Kikoneni in Coast Province. An unknown number of people have drifted into this area following the one road which cuts the Division from north to south. Land is just being registered.

The Division lacks secondary roads; there is no electricity or central water supply. Educational facilities and other public services do not

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It is in this [illegible] of trade and in [illegible] for this purpose, the Ministry of [illegible] employ four deve[illegible] officers [illegible] to work in close co-operation with its Trade Officers, and the Industrial Survey and Location Centre. See Recommendation No. 6.

While the Government [illegible] private resources, no effort is [illegible] private industry to participate in the [illegible].

The omission is not to my mind - a valid indication that additional pioneers are needed. Certainly, private industry could help to establish trade and industry in the rural areas since it has the know-how, capital, production and distribution facilities which the Government would have difficulty establishing on its own account.

In this connection, it is generally recognized that industry follows trade as a subsistence economy gives way to a monetary economy. The rural areas selected for intensive development are apparently in the transitional stages of such a change.

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Industri[illegible]tion in urban are[illegible]tside [illegible]
has foremost been related to the processing of [illegible]ops, live-
stock and forest produce, both for the domestic market and for
exports. Towns such as Lakuru, Nakuru and Kisumu grew up initially
as distribution centres and constituted a natural choice for
location of industries based on such raw materials. In addition,
such urban centres early developed infrastructural facilities
to serve government administration and the distributive trade
which also could be utilized by industry.

During the [illegible]

has [illegible]

stimulated [illegible]

to some [illegible]

In [illegible]

of [illegible]

ar[illegible]

[illegible]

in[illegible]

examp[illegible]

are th[illegible]

[illegible]

[illegible]

sector[illegible]

th[illegible]

comm[illegible]

re[illegible]

urban pr[illegible]

Table 14 [illegible]

	[illegible]					
	[illegible]					
	Nation					
Food manufacturing	25.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Beverage industries	7.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tobacco manufactures	[illegible].7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Textiles	20.2	[illegible]	[illegible].4	[illegible].9	[illegible]	[illegible]
Footwear and clothing	17.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wood except furniture	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible].0	[illegible].0
Furniture and fixtures	6[illegible].	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Paper and Paper products	12.0	[illegible].1	[illegible]	[illegible].0	[illegible].0	[illegible].0
Printing and Publishing	[illegible]0.[illegible]	7.3	[illegible]	[illegible]	[illegible]	[illegible]
Leather and fur products	[illegible]5.1	0.[illegible]	[illegible]	[illegible]	[illegible].0	[illegible]
Rubber manufactures	91.5	2.[illegible]	[illegible].3	[illegible]	[illegible].0	[illegible]
Chemicals	47.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Petroleum	0.[illegible]	[illegible]	[illegible]	[illegible]	[illegible].0	[illegible].0
Non-metallic minerals	28.3	50.[illegible]	[illegible].1	[illegible]	[illegible].9	[illegible].0
Basic metals Industries	73.9	26.[illegible]	[illegible].0	[illegible]	[illegible].0	[illegible].0
Metal Products	28.6	47.1	[illegible]	[illegible]	[illegible].3	[illegible].0
Non-Electrical machinery	71.[illegible]	7.[illegible]	[illegible].3	[illegible]	[illegible].7	[illegible].0
Electric Machinery	77.5	3.[illegible]	[illegible].7	[illegible]	[illegible].[illegible]	[illegible].0
Transport Equipment	54.3	[illegible]0.[illegible]	[illegible]	[illegible]	[illegible].1	[illegible].0
Misc. Man. Industries	73.3	[illegible].4	[illegible]	[illegible]	[illegible].5	[illegible].0
All Manufact.Sectors	43.5	[illegible].1	[illegible]	[illegible].5	[illegible].5	[illegible].0

The [illegible] regional location structure [illegible] regional location structure to the population structure [illegible] industrial employment factors in Country A. [illegible] area structure [illegible] series of population density [illegible].

The industrial employment factor for a regional unit, in the present context, is the ratio of industrial, to the [illegible] between the percentage figure for [illegible] population for the unit. Similarly, the population [illegible] is calculated as the quotient between the percentage [illegible] area.

An employment factor of 1 for a regional unit indicates that the region's industrial share in terms of employment is exactly proportional to its share of total population; an employment figure less than 1 implies that the industrial share is less than the population share. In interpreting the series of employment factors it should be borne in mind that the series does not only measure the relative levels of industrial development but also reflects regional specialization between industry and other economic activities.

Table 15.

RIFT VALLEY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-Kisumu	6.[illegible]	[illegible]	0.[illegible]	1.[illegible]	[illegible]
-Other Districts	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NYANZA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Kisii	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Nyanza	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Other Districts (3)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CENTRAL PROVINCE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Kiambu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Other Districts (4)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
COAST PROVINCE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Mombasa	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Other Districts (5)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EASTERN PROVINCE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Machakos	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- Other Districts (6)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NORTH EASTERN PROVINCE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	**100.00**	**100.00**	**100.00**	**1.00**	**1.00**

Sources: Derived from Labour Enumeration Statistics, Statistics Division
Population [illegible], Statistics Division
Ministry of Lands and Settlement (area figures)

It can be seen from the [illegible] in Table 15 that the present localisation structure of industry is [illegible]. Of the three Lake, six provinces out of [illegible] have industrial employment factors smaller than 1. The two provinces with [illegible] and the Coast Province, [illegible] factors of 10.45 and 2.06 respectively. Equally low levels of industrialization in relation to population [illegible] the Western and Nyanza Provinces, which have employment factors of 0.1[illegible] and 0.38 respectively. These two provinces have population density factors in excess of 1.00 and account in absolute terms for [illegible] per cent of the Kenyan population. On a district level the uneven localization structure is still marked, 31 districts out of 43 have industrial employment factors below 1.

Of special interest in this latter context are the 14 districts that have been selected for the integrated development approach aimed at in the Rural Development Programme. The profiles of these districts are outlined in Table 16.

Table 16. Industrial [illegible] to total [illegible] and [illegible] structure in 1971 of Districts [illegible] the Rural Development Programme

	Per Cent Ind.Empl.	Pop.	Area	Employment Factor	Pop. Density Factor
NYANZA PROVINCE					
- Kisii	0.13	6.09	0.39	0.02	15.61
- South Nyanza	0.12	5.58	1.08	0.02	5.58
WESTERN PROVINCE					
- Kakamega	0.72	6.92	0.62	0.10	11.21
- Busia	0.29	2.00	0.29	0.15	6.90
RIFT VALLEY PROVINCE					
- Baringo	0.29	1.74	1.87	0.17	0.93
- Nandi	0.13	1.94	0.48	0.07	4.04
- West Pokot	0.00	0.68	0.62	0.00	1.64
CENTRAL PROVINCE					
- Nyeri	0.75	3.18	0.58	0.24	5.48
- Murang'a	0.25	4.28	0.43	0.06	9.95
COAST PROVINCE					
- Kwale	0.02	1.83	1.45	0.01	1.26
- Taita Taveta	0.40	1.04	2.98	0.38	0.35
EASTERN PROVINCE					
- Embu	0.19	1.56	0.48	0.12	3.25
- Meru	0.27	5.49	1.74	0.05	3.16
- Machakos	3.32	6.62	2.49	0.50	2.66

Source: Refer to Table 1

those which [illegible] ment Programme. It [illegible] districts and [illegible] lar of low or [illegible].

The [illegible] structure, [illegible] to industrial [illegible] development [illegible] for mining [illegible] emphasis might [illegible] manual activities.

In the [illegible] economic and profitable to be extracted. In [illegible] must be provided [illegible] profitable operation of an enterprise.

The aim of the Government is to establish industries which are viable, and, on balance, meet the tests of national economic profitability. From that viewpoint, industrialization might take certain courses:

(a) consumer and intermediate goods industries, dependent upon the market, will continue to locate in the largest urban centres of Nairobi and Mombasa: clothing, rubber tyres, chemicals and adhesives;

(b) process industries which must be located near their sources of raw materials will develop in the lesser urban centres of Nakuru, Eldoret, Kisumu and Kitale: sawmilling, food processing;

(c) small industries might develop in "growth" centres to serve local markets with goods priced to compete with goods shipped in from outside: household utensils, furniture, automotive and tractor parts, chemical toilets;

(d) small industries might develop in "growth" centres which are capable of producing high value specialities for sale in larger markets: Leather goods, medicinal supplies, canned fruit and juices;

(e) large firms in urban centres might find it advantageous to sub-contract to small rural industries: veneer and kiln dried lumber for the furniture and building trades.

A. CHEMICAL INDUSTRY

The chemical industry is one of the most dynamic sectors in the industrial structure of developed countries, and investment in that industry is normally higher than in any other industrial sector. In many developing countries chemical industry sectors are in the early stage of development. In Kenya it is still in its infancy.

Chemical technology is applied to the following products now being produced in Kenya in addition to products from oil refining:

Alcohol	Pyrethrum Extract
Caseine	Salt
Cement	Silicate of Soda
Charcoal	Soap
Essential Oils	Soda Ash
Industrial Gases	Sugar
Lime	Tanning Extract
Paints	Vegetable Oils
Paper	and others.

The following chemical products are now being implemented in Kenya, namely:

polysynthetics, based on imported vinyl acetate

detergents, based on sulphonation of petroleum.

Under normal conditions of supply and demand in an expanding economy the availability of basic chemicals in Kenya could provide the basis for establishing further industries, such as pulp and paper, textile, plastics, fine chemicals, organic and inorganic chemicals, solvents, etc. Since such basic chemicals as caustic soda, chlorine, sulphuric acid, etc. are usually produced in developed countries on a large scale at low cost, the economies of scale of such production in Kenya must be carefully considered.

In addition, because of the need to utilize a variety of products made, Kenya should encourage the development of one or more basic chemical complexes which would be oriented to transportation and labour and close to markets and raw material [illegible] complexes could take maximum advantage of backward and forward integration of products.

Ethanol

Ethyl alcohol is being produced in Kenya by fermentation of molasses. Approximately [illegible],000 tons of sugar is now produced annually in Kenya from which 37,000 tons of molasses is obtained. When the present facilities have reached full production, 135,000 tons of sugar and 37,000 tons of molasses will be produced. One of the plants is producing alcohol at a rate of about 500 tons per year but its capacity is only utilized to about 25 per cent. Surplus molasses is being used in cattle-feed or is exported, while some until recently has simply been dumped.

At present the alcohol is used in beverages or as methylated spirit and as a solvent. In addition, alcohol can be further concentrated and used as an additive with gasoline in quantities up to 25 per cent of volume. If all gasoline presently used were to be mixed with 25 per cent alcohol, Kenya could dispose of approximately 35,000 tons of alcohol yearly! The 37,000 tons of molasses produced, could theoretically be converted to about 8,000 tons of alcohol or 2.5 million gallons.

Alcohol - gasoline mix constitutes an excellent motor fuel with a suitable high octane value for road vehicles and its use would depend on the price at which the alcohol can be produced. If introduced in Kenya, it could be substituted for part of imported oil and a hitherto little-used waste product could be utilised. The alcohol-gasoline mix, in some countries called "bentyl", could be marketed besides the common gasoline, 1/

1/ As is done successfully in South Africa for example.

and the Government [illegible] its, e.g. by fixing the pr[illegible].

[illegible] production, other [illegible], [illegible] used, such as maize, [illegible], [illegible], etc. It should also be mentioned that the [illegible] production [illegible] a by-product. The fermentation [illegible] that the production of yeast [illegible] while [illegible] is reduced [illegible].

Kenya presently imports [illegible] of £90,000 [illegible] and the consumption of bread has increased 500 per cent during the last 5 years. Continued growth in bread consumption is expected. A study of the production of yeast should therefore be considered.

As mentioned above, yeast can be produced from such products as maize, cassava, etc., but also from such agricultural wastes as maize cobs, bagasse, and probably also from papyrus, whereby the hydrolysis is carried out in 2 stages, so as not to destroy the pentosans. Valuable torula yeast, which is receiving increased importance in animal feeds and also as a nutrition additive for humans, could be produced [b].

An important use fuel alcohol, where petrochemical feed stocks are not available, is as a raw material for the production of acetaldehyde, acetic acid, ether, ethylene etc., and subsequent production of secondary compounds based on the primary chemicals.

---

[a] If the agreement with the oil refinery prevents this use, agreements like laws, can be changed.

[b] East Africa: 600 tons at a value of £180,000.

[c] Edible yeast could easily be recovered by the breweries by installing a rotary vacuum filter, an autolyser and a yeast drier plus a pasteuriser for the waste beer. Such an installation would cost about Shs.300,000. One brewery, which has a production of 7,500 barrels (à 32 gallon) per week, could recover approximately 4,000 lbs. of 30 per cent yeast during 14 hours, i.e. 8,400 kgs. of yeast with 30 per cent dry matter per day, which is an appreciable and valuable quantity.

Example: One of the sugar mills could at full capacity produce about 14,000 tons of molasses. This quantity would be transformed into 4,0[illegible] tons of alcohol in a plant costing about $135,000. Cost of production would be:

Depreciation, 10 per cent of £[illegible],000	£13,500
Interest, 6 per cent on £[illegible],000	8,100
Maintenance, [illegible] per cent on £135,000	2,700
Steam, 10,000 tons à Shs. [illegible].50 —	20,250
Other operating costs, incl. labour	6,750
	£51,300

This corresponds with a processing cost of Shs. 0.[illegible]7 per litre.

Thus the importance of ethyl alcohol is clearly seen and the possibilities for establishing a chemical industry based on its conversion will be studied further in this report.

Acetic acid can be produced by fermentation of ethyl alcohol but is presently generally produced (in countries not having access to petrochemical feed stocks) by the oxidation of acetaldehyde, which is produced from ethyl alcohol through a dehydrogenation process. Acetic acid is also received as a condensation product from the destructive distillation of wood.

Acetic acid has a major industrial use in the food and pharmaceutical industry.

Acetic acid is also the raw material for the production of such chemicals as acetic acid anhydrid, which is used to introduce acetyl groups and in the production of acetyl cellulose, in the paint and plastics industries and in the production of vinyl acetate, a raw material for polyvinyl acetate (PVA).

Since acetic acid is a useful raw material in the chemical industry, Kenya should consider its use in the overall planning of establishing of an alcohol industry. While certain products

---

1/ Steam (being produced from bagasse) and other utilities are supposed to be produced in an already existing plant. No price has been put on molasses, as the calculation is for the processing cost only.

mentioned, such as ethylene, and acetic which probably will not be viable [illegible] a first stage [illegible] operation, many products and [illegible] interesting. [illegible] the capital investment [illegible] three different [illegible] be made.

As already mentioned [illegible] the total [illegible] raw material [illegible] province, [illegible] be included, but [illegible] which is being [illegible] and therefore the total Kenya [illegible] this calculation. It should also be mentioned, that the above mentioned company, through a Geneva based affiliary is dealing on a world wide basis in alcohol and will be approached by the Mission to consider the production of alcohol in Kenya for export and domestic use and possible further processing into various chemicals.

To ferment 27,000 tons of molasses, a total fermentation volume of 1,000 m^3 would be required, which could be done in 10 fermentation vats. These could be housed in a building covering about 1,000 m^2, being 10 meters high and may be a second floor at the 5 meter level. Part of the building would go up to 25 meters in a tower for distillation columns. Estimating local deliveries for fermentation vats (in mild steel) piping, etc., at £50,000 and land and buildings at £35,000 plus cost for a total volume of 11,000 m^3 storage capacity (molasses in concrete bins) the total erected investment will be about £280,000.

1/ United Molasses of London

The production cost for alcohol will depend on the price put on the molasses and the cost for steam, power, water, etc. The price for molasses must correspond with the export price. This price varies. It has been at a minimum of Nyanza as low as Shs. 12 and is now Shs. [illegible] per ton. An average of Shs. 30 will therefore be used. Steam can be produced from either furnace oil or wood. [illegible] for furnace oil is Shs. 100 per ton in Mombasa and freight to Nyanza about Shs. [illegible] per ton, i.e. Shs. 300/- per ton delivered at the plant. Fuel cost for steam, using about 100 kgs. of oil per ton steam, would be Shs. [illegible] per ton steam in fuel oil operating costs a price of Shs. [illegible] per ton steam is likely. Fire wood is sold in Nairobi at a price of Shs. 30/- per ton, but if delivered it can be had for Shs. [illegible] per ton. This of course would give a very low price for the steam, and therefore the availability of sufficient wood-fuel in the area should be investigated. For this calculation, however, the higher price will be used. Electricity is calculated at 12 cts. per kilowatthour. However, it must be mentioned, that by installing a back-pressure turbine, the steam needed in the process will be able to produce the necessary electricity, which then will cost less than the figure suggested.

An estimate for the yearly production cost of 5,000 tons of alcohol would then be as follows:

Table V.

