REPORT ON INVESTIGATIONS FOR MEDIUM AND SMALL SCALE INDUSTRIES DEVELOPMENT PROJECT TANGANYIKA

MARCH 1964

OVERSEAS TECHNICAL COOPERATION AGENCY

TOKYO JAPAN

FOREWORD

The Report is hereby presented on the results of the investigations on the Medium and Small Scale Industries Development Project in Tanganyika by the Japanese Survey Team which was despatched by the Overseas Technical Cooperation Agency of Japan (OTCA) in response to the request made by the Government of Tanganyika.

The OTCA which was established on July 1, 1962, serves as an executing agency of the Japanese Government in conducting Japan's government-level technical cooperation to Asia, Near and Middle East, Africa and Latin America. Its principal activities are acceptance of overseas trainees, assignment of technical experts abroad, establishment of overseas technical cooperation centres, and performance of surveys for development projects.

The Survey Team, comprising seven experts specialized in different industries, arrived at Dar es Salaam on February 5, 1964. Investigations were then conducted for a period of approximately two weeks on basic matters relating to the desired development of medium and small scale industries. The Team completed its mission and left Dar es Salaam for Tokyo on February 20, 1964.

Being fully aware of the significance of the Project, I shall be more than pleased if this Report should serve in some measure for the materialization of the Project, contributing in the ultimate to the establishment on a commercial basis of the six industries investigated.

I avail myself of this opportunity to express on behalf of the Team my deepest gratitude to His Excellency Mr. Kahama, Minister for Commerce and Industry, Mr. Mufuto, Secretary of the Ministry of Commerce and Industry, Mr. J. M. Rowlands, Ministry of Commerce and Industry, and other officials of the central and provincial authorities, for their unlimited and invaluable assistance and cooperation without which the Survey could not have been conducted successfully.

S. Shibusawa

March 1964

Shinichi Shibusawa,
Director General,
Overseas Technical
Cooperation Agency of
Japan, Tokyo.

TABLE OF CONTENTS

****

I. INTRODUCTION

1. OBJECT OF INVESTIGATION

2. FORMATION OF SURVEY TEAM

3. ITINERARY OF SURVEY TEAM

I. INTRODUCTION

1. OBJECT OF INVESTIGATION

The investigations were carried out in compliance with the request of the Government of Tanganyika on the development of medium and small scale industries inclusive of ceramic wares, wood working, wooden vessels, bee's wax, agricultural chemicals and footwears, with the ultimate objective of developing Tanganyika's economy and promoting the economic and technical cooperation between Tanganyika and Japan.

Prior to the despatch of the Survey Team, a request was made by His Excellency Mr. Kahama, Minister for Commerce and Industry of Tanganyika, during his visit to Japan in 1962, for Japan's technical cooperation in the development of medium and small scale industries of Tanganyika. Further arrangements were made in August 1963 between Mr. Mufuto, Secretary of the Ministry of Commerce and Industry, and the Japanese Consulate-General in Nairobi, and in September 1963 the official request from the Government of Tanganyika reached the Japanese Government.

The Survey Team, organized by the Overseas Technical Cooperation Agency of Japan, aimed at reviewing the feasibility of developing above-mentioned industries, drawing up plans and measures for the desired development, and making recommendations regarding the introduction of affiliated industries.

Today, Tanganyika is reforming herself from the primary products producing country into a modern industrialized country. Industries are planned to be established utilizing raw materials that have hitherto been exported; production within Tanganyika is also contemplated for such import items that are relatively easy to manufacture.

It is expected, however, that in the course of the desired development, difficulties such as competition with imported goods, shortage of techniques and funds, market limitations and so forth will be encountered. It is hoped that Japan's technical cooperation at this important stage would contribute to the economic development of Tanganyika and serve at once as the basis for the joint ventures that may take place in the future.

2. FORMATION OF THE SURVEY TEAM

The Survey Team consisted of the following members.