Capital Cost (depreciation, interest and Maintenance), 18 per cent on investment	£50,000
Raw Material and Utilities	
Molasses, 37,000 tons à Shs. 30	55,000
Steam, 40,000 tons à Shs. 20	40,000
Electricity, 800,000 kwh. à Shs. 0.12	4,800
Water, 240,000 m^3 à Shs. 0.50/m^3	6,000 V/
Process water, 100,000 m^3 à Shs. 1/m^3	5,000
Labor	
1 Supervisor, 1 assistant, 8 shift workers, 4,600 Shs./mo	2,750
Administration and Overheads	
Plus contingencies	6,450
	£176,000

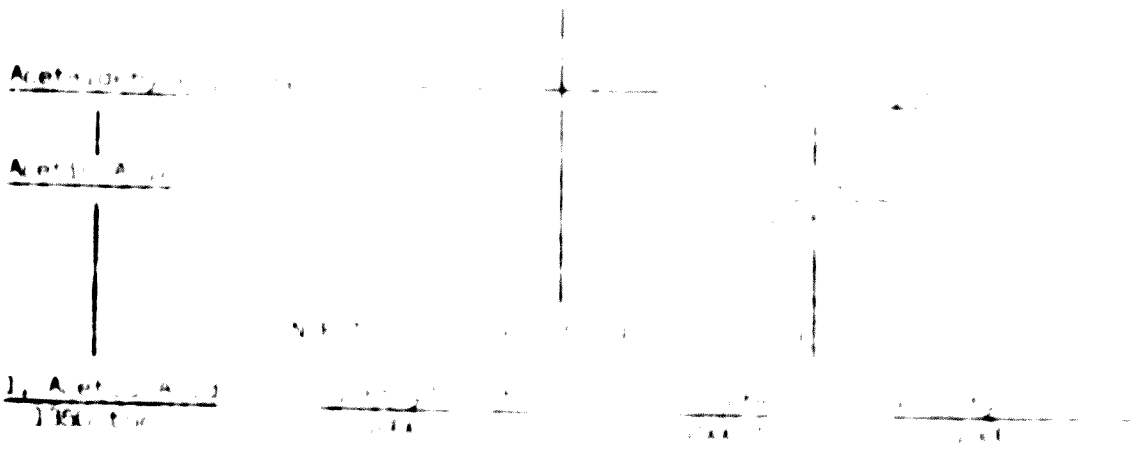
V/ The cooling water consumption depends on the water temperature and may have to be adjusted. On the other hand the quantity can be decreased by the installation of a cooling tower, whereby the net consumption will be only about 10 per cent of the figure given

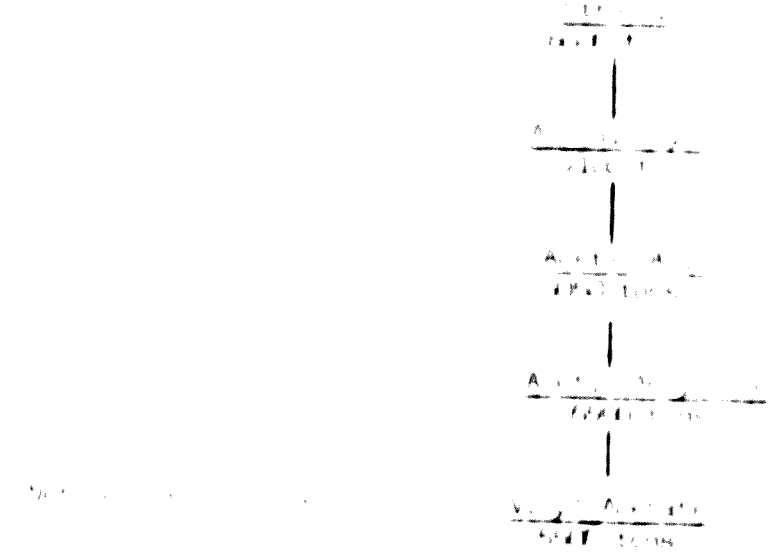
This gives a [illegible] molasses. The [illegible] molasses [illegible] investigation.

If [illegible] molasses, there is [illegible] about [illegible] per cent [illegible] water [illegible].

If the above [illegible] were to be exported [illegible] world market price, which is about £[illegible] per ton, and freight from Nairobi to Mombasa is calculated at £5/ton, the gross profit would be about £[illegible],000 per year.

As has been mentioned before, various chemicals could be produced, using the alcohol as a raw material and although export of the alcohol may be a first step in the processing of the molasses, at a later stage or immediately following the first stage, such further processing may prove desirable and viable. In the following, three alternatives are suggested.





World market price, $/ton	63	80
Value, $	189,000	288,000

Total value, alternative 3: 647,000

As raw material for sulphuric acid production in Kenya one would probably use imported elemental sulphur [1], the price for which has decreased drastically during the last year, depending on increased world production from refinery and sour gases occasioned in part by stricter anti air-pollution laws. Thus

[1] Which for example is done by the sulphuric acid plant in Tororo, Uganda.

be used. The important fac-

ulphate of ammonia might

be

of acid. Sulphate

of ammonia is cheap and easy to handle, it is not hygroscopic and it is easy to manufacture and now that the big nitrogen fertilizer project in Kenya has been abandoned, it seems opportune to start the manufacture of this salt in Kenya on a more modest scale

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1/ The deposit is estimated at minimum 5 million tons. Analysis shows 42 per cent sulphur.

(perhaps [illegible] the country [illegible] fertilizers were [illegible] tons. [illegible] sulphate of ammonia was [illegible] eight [illegible] 10,000 [illegible] tons of [illegible] phuric acid.

Sulphuric acid is [illegible] phosphates [illegible] In the Lake Victoria [illegible] contain apatite [illegible] with a suitable [illegible] needs more exploration, but must be kept [illegible] for. One must also remember, that with [illegible] Lake Kivu and with [illegible] the prerequisites [illegible] hand, but admittedly [illegible] of super-phosphates [illegible] based on imported rock phosphates and [illegible] the coast, where production of sulphuric acid also would be cheapest [3].

---

[1] The program launched by the Ministry of Agriculture for increased production of maize, aiming at the export of 400,000 tons in 1974 produced on an acreage of 750,000 necessitates increased yields which only can be achieved with increased use of fertilizers and recommend quantities of 2 cwt. of super-phosphate and 3 cwt. of nitrogenous fertilizer per acre will require 60,000 tons of super-phosphate and 90,000 tons of nitrogenous fertilizers. And this is for one crop only!

[2] There now exists a small plant in Uganda.

[3] The Mission has discussed a project for a combined super-phosphate sulphate of ammonia plant in Mombasa based on a 200 ton/day sulphuric acid plant. The plans however are still much too preliminary to be dealt with in this report.

[illegible]

[illegible]

[illegible]

[illegible] possible [illegible] the needs of [illegible] by local [illegible] one arrives at [illegible] per year.

Before [illegible] can be taken, a market [illegible] must of course [illegible] Mission has not had the time to do. However, based on a proposed 10,000 tons per year [illegible] grow at what approximate price sulphuric acid [illegible] and production cost for such a plant is made.

1/ During the war, Kenya produced aluminium sulphate using clay and locally produced sulphuric acid, according to a method developed by EAIRO.

2/ Chromium salts could be produced in Kenya using the chromite deposits in West Pokot, which are estimated at 60,000 tons and using sulphuric acid and local soda in the process. Chromium salts are used in the tanning industry in Kenya and chromic acid in the galvanizing industry.

[illegible]

[illegible]

Type [illegible]

Capacity [illegible]

[illegible]

[illegible]

Project [illegible]

A. [illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

B. ANNUAL [illegible]

Sulphur, 1/ [illegible] 1,400,00

Water, 18 m³/ton [illegible] 90,00

Boiler feed chemicals 20,00

1,510,00

2. Labour:

Foreman, 1 @ Shs. 800/mo	9,600	
Labour, skilled, 1 x 3 shifts, @ Shs.500/mo	18,000	
Semi-skilled, 1 day shift @ Shs.350/mo	4,200	
Un-skilled, 1 x 5 day shift @ Shs.200/mo	12,000	43,800

3. Other Operating Costs:

Steam (1)	-	
Electricity (2) 30 kwh/ton acid, @ 12 cts/kwh	36,000	
Maintenance & repair, 9 Shs/ton	90,000	126,000

(1) Plants producing more than 20 tons acid/day have surplus steam available.

(2) Waste heat recovery can render plant self-supporting.

[illegible]

4. [illegible]

10% on [illegible]

[illegible]

5. Interest

6% [illegible]

6. Depreciation

Buildings [illegible]

Machinery [illegible]

[illegible]

[illegible]

Cost price [illegible]

[illegible]

Price paid for [illegible] the import duty [illegible]

Thus, [illegible]

Less cost [illegible]

Gross profit [illegible]

= [illegible]

As can be seen from [illegible] can be produced at a price [illegible] imported acid. The Mission recommends that [illegible] carried out on the production of sulphuric acid [illegible] of the manufacture of other [illegible].

(27) Price paid in Nairobi for commercial acid, [illegible] of H_2SO_4, density 1.8 in 250 kg. steel drums (deposit for drum Shs. 25 as Shs. 25% drum, i.e. Shs. 1,200/ton.

(28) Sulphuric acid was imported from overseas in [illegible] at a cif cost price of £ 69 per ton i.e. Shs. 1,380 ton. It is said that recent imports at dumping prices have been received, but no economic analysis can be based on such prices.

Furfural

Plants and agricultural wastes such as bagasse, maize cobs, groundnut hulls, cotton-seed hulls, sisal waste, coconut shells, spent wattle bark, etc. contain pentosans and produce furfural when treated with dilute mineral acids. Yields from 5 to 22 per cent of furfural can be obtained.

Furfural is a product which has a wide range of application in the chemical and mineral oil industry. Thus it is used as a selective solvent in the production of lubricating oils and the oil refinery in Mombasa will need 600 tons furfural per year, when their new lubricating oil plant goes on stream. Furfural is also used in edible oil refining, and it can be used instead of formaldehyde as preservation and desinfection agent. The fungicide feature of furfural is used in the preservation of grain, wood, etc., and it has been used as a weed killer and a vermin killing agent.

Furfural has great importance as raw material for the production of adipin acid, an intermediate in the production of polyamids (nylon) but perhaps the most important field of use is the production of duroplastic synthetic resins, whose most characteristic property is that they can be cast. The derivatives of furfural are used as solvents and intermediary products.

Thus the wide use of furfural is clearly seen and next step is to establish the size of the present and future local market in Kenya as well as in the whole of East Africa. It is probably not possible to produce furfural in Kenya and, including transport cost to distant overseas consumers, be able to compete with world market prices. However, the market in East Africa and the Indian Ocean area may be accessible and sufficient for a Kenya producer. Such a market study can unfortunately not be carried out by this Mission. On the other hand, it must also be established whether furfural at all can be produced in Kenya at a reasonable price and be economically feasible and such a preliminary study is detailed below.

[illegible]

[illegible]

[illegible]

Bagasse
Maize Cobs
[illegible]
[illegible]
[illegible]
[illegible]
Pyrethrum [illegible]

As [illegible] to be available at [illegible] cost, [illegible] maize stover [illegible] to be [illegible] not [illegible] 40/ threatening [illegible] taining several [illegible] paid for [illegible] up and [illegible] furfural production, [illegible] moted. As the [illegible] material, the price at which the [illegible] delivered at a proposed [illegible] plant site, as of [illegible].

Bagasse gives a higher yield of furfural than papyrus, but as it is now used as fuel in the sugar process, and would have to be replaced

---

(A) As calculated from the crop production.

by fa[illegible]
will be ava[illegible]
possit e

We se[illegible]
of [illegible]
the [illegible]
be done [illegible]
[illegible]
large farms, [illegible]
it can [illegible]
it will be [illegible]
should be [illegible]
crop[illegible]
of at the [illegible]

The [illegible]
to [illegible]
However, [illegible]
have [illegible]
economic [illegible]
furfura[illegible]
the wor[illegible]

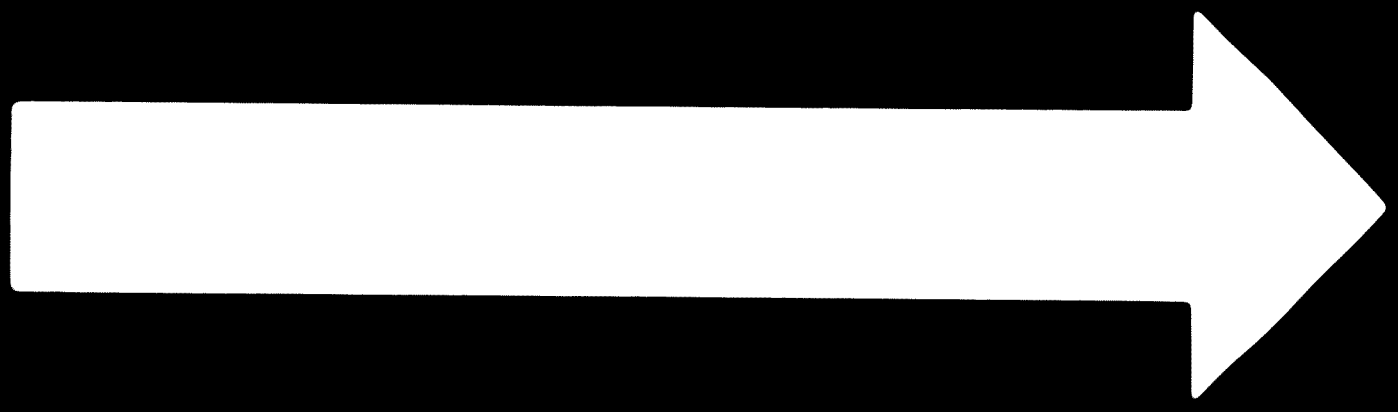
Table

[illegible]

For a [illegible]
and su[illegible]

Type	HMA 181[illegible]
Capacity	2,[illegible] tons/year
Working Hours	24 hours/day
Working Days	300 days/year
Proposed Location	Eldoret

(*) The cost for sulphuric acid, calculated in paragraph 3 has been used plus freight cost to Eldoret from Thika.



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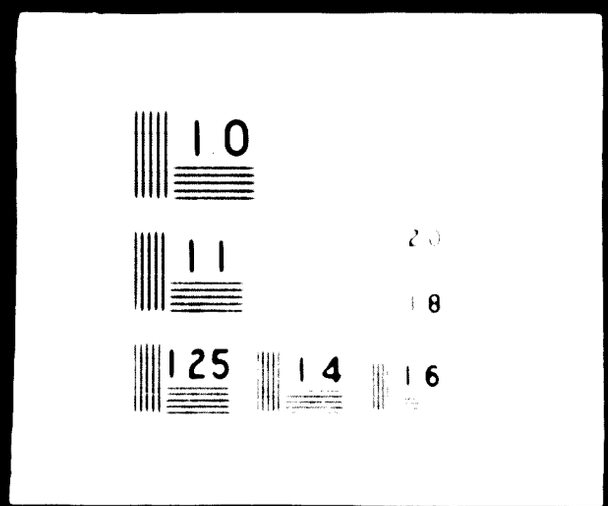

[illegible]

A large [illegible] produce charcoal fr[illegible] combined with range [illegible] in the ground, [illegible] in diameter, the pre-cut wood is fille[illegible] and a half-sphere is [illegible] Openings are left at the [illegible] Charring takes about [illegible] days.

A somewhat more [illegible] is the portable steel kiln with a diameter of [illegible] and a height of [illegible] which has a capacity of [illegible] It produces 2-4 bags (à 80 lbs.) of charcoal in 2-3 days, depending upon the type of wood used.

A stationary variant of the portable kiln is built of brick but has a steel lid. It is cheaper in construction, has less heat losses and gives a higher yield but needs longer cooling period. This kiln could be provided with an electric driven fan to speed up the charring period and also, if provided with a condensation unit, some by-products could be recovered, mainly tar.

Proper retorting kilns, using the process of permanent gas for the pyrolysis and recovering the tar and pyroligneous acid are not in use in Kenya.

In order to study the possibilities for a more technical approach to charcoal production, the Mission has, together with the FAO Range Management Project, selected various trees and shrubs, which have been tested by the East African Industrial Research Organization [1], the results of which appear in the following table:

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[1] At present time, E.A.I.R.O. have only tested 6 out of 17 species and on those tested, values for methanol and charcoal density are still missing.