Name	Assignment	Present Post
Mr. Hitoaki Yamaguchi	Leader	Technical official, Technical Cooperation Section, Economic Cooperation Division, Trade Bureau, Ministry of International Trade and Industry

Name	Assignment	Present Post
Mr. Fukumatsu Kato	Wood working industry	Technical official, Planning Section, Industrial Arts Institute, Ministry of International Trade and Industry.
Mr. Sukezo Kawamura	Ceramic industry	Technical official, Seto Branch of Nagoya Research Institute of Technology, Agency of Industrial Science and Technology, Ministry of International Trade and Industry.
Mr. Fujio Ito	Agricultural chemical industry	Technical official, Plant Quarantine Section, Agricultural Administration Bureau, Ministry of Agriculture and Forestry.
Mr. Masao Murase	Footwear industry	Director, Shizuoka Sandal Industry Cooperative Union.
Mr. Tadao Masago	Wooden vessel industry	Managing Director, Koa Shipbuilding Co., Ltd.
Mr. Takuya Miki	Bee's wax industry	President, Miki Chemical Industry Co., Ltd.

3. ITINERARY OF THE SURVEY TEAM

Date	Description
Feb. 2, 1964	(Mr. Ito, Mr. Murase, Mr. Masago and Mr. Miki left Haneda International Airport)
Feb. 3	(Arrived at Cairo Airport)
Feb. 4	(Left Cairo, arrived at Narobi) Members from Japan joined the Survey Team. All members paid courtesy call to the Japanese Consul-General with whom were made preliminary consultations.
Feb. 5	(Left Nairobi, arrived at Dar es Salaam) Courtesy call paid to H.E. Mr. Kahama, Minister for Commerce and Industry; arrangements made with H.E. concerning the schedule of the Survey Team.
Feb. 6	Investigation of Dar es Salaam district.
Feb. 7	(Mr. Yamaguchi and Mr. Kato left for Moshi - Arusha - Tabora districts)
Feb. 8	(Mr. Miki left for Moshi - Arusha - Tabora districts)

Date	Description
Feb. 10	(Mr. Masago, Mr. Ito, Mr. Kawamura and Mr. Murase left for Mwanza - Arusha - Moshi districts)
Feb. 17	(Survey Team returns to Dar es Salaam)
Feb. 18	Progress of the investigations reported to the Government of Tanganyika.
Feb. 19/20	(Survey Team left Dar es Salaam)

****

II. REPORT ON INVESTIGATIONS

1. CERAMIC INDUSTRY

2. WOOD WORKING INDUSTRY

3. WOODEN VESSEL INDUSTRY

4. BEE'S WAX INDUSTRY

5. AGRICULTURAL CHEMICALS INDUSTRY

6. FOOTWEAR INDUSTRY

III. CONCLUSION

1. CERAMIC INDUSTRY

1-1 PRESENT STATUS OF CERAMIC INDUSTRY OF TANGANYIKA

As one can judge from the mining output of mineral resources, no modern ceramic industry exists in this country at present. However, about 20 miles westward in Dar es Salaam district, there is found a red clay layer, the mining right of which is owned by a man named Mr. A. Pivetta. The gentleman runs a factory for bricks and pipes for construction use. The factory was comparatively mechanized to the extent that pugmills and kneading machines were used for the process of mixing, kneading, firing and forming. The firing was carried out in the flat kiln with firewoods used as fuel. This was found the only one that might deserve the name of factory throughout the districts investigated in Tanganyika.

The employees were all Tanganyika natives whose weekly pay was on an average Sh.23 which is equivallent to ¥1,150.00 in Japanese currency. This sum of pay was understood to be fairly below the standard wage prevailing in Dar es Salaam. In Tanganyika, the minimum wage system under the Labour Standard Law is in force to guarantee all the workers the monthly income equivallent to ¥7,500.00. As seen in this case, however, it seems that exceptions like this are in practice.

In one way or other, the factory of this size is actually in operation, and considering the availability of raw materials and the desired development of light industries as well as of the existing large domestic demand for commodities for daily use, it will be necessary to introduce advanced techniques and establish porcelain factories.

An 80 mile drive from Moshi to Tanga and a further 5 miles stemmed from the main road, along the steep mountaineous path, there comes out a little village called Usangi, where all the villagers are engaged in the manufacture of pottery. The material clay is found far in the recessed area and must be transported from 2 miles away from the mountain, but the quality of the clay is evaluated to be fairly good and suitable for earthen and porcelain wares.

The clay is excellent in its plasticity. In preparation for the kneaded clay, added is the non-plastic sandy material to it and the mixture is agitated by a wooden club. The forming is entirely so handmade that a little clay after another is skilfully placed to shape a water jar or likewise. This handicraft is exclusively performed by the native women. Thus, the shaped articles are dried in the shadow and arranged in links on the shallow hole dug in the ground,

piled up in 30 or 40 each for a lot. The hay covered on the stacked-up body jars is set to fire, and the firing is carried out.

The complete articles are brought to the market by trucks. The pottery is indispensable for the everyday life of the native people, and is used to stock cold water in every home. The making-up of pottery in Usangi is exclusively performed by native women and it seemed that the acquirement of the craft was obligated for them. Though recessed far in the mountain, the children are being given a qualified schooling by good teachers, receiving satisfactory compulsory education. The villagers of Usangi were found to live in abundance. All these facts would probably have been brought about by the income besides the agricultural earnings. When compared to the life of other tribes in the neighbouring districts, it was felt in reality that the Usangi people lead a life rather intellectual and more civilized.

1-2 PRESENT DISTRIBUTION CONDITION OF MATERIALS FOR PORCELAIN AND EARTHENWARE

The ceramic industry in Tanganyika has been only developed to such a degree as described above and that is all there is to it. No new findings concerning the ceramics were to be obtained. The only earthenware needed in everyday life is the jar to stock cold water, and this is far from the industrial background in a sense of the word in both quality and technique of manufacture. Much less is considered the development and utilization of the kaoline soil and feldspar. From this point of view, the survey of this time is concentrated to make clear the quality of the available resources and their distribution condition in an attempt to draw up the future development of the ceramic industry in Tanganyika.

1-2-1 Kaoline

20 miles westward from Dar es Salaam, there is Pugu-Kaoline mine which is the largest in Tanganyika. The thickness of layer is estimatedly measured to be 600 feet and its reserve is called to amount to about 2 billion tons. However, the local demand is slim and only £780 is dug out for the export purpose as of 1959. The destination of the exported kaoline was unknown, but for the most part it probably was shipped for the use of coating material of paper, not for ceramic industrial purpose.

Judging from its origin and feature, the kaoline of this area would belong to the secondary kaoline with fine particle which is deemed to be well plastic compared to the standard quality.

Nearby the Pugu-Kaoline mine there is a railroad, and also for 3 miles all the way down to the main road, though very bad in condition, a road is available for the truck transportation of the clay.

Next, there allegedly exists a comparatively large kaoline mine at Matamba northwest to Njombe. Though the site investigation could not be made in the area, the mine is reportedly located at the altitude of 2,000 feet, and what is worse, no transportation way is opened for about 10 miles leading to the main road. The exploitation of this mine would be possibly impracticable.

The result of the quality analysis of the Pugu-kaoline will be shown separately in this report.

1-2-2 Feldspar

Same as in the kaoline, no local demand for the feldspar material is either recognized in the district, nor export is practised. However, if the ceramic industry should be exploited, the demand would rise for it, enabling the mining to run on a commercial basis. So much as the feldspar material is concerned under the present circumstances, it gives no profit to Tanganyika. On the other hand, its rich reserve is expected. Since the feldspathic material is found in the same pegmatite mine as mica, a large potential output can be estimated from the fact that the mica mining is now prosperous in the area. The mica is widely known as one of the remarkable mineral resources of Tanganyika, and its export amounts to £50,000 through £80,000 annually.

There are two kinds of the feldspar material found in Tanganyika. The results of the quality analysis will be shown separately. The mere X-ray mineral analysis and microscopic photograph of the flakes reveal that both of the feldspar should belong to the microcline perthite.

The main productive districts of the feldspar in Tanganyika are as follows:

(a) Uluguru Mountain observed to be wholly a mica-pegmatite to itself, and in its neighbouring Morogoro runs another feldspar dyke.

(b) Around Dodoma, a monomineralic feldspar dyke observed.

Next to diamond, gold is the second largest mineral product in Tanganyika. In the debris resulted from the gold-extraction out of the auriferous feldspar dyke, the material is also obtainable in quantities.

No clay of this country is so much superior in quality as to be equal to Kibushi or Gairome clay of Japan, which are excellent both in

plasticity and quality. But, the Pugu-kaoline is considered to be a secondary kaoline having a comparatively strong plasticity. It might probably be available for the industrial use. The cost estimation, however, was based on the assumption that the ball clay of Japanese produce should be imported instead of this local material.