Table 1

	No.1. COMMIPHORA AFRICANA	No.2.	No.3.	No.4.	No.5.	No.6.
Moisture content at distillation %	30.24	12.71	12.10	12.28	9.61	11.11
	Yields on dry basis (%)					
Charcoal	37.62	34.35	40.84	35.35	32.4	36.17
Tar	8.18	8.14	7.99	10.2%	13.50	11.55
Aqueous* Condensate	21.57	22.84	27.39	29.13	30.77	27.23
Gas	19.66	17.15	18.91	12.1	16.54	15.14
Total	87.03	82.60	90.66	89.01	91.13	90.29
Acetic Acid (%)	3.09	2.34	5.20	4.11	3.21	2.65
	Gas Composition (Vol.% of sum of CO_2, CO, H_2, CH_4)					
CO_2	29.6	28.3	45.0	58.5	44.1	44.0
CO	22.0	20.2	25.6	33.8	33.4	32.3
H_2	20.7	22.7	21.2	5.2	7.9	18.1
CH_4	27.7	28.8	8.7	22.5	25.6	25.6
	Charcoal Composition, Wt.%					
Moisture	2.67	2.89	3.44			
Ash	7.30	7.26	2.24			
Volatile Matter	12.57	14.34	17.37			

* Corrected for initial moisture content.

The two first species, Commiphora Africana and Boswellia Hildebrantii can be regarded as a pest which covers thousands of square miles of land Kenya and cause a problem for the ranges. They are considered as valueless and money is spent on their removal for clearing the range.

[illegible] have been carried out [illegible] that [illegible] can be produced [illegible] for the black wattle [illegible]

[illegible] other [illegible] are [illegible] Tarchonanthus Camphoratus [illegible] foliage with a high [illegible] of these [illegible] distillation. The first [illegible] showed a yield of between 0.11 [illegible] oil. The other [illegible] gave a yield of [illegible]%. [illegible] any commercial use(1).

[illegible] also [illegible] the production of charcoal. [illegible] concentrated [illegible] the Mission believes [illegible] by-products. As can be seen from Table 3, [illegible] are the theoretical yields. The aqueous [illegible] also contain methanol.

[illegible] the charcoal [illegible] produced from debarked wattle, and the bark is rich [illegible] substances, a [illegible] test has been requested on debarked wattle. [illegible] is not yet available [illegible] yield from 50,000 tons of debarked wattle [illegible] to be 15,000 tons of charcoal, 3,000 tons of tar, 2,000 tons of acetic acid and 1,300 tons of methanol.

[illegible] Eucalyptus Saligna, which has turned out to be less suitable for sawn [illegible] largely used as fuel-wood. The test shows, that it gives a high yield of [illegible] charcoal and tar as well as acetic acid, and is obviously an [illegible] material for a charcoal industry.

[illegible] (No.6) of which there are now large plantations in Kenya, and [illegible] used more and more for sawn wood and eventually for the manufacture of pulp and paper, and which will produce much thinnings and waste, [illegible] low yield of charcoal but a high yield of valuable pine tar products. The Podocarpus (No.5), which is used for the production of sawn wood and plywood, shows higher yield of charcoal than the pine, but low compared to the other species. Tar yield is high while the yield of acetic acid is very low.

---

(1) Will be done by E.A.I.R.O.

In order to recover [illegible] from the [illegible], i.e. from the [illegible], the [illegible] out in a closed retort or oven [illegible] divided into four different [illegible]:

1. The evaporation [illegible] temperature [illegible] the requirement.
2. The pre-carbonization [illegible] the temperature [illegible] reaction, [illegible].
3. The exothermic [illegible] of heat [illegible] result of [illegible].
4. The cooling period, [illegible] pressure in the [illegible] absorption [illegible] its subsequent [illegible] period.

The simplest type of retort is a horizontal, cylindrical steel oven heated externally from a fire box. The volatile products are taken off and led to a scrubber and/or water cooled condensers, where tar and pyroligneous acid is recovered. The process is a batch process.

Wood carbonization, system Perstorp, takes place as a discontinuous process in vertical retorts and is effected by circulating gas at a temperature of about 900° F. The hot gas enters at the top of the retort and leaves at the bottom at a reduced temperature, the direction of the gas flow being the same as the gravitational flow of the tar. This method serves to prevent immoderate heating of the tar and thereby avoids cracking of its valuable components. The gases are led to the condensation unit and the non-condensable gas is used partly as circulating gas, partly to heat the circulating gas(1).

A continuous working retort is the Lambiotte retort with top and bottom sections with special valves permitting charging and discharging without air intake. This type of retort is cheaper in investment cost, saves labour and

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(1) A second hand retorting plant of this type, with a capacity of 130 tons of wood per day, and with a replacement value of $200,000, can be made available from Sweden at a cost of $135,000.

[illegible] different coal and by-products. The temperature in the [illegible] is higher and the coal produced is extremely low in volatile components. Such coal is not suitable for use in blast furnaces. The tar obtained is not of the same quality as that from a batch process.

To determine whether the recovery of by-products from the charcoal manufacture in Kenya can be a viable proposition [illegible] the present and composition of the hydrocarbons [illegible] steam. In Escort, where charcoal is already produced [illegible] where wood-fuel costs Shs. 25 per [illegible], it is probable that [illegible] very near to feasible, especially if it can be made as an integrated part of an existing industry. As another benefit of the industry in question, the preservation of telephone, telegraph and fence poles with impregnated creosote and [illegible], tar and/or tar-oils, perhaps with the addition of penta chlorphenol, could probably be used instead. The Mission recommends that a study of the viability of recovery of by-products from charcoal manufacture in the Escort area be carried out.

As is explained in paragraph 32, much charcoal is produced in Kenya in earth pits or small portable kilns. The Mission recommends that further studies are carried out to determine the type of kiln or retort that can be used on a semi-industrial scale and which gives better coal and better yields and may make it possible to recover some by-products, at least tar, which can find use to water-proof houses, preserve fence poles, serve as a fuel, etc. It is suggested that this is done in close cooperation with the FAO/Range Management Project, who have recently acquired a portable kiln for use in charcoal production in connection with range clearing projects. Close cooperation should also be kept with the East African Industrial Research Organization, who are making further tests on other Kenyan trees and shrubs than the originally chosen by the Mission. Such other species are for example the coffee tree and mangrove.

In the coastal area mangrove, which produces an excellent, dense charcoal, apparently is cut and shipped to Somalia where it is carbonized and then exported to countries in the Indian Ocean area. It seems natural that the carbonizing also should be done in Kenya and as it appears that the overseas market for charcoal is quite substantive, it may be that industrial production of charcoal, with or without recovery of by-products, could be feasible at the

coast, and th[illegible] in the overal[illegible]

Where the [illegible] smaller brand[illegible] there is no [illegible] coal can be [illegible] a kiln or [illegible] briquetted a[illegible] pressed to b[illegible] briquett[illegible] 5% of a star[illegible] fluxer and [illegible] are dried dur[illegible] in the sun, i[illegible]

Also wood waste can be made into briquettes. The self-bonding texture of wood is [illegible] dust, shaving and other [illegible] very high pressure [illegible] generates enough heat to plasticize the [illegible] for self-bonding. Other vegetable [illegible] waste, etc., can also be treated as [illegible] but it is essential that the, are dry, i.e. [illegible] preferably 6%.

Formaldehyde is [illegible] with a wide use in the manufacture of [illegible]. As a water solution it is used in the [illegible]. The largest use is perhaps in the [illegible] of urea - and phenol formaldehyde resins, which are [illegible] compounds. [illegible] quantities [illegible] with 6 factories, [illegible] and Tanzania, plus another phenol factory planned in Kenya and two more projected in Tanzania, with [illegible] to support a resin plant. Such resins (thermosetting) are generally produced in batch processes and [illegible].

If liquid resins were to be produced in say, Nairobi, the distance to consumers in Uganda and Tanzania is relatively large, so the resin, if [illegible] would have used up perhaps half of its shelf life [1], and therefore a resin in powder form, i.e. spray dried, would be preferable. In such a case the minimum economic unit would be 5,000 tons per year (because of the additional investment for a spray drying unit), which however, would be too big for the East African market. This problem seems to be solved now by a new type of resin, which has a shelf life of 6 months, and therefore the Division recommends that the production of urea - resorcine - and phenol-formaldehyde resins in Kenya be investigated. Production could be started using imported formaldehyde but at a later stage the formaldehyde could be produced from imported synthetic methanol or perhaps from methanol recovered from charcoal production.

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[1] Shelf life is the time a resin can be stored without polymerizing or have its quality affected.

Caustic Soda [illegible]

Caustic soda is one of [illegible] chemicals. In 1963 Kenya imported [illegible], and the whole of East Africa imported 4,[illegible] tons. Consumption is increasing. No domestic production of [illegible] facture and [illegible] When the Pyrethrum Board [illegible] production, [illegible] soda will provide [illegible] will be some 7,000 tons, [illegible] production.

It has been stated that Brooke Bond, [illegible] into production, will produce their own caustic soda in an electrolytic plant - using salt [illegible] - and tentatively they could make this plant large enough to produce and fill the demand of the rest of Kenya (or East Africa), should the economics show that this is feasible. However, though electrolysis also chlorine is won and as the consumption in the pulp and paper mill is calculated to be 2,000 tons/year and an electrolytic unit produces 1 ton of chlorine and 1.13 tons of caustic soda, they will obviously first have to dispose of or find a use for 1,200 tons of chlorine [2] before they can think of expanding the caustic soda production. One possibility is that they produce the exact amount of chlorine needed and import the missing part of caustic soda. Should that be the case the necessary amount of caustic soda could be produced from gaylussite, should the East African Industrial Research Organization go ahead with their plans to erect a pilot plant for that purpose, and find that the process is economical [3].

---

[1] Kenya now produces both crude and refined salt, but for electrolytic purposes the salt has first to be further refined.

[2] Present consumption in Kenya of chlorine for water treatment, bleaching powder, etc., is relatively insignificant, but could of course then be filled by the local production.

[3] Experience on gaylussite processing in Ethiopia might be consulted first.

One Kenyan company [1] has declared, that they might be interested in running the caustic soda - chlorine plant as a separate entity, in which case they probably would produce the total needs for East Africa of caustic soda and chlorine and use the surplus chlorine in the manufacture of chlorinate compounds. However, it is doubtful whether a plant located at Broderick Falls could be competitive and the Mission believes that a plant there will only be able to produce for their own consumption.

Under such circumstances a more centrically located electrolytic plant, preferably as an integrated part of a chemical complex, should be investigated, and such suggestions to that end are made.

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[1] Twiga Chemical Industries Limited.

A Chemical Complex

The Mission has discussed with interested parties various possibilities for establishing a chemical complex based on the production of sulphuric acid. As has been mentioned before, this could involve either the production of sulphate of ammonia or rayon. As information on the latter has not been forthcoming, a very preliminary lay-out of such a complex is made in the following.

Present local consumption of rayon fibre is 3,600 tons per year. Taking into consideration an expanding market, a daily output of 20 tons is taken as a basis plus production of 5 tons per day of cellophane, or a total production of 25 tons per day.

Raw material for the production of rayon is cellulose, which to begin with has to be imported but can later be produced by Broderick Falls. The chemicals needed for its production are 0.85 tons of sodium hydroxide [1] per ton of rayon for the production of alkali cellulose, 0.6 tons of carbon disulphide for dissolving the alkali cellulose and 1.10 tons of sulphuric acid for the precipitation of the rayon fibre.

The sodium hydroxide has to be produced in an electrolytic plant from salt. Production capacity should be 30 tons/day. By-products will be hydrogen and chlorine. Surplus chlorine can be converted into hydrochloric acid which again can be used in steel pickling and for the production of, for example, copper-oxy-chloride, a useful pesticide.

Carbon disulphide can be produced in an electric furnace from charcoal and sulphur. Capacity should be 15 tons/day.

The sulphuric acid should be produced in a plant like the one already described. However, the capacity will have to be increased to 50 tons per day, which will further decrease the cost price. The surplus sulphuric acid can be used to produce

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[1] Must be iron free.

metallic sulphates such as aluminium sulphate, etc.

A by-product from the rayon production will be sodium sulphate. It will be recovered in a quantity of 37 tons per day in the form of glaubersalt. Calcined, it will produce 12 tons of sodium sulphate. When Broderick Falls go into production they will need 5,800 tons of salt cake (glaubersalt) per year and there will be no need to calcine that quantity.

A chemical complex as outlined, will need approximately 2.5 million gallons of process and cooling water per day, i.e. 400 m^3 per hour or 4 cu.ft. per second. For this reason the complex must be situated where there is an abundance of water and for that reason the town of Thika is proposed. There, two rivers are found, the Chania river and the Thika river. The minimum flow in the Chania river is 51 cu.ft./second and in the Thika river 11 cu.ft./second. Both rivers join beyond Thika town. The water is of good quality and, as can be seen from the given figures, abundant.

Other reasons for situating the proposed complex in Thika are the existence of good road and railroad connections. Labour is also abundant and electric power is available [1]. Thus many facts speak for situating the complex in Thika.

The Mission has not had the time to work out even a preliminary cost estimate for the proposed complex, but recommends that this is done in cooperation with the interested investors.

Resume:

The Mission has discovered much interest in Kenya in the production of chemicals and believes that several of those dealt with in this chapter may eventually prove viable for domestic production. Obviously there must be other chemicals which also are of interest and can be produced, but it would go beyond the

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[1] The complex will most probably install a steam turbine and produce a large part of its own electricity.

purpose of this exercise to go into more detail. Below, the various chemicals discussed are listed in their various complexes.

[illegible]

[illegible]

[illegible]	Production	Raw Materials Local	Imported
[illegible]	45,000 tons/year	Wood	
[illegible] Sodium hydroxide	4,700 tons/year (1)	Salt	
[illegible] Chlorine	2,000 tons/year (1)	Salt	
B. Extracts:			
[illegible] tanning extract	12,000 tons/year	Wattle Bark	
[illegible] Fibre board	6,000 tons/year	Wattle Bark	
[illegible] Wood	15,000 tons/year	Wattle	
7. Tar	3,000 tons/year	Wattle	
8. Acetic Acid	2,500 tons/year	Wattle	
9. Methanol	1,300 tons/year	Wattle	
10. Furfural	2,000 tons/year	Maize cobs or Wattle Bark	
C. West Nyanza:			
11. Ethanol	8,000 tons/year	Molasses	
12. Acetic Acid	3,000 tons/year	Molasses	
13. Solvents	-	Molasses	
14. Vinyl Acetate	3,600 tons/year	Molasses	
D. Thika:			
15. Sulphuric Acid	15,000 tons/year		Sulphur
16. Sodium hydroxide	9,000 tons/year	Salt	
17. Carbon disulphide	4,500 tons/year	Charcoal	Sulphur
18. Rayon staple fibre	6,000 tons/year	Cellulose (2)	
19. Cellophane	1,500 tons/year	Cellulose	
20. Chlorine	8,000 tons/year	Salt	
21. Hydrochoric Acid		Salt	
22. Sodium Sulphate	11,000 tons/year	By-product	
23. Metallic sulphates	5,000 tons/year	Clay, etc.	
24. Copper-oxy-chloride	1,000 tons/year	Copper-scrap	

(1) Consumption.

(2) To be imported at the beginning, later from Broderick Falls.

Table 25 (cont.)

E. Nairobi

25.	Polyvinyl Acetate	2,500 tons/year	Vinyl Acetate (33)	
26.	Thermo setting resins and glues	2,000 tons/year		Urea and phen + Formaldehyd (34)

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(33) To begin with imported, then from complex in Nyanza.

(34) Can at a later stage be produced from either imported synthetic methanol or methanol recovered from charcoal production.

[illegible]

The largest unsatisfied market in Kenya is for housing. There are a number of reasons for this condition:

1. Rapid family formation due to high rate of population growth (over 3 per cent).

2. Increase in the average size of families from 4.2 persons in [illegible] persons, by 1984 urban families will comprise 5.2 persons.

3. Migration of rural families to urban centres.

4. Limited funds for the purchase of housing at needed and high construction costs in relation to such needs.

Effective demand for housing in urban areas is estimated at 10,000 units per year; in rural areas at 50,000 units. Seventy per cent of urban demand is for housing costing less than £600.

Table 26: Urban Demand in Relation to Income Levels, House Cost and Rental or Payment

Annual Income	Affordable House Cost	Affordable Rent	Number Units	Percentage of Total	Percentage Cumulative
Up to 119	Up to 300	50	3,500	35	35
120 - 179	450	75	2,100	21	56
180 - 239	600	100	1,300	13	69
240 - 359	900	150	900	9	78
380 - 470	1,200	200	500	5	83
480 - 599	1,500	241	400	4	87
600 - 839	2,250	375	600	6	93
900 - over	2,250	375	700	7	100

Source: Ministry of Housing, Ministry, Economic Planning and Development.

The number of housing units required each year for the next five years by cities are estimated as follows:

Table 27

Nairobi	5,880	Eldoret	420
Mombasa	2,000	Thika	500
Nakuru	640	Kitale	60
Kisumu	400		

In the face of this heavy demand, actual construction has not been able to keep pace. In 1968, only 275 private residential units were built at a cost of £1.65 million; public housing units completed amounted to 1,468. It is predicted that the number of public housing units constructed this year will be about 1,000; the number of private residential units between 300-400 units.

Five Year Housing Programme

As part of the Development Plan, 1969-1974, the Government is projecting a housing programme to cost £53 million starting with £3.83 million the first year and rising to £6.7 million the last year. Some of these appropriations will be for institutional housing.