1-3 RESULTS OF EXAMINATION

1-3-1 Pugu-Kaoline (refined in the site)

(a) Chemical components (according to chelatometry)

Component:	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	TiO_2
Percentage:	52.37	31.03	1.65	0.18	0.25	0.04

Ig. loss	K_2O	Na_2O	Total
12.50	0.30	0.74	98.06

(b) Fire-resistence : SK 34

(c) Diffraction in X-ray powder examination is shown in appendix..

The diffraction indicated that the test piece consists of a very pure kaoline of well developed crystalization and mixed in an extremely small amount of silica.

The percentage of alumina content is small. The fire-resistence SK34 is counted to be a middle-rating for kaoline. According to the result of chemical analysis, the amount of the contained alkali, silica and other components as a whole shows the very approximate values to those of the Japanese sedimentary clay of several kinds.

As known in the preceding study, the physical and chemical features would be suitable to the material of the porcelain and earthenware, but in the pilot manufacture which should be conducted in parellel with the full-scale practical plan, it is recommended that an appropriate amount of feldspar and kaoline should be sent from Japan.

1-3-2 Feldspar of Dodoma (brown-coloured)

(a) Chemical components (according to chelatometry)

Components:	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	TiO_2
Percentage:	66.26	17.27	0.23	0.15	0.35	0

Ig. loss	K_2O	Na_2O	Total
0.40	10.81	2.79	98.26

(b) Diffraction in X-ray powder examination is shown in appendix.

(c) Microscopic photograph (x20 on film) is shown in appendix.

1-3-3 Feldspar of Dodoma (green-coloured)

(a) Chemical components (according to chelatometry)

CaO and MgO are omitted. Other components are as follows.

Components:	SiO_2	Al_2O_3	Fe_2O_3	K_2O	Na_2O
Percentage:	66.59	17.75	0.24	10.24	2.83

(b) Diffraction in X-ray powder examination is shown in appendix.

(c) Microscopic photograph (x20 on film) is shown in appendix.

According to the results of the overall examination including X-ray, chemical analysis and microscopic observation, the feldspar of two kinds should be of microcline perthite with a little oligoclase contained (not probably of albite).

The ferrous component is found very small, and the alkali percentage is considered to be on an average for clay. All these factors will conclude that the feldspar having potassium as chief feature should make a good material for porcelain and earthenwares.

1-4 MARKET CONDITIONS

Exact scale of the market has not been able to be figured out because of the short period of the investigation of this time.

Prior to the establishment of enterprises, therefore, further investigations should be conducted both on the size of market and deposits of materials.

The selling price on the market is generally about 1.2 times as high as in Japan. Few highest quality goods are in the market, but mostly are sold the middle class wares in both quality and design. As for the expensive wares, those fire-proof of English, French and German makes have come up in the market. Especially notable is that the hard earthenwares share a larger market than the ceramic ware. In anyway, it should be pointed out that the most attractive condition about this market is that there comes out nothing of home-made products whereas a certain amount of demand exists and will be anticipated to be on the increase.

1-5 DRAFT PLAN FOR THE PRODUCTION

1-5-1 Item

The ceramic industry of Tanganyika is just at its beginning stage and has no traditional background for the manufacturing technology.

Taken into consideration the results of the actual investigations, the ironstone wares would be more suitable for the market than the porcelain wares.

1-5-2 Annual Output

In determining the scale of production facilities, plans may be drawn up from two different angles. One would be based on a positive attitude of taking into consideration the past import and export results as well as the outlook for the future economic development of the entire Africa. The other, based on a conservative policy, would aim at the minimum feasible success in a country without the traditional background of the ceramic industry. The two plans, based on these different viewpoints, are given below in detail.

(a) Plan A

In this plan, the highest importance was given to the production flexibility. The production scale was accordingly drawn up on the basis of intermittent kiln (push-car type, firing to be performed with heavy oil) the productivity of which is lower as compared with the tunnel kiln method given in (b) below. However, it has the advantage of preventing the loss expected during the infantile stages when the production techniques are not satisfactorily established. It also has the advantage of bringing the production gradually to success.

(b) Plan B

In this plan, importance is attached to the productivity rather than the prevention of loss. The long kiln to be utilized in this plan necesssarily calls for production in large quantities. Since no intermittent operation is possible with the tunnel kiln, this plan has the drawbacks that it may suffer economic disadvantage at the outset when the production techniques are not stabilized. However, once it gets into smooth production order, its productivity will be much higher than may be achieved by Plan A above, and the firing should be performed much more easily.

Facilities and cost required for Plan A, and B, above are given hereunder.

1-6 INTERMITTENT KILN - SHUTTLE KILN

Shuttle kilns are recommended to serve as intermittent kilns. The structure of the shuttle kiln is as illustrated in appendix. Facilities required for production based on 2 units of shuttle kilns are given

below.

(a) Crushing and clay preparing shop

Jaw crusher, edge runner, bucket conveyor, rotary sieve, magnet separator, membrane pump, filter press, ball mill, kneading machine, etc.

Rough estimate: £8,000

(b) Clay forming shop

Clay agitator, jigger, hand jigger, press for casting slip, shelf transport car, drying room, etc.

Rough estimate: £4,000

(c) Shuttle kiln - 2 units £13,000

(d) Electric decorating kiln £1,600

(e) Sagger making machine

Edge runner, bucket conveyor, pug machine, friction press.

Rough estimate: £2,500

(f) Mold making shop

Vacuum bubble eliminator, table jigger, etc.

Rough estimate: £200

(g) Laboratory shop

200 kg ball mill, pot mill, auto-crave, test kiln

Rough estimate: £1,000

GRAND TOTAL: £30,300

Facilities and cost for Plan B are given below.

1-7 TUNNEL KILN

1-7-1 Introduction

The most decisive factor in making up the production scale is the tunnel kiln equipment which is supposed to be used as follows.

Glost tunnel kiln

All length: 50 m

Effective area: 700 mm x 1,200 mm

(a) Based on the firing capacity of the tunnel chamber as described above, all the manufacturing equipments will be set up accordingly.

(b) With an 8 hour work a day (25 working days a month), the facilities is capable of producing 450,000 pcs. of hard earthen wares each month.

1-7-2 Equipments, Manufacturing Process and Plant Layout

Necessary equipments are as given below. Manufacturing processs and plant layout are given in appendix.

(a) Elutriation & clay preparing shop
(b) Clay forming shop
(c) Drying conveyor
(d) Biscuit firing kiln
(e) Glost firing kiln
(f) Electric decoration kiln
(g) Glaze making shop
(h) Sagger making shop
(i) Laboratory shop
(j) Mold making shop
(k) Gypsum firing shop

For each section mentioned above, the composition of the machinery and equipments are as follows.

(a) Material preparatory section

1.	Jaw crusher	1 set
2.	Edge runner	1 set
3.	Bucket conveyor	1 set
4.	Portable platform scale	1 set
5.	Elevator	1 set
6.	Ball mill	3 sets
7.	Agitator	3 sets
8.	Rotary sieve	2 sets
9.	Magnet separator	2 sets
10.	Diaphram pump	2 sets
11.	Filter press	2 sets
12.	De airing auger machine	1 set
13.	Pipe and fitting	1 set

Approximate total value: £18,500

(b) Forming section

1.	Semi automatic jigger	6 sets
2.	Machine jigger	16 sets
3.	Automatic dryer	1 unit
4.	Finishing jigger	6 sets
5.	Shelf transfer car	5 sets
6.	Hand jigger	20 sets

7.	Press for casting slip	2 sets
8.	Agitator for casting slip	1 set
9.	Duct for drying furnace	3 sets
10.	Blower for drying furnace	3 sets
11.	Sagger pin forming machine	1 set

Approximate total value: £13,300

(c) Biscuit Firing section

1.	Biscuit firing tunnel kiln	1 unit

Approximate value: £20,500

(d) Glost firing section

1.	Glost firing tunnel kiln	1 unit

Approximate value: £18,200

(e) Decorating section

1.	Electric decoration kiln	4 sets

Approximate value: £3,600

(f) Glaze making section

1.	Ball mill	1 set
2.	Rotary sieve	1 set
3.	Magnetic separator	1 set
4.	Glaze agitator	1 set

Approximate total value: £3,100

(g) Sagger making section

1.	Edge runner	1 set
2.	Bucket conveyor	1 set
3.	Pug machine	1 set
4.	Friction press	1 set
5.	Steel press for friction press	10 sets