Most of the money will go to the National Housing Corporation which contracts direct with builders, or indirectly through local authorities. Loans to municipalities bear interest at 6½ per cent and run for twenty years in the case of tenant purchase schemes, and up to forty years on rental projects.

The maximum value of housing financed by NHC is fixed at £1,200 although it is reported that this limit has been exceeded in the past.

The Government also plans to spend £3.9 million on so-called site and service schemes which are intended to meet the needs of the lowest income groups. £2.26 million are earmarked for rural housing to be spent over the five year period.

Illustrative of the Government's plan for spreading its funds over different grades of housing is the division proposed for 1970-1971. 4,730 units are to be constructed, as follows:

Table 26

£ Value	Number of Units
0 - 250	2,020
250 - 600	1,940
600 - 900	500
900 - 1,200	270

[illegible] more than £1,[illegible]0, [illegible] Corporation of Kenya. [illegible] per cent on loans representing [illegible] for periods of 15 to 30 years. [illegible].

It is apparent that about half the [illegible] required to finance the [illegible] planned to be built in the next five years will have [illegible] outside the Government. For example, the city of [illegible] is planning to build 10,0[illegible] units of [illegible] cost less than £1,000. A large part of the [illegible] of £4 million will have to be borrowed, probably from those agencies which have made loans on housing to the city in the past.

Pre-fabrication

Although much of the capital required for the five year housing programme is being allocated, there is still no certainty that the building industry will be able to produce in sufficient volume within the cost limits of the classes of housing most in demand.

For example, a typical 2-room house provided low income families [illegible] of [illegible] block construction on a concrete base and comprises [illegible] sq. ft. The cost of this house varies from £600 to £900 depending on the locality where it is erected.

Another 3-bedroom house with an area of 500 square feet built of pre-fabricated concrete panels has been constructed at a cost of £450.

Although there has been this experimenting with concrete construction, traditional building methods are followed on most projects. The costs of materials and labour for this type of housing are on the increase; from 1963-1968, the index of building costs rose from 91 to 154.5. To make matters worse, the costs of supplying utilities and services

is very high in relation to the cost of the houses.

Integrated Production Scheme

For these reasons and others, the Government has been investigating housing of new design which could be built of timber, and other locally produced materials, according to mass production methods. It is conceived that an integrated operation with all major materials supply not otherwise available on satisfactory terms, as well as construction, under one ownership and management, might result in greatly increased output of housing of acceptable quality at the lowest possible price.

Such a scheme is particularly attractive because 15 - 30 per cent of the total cost of a dwelling unit is now made up of imported materials. Moreover, Kenya has ample resources of timber - cypress, cedar, pine and podo - which the Government feels should be devoted to housing.

Experimental timber housing is now being built in Nairobi and Nakuru to demonstrate the uses of local materials and new construction methods. Figures showing the costs of these houses will be available within a month or two.

Considering the urgency of the housing situation, discussions have been entered into with two foreign companies experienced in large-scale production of inexpensive houses of wood construction. In each case, the organization of an integrated production scheme was believed to be a pre-requisite to their participation:

In plan, the scheme would eventually involve:

One sawmill, complete with kiln and pressure impregnating facilities.

One plant to manufacture fibroue plaster board for interior finishing.

One plant to prefabricate modular units of various types of housing specially designed for each construction.

Accessory to this plan, but not necessarily a part of it, is a

proposed to construct a 10,000 ton fireboard mill making soft and hardboard [illegible] quantities. Such a plant is intended to serve [illegible] the East African market, including housing. Similarly, [illegible] would be given to the establishment of a [illegible] growth plant, [illegible] co-operation with one of the [illegible].

[illegible] feasibility study of this integrated production scheme [illegible] at the earliest possible time. One or both of the interested [illegible] would be helpful in such a study although [illegible] the Ministry of Commerce and Industry to [illegible] in the activities.

[illegible] question would be the number of housing units of different types which the proposed organization might be able to produce. A minimum, economic operating level (break-even point) could, of course, be determined; but a more important question is the amount of financing that will be available for, let us say, low and middle income housing.

It is demonstrable that an organization capable of producing 500 units of acceptable housing at relatively low prices could expand to the point where it could turn out 1,000 units or 5,000 units, by expanding its facilities.

Experts in the Ministry of Housing estimate that the least expensive of the timber housing now under consideration could be built in large numbers for about £300 per unit. This would be a 2-room house on a concrete base comprising 321 sq. ft. with inside toilet and shower bath. Since there is no financing available for housing costing less than £1,200, excepting Government financing through NHC, it appears that direct allocations of a portion of the Government's appropriations would have to be made for such construction from year to year. At the same time, consideration would have to be given the question of acquiring additional

financing from outside sources.

Action by the Government along these lines should be based on the overall feasibility study just suggested, including studies of the individual industrial projects proposed in the integrated production scheme with which the Mission is concerned. Some of these projects, and others, are described in the following section of the report, entitled "Building materials".

Building materials

The complexity and diversity of the building materials and components [illegible] and the absence of statistical data pertaining to production, import and consumption and the present changes in distribution channels for these materials in Kenya, make it difficult to get a clear picture of this sector. However, [illegible] dealing with the increasing building activity [illegible] the Government is of the opinion that a full scale study of the building materials and components market ought to be done. Earlier studies of [illegible] are available, namely the United Nations Mission to Kenya on Housing (1) and the study made by the University College of Nairobi of the Kenyan building industry (2) have only lightly touched upon the building materials sector. The ECA/Bouwcentrum Mission to Kenya in 1967 recommended among other things that a study of the building materials industry should be undertaken.

This mission has collected some information on the building materials sector and has tried to identify products, which could be produced in Kenya. Pre-investment studies on a few of these has been made.

Asbestos Cement Products

Asbestos Cement products are finding an increasing use in Kenya, especially in the form of A/C sheeting for industrial buildings and for roofing in low cost housing. A/C products in the form of pipes are also imported and the quantities are seen in Table .

TABLE 29

Imports of Asbestos Cement Products, Tons

	1967	1968
Sheets and tiles	5,020	5,800
Pipes	1,515*	2,250**
	6,535	8,050

(1) United Nations Mission to Kenya on Housing, prepared for the Government of Kenya by L.N. Bloomberg and Charles Abrams, United Nations, 1964.

(2) Constraints & Costs in the Kenya Building Industry, by E.J. Wells, and E.R. Rado, Institute for Development Studies, University College, Nairobi, 1968.

* of which 5,850 tons from Uganda

** of which 3,950 tons from Uganda

The total imports in 1965 were 8,050 tons, and if consumption increases with the projected building activity (see Table , page) Kenya will be using 15,000 tons by 1970. This is the output from a 1-cylinder plant working 2 shifts and in the following the economical feasibility for installing such a plant in Kenya will be studied.

Raw Materials

(a) Cement. Cement is produced by two cement factories, one in Athi River, 16 miles south-east from Nairobi, and the other just north of Mombasa. Both produce cement in surplus quantities. The price in Nairobi is Shs. 251/ton, in Athi River Shs. 244/ton and in Mombasa Shs. 187/ton. Bulk deliveries are Shs. 8/ton.

(b) Asbestos. Anthophyllite is the only asbestos mineral occuring in any quantity in Kenya. Mining has been done for over 30 years but output has with few exceptions been only a couple of hundred tons per year. The deposits, so far as is known, with one exception, are small. In 1965 production was only 50 tons. However, there are indications that Kenya has more asbestos[1], but exploration must be done to find out the location and magnitude of the deposits. The U.N. Mineral Resources Survey in its last Report has recommended that exploration for asbestos be carried out.

A deposit of anthophyllite in Makimyambu, Taita Hills, Coast province, has recently been surveyed by the Mines & Geological Department and the ore reserves have been estimated at 1 million tons. Unfortunately the ore is heavily contaminated with carbonates and the tensile strength of the fibre is low. The Mission has had a sample of this and other ores tested[2] with a view of possibly mixing in a smaller amount with imported asbestos. The received statement says: "The asbestos are from Makimyambu seems to be more suitable than the Sigor or Wewey samples. It containe plenty of sand, which can be taken off by milling and by carefully preparing the asbestos. There are some fibres, of sufficient strength so we believe at least a limited quantity of 10 to 15 per cent of these fibres could be used, if they can be delivered in clean quantities".

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[1] Until recently a very good asbestos has been delivered from Kitale to a Nairobi firm, but production has ceased because of illness.

[2] Gebr. Mehrhahn, Delmenhorst, Germany

Obviously the quantity of the only known large deposit in Kenya is poor, and no production of A/C products can be based on that deposit. However, it is not necessary to base a local A/C production on local asbestos. Only very few countries can do that. The overwhelming majority import the asbestos and as Kenya can get a very good long-fibre asbestos from another African country, namely Swaziland, the economical feasibility of production of A/C products will be made, based on such import.

Table 38

The estimate will be based on the following prices per short ton f.o.b. Lourenco Marques:

Quality HVL 3: R200.00
HVL 4: R160.50
HVL 5: R123.60

Both sheets and pressure pipe production will be foreseen. The following mixtures will be used:

Sheets:	15 % HVL 3 @ Shs. 2,200 =	Shs. 330
	25 % HVL 4 @ Shs. 1,760 =	Shs. 440
	60 % HVL 5 @ Shs. 1,360 =	Shs. 816
		Shs.1,586
	Freight to Mombasa	50
	Rail to Athi River	100
		Shs.1,736/ton
Pipes:	25 % HVL 3 @ Shs. 2,200 =	Shs. 550
	35 % HVL 4 @ Shs. 1,760 =	Shs. 616
	40 % HVL 5 @ Shs. 1,360 =	Shs. 544
		Shs.1,710
	Freight to Mombasa	50
	Rail to Athi River	100
		Shs.1,860/ton

Three possible sites for the plant can be chosen between namely Mombasa, Athi River and Nairobi. The lowest cost of production would be achieved in Mombasa and the highest cost in Nairobi. Transport cost

to the largest consumption centre would be highest from Mombasa and likewise nearest. Therefore, for the purpose of this calculation, Athi River has been chosen as site for the plant. If the plant can be situated next to the existing cement plant, cement can be transported pneumatically to the A/C plant and no cement silo will be necessary for cement storage, thus giving corresponding savings.

When planning the part of the plant for the production of pipes one can chose between a proper pressure pipe machine or a Hatschek type plant, which however can only manufacture low-pressure pipes. While the latter plant is considerably less expensive only the former can produce high-pressure quality pipes and therefore a fully automatic pressure pipe machine has been chosen.

As the consumption of A/C products in Kenya will not be so great as to allow both the pipe machine and the sheet machine to run 3 shifts the year round, it will be assumed that the sheet machine runs 200 days per year and the pipe machine 100 days per year with for example 2 weeks sheet production, 1 week pipe production, etc., while the same labour force is being used. As sheet plant and a pressure pipe plant work approximately according to the same system, the same preparation line consisting of desintegration, balances, turbopulper and rabbling vat can be used as well as other additional equipment such as settling tanks, vacuum installation, spraywater pumps, backwater pumps, etc. In the following the investment cost and cost of production for such a plant are estimated.

Table 31

FINANCIAL ESTIMATE

For a combined Plant for manufacturing Asbestos-cement pressure pipes and flat and corrugated sheets.

Type: Wehrhahn 1-cylinder sheet machine + 1 fully automatic pressure pipe machine.

Capacity: 10,000 tons/year per machine

Working Hours: [illegible] hrs/day

Working Days: 300 days/year

Proposed Location: Athi River

Table 31 ...t.)

A. CAPITAL INVESTMENT

1. Building site, 5 acres @ Shs. 5,000	Shs. 30,000	
2. Factory buildings, 3,000 m²	364,000	
3. Roads, fencing, fencing, water tower, transformer, etc.	150,000	
4. Machinery and equipment:		
Material preparation	280,000	
Pressure pipe production	1,170,000	
Pipe finishing	300,000	
Socket finishing	236,000	
Additional equipment	535,000	
Laboratory equipment	150,000	
Spare parts	155,000	
Mandrels, pipe production	185,000	
Mandrels, socket production	46,000	
Sheet production	360,000	
Templates + intermediate plates	125,000	
Additional equipment	15,000	
Working and spare parts	44,000	
	3,601.000	
Tansport + insurance and transport to site	180,000	
Installation	225,000	4,006,000
5. Preliminary expenses and administration during building period, publicity		100,000
Total investment cost		**Shs.4,650,000**
6. Working capital,		
3 mo production and sales cost, excl. depreciation and contingencies		1,500,000
Total capital requirements		**6,150,000 Sh**

Table 31 (cont.

B. ANNUAL COST [illegible]

Raw materials:

Sheet production, 200 days			
Cement, 5,000 tons @ shs [illegible]	Shs.	1,[illegible]	
Asbestos, 850 tons @ shs [illegible]		1,4[illegible]	
Water, 3,000 m³ @ shs [illegible]		[illegible]	
Pipe production, [illegible] days			
Cement, 2,500 tons @ shs [illegible]		[illegible]	
Asbestos, 475 tons @ shs 1300		610,000	
Water, 1,500 m³ @ shs [illegible]		750	Shs. [illegible]
Labour:			
1st shift, 1 engineer @ 2000 shs/mo		24,000/- yr	
1 foreman @ 800 "		9,600	
3 mechanics @ 600 "		21,600	
22 labour @ 350 "		92,400	
2nd and			
3rd shift 2 x 1 foreman @ 800 shs/mo		19,200	
2 x 3 mechanics @ 600 shs/mo		43,200	
2 x12 labour @ 350		100,800	310,[illegible]
Utilities			
Electricity, 200 days x 70 kw x 24 h		40,300	
@ 0.12 shs			
100 days x 300 kw x 24 h			
@ 0.12 shs		86,400	
Sieves		36,000	
Felts, 25 pieces		150,000	
Lubricants,		20,000	332,7[illegible]
Maintenance			40,00[illegible]

(1) Present price is shs. 244/ton. For delievery in bulk and to a large customer, 10 per cent discount has been allowed.

Depreciation:		
Building, 20 yrs	25,500	
Machinery, 10 yrs	400,000	425,500
Interest:		
6 % on total investment cost,		370,000
Administration:		
[illegible] superintendent	36,000	
[illegible] ntant	12,000	
[illegible] tary	6,000	
[illegible] s	12,000	66,000
Selling costs:		
Sales manager, salesmen, commissions, advertising and publicity, service, telephone, mail, etc. 12 % on sales.		925,000
Contingencies:		42,750
	Total costs	6,450,000 Shs.

C. PROFIT POTENTIAL

Sales: 6,666 tons of sheets @ 770 shs/ton (1)			
	= 5,130,000		
less 20 % sales discount, breakage, etc.	1,026,000		4,104,000
1,334 tons of pipes @ 1,200 shs (2)	4,000,000		
less 10 % discount	400,000		3,600,000
			7,704,000
less cost of production			6,450,000
Gross Profit		shs	1,254,000
	= 27 % on total investment cost.		

(1) This corresponds with present selling price in Nairobi, including a recently introduced 15 % discount.

(2) Present selling price in Nairobi for imported 8 in.pipe, class B is 1640 shs/ton and for the same pipe, class D, 2200 shs/ton. A 4 in. drain pipe costs 1035 shs/ton.

Gypsum

Gypsum occurs at several localities in the North-Eastern province in the [illegible] and also in the Kajiado area in the Rift Valley. In this latter area there are two producers, one of whom is providing one of the cement plants in Kenya with its entire supply of gypsum and the other with part of its needs. The other producer calcines the gypsum and produces building plaster though on a relatively small scale.

The first deposit is said to be 2 miles long and 1 mile wide but no real estimate of the tonnage has been made. However output has been steadily increasing and in July this year the production figure for 1968 had already been doubled. The second deposit, which is 10 miles apart from the first one, has been estimated to contain 8 million tons. Both enterprises are interested in finding new use for gypsum and the Mission has proposed the manufacture of gypsum slabs, fibrous plaster, plaster board, ceiling panels and/or acoustic tiles.

Plaster of Paris can be made either in a rotary kiln, on a travelling grate bold or in calcining kettles. Genuine hard plasters however must be produced in autoclaves. For a relatively low production, the calcining kettle is ideal. The procedure consists of milling the rock in a hammer-mill and then passing it through a desintegrator to produce a fine powder. The powder is then calcined in the kettle, which is oil-heated and equipped with a stirring device. The operation is a batch process. The calcined powder is then put through an atomiser taking the powder down to about 300 mesh. By varying the grain size, the temperature and the time in the kettle, the setting time of the plaster can be varied according to what is requested and the use to which it will be put.

Gypsum slabs, for partition walls, poured from a plaster mix with or without aggregate can be made in a fairly simple, water-cooled machine, (1) which produces 12 to 24 slabs 50 x 66 cm, 6, 8 or 10 cm thick per working cycle of 10 minutes. The slabs can be made with tongue and groove.

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(1) For example the Exakta by Wehinger, Austria.

These slabs weigh 55, 75 and 95 kgs/m^2 respectively. Their cost depends of course mainly on the price of the plaster, which is the main raw material, can be purchased or produced at. The machine produces about [illegible] m^2 per 8 hour shift operated by two men, it needs 20 kw of electricity supply and also process and cooling water. The machine costs £ 11,000 plus freight cost to Mombasa estimated at £ 450. As partition walls are easily and quickly erected with these slabs and no water is introduced in the building, they may find a good market in Kenya, provided they can be produced at a competitive price.

Fibrous plaster is a thin sheet or slab of plaster, reinforced with a fibre, usually sisal fibre. This makes the slab so strong that it can be produced in large sheets, usually storey high and 4 to 6 ft wide but even larger sheets up to 24 ft x 9 ft are produced.

The production is usually carried out on a half industrial half artisan scale where the only machinery needed is a mixer and some transport facilities. The plaster mix is poured on large concrete tables, which may have a flat steel surface or the concrete itself may be trowelled to a high gloss. Plastic surfaces are also used. The table is greased before the mix is poured. Steel bars, 1/16 in. thinner than the sheet thickness required are laid at the edges of the table to retain the plaster while it is setting. Retarders are used to modify the setting time. When the plaster has been poured, cut and fluffed up teased sisal fibre is spread evenly over the surface - about 11 ounces per sq. yd. - and then forced into the plaster with a roller, whereafter the surface is smoothed. While the plaster is setting on one table the crew casts another sheet on a second table. When the sheets have set they are lifted into a vertical position and carried to the drying racks.

The fibrous plaster is used in countries as far apart as Spain and Australia (1). The main use is as an internal lining for walls and as ceiling panels and as it is fire-proof, strong and easily fixed it could well find a market in Kenya where both raw materials exist. Its

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(1) In Australia further information may be had from:
The Associated Fibrous Plaster Manufacturers of Australia, 24 Bond Street, Sydney N.S.W.

price will mainly depend upon the price of the plaster. Today building plaster costs £ 30/ton in Nairobi, which is very high but with larger or additional production it will probably decrease.

The investment for machinery and additional equipment for a small plant with 6 tables producing 2,000 sq.ft. fibrous plaster per shift with a crew of 6 men, will cost less than £ 5,000. Consumption of raw materials will be 500 tons of plaster and 20 tons of sisal per year for the production of 600,000 sq.ft.

Plaster board refers to panels made of plaster, the surface and longitudinal edges being sheathed in a closely adhering special cardboard, which has the double function of exterior reinforcing and surface finishing. It has the same use as the fibrous plaster. It is produced in large, fully automatic industrial plants where the plaster mix is discharged continously between a lower and upper endless cardboard web, which passes at production speed over a forming table, through a combined convention-radiation drier followed by a cooler and cutting and trimming station.

The capacities of plaster board plants are generally 1000 or 2000 m^2 per hour, the smallest having an output of 250 m^2 per hour producing 1.5 million m^2 or 15 mill.sq.ft. per year, working 3 shifts. Even this quantity is large for the Kenyan market where the output from one shift would suffic

A market study must be made to determine whether the output from a 1-shift operation i.e. 500,000 m^2/yr can be sold in Kenya or East Africa. This Mission has not been able to make such a study but as it is necessary to know at what price plaster board can be manufactured a cost calculation has been carried out for a 3-shift operation and the break-even point has been decided to see if a 1-shift operation is possible.

Table 32

COST ESTIMATE

for a 250 m^2 per hour Plaster board plant

A. Plant cost

1.	Machinery and equipment, including silos, mixer, forming station, conveyors, drier, take-off unit, etc.	3,150,000 Sk
2.	Transformer 400 kw, cables etc.	290,000
3.	Erection and commissioning	740,000
4.	Freight to Mombasa	40,000
		4,220,000 Sk
5.	Land, 15,000 m^2, and factory building, 100 x 24 x 5/12 m	1,600,000 Sk
6.	Workshop, laboratory, admin. building, roads, forklift trucks e.o. equipment	850,000 Sk
7.	Hot-oil unit w. pipes and compressor 5,000 l/min, 8 atm	330,000 Sk
	Total investment cost	7,000,000 Sk

Table 3 (cont.

B. Raw material cost and utilities.

		kg/m^2	¢/m^2
1.	Gypsum	0.3	0.63
2.	Wood pulp	0.1	0.19
3.	Foam		0.02
4	Adhesive	0.00	0.03
5.	Starch	0.0	0.10
6.	Accelerator	0.1	0.10
7.	Retarder	0.1	0.5
8.	Cardboard	0.7	1.20
9.	Glassfibre		0.20
10.	Water	6.0	0.05
11.	Heat transfer oil	9.0	0.25
12.	Electricity	0.30 kwh	0.04
		Total material cost:	2.96 ¢/m^2

C.	Production cost (3 shifts operation)	¢ per sq.ft. board
1.	Capital cost (1)	0.36
2.	Material cost	2.86
3.	Labour, 45 men, 3 shifts (2)	0.16
4.	Administration, 10 persons, 1 shift (3)	0.05
5.	General overheads and repairs	0.34
	Total production cost:	3.77 ¢/m^2

(1) at 8% per annum and an amortization of 10 years average capital cost.

(2) with 9 operators and 1 foreman per shift; 4 mechanics, 2 electricians, 4 drivers and 5 packers per 2 shifts.

(3) with 1 technical and 1 commercial manager, 9 clerks.

Break- [illegible]

[illegible] to the [illegible] sq.ft. As is [illegible] per cent of capacity. [illegible] per cent to [illegible] per cent of capacity, [illegible] is possible although it [illegible].

[illegible] that such a feasibility study ought to be [illegible].

Acoustic tiles is a product which could easily be produced in Kenya and used instead of imported tiles. Various types can be manufactured, but if one wishes to find use for gypsum, they should be made from plaster of paris and mixes for example with vermiculite, pumice or sawdust and/or shortfibre asbestos if that is available at a reasonable price. Overseas this type is made with mineral wool, but as that is not available in Kenya one could possibly use waste from textile mills.

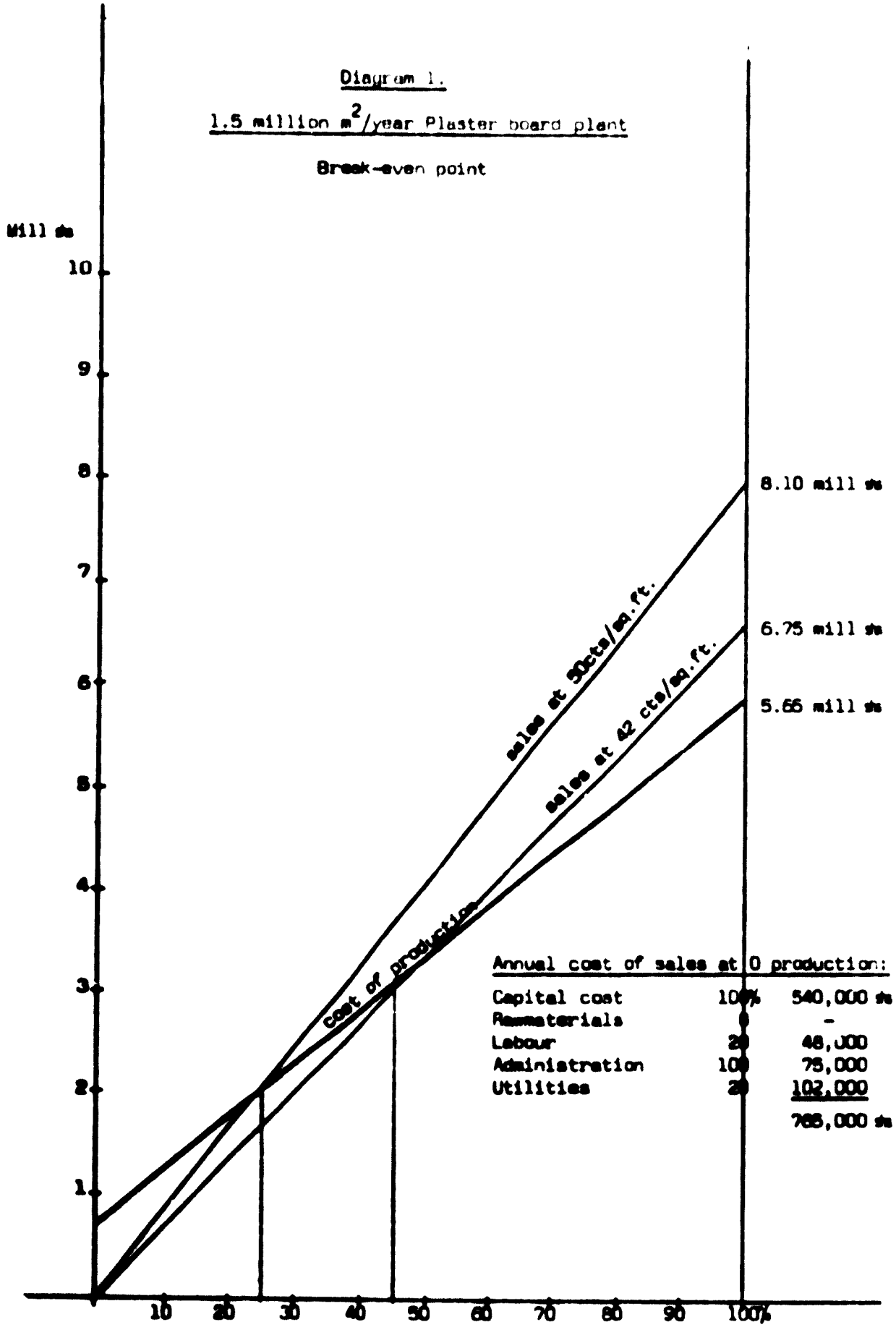
The manufacture may be very simple, similar to that used for the production of fibrous plaster. A number of moulds or frames the size of the tile to be produced, for example 12" x12" are put on a table with a smooth surface, the mix is poured into the moulds (which have no bottom), and the upper surface is levelled with a wooden ruler. This should be done with a few quick strokes so that a relatively rough surface is obtained. The surface should not be smooth, because the rough surface gives the tile sound absorbing quality. When the tile has set, it is taken out of the frame and stacked vertically and allowed to dry. The sound absorbing quality can be increased if the tile is provided with a series of small holes, i.e. it is perforated. This can be done with a die, full of spikes, but must be done at just the right moment of setting for the plaster.

The Mission believes accustic tiles can advantageously be produced in Kenya, and has recommended the gypsum producers to consider such manufacture.

Diagram 1.

1.5 million m^2/year Plaster board plant

Break-even point



Annual cost of sales at 0 production:		
Capital cost	100%	540,000 $s
Rawmaterials	0	-
Labour	20	46,000
Administration	10	75,000
Utilities	20	102,000
		765,000 $s

Fiberboard

[illegible] in Kenya, [illegible] these discussions. [illegible] East Africa market, [illegible] considered to be too small [illegible] for [illegible] table.

[illegible] 33

[illegible] years [illegible]

	Kenya			East Africa		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chipboard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hardboard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34,250
Softboard	2,[illegible]	1,[illegible]	[illegible]	[illegible],0	[illegible]	[illegible]
Other	307	1,454	[illegible]	[illegible]2	1,921	[illegible]
Total	9,[illegible]	[illegible],0[illegible]	[illegible],[illegible]	[illegible],[illegible]	[illegible],[illegible]	[illegible],[illegible]

In 1968 the various [illegible] taken together in the import statistics, but if the [illegible] distribution [illegible] previous years is assumed, i.e. about 60 per cent below hard board, then the 1968 figure would be 8 million sq.ft. for Kenya [illegible] for the [illegible] East Africa, or in tons (assuming 5 mm board), 3,600 tons in Kenya and 4,000 tons for East Africa. This latter figure is an economic unit.

The building activity in Kenya - and consequently the use of building materials - is illustrated in Table 34.

Table 34

Total planned and projected expenditure on housing public and private sector, in million £

1968	1969/70	1970/71	1971/72	1972/73	1974/75
6.7	7.15	4.46	10.63	12.85	13.68

Source: Development Plan

If the consump[illegible] on housing, Kenya [illegible] have reached [illegible] in 1972. An [illegible] to start the [illegible] be made.

[illegible] mill located [illegible] opinion, that [illegible] are found and [illegible] consumption in. [illegible] areas while a [illegible] Nairobi.

It is not the [illegible] mill, but to [illegible] suitable rawmaterial [illegible] and probably make a [illegible] feasible.

In the manufacture of [illegible], [illegible] then processed with [illegible] pressure of 30 psi for [illegible] drawn off and the [illegible] the manufacture of [illegible] mission (1) show that [illegible] part of the processing has already been carried out, it must obviously be cheaper to use this rawmaterial than any other. It is true, that the spent bark must be replaced by other fuel, but its value as fuel is minor. The spent bark, when put into the furnace of the boiler, has a moisture content of 70 per cent. Thus 700 kgs of water must be evaporated, which takes 100 kgs of dry bark, with the result that 1 ton of spent bark can be replaced by 200 kgs of wood.

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(1) By the Swedish Forest Products Laboratory.

The [illegible] bark [illegible] composition:

Extract	[illegible]	1%.
of which [illegible]	[illegible]	14.
Water	[illegible]	1[illegible].
Fibre	[illegible]	[illegible].

The [illegible] of extracting [illegible] per cent [illegible] during the harvesting season for [illegible] the rest of the year. [illegible] or thinnings, which are [illegible] from the saw[illegible] [illegible] of little value can be [illegible] the [illegible] of the wattle extraction [illegible].

The question of water supply is a basic factor when a fibreboard plant is being [illegible]. [illegible] day processing of timber must be utilized. [illegible] particular case the wattle extract company is situated very close to the Umgeni River, which [illegible] 1903 had a mean flow of [illegible] acre ft., [illegible] c.ft. per sec. The proposed plant will use approximately [illegible] c.ft. per sec. However permission to use water from the river [illegible] the Natal Town and Regional Planning Board who also will stipulate the conditions under which the effluents may be discharged back into the river. The quality of the water may be judged from the fact that Pietermaritzburg town takes its entire water supply from the said river.

In the following a cost estimate for a fibreboard mill under the previous conditions will be made. The initial capacity will be laid out for a production of 2[illegible] tons per day, i.e. 6[illegible] tons per year. It is cheaper to run a 6000 ton plant at full capacity than a 10,000 tons plant at 60 per cent capacity. The investment cost for the larger plant, in

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(|) It would be preferred if spent bark could be used the year round as there otherwise will be a slight difference in colour and quality. The bark is also cheaper than the wood. This is something that has to be studied.

machinery only, is 20 per cent higher. However, the layout for the plant should of course be made for future expansion. A thorough market investigation of Kenya's future needs, of the Common Market's development and possible exports to other neighbouring countries, a study which this Mission has not had the time or opportunity to make, must ultimately decide the size of the plant.

The Cost Estimate would be based on the following assumptions:

(a) the mill will receive 1½ tons of spent bark and 4½ tons of wood,

(b) the value of the spent bark is equivalent to its replacement by wood-fuel the cost of which, in this case, is Shs. 45/- per ton at the boilers. Thus 1 ton of spent bark = 0.2 ton of dry wood or 0.3 ton wood @ Shs. 25 = Shs. 7.50/ton.

(c) no value has been stated for chippings, as it is not known whether or what quantity might be available; there is a ready price for wood-fuel and it will be used, although this obviously is not the case as waste at most mills is burnt or given away.

Table 46

COST ESTIMATE

For a 6,000 tons per year Fibreboard Mill

Plant Cost

(a) General costs for plant site, road works, wood yard, water and sewage, power connection, etc.	Shs.	200,000
(b) Building cost		1,300,000
(c) Production equipment, including log chipper, chip screen, defibrating machine capacity 25 tons/24 hrs., raffinating machine with decker of screw type, capacity 40 tons per 24 hrs., sizing department, a Fourdrinier machine for 25 tons/hour planned to be expanded to 50 tons/hour, 1 2000 tons press with 10 openings, heat treatment and conditioning equipment, steam plant, water pump station and water treatment plant, impregnating department, production control department, repair shop equipment, consulting cost and projecting fee including supervision of building work and erection.		5,600,000(1)
(d) Freight and transport cost for 250 tons of machinery		90,000

(1) If the mill should be designed for spent bark only, this price can be lowered as it includes log chipper and both defibrating and raffinating machines. However, it might be wise to have the possibility of using wood as well.

Table 4 (cont.)

(e) Customs duties, etc.