Approximate total value: £3,500

(h) Mold making section

1.	Vacuum bubble eliminator	1 set
2.	Table jigger	1 set

Approximate total value: £300

(i) Laboratory section

1.	Pot mill	1 set
2.	Auto-crave	1 set
3.	Test kiln	1 set
4.	Agitator machine	1 set

Approximate total value: £1,000

(j) Other tools

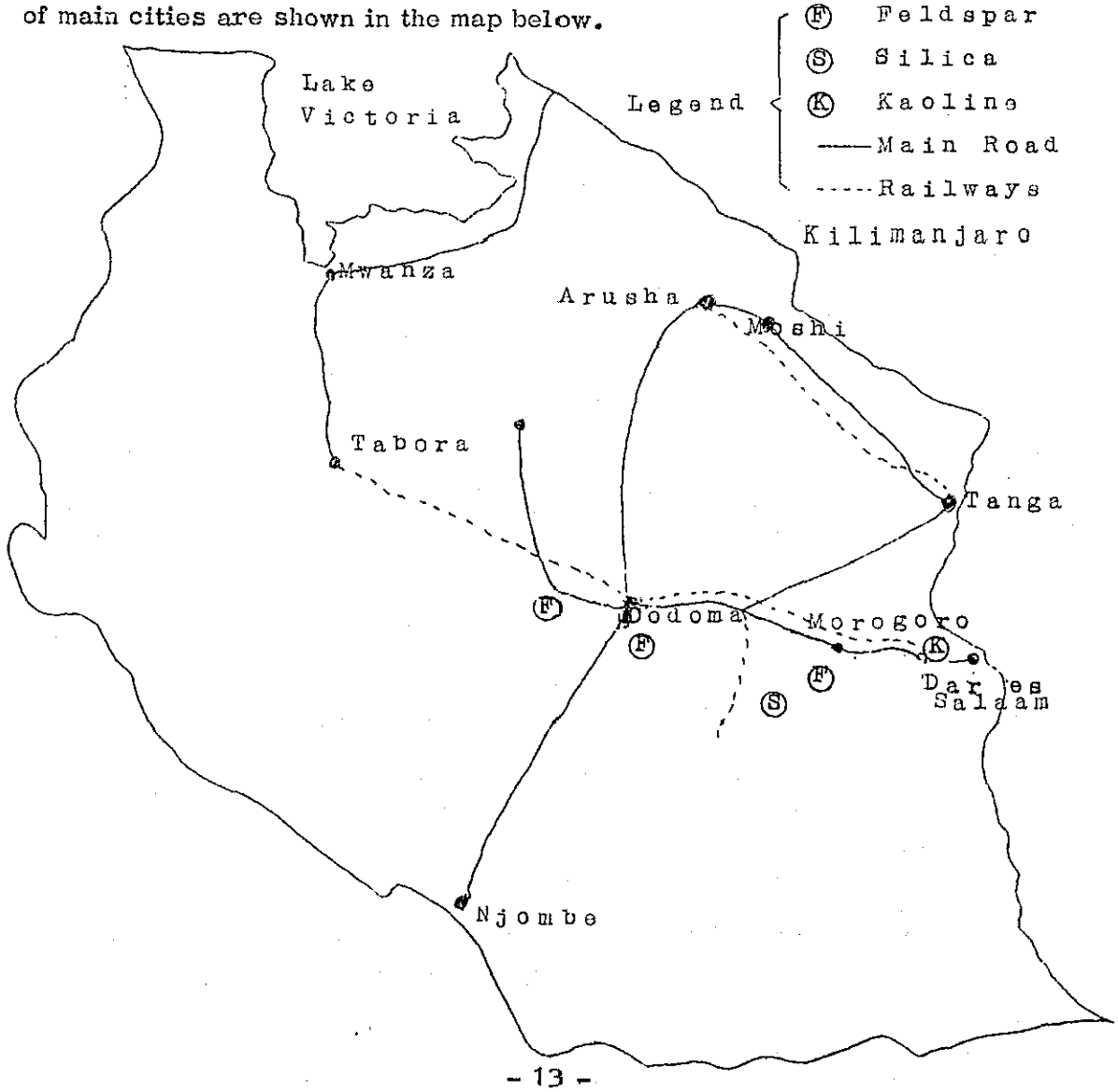
1.	Mold case	1 unit
2.	Drying conveyor	1 set

Approximate total value: £1,600

Approximate Grand Total: £83,600

1-7-3 Suitable Plant Site

In the west part of Dar es Salaam city, the Government of Tanganyika is concentrating its efforts to develop the industrial zone, and there have been established BATA Shoemaking Factory, East African Tobacco Factory and several other light industrial factories. Electricity and labour population is in the state of oversupply. Further, the area commands a very convenient position to exchange various materials and resources with other concerns, domestic or abroad. The distribution condition of ceramic materials and the location of main cities are shown in the map below.