(f) Erection cost 110,000

Total cost of the Mill: Shs. 2,200,000 (1)

Estimated cost of Production — Per ton fibreboard

A. Raw materials and other operating costs:

(1) Bark, 150 days x 40 tons (= 20 tons dry)
@ Shs. 250 = Shs. 50,000

+ wood, 140 days x 10 tons
@ Shs. 25 = Shs. 41,000

Shs. 91,400 — 29

(2) Fuel for steam, 0.2 ton wood fuel
@ Shs. 25 — 18 (2)

(3) Electric power, 400 kwh @ Shs 0.12 — 48

(4) Water, 30 m^3 @ Shs. 0.15 — 5

(5) Wires and rope sheets, stainless sheets, sizing & oils, repair costs — 12

(6) Wages for workers, 1 man-day — 15

B. Administration Costs:

Manager	Shs. 30,000
Engineer	24,000
Accountant	12,000
Secretaries	12,000
Foreman, repair shop	10,000
3 shift foremen	30,000
Clerk, paymaster	8,000
Cost of mill administration:	126,000 — 21

(1) A conventional 10,000 ton plant costs $2 - 2½ million, i.e. more than twice this figure.

(2) During the time of the year when the hot, spent bark is taken direct from the extracting plant, less steam and electricity will actually be used.

C. Interest of working [illegible] %

D. Depreciation of total cost of [illegible] plant, [illegible] %

10 % on [illegible]

[illegible]

This cost price, although [illegible] with the c.i.f. value [illegible] available figure was Shs. [illegible] Nairobi is Shs. [illegible] 8' x 4' 6 mm hardboard sheet, which equals [illegible].

The mission recommends that the [illegible] fibreboard mill with the present wattle extraction plant and sawmill be followed up and that more detailed studies be made. The Swedish Forest Products Laboratory has undertaken to carry out tests on the raw materials during a period of 2 months for a fee of Shs. 14,000 for which they need 500 kgs. of dry, spent wattle bark. The Mission has passed this information on to the company concerned, who have also received a sample of the hardboard produced from their spent wattle bark.

Wood-wool cement board is another type of building board which the mission believes could advantageously be produced in Kenya. It is now imported in significant quantities and is used as ceiling panels and for partition walls. Other uses are for roofing and also as fill-in material in wooden frame houses. In many countries it is used for low-cost housing projects. The large panels, which are strong and light, are quickly erected. The raw materials used are wood-wool or wood chips mixed with cement, both of which are available in Kenya.

Machinery and equipment for a plant producing 1.7 million sq.ft. per year of 2 in. board, i.e. 10,000 cu.yard per year, will cost approximately £ 60,000 erected in Kenya. Cost of production would probably be under 1 shs per sq.ft.

As an alternative to cement as binder, magnesia cement can be used. Recently a different type of a glue-like binder has come to use, which is said to produce a superior board, although it may be somewhat

[illegible] that a type of bonded wood-wool or wood fibre board with fire resistant properties and recommends that a study for the manufacture of these boards be carried out.

Straw board is made from straw which is pressed together under heat and pressure to utilize the lignin-cellulose feature of the straw. [illegible] to the wood-wool cement to [illegible] The raw material, the straw, [illegible] when harvesting, the straw is cut short. However [illegible] have made it known that straw for this purpose could be [illegible].

A factory for the production of straw board with a capacity of about 3 million sq.ft. per year would cost about £ [illegible] installed in Kenya. The sales price would probably be approximately 1 sh per sq.ft. or similar to wood-wool cement board. The two types of boards for many instances be substitute for each other.

Before the straw board is considered for manufacture in Kenya, it is important to find out whether by-laws and regulations permit their use in the various forms contemplated and that the acceptance of governmental and local authorities is secured.

Chipboard is being produced in Uganda and another plant is under construction in Tanzania and both together will be able to more than cover the whole East African market. There is however one possibility that could make it feasible to also erect a plant in Kenya, namely if the extrusion process was employed which can use valueless sawdust and convert it into large sized panels of tubular board up to 5 in. thick which can be used directly as loadbearing exterior wall elements. If such a plant is directly combined with an assembly-line production of standardized prefabricated houses it may not only be feasible but also profitable and thereby contribute to solving the housing problem in Kenya. The Mission recommends that a complete cost estimate of the manufacture of extruded tubular board is made.

Lime

Limestone deposits in the coastal area [illegible] done in two places, one at [illegible], the other at [illegible], the Pliocene lake formations at [illegible], and from Nairobi, using [illegible] using coral, but that [illegible] lime contains [illegible] the marble [illegible] magnesia.

Besides burnt lime, [illegible] for agricultural purposes, and the three firms also produce crushed stone and marble sand. Only the two firms producing hydrated lime, [illegible] production of all the lime products from the two firms is about 1,500 tons. Lime is imported from Tanzania and Zambia at considerably higher prices than the locally produced lime.

It is the Missions opinion, that more lime could be used and should be used if it was more readily available, especially in hydrated form. The present contractors hesitate to use quick-lime, which must be slaked, and if the slaking is not done properly, bad results are achieved. It is recommended that a proposition which the Mission has made to one mining company to set up lime-burning between Athi River and Nairobi from a pure limestone deposit which has been discovered, should be followed up, and that hydrated lime should be manufactured. It is important, that a well designed hydrator be used so that high quality lime can be produced. The Mission also hopes that negotiations which are going on to put the Tembaca lime burner back into operation, shall succeed. Equipment for the production of hydrated lime does exist there.

Structural clay products

The pre-requisites for production of clay bricks and other clay products do not seem to be at hand in Kenya. The raw material the clay, which so far has been used, is not of the proper quality for production of ceramic products, and that may be the reason why the brickworks in Kenya go bankrupt.

In Mombasa there are two brick works, one of which went bankrupt five years ago and was then bought up by the creditors. They have a very difficult clay, which when drying gives a very high rate of breakage and on top of this it must be burnt at a very high temperature (1100°C) to reach the irreversible

point, and that for 24 hours. Under such circumstances it is not easy to run the works economically.

In the Nairobi area [illegible] valley, there are two brick works, which during the last years [illegible]. The larger one, which has a capability of [illegible] bricks a day, [illegible] definitely [illegible]. [illegible], because they are full of [illegible], [illegible] the clay, which is the [illegible], and in spite of bringing [illegible] clay, a quality product could not be made. However there is the [illegible], of treating the clay in a pre-preparation plant, which would cost an estimated £45,000, which could remedy the fault, but the present owners do not think this is worth while trying, especially, as the market is uncertain. The smaller brick work, which is situated next to the larger one, produces some brick from time to time, when there is demand for them.

In the Highlands in places like Eldoret and Kitale clay bricks are produced in a less sophisticated way. When someone intends to build a house or needs bricks, he sends his men in the bush where they dig the clay, hand-mould bricks, puts them in a clamp, cuts wood-fuel and fire the bricks. The bricks are not and cannot be of any outstanding quality, but they build houses with them and they stand up. As people seem to be more brick minded in this area it is possible that industrial brick manufacture there could be feasible.

In the Nairobi area, where the clay is unsuitable, it is doubtful whether a new brick works, which is being contemplated, can be successful. Although a clay has been discovered, which shows the right properties, the deposit is in Masai land, where it is difficult to get a lease, and the transport cost to Athi River, where the plant would be located, will probably be high. Even if a first class product is produced, which it supposedly would be, the market has, because of the earlier, limited and off-and-on production of low quality, probably built up a certain resistence to brick products. It is therefore of vital importance, that a proper market study is made before any step is taken.

The large brick works [illegible] closed down, has [illegible] concrete and concrete [illegible] expanded clay aggregate, which, when used as ballast in concrete, produces a strong and light [illegible] steel.

The process, which is used in the production of [illegible], is characterized by heating clay, [illegible] to a temperature that chemically bound water or gases are driven off at a stage when the clay is just soft and about to melt, whereby the interior pressure of the gases makes the clay nodule expand in volume. Immediately thereafter the nodules are cooled off and thus stay porous, with the interior similar to pumice but with an exterior hard skin around the nodule.

Some clays show this bloating effect, others not and therefore the clay to be used must first be properly tested. If the Gatharaini clay should prove not usable, the other clay from Karura might prove suitable, and besides it is much more plastic. Another property of importance is the lime content, which should be low, as otherwise the melting point will be too high. If an otherwise easily available and suitable clay shows a low bloating effect, this can be remedied by mixing in an organic substance, which gives off gases at the right temperature. Mostly used is spray-dried sulphite liquor, which would then have to be imported. There are however other substances, which can be used, one of them being dried sewage sludge.(1)

There are, in principle, three different types of kilns which can be used in the production of expanded clay, namely the rotary kiln (LECA), the moving grate belt (LURGI) and the vertical kiln (DETOON). Only the rotary kiln and the vertical kiln give spherical nodules and of them the vertical kiln is cheaper and has lower fuel consumption. The Mission will provide the interested party with cost information, which it has not yet had time to do, and <u>recommends</u>, that a feasibility study for the production of expanded clay aggregates be carried out.

( )The city of Nairobi, produces such sludge at a rate of 10 tons/day with a moisture content of 17%. They also have surplus gas of 50.000 cu.ft. per day, containing 60% methan which could be used to dry the sludge.

Other building materials and components

Cement

Production of cement in Kenya by the two cement companies was 544,000 tons in 1968, while consumption was 481,000 tons: the surplus was exported. With new cement plants going up in Africa and the Indian Ocean area, it may become harder to export and domestic consumption ought to be encouraged. This can be done in the form of production of more cement consuming products, such as cellular lightweight concrete, asbestos-cement products and cement stabilized earth blocks, and roads.

Readymixed concrete

is not produced in Kenya but the Mission recommends that such production is started in the largest consumption centres. Such concrete, made under controlled factory conditions is of high quality and can be depended upon; it saves cement, saves time for the contractor and speeds up building.

Sand lime brick

is another type of building material which has been used for many years in other countries. It is produced by dry-pressing a mixture of graded silica sand with 5 - 10 per cent of hydrated lime and then steam-curing the bricks in autoclaves at 8 atmospheres pressure, whereby a strong bond is obtained. As clay bricks have had no great success in Kenya, mainly depending on un-suitable raw materials, sand-lime brick may be the answer. The machinery is not very complicated, it consists of mainly a mixer, a press, a steam-plant and autoclaves. The bricks produced have exact dimensions and are strong. One draw-back might be that they are only produced in one standard size, 9" x 4½" x 3" and consequently it takes more bricks, more mortar and more time to build a wall with these bricks than with large sized concrete blocks for example, which are so common in Kenya. Cellular concrete, which is also a sand-lime product, may therefore be prefered, if it can be produced at a competitive price, and as it is produced in large sized blocks and panels.

Cellular lightweight concrete

is a modern, structural building material, with low weight and high compressive strength. It has good thermal insulating properties, it can be worked like wood (can easily be sawn, cut and nailed) and is fire resistant. It can be produced in blocks but also as reinforced, storey high slabs for partition walls and as load-carrying walls and roofing slabs.

The raw materials for cellular concrete are a siliceous and a calcareous material, which are ground finely together, mixed with water to form a slurry to which a porosing agent is added. The slurry is poured in a mould where it rises and after setting it is steam cured in autoclaves at 8 atmospheres steam pressure and 140°C. The siliceous and calcareous components then form stable calcium-hydro-silicates, which constitute the finished product.

The siliceous raw material generally used is silica sand, but possolanas can also be used. In Kenya there is good riversand and the rhyolitic lavas that occur in several places have pozzolanic properties, some of a high standard and may make a very good product. The calcareous raw materials used are cement and/or lime, which are both available in Kenya. The porosing agent however, a special aluminium powder, has to be imported, but as the amount needed is about 1 lb per cu.yd. this is insignificant.

The minimum economical size of a cellular lightweight concrete plant has an output of 250 cubic yards per 24 hours. Cost for machinery and equipment is about 2½ million dollars. To this must be added costs for land and buildings, quarry equipment and trucks, steam plant and water purification, etc. plus 6 months working capital, as it concerns a new product to be introduced.

It is very probable that a decent sized cellular lightweight plant is just what the Nairobi area needs to fill its requirements of structural building material, and the Mission recommends that a complete study as carried out to decide whether this is feasible or not.

Iron mongery,

pipes, sanitary and electrical fittings are mostly imported but nails, screws and simpler hinges are produced in Kenya. It seems that this is a sector where more products could be manufactured in Kenya.

Pitch fibre pipes,

which are being used as drain pipes are imported to Kenya, in an amount of close to 500 tons per year and East Africa takes over 1,000 tons per year. The raw materials are coal-tar pitch and waste paper with the addition of some asbestos. Lately work has been done in the U.K. on using oil residues which seems to have had success and in that case all the raw materials would be found in Kenya. However the size of a plant is large and a production capacity of 3,500,000 ft. calculated as 4 in. pipe is considered

to be the minimum size to be run efficiently. The cost of such a plant would be in the region of £ 250,000. It is possible that the U.K. firm who now exports to East and West Africa as well as to the Middle East might be interested in setting up a joint venture in Kenya and do the export to other countries from here. The Mission suggests that this idea be followed up.

Resume:

While it may be possible that each one of the different building materials, which the Mission has recommended for further study, by itself, may be a viable proposition, it will certainly not be possible to produce all of them side by side in Kenya. This is why an ad hoc approach is not feasible. The whole sector must be studied and the costs and advantages of the various types of building materia be compared and evaluated against each other. The main type of housing that is expected to be built during the foreseeable future must also be taken into consideration.

If the majority of houses should for example be 2 - or 3 - bedroom houses of 400 to 500 sq.ft. and not costing more than a few hundred pounds, ( ) then it seems that the way to build such houses may be the prefab concrete panel houses of the type that the City Council of Nairobi are building or the prefab wooden houses of the type the Forest Industries' Training Centre in Nakuru are turning out.

For further expansion of the housebuilding activity the Mission has collaborated with the Ministry of Housing to encourage the establishing of a prefab wooden house manufacturing plant, integrated with production facilities of various building materials. Before such a scheme can be actively promoted the purchasing power of the market must be investigated in relation to the output and cost of production. Not only must the feasibility of the production of the individual building materials as such first be established, but the cost advantage of prefab manufacture, distribution and erection clearly be arrived at before any decision can be taken at its realisation, but the Mission recommends that a complete study be considered for this purpose.*)

( ) According to the Development plan 56 per cent of the demand for housing can only afford to pay less than £ 450.

*) Attention is called to a recently published report by a SIDA/FAO team in which they express a doubt about a market for a prefab housing plant. The same conclusion has earlier been reached by a Japanese survey team

An alternative to a large, modern, [illegible] with a high output could be [illegible], centrally directed units, [illegible] locally acquired building [illegible] modular elements according to [illegible] alternative [illegible] high transportation cost, [illegible]. If this were to be [illegible] of the kitchen and sanitary equipment, [illegible] in the house and be connected to [illegible], skilled labour and [illegible] answers to the housing problem, [illegible], not yet feasible in Kenya. There is however existing one system which the Mission believes could be used to advantage; the shell of the house could be erected in 1 day and at a low cost. The construction is done in the following way. On a prepared concrete slab a hemi-spherical plastic-impregnated canvas balloon is inflated. It is then covered with [illegible] mesh whereafter concrete is sprayed on it to form the shell of the house. Openings for door and windows as well as for a chimney are left. The concrete surface is smoothed and after a day or two, when it has set sufficiently to carry its own weight, the balloon is de-flated and put up on another slab. The concrete can be made with mixed-in pumice aggregate or scoria to make it better heat insulating. Another possibility is to spray polyurethane foam on top of the concrete followed by a coat of a bituminous emulsion. Partition walls and sanitary equipment are then installed in the house.

This type of house, because of its hemi-spherical construction, needs very little steel and the shell can be thin and consequently little concrete will be needed. A house with a diameter of 23 ft. for example will have a floor area of 400 sq. ft. and a wall-roof area of 830 sq.ft. (if it is a complete half-sphere). If the shell is made 3 in. thick it would use 207 cu.ft. of concrete, which with the Nairobi price of 6 shs/cu.ft. then would cost £ 62. To this has to be added the cost of labour, the reinforcing, the partition walls and sanitary and electrical installation, etc. It does appear that the house could be built at a low price in Kenya and the Mission recommends that a complete cost estimate is made and that a pilot scheme be considered.

In some countries people might object to live in a round house, but in Kenya, where the large part of the population already live in round houses, this ought not cause any problem.

AGRO-BASED INDUSTRIES

The Industrial Survey Mission recommends consideration and action on the following projects, as indicated in each case:

Castor Oil

Production of castor oil seeds in Kenya, which is controlled by the Maize and Produce Board, varies from 3,000 tons to 7,000 tons per year. Whatever quantity is produced is readily sold in the European market.

In 1968, Kenya exported, mainly to the United Kingdom, 2,791 tons of seed valued at £145,816. Total exports from East African countries amounted to 13,115 tons valued at £652,770.

Considering the value of this crop, it was proposed a number of years ago that the Government attempt to cultivate it on a large scale and provide for its processing within the country . The services of an expert from UNIDO were obtained who made a feasibility study in 1968.

The report recommended construction of a new plant in Mombasa at a cost of £125,000 capable of processing 6,000 tons of seed in a forty week period. At prices prevailing at that time, the plant would have paid a 20 per cent-25 per cent return on the investment.

Implementation of the project was delayed for two main reasons: uncertainty as to the annual supply of seed, and indecision as to the location of the plant. It was first thought that the plant should be located in Kibwezi where a good deal of castor grows.

It is understood that location of the processing plant in Mombasa is now acceptable to the Government; but the Maize and Produce Board is unable to give assurance as to the supply of seed.

In the circumstances, it was proposed that an existing processor of oil seeds be asked to undertake the production of crude castor oil from the available seed. An established firm in Mombasa, expanding its facilities, responded favourably to this suggestion. The same equipment used to extract oil from cotton seed or other oil seed can be used for castor oil provided it is thoroughly washed after processing the castor seed.

The company is now investing £50,000 in new plant and equipment to replace obsolete equipment and increase its capacity. It will use one of its new expellers to process about 25 tons of castor seed next spring when it is expected to be in operation as a test.

The trial run will enable the company to ascertain the amount and quality of oil which can be extracted from the seeds provided, and the character of the residual cake. All costs can be calculated under operating conditions.

There is a ready market for crude oil as there is for the castor seed. Oil which meets quality standards is being quoted at Kf 108.50 per metric ton, c.i.f. Marseilles. The ton value of exported seed has varied from £49 to £52. The price of seed varies more than the price of oil.

If the trial run of the Mombasa firm gives favourable results, studies will be instituted to determine uses for crude and refined castor oil in Kenya. The oil can also be converted into a dehydrogenated product which could be used in substantial quantities in paint manufacture. The marketing of the oil cake must also be studied. Because it is toxic it cannot be used in animal feed but it has value if it can be sold as fertiliser.

Meanwhile, it is expected that the Ministry of Agriculture will

continue its experiments with hybrid castor seed in order to find a hardy variety less subject to pests which can be cultivated on a plantation basis. The Industrial Survey Mission recommends that efforts to implement this project be continued.

Cassava

Although cassava has for years been a staple in the diet of the peoples of Asia and Africa, it has now become an important export crop. Since 1962, Germany, Belgium and Holland have been importing cassava, mainly from Asia, using it as a fattening agent in compound animal feeds.

The prospects are that the consumption of cassava will increase. In 1967, the three importing countries used 800,000 tons. By 1970, this amount is expected to rise to 1.1 million tons.

The annual increases which are predicted in the production of animal feeds give a clue to the rate of increase in the use of cassava. In Germany, animal feed production will rise 13 per cent, in Belgium at the rate of 7 per cent, and in the Netherlands at 4 per cent.

However, the use of cassava depends to a large extent up to the price of maize and barley which are also used in compound animal feeds. As their prices become more or less favourable in relation to the price of cassava, imports of cassava will fluctuate.

Despite these circumstances, there is an unsatisfied demand for cassava today, according to German importers, which is likely to persist for at least two to three years for certain, and much longer in prospect. This demand is estimated at 30,000 to 40,000 tons a year. In the studies proposed below further analysis of future markets for cassava should have first consideration.

Aware of this prospect, the Ministry of Agriculture has decided to

enter upon a campaign to develop cassava as an export crop, particularly in the Coast Province. Farms large and small will be encouraged to plant a special variety of cassava which has a relatively high yield, as high as 15 tons per acre. It will be promoted as a valuable cash crop in connection with settlement schemes. A plan is now being developed to have the Agricultural Development Bank take over a six thousand acre "mismanaged farm" just south of Mombasa and operate it on a plantation basis.

The Government is preparing to assist the farmers by providing seed stock and extension services. Mechanical methods of planting and harvesting cassava are being studied in connection with plantation and large farm operations.

A ton of cassava chips, at current prices, brings Kf 422.80 at Hamburg. Assuming marketing by the Maize and Produce Board, which controls this crop, the following expenses would be incurred to move the crop from farms in the Coast Province to Hamburg:

Table 37	Shillings per Ton
Transport pool costs, M and P Board	14.00
Warehousing	24.00
Bags	24.00
Transport, depot to Port	6.00
Overhead, M and P Board	35.00
Port Handling	26.00
Transport Overseas	90.00
Importers Fee	4.00
Total Charges:	223.00
Cost, raw material	150.00
Total Cost:	373.00
Margin	49.80 per ton

Figures furnished by Maize and Produce Board.

Estimates must still be made to determine the relative advantages of different methods of collecting, processing and marketing the cassava. Under one procedure, the cassava would be collected from the farmers wet;

it would be washed, peeled, chipped and dried at intermediate processing plants, stored for shipment overseas in bulk.

In an alternative procedure, the cassava would be collected from the farmers sun dried, presumably at a higher price. It would be sliced into chips at collection depots, packed in polythene bags and stored until time for shipment.

In this case, the farmers would be responsible for washing and drying which raises a question of quality control. But the peeling could be avoided, heretofore considered necessary, as the outer skin contains prussic acid which is toxic.

However, the East African Industrial Research Organization has been studying the problems of processing cassava on a large scale, and it claims that the prussic acid is dissipated in handling and drying, and that the peeling is unnecessary.

These findings will have to be verified and communicated to importers and buyers abroad who usually test shipments of cassava for quality before accepting them.

Estimates must also be made for processing cassava into pellet form. As such, it would earn a premium price of £1 to £2 per ton, and lower overseas transport rates. However, the processing costs would be higher. Pelletized cassava is less likely to turn colour, heat, and gather mould during shipment.

Regardless of the method finally adopted, a critical factor of cost will be the price paid the farmers. This price has to be set by the Maize and Produce Board which has statutory control of the collecting and marketing farmers to sell part of their present crop of cassava and plant more, and at the same time, not so high as to jeopardise the profitability of the project.

If the government permits the processing and marketing of cassava to be done under private auspices, there will be no difficulty financing the project. The German Development Bank has already agreed in principle to participate in the project in company with a German sponsor who will invest his own capital and take an active part in the management of the organization which was formed. The Bank has nominated the German sponsor.

The Industrial Survey Mission feels that efforts to implement this project should be continued, specifically with reference to studies of the processing and marketing of cassava as a component in animal feeds, and the development of useful by-products, such as flour, starch and alcohol.

Maize Oil Mill

Maize is regarded by the Government as an important export crop, and its production is being increased on that assumption. Nevertheless, the Government is greatly interested in the industrial utilization of this grain in Kenya.

The available supply seems to be ample for all possible purposes. Estimates of production for this year are somewhat lower than actual production in 1968; but the marketed crop will be about 2,500,000 bags of which 1,100,000 bags will be for domestic consumption.

So far this year, the Maize and Produce Board has exported 2,444,000 bags from the 1967-1968 crops; the carry-over is 850,000 bags.

For the five year period of the Development Plan, maize production will be increased largely through the conversion of large farms from wheat to maize. The estimated surplus by 1974 is 400,000 tons.

With an assured supply of raw material, the Government requested a feasibility study of the industrial uses of maize and such a study was completed earlier this year by an expert of UNIDO.

Consideration was given to the manufacture from maize of starch, glucose, alcohol and breakfast cereals; and in each case, the size of the market and other considerations made processing uneconomic. The study recommended, however, that the processing of maize to extract the oil would conceivably be tied to the milling of maize to produce maize meal, or Posho.

Posho is produced in three grades: Posho No. 1 which is mostly starch, and Posho No. 2 and 3 which contain starch and the germ oil fraction. The latter two grades are more nutritious food although they cost less.

The study suggests that the larger mills in Nairobi and Eldoret forego production of Posho No. 2 and 3 and concentrate on Posho No. 1, extracting the oil germ and bran at the same time.

One mill at Eldoret, the Mission was told, is now able to extract the germ fraction economically when production of Posho No. 1 exceeds 70 per cent of capacity. Other mills might have to buy additional equipment.

Increased production of Posho No. 1 by the mills undertaking it would cause a shift of production of Posho No. 2 and 3 to other mills. This milling is said to be relatively profitable despite the lower prices obtained from these grades, so the shift of production would have to be studied with care by the mills giving up the production of Posho No. 1 and also by the mills taking on this production.

It is essential, of course, to find out the total amount of Posho No.1 that can be milled and sold, and the quantity of the germ fraction which could be extracted. This figure would indicate the capacity of the facilities required to process the germ oil.

There is no mill in Kenya at this time which could extract crude corn oil and bran from the germ fraction; if the volume of production were

sufficient such a mill would probably have to be constructed. The refining of the crude oil could eventually be done in existing vegetable oil plants which for the present have the necessary capacity.

These are major questions to be studied before it will be possible to determine the feasibility of processing palm oil and bran. They will be considered, among other matters, by another expert of UNIDO who is expected to arrive in the country in the near future.

In addition, the mills considering the prospect of concentrating on Kosbo No.1 will need to study the effects on their earnings of the proposed change in their product mix.

On completion of the study now in process, the Industrial Survey Mission recommends that steps be taken to implement its findings as circumstances may permit. Such action, if any, should be taken in the light of recommendations in studies of the edible oil processing industries which are recommended in this report.

Edible Oils

Consumption of edible oils and fats imported into Kenya have been increasing yearly and now are valued at more than £2.3 million a year. The deficit in oils alone, according to industry sources, are in excess of 20,000 tons a year, and rising.

Domestic production at present consists largely of cotton seed which amounts to 12,500 tons in 1967. Lesser quantities of coconut, and sunflower are also produced, for which reliable figures are not available.

Concerned about this situation, the Ministry of Agriculture has been promoting oil crop production; and at the same time, it has devoted considerable time and effort to the development of better seeds. This is particularly true in the case of sunflower and soya beans.

Sunflower grows well in Kenya, but the bulk of the crop now being grown is shipped to the United States as bird seed. Research is being done to develop strains with a higher yield which would also have finer cake after milling. It is predicted that the new seeds will be available for planting in the near future, and that the production of sunflower will be greatly increased.

The prospects for soya beans are still doubtful. Climatic conditions do not favour this crop; although extensive efforts have been made to find new strains that will give high yields, they have been only moderately successful up to this time. Research is being continued however.

With the help of FAO, the Government will attempt to introduce safflower which has been cultivated in Somalia with considerable success. It would be a suitable crop for large areas of semi-arid land which exist in Kenya.

The Government anticipates an increased supply of coconut oil especially from the coast province where plantings have been encouraged in connection with settlement schemes.

The rising demand for edible oils, and the prospect of augmented domestic supply raise questions concerning the capacity of the existing industry, and its state of efficiency. For example, the Ministry of Agriculture estimates that the present capacity of the vegetable oil industry, fully utilized, could process 26 per cent of the edible oil requirements of the country.

The Ministry of Commerce and Industry has been asked to make a survey of the industry in the light of these circumstances, and recommend such changes and additions to plant which may be indicated. This survey is recommended by the Industrial Survey Mission. In making the survey, it is suggested that all projections for new plant or plant expansions

should be related to the findings of the final report on maize which has already been referred to.

Bicycles

No bicycle factory has been established in East Africa though a number of proposals have been forwarded during the last few years. The main reason why none has materialized is that none of the East African countries taken alone has a sufficiently big market to sustain an economic scale of production, which is of the order of 20.000 - 30.000 units per year. The possibility of establishing reliable export outlets from a factory in one of the member states to the others is regarded as very uncertain.

For the present bicycle frames are being produced on a very moderate scale in Kenya by overseas cycle industries in Mombasa and there is also unconfirmed information at hand that bicycle frames in small quantities are being produced in Uganda and Tanzania. According to information from bicycle retailers in Nairobi, the local production of frames has not met with success owing to low quality.

A factory for the production of bicycle rims, chain wheels and handle bars is about to start production in Tanzania. The factory will also have a chrome plating line. The factory has a rated capacity of 500 rims per shift. Working 2 shifts for 250 days per year the factory will thus be in a position to supply rims for 125,000 bicycles, a figure which is substantially higher than the present bicycle consumption in East Africa. The factory is set up in Dar-es-Salam. The project is financed by a Nairobi firm which has previously been engaged in wholesale trade of bicycles. It is the intention of the firm to assemble complete bicycles, initially by importing such parts which are not produced. The company will try to sell in all three East African countries.

The imports of complete bicycles during the period 1963-1968 is shown in the table below. All bicycles imported to Kenya and the other East African countries are shipped completely knocked down (CKD), in crates containing 10 or 25 complete bicycles. Assembling is carried out by wholesalers and bigger retailers. The cost for assembling a bicycle from a CKD kit is 10 - 15 shillings.

The average cif-price of bicycles imported to the East African countries has been fairly stable during the last 5-6 years. It can be seen from the table on the next page that it has been of the order £ 9 - 10.

Retailers price of bicycles vary, depending on the [illegible], between Sh 300.— and Sh 430.— in Kenya. A standard bicycle retails for the present at Sh 430 in Nairobi.

Table 38

Imports of Complete Bicycles to East Africa 1963 - 1968

	1963	1964	1965	1966	1967	1968
Kenya (No)	14.604	18.756	9.960	[illegible]	14.245	13,141
Uganda (")	16.509	16.418	17.238	19.[illegible]	16.062	13.675
Tanzania "	29.57[illegible]	37.53[illegible]	21.939	28.944	[illegible]	36.224
E.Africa "	60.[illegible]	72.7[illegible]	49.147	60.468	49.11[illegible]	63.040
Kenya (1,000 K[illegible]	134.2	181.2	[illegible]	10[illegible].9	12[illegible].8	122.7
Uganda "	152.[illegible]	16[illegible].9	170.1	191.[illegible]	[illegible]6.2	136.7
Tanzania "	293.3	373.5	[illegible]	278.9	286.8	375.2
E.Africa "	586.6	716.6	467.[illegible]	5[illegible].6	494.8	634.6
Kenya (Kf cif/cycle)	9.2	9.7	9.4	8.8	9.0	9.3
Uganda "	9.6	10.0	9.9	9.9	10.6	10.0
Tanzania "	9.9	10.0	9.3	9.6	10.5	10.4
E.Africa "	9.7	9.9	9.5	9.6	10.1	10.1

Source: Trade Statistics

The table below shows the development of the rolling stock of bicycles in East Africa during the period 1963 through 1968. The figure of the rolling stock for any particular year has been calculated by aggregating the imports of bicycles for the particular year with imports of bicycles during the preceeding 14 years. The calculations are thus based on the assumption that the average life-time of a bicycle is 15 years in East Africa, a figure which has been selected after consultations with bicycle retailers in Nairobi.

Table 39

Development of Rolling Stock of Bicycles in East Africa 1963-1968

	1963	1964	1965	1966	1967	1968
Kenya (1,000 bicycles)	366.6	351.9	346.7	337.1	310.2	296.2
Uganda "	711.4	703.3	675.4	638.9	543.2	448.6
Tanzania	547.5	572.7	581.2	589.7	561.3	569.4
E.Africa	1,625.4	1,627.9	1,603.3	1,565.6	1,414.8	1,314.2

Source: Derived from Trade Statistics

It can be seen from the figures in the table that the rolling stock of bicycles during the period has declined in Kenya and Uganda whereas it has increased moderately in Tanzania during the same time. In the case of Kenya, where the rolling stock is estimated to have been some 365,000 bicycles in 1963 and has

[illegible], a possible application to the [illegible], which in the past used [illegible] to improved income [illegible], low-income [illegible] to compensate for the [illegible] groups [illegible]. It should [illegible] of years [illegible] of the [illegible] measured on the [illegible] cycle in general [illegible].

[illegible] of starting a local [illegible] the local market it should be noticed [illegible] only constitute some [illegible] cent of the [illegible]. This can be seen from the break-down below which [illegible] and bicycle retailers in Nairobi.

[illegible]	[illegible]	Frame Size
[illegible]	[illegible]	22",24"
[illegible]	[illegible]	22",24"
[illegible]	[illegible]	14,16,18,20"
[illegible]	[illegible]	
[illegible]	[illegible]	

[illegible] market for bicycle [illegible] is considerable. It has been [illegible] that [illegible] average life-time of 12 years a bicycle in Kenya will require maintenance spare parts to a value of some 45 % of the cif - value of the bicycle. A bicycle costing £ 10 cif will thus, measured in constant prices require spare parts for about £ 4.5 during its life time. The imports of spare parts fluctuate considerably in time as can be seen from the table below which sets forth the imports of spare parts to the East African market during the period 1963 through 1968. The figures do only relate to mechanical spare parts and do thus exclude tires and tubes.

Table 41

Imports of Bicycle Spare Parts to East Africa 1963-1968

	1963	1964	1965	1966	1967	1968
Kenya (1,000 K£)	120.9	131.4	99.7	128.1	96,8	114.5
Uganda (")	279.9	237.7	300.8	316.0	196.0	254.8
Tansania (")	172.8	142.1	165.6	270.3	122.8	192.2
East Africa (")	573.6	511.2	566.1	714.4	413.6	561.5

Source: Trade Statistics

Tires and tubes are produced by all three East African countries. Bata produces tubes in Kenya and tires in Uganda. In Kenya Avon produces both tubes and tires in Nairobi. In Tanzania Dunlop has a factory producing both tires and tubes. In Tansania, the National Shoe Company, before being nationalized Bata Shoe Company, manufactures both tubes and tires. In spite of the local production facilities imports still take place which can be seen from the table below.