1-7-4 Construction Cost

Item	Area (m^2)	Unit (£)	Amount (£)
Main factory	72 x 60 = 4,320	25	108,000
Decorating factory	24 x 18 = 432	20	8,640
Material warehouse	20 x 5 = 100	5	500
Product warehouse	24 x 6 = 144	8	1,152
Sagger factory	18 x 12 = 216	5	1,080
Office building	18 x 10 = 180	25	4,500
		Total:	123,872

1-7-5 Material Cost and Its Prospect

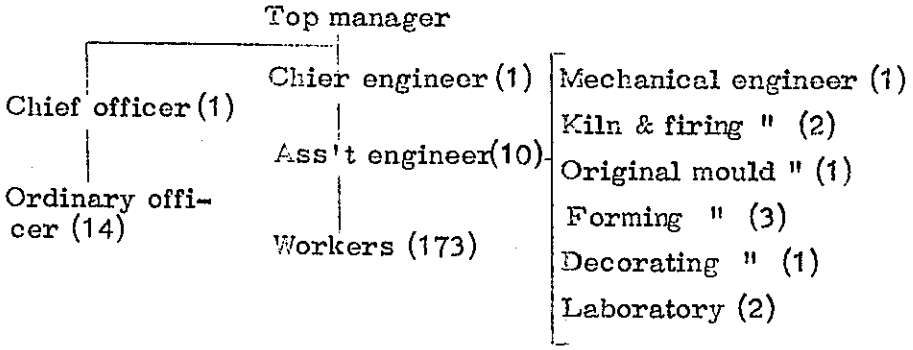
	Item	Annual Consumption (ton)	Unit cost per ton delivered at Dar es Salaam (£)	Amount (£)	Remarks
BODY	Kaoline	480	10	4,800	
	Silica	456	5	2,280	
	Feldspar	120	10	1,200	
	Ball clay	144	20	2,880	Imported
GLAZE	Frit	120	36	4,320	Imported
	Silica	24	5	120	
	Feldspar	55.2	10	552	
	Lime-stone	14.4	5	72	
	Kaoline	14.4	10	144	
	Zinc white	11.0	16	176	Imported
SAGGER	Fire-clay	150	5	750	
	Shamotto	90	7	630	
	Ball clay (2nd grade)	60	10	600	Imported
SUBSIDIARY MATERIAL	Gypsum	50	6.9	345	Imported
	Crude oil	364,000 gal.	£2/44 (gal.)	16,600	Imported
	Water	1,200,000 "		240	
	Electricity	420,000 KWH		5,000	
			GRAND TOTAL:	£40,709	

Among the materials required, the feldspar, kaoline and limestone would cost cheaper if the proposed establishment should be granted the licence for mining right. The gypsum is also available in the district, and should be further developed for the industrial purpose. Furthermore, the frit could be made provided the frit kiln is equipped. All these possible ways of rationalizing the cost might be reviewed in 5 years, when the production will be stabilized.

1-7-6 Pay, Wage and Other Costs

(a) Composition of employees

The composition of employees corresponding to the proposed production scale is as follows.



(b) Estimation of pay and wage

The estimate of the total pay and wage, based on the member composition given in (a) above, shows that the required amount should reach approximately £40,000 yearly.

(c) Estimate of indirect cost

To meet the production of this size, the depreciation, maintenance and repair costs and other expenses cost approximately £40,000 annually.

(d) Annual total cost

(Material cost)		(Pay. and wage)		(Indirect cost)	(Total sum)
£40,000	+	£40,000	+	£40,000	= £120,000

1-7-7 Annual Total Output and Profit

The monthly output of 450,000 pcs. makes 5,400,000 pcs. for one year, and the average selling price would be presumedly set at 60 cents per piece:-

Annual total amount: 5.4 million pcs. x 60 cents = £162,000

Annual profit and profit rate:

(Annual output) - (Annual total cost) = Profit

£162,000 - £120,000 = £42,000

(Profit) ÷ (Annual total output) x 100 = Profit rate

£47,000 ÷ £162,000 x 100 = About 26%

1-8 CONCLUSION

In view of the present domestic demand for porcelain and earthenwares and availability of raw materials, establishment of ceramic factories is considered quite promising and feasible. Though some difficulties may be encountered at the outset due to the lack of technical background, establishment of the ceramic industry in Tanganyika is strongly urged to be materialized as a part of the country's light industries development project. Needless to say that it will contribute to the overall economic development of the country in a great measure.