Table 42

Imports of Bicycle Tubes and Tires to East Africa 1963-1968

Tubes:	1963	1964	1965	1966	1967	1968
Kenya(1000 pcs)	791.7	15.6	3.9	56.6	19.2	28.2
Uganda (")	572.9	528.4	255.4	11.6	9.9	37.5
Tansania (")	388.0	293.2	219.3	252.4	119.1	115.9
East Africa (")	1,752.6	837.2	478.5	320.6	148.2	182.1
Kenya (1,000 K£)	89.7	8.3	4.6	7.3	2.1	3.3
Uganda (")	61.8	58.1	31.3	1.6	1.4	4.5
Tansania (")	39.8	30.9	17.2	18.8	10.0	10.7
East Africa (")	191.3	97.3	53.1	27.7	13.5	18.5
Tires						
Kenya (1,000 pcs)	347.7	24.9	44.5	53.3	20.6	24.3
Uganda (")	513.5	301.3	140.2	7.3	34.9	21.4
Tansania (")	255.7	105.0	65.6	82.6	54.2	66.6
East Africa (")	1,116.9	431.1	250.3	143.2	109.7	112.3

cont'd

Table [illegible]

	1923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kenya (1,000Kf)	107.[illegible]	20.1	1[illegible].4	19.2	[illegible].3	9.4
Uganda (")	160.1	103.7	45.[illegible]	[illegible].[illegible]	21.1	7.1
Tanzania (")	84.2	55.4	[illegible].3	[illegible].7	[illegible].[illegible]	[illegible].6
East Africa (")	352.2	[illegible].[illegible]	82.6	[illegible].[illegible]	[illegible].3	[illegible].1

(Due to roundings totals do not always add up)

Source: Trade Statistics

The tyre and tube manufacturing has been very successful in replacing imports which the figures in the table above clearly show.

The custom duties on bicycles and bicycle spare parts are shown in the table below.

Table 4:

Custom Duties on Bicycles and Bicycle Parts

	Tariff No.	Import Duty
Frames, together with front fork and back stay	87.12.C.1	Sh. 22 or 30 per cent
Frames without front fork and back stay	87.12.C.2	Sh. 14.50 or 30 per cent
Front Forks	87.12.C.3	Sh. 4.50 or 30 per cent
Back Stays	87.12.C.4	Sh. 3 or 30 per cent
Handle-bars, with or without fittings	87.12.C.5	Sh. 5.50 or 30 per cent
Saddles	87.12.C.6	Sh. 3.75 or 30 per cent
Rims	87.12.C.7	Sh. 1.50 or 30 per cent
Other parts	87.12.C.8	30 per cent
Complete bicycles and tricycles, not motorised	87.10	Sh. 45 or 30 per cent
Motor-cycles, auto-cycles and cycles fitted with auxiliary motor	87.09	30 per cent
Tyres and Tubes		
- Kenya and Tanzania	40.11	Sh. 1.25 per lb.
- Uganda		
— Tyres	40.11	Sh. 1.50 per lb.
— Tubes	40.11	Sh. 1.25 per lb.
— consumer goods tax on both tyres and tubes of Sh. 1.25 per lb.		

At the present imbalance of trade in manufactured goods Tanzania can impose transfer tax on goods originating from Kenya and Uganda. Uganda can impose transfer tax on only goods originating from Kenya, whereas Kenya cannot impose any transfer taxes on goods coming from Tanzania and Uganda. From

the point of view of avoidance of transfer tax Tanzania is thus the strategically best choice for the allocation of a bicycle factory, marketing its products on the whole East African market, and Uganda the second best choice. It should however be mentioned in this context that at the present external tariff of 30 per cent the maximum transfer tax that can be imposed is 15 per cent. Calculated on the present c.i.f. price of some £10 per bicycle the maximum transfer tax that could be levied is thus Sh. 45. Of relevance is also the fact that bicycles are specified commodities and trade in them is monopolised by the national trading corporations which in actual fact can constitute an absolute trade barrier.

The present total consumption of bicycles of all kinds on the East African market is of the order 60-70,000 vehicles per year as has been shown above. It is estimated that some 55-60 per cent of this quantity are standard bicycles, say some 35-40,000. The minimum capacity for an economical production of bicycles is of the order of 20-30,000 units. None of the East African countries can thus establish an economical plant based only on their respective local markets, but the access to the whole East African market is required.

In addition to the market for complete bicycles a bicycle factory in East Africa would also have access to the market for spare parts which, as has been mentioned earlier, is substantial and would contribute to a low-cost overall production.

Summing up, it appears that a bicycle manufacturing operation would be feasible if it could be based on the total East African market.

The Mission belisves that this would be possible if a formula could be found that allowed all three countries to partake in the production and thus share the employment and other benefits of the project. One possible formula is to establish a bicycle assembling company in which the Development Corporations in Kenya, Tanzania and Uganda would be shareholders,

or, alternatively, [illegible] component producers in each of the countries [illegible] manufacturer who could supply the know-how. The assembly company would have branches in each of the East African countries - the economies of scale are insignificant where assembly is concerned but important in the production of components - and would operate on an exclusive basis the production of the component manufacturers. The components would thus be exchanged between the countries. Such an arrangement would enable the component manufacturers to produce for the whole East African market, whereas the assembling in each country would be scaled to the requirements of the local market.

The Industrial Survey Mission is particularly interested in that this project is followed up, also for the reason that it would bring the Development Corporations in the three countries together. This project might then serve as a model for future joint ventures.

Ladies compliments slips

1. The [illegible] to give a rough estimate of cost of production for a consignment of [illegible] the estimates have been based on the project size, [illegible] to cover each [illegible], with a total [illegible] at 660,000 packets. [illegible] to produce [illegible] in 1983.

Table 1:

2. Cost Estimate

for the [illegible] unit to [illegible]

Machinery: Fully [illegible]

Capacity: [illegible] packets per minute

A. Annual Output

500,000 packets at Shs 2.00 each		1,000,000 shs
Less 25% trade discount	250,000	
Less 10% wholesale discount	75,000	325,000 "
		675,000 "
Less cost of production		508,225 "
Net profit before taxes		166,775 shs

Shs 1.33 on cost

B. Annual Cost of Production:

Raw materials	336,000 shs
Labour	26,800
Other operating costs	63,425
Administration	50,000
Depreciation, 10% on machinery	30,000
	508,225 shs
	i.e. 1.02 shs each packet

Raw materials:

Prices

Wood pulp, cif Mombasa	1,680 shs/ton	
handling charges	20	
duty	-	
trpt. to Nairobi	197	1,897 shs/ton
2-fold paper, cif Mombasa	3,150 shs/ton	
handling charges	20	

(continued....)

[illegible]

Table 4[illegible]

duty [illegible]

trpt to [illegible] | 1[illegible] | 3.[illegible]

Non-woven [illegible]

Handling [illegible]

duty | –

trpt. to [illegible] | [illegible] | 2[illegible] shs [illegible]

Plastic [illegible]

handling [illegible]

duty | –

trpt to [illegible] | 14 | 493 shs [illegible]

Cost, [illegible]

Loc[illegible], [illegible] | [illegible]

2-fold p[illegible]r, [illegible] | 2[illegible]

Non-wove[illegible], [illegible] | 1[illegible],[illegible]

Plastic [illegible] | [illegible]

| 2[illegible] shs

Less waste, [illegible] | 1[illegible]

| 2[illegible] shs

Glue and [illegible],

500,000 at 0.10 shs | 5[illegible]

| 3[illegible]

Labour:

1 technician, 1[illegible] shs/mo | 1[illegible]

1 assistant, [illegible]00 " | [illegible]

5 packers, 200 " | [illegible]

| 28,800 shs

Other operating costs:

Power and light, 90 kwh/day,

250 days: 22.500 kwh at 20 cts | 4,500 shs

Water | 500

Maintenance | 5,000

Rent, 500 shs/mo | 6,000

Interest on loan, [illegible]% on 2[illegible]0,000 | 23,800

Royalties, 4% on 590,625 | 23,625

| 63,425 shs

[illegible]

[illegible]
heater,
[illegible]

1. Solar
[illegible]
coun
[illegible]
with
[illegible]
be giv
2. A
circ

3. The
onto
water to be heated is circulated. [illegible], to increase
[illegible], [illegible] energy from the sun is transferred to the water. The temperature of the water may reach [illegible] and even [illegible], under certain circumstances reach the boiling point. The absorber must be covered with glass to prevent heat losses [illegible] greenhouse effect in the absorber, i.e. in a green house.

4. When the water has been heated it must leave the absorber and it rises through the natural thermo-siphon circulation cycle. The hot water enters the storage tank, with which it is connected and cold water flows towards and enters the absorber. Thus the longer the absorber is subjected to the sun-rays the more is the water heated each time it circulates through the absorber.

5. The size of the storage tank will depend on the needs of the household but must be large because of the intermittent nature of the solar energy. It must also be well insulated as must the hot water pipes be.

6. The investment cost for a solar water heater is greater than for a gas or electric heater but once installed the sun does not send any bills for energy. Only maintenance costs must be taken care of. The Mission recommends that the production of solar water heaters be considered.

[illegible]

This Interim report [illegible] and industrial [illegible] which the Industrial Survey [illegible] in the [illegible] fashion in the time available. [illegible] occasions [illegible] effort [illegible] it is recommended [illegible] more [illegible] of [illegible].

This material [illegible] the main body of the report to the Government. Attached, as Appendices, is the Index of Industrial Establishments, and [illegible] of tables [illegible] information which the Mission has collected.

The latter material [illegible] for inclusion in the report. Moreover, the statistics need to be processed and analysed to make it fully useful in the future. This will be done by the UNIDO staff in Vienna and forwarded in due course to the Government.

It is the hope of the Industrial Survey Mission that many of the proposals put forth here will in time become industries, and that the benefits which accrue from their activities will justify the efforts required to create them.

Industrial Survey Mission to Kenya

(a) [illegible] with a view to finding out [illegible] country and the [illegible];

(b) Study and report on the [illegible] in the country;

(c) The analysis of [illegible] with a view to ascertaining [illegible] to complete or partially [illegible];

(d) A systematic [illegible] that could in principle be produced on the basis of agricultural and other available [illegible] and the structure of demand;

(e) Selection of new [illegible] suitable feasibility studies might have to be carried out;

(f) Feasibility estimates of the [illegible] to which appear most promising and characterise the present [illegible] for the [illegible] priority sectors;

(g) Assessment of the present system of incentives and recommend changes or improvements it warrants;

(h) Investigation of problems of industrial employment such as supply and demand for skilled industrial workers and managers;

(i) Study the adequacy of infrastructure in the rural towns with a view to getting to know what else could be done to make them more attractive to investors;

(j) To advise on the economic and social desirability of measures to facilitate the decentralisation of industrial development, and to advise on areas or locations where decentralised development could usefully take place;

(k) To advise which industries if any are most suited for decentralisation and the probable effect on industrial costs in each case;

(l) To consider with the Town Planning Adviser the planning and siting of industrial areas in locations where decentralised development is recommended;

(m) In putting forward recommendations under (a) - (f) above, to take into consideration the probable effects of the Common Market Treaty, and particularly of transfer taxes.

[illegible] Contacts

✓ Chamber of Commerce, Mombasa
✓ Kibarani Port Warehouse, Mombasa
✓ East African Paperbags Manufacturers Ltd., Mombasa
✓ General Foam Ltd., Mombasa
✓ Kenya Cashews Ltd, Kilifi
✓ Diamond Perfumery Works, Mombasa
✓ Kenya Casements Ltd., Mombasa
✓ East African Wire Industries Ltd.
✓ Christiani Industries Ltd., Mombasa
✓ Eastern Chemicals Ltd., Mombasa
✓ Steel Wire Ltd., Mombasa
✓ Kenya National Chamber of Commerce and Industry
✓ Mombasa Municipal Council
✓ National and Grindlays Bank (Mombasa)
✓ Shell Petroleum, Transportation Division
✓ Sanah Textiles, Ltd.
✓ Kenya Glass Works, Ltd.
✓ African Radio Manufacturing Company, Ltd. (ARMCO)
✓ TAI Manufacturing Company
✓ Pyrethrum Marketing Board
✓ The Raymond Woolen Mills Ltd - Eldoret
✓ East Africa Tanning Extract Co. Ltd.
✓ Elgeyo Sawmills Ltd. - Eldoret
✓ Amalgamated Sawmills, Ngoro
✓ Sobpro Plywood, Elburgoon
✓ Kinkmill Furniture
✓ Forest Industry Training Centre
✓ A.P.C. Woods Ltd, Nakuru
✓ East African Diatomite Syndicate Ltd.
✓ Provincial Planning Officer - Nakuru
✓ Nakuru Tannery
✓ Serafric Co. Ltd.
✓ Ministry of Agriculture - Mr. Lax Bhandari
✓ East African Industries Ltd.
✓ Dragon Tanning Company Ltd.
✓ The Industrial Promotional Services
✓ Ministry of Agriculture - [illegible]
✓ Tinsales Ltd.
✓ National Housing Corporation
✓ Moechat (East Africa) Ltd.

Totals
Plus additions. Companies - 10, Institutions - 17, Government 26

- UNDP/FAO Range Management Project
- Ministry of Economic Planning and Development, Statistics Division
- Nairobi City Council
- Kenya Sisal Board
- Ministry of Agriculture, Veterinary Services
- City Council of Nairobi
- Ministry of Natural Resources
- Burns & Blake
- I.C.D.C.
- Ministry of Works
- Ministry of Industry
- International Bank of Reconstruction and Development
- U.N.: Mineral Resources Survey in Eastern Kenya
- Asbjorn Berntsen
- Reichholds Chemicals, Ltd.
- Department of Mines and Geology
- Association of Manufacturers
- East African Industrial Research Organization
- Ministry of Lands and Settlement
- Meeting with Mr. O. Olivas, Senior Industrial Field Adviser/UNIDO
- Meeting with the Management of the Industrial Estate (Nairobi)
- Meeting with the Industrial and Commercial Development Corporation - ICDC
- Kenya Rayon Mills, Ltd.
- Towel Manufacturers, Ltd
- East African Cables, Ltd
- East African Hosiery, Ltd
- Kenya Aluminium, Ltd
- Dubois Oil Mill & Soap Factory, Ltd
- Mombasa Builders, Ltd.
- Horticultural Research Station, Thika
- High Level Sisal Research Station, Thika
- East African Oil Refineries Ltd, Mombasa
- Bookers Agricultural & Technical Services
- Ministry of Agriculture - Economics & Market Research Division
- Korongo Ltd., Naivasha
- Ciba (E.A.) Ltd., Nairobi
- Sadolin Paints (E.A.) Ltd, Nairobi
- Steel Spuncrete Co.Ltd, Nairobi
- Foale & Co. Nairobi
- Walpamur Co. Kenya Ltd, Nairobi
- Refractories Ltd., Nairobi

Additional Company Contacts

Vilifi Estates, Ltd.
Vipingo Estates, Ltd.
East African Airways, Ltd.
Bamburi Portland Cement, Ltd.
African Ponderosa, Ltd.
Orahan, Ltd.
Chemolimex
Frederick Parket, Ltd.
Marex Corporation
Kenya Canners, Ltd.
Century Rayon
Kenya Coffee and Produce, Ltd.
African Packers and Manufacturers, Ltd.
Samson Tyres
East African Power and Lighting Company
Corn Products Refining Co.
Kenya National Trading Corporation
Kassem Kanji
Bata Shoe Co.
Sultan Glass Mart
Mamba Cycle Industries, Ltd.
Viwanda Leo, Ltd.
Cambeel & Co.

Additional Government Contacts

Ministry of Labor
Registrar-General
Ministry of Finance
Commissioner of Lands
Ministry of Agriculture, Mombasa Division
Nairobi City Planning Division
Ministry of Commerce and Industry

Additional Institutional Contacts

Ford Foundation
Canadian Regional Planning Group, Mombasa
U.N. Development Program- Stedman, Davis, Glitterberg, Lennacchio, Persson
Animal Husbandry and Industrial Training Institute
Maize and Produce Board
Regional Office, FAO
Housing Finance Corporation of Kenya
German Development Bank
British High Commission
Economic Commission for Africa - Nemvete, Lewis, Kamarofski, Putna, Prichett
Barclays Bank Overseas Development Corporation
Management Training and Advisory Center
Kenya Industrial Training Institute
Kenya Employers Association
Japanese Trade Delegation
Committee for Industrial Cooperation
with Developing Countries (Norway)
Swedish Trade Commission
Agency for International Development, Regional Office
Swedish Embassy
American Embassy
Norwegian Regional Planning Group, Mom[illegible]


76.02.12