Setting aside the introduction of a modern ceramic ware factory, it is recommendable to establish in Usangi district a ceramic factory with intermittent kiln system in view of the enthusiasm expressed by Usangi people for the development of the ceramic industry and of the tradition of that part of the country. The proposed factory will introduce forming techniques utilizing hand-jiggers and automatic-jiggers as well as moulding techniques utilizing gypsum. The locational conditions and availability of raw materials of this district makes it further recommendable to study the possibility of producing improved pottery products for everyday use.

****

2. WOOD WORKING INDUSTRY

2-1 FOREST RESOURCES

Tanganyika is located in the central part of the east coast of the African continent, latitudinally 1° - 12° S. and longtitudinally 29° - 41° E. About 6% of its entire area (361,800 square miles which is approximately 2.5 times as wide as Japan's total area) is covered by waters and its climate ranges from sub-tropical to tropical. A vast woodland area is found in the north eastern part of the country along the foot of Mt. Kilimanjaro, the highest peak in Africa. A wide range of woodland areas is also discovered in the plain extending in the west surrounding Tabora as well as in the coastal region in the east. Though the forests in Tanganyika are not congested and their density is rather low, trees of fine quality are available in many different specieis. With the forest resources exploitation and afforestation concurrently to be undertaken in the future, timbers of superior quality produced in this country will be quite valuable for the development of the lumber industry. The northern part of the country, covering Arusha - Moshi - Lushoto districts, produces timbers of superior quality though not in abundance. Timbers available in this part of the country will be sufficient for the development of the lumber industry which involves the manufacture of furnitures, pre-fabricated houses, floor boards, plywoods, chip boards and hard boards.

Among many different timbers available in Tanganyika, Muninga is considered most promising for future exploitation. It is found in substantial quantities in the extensive area around Tabora in the west. Quality tests have revealed that Muninga is quite suitable for furnitures of superior quality.

Podo, which is found in the northern part of the country, has comparatively soft lignin and can therefore be utilized for diversified purposes. These two kinds of trees are most representative of the broad-leaved trees available in Tanganyika.

Major species of the trees available in Tanganyika are:

1. Muninga
2. Podo
3. Brachystegia Spiciformis
4. East African Camphorwood
5. Cephalosphaera
6. Mvule
7. Khaya Mahogany
8. Teak
9. Panga Panga

10. Juniperus Procera
11. Cypress
12. Pinus
13. East African Blackwood

In addition to the above-listed trees, bamboo forests are found in the proximity of Ngorongro. Investigations revealed, however, that the bamboo of this district is not of good quality. (See the "Distribution Map of Forest Resources" and "Amount of Wooden Material Production in Tanganyika" attached in appendix)

2-1-1 Muninga

Muninga is found in substantial quantities in the western part of the country. One also finds Muninga forests in the eastern and southern part of the coastal region. With its excellent quality, this tree is best fit for high class furnitures. If proper seasoning process is performed, it could be supplied as the main timber material for the furniture industry of Tanganyika. It should be pointed out that though at present it is used for building wooden vessels, its qualities, the solidness and the fine grain in particular, better suit the purpose of manufacturing furnitures. Exploitation of Muninga is therefore strongly recommended for the desired development of Tanganyika's furniture industry.

2-1-2 Podo

Podo is produced in the extensive foot along Mt. Kilimanjaro and Mt. Meru in the northern part of the country, i.e., in Arusha - Moshi - Lushoto districts. Being a broad-leaved tree of relatively soft lignin, it resembles Japanese Judas-tree and lime tree, and is therefore an important timber material for the future development of the furniture industry. Exploitation of Podo and Muninga, above all other species, is therefore highly recommendable.

2-1-3 Brachystegia

Though available in large quantities, this tree has hard lignin and is used for general purposes other than furnitures.

2-1-4 Muhuhu

A hard lignin timber for floor boards.

2-1-5 East African Camphorwood

Produced in Lushoto district in the north, this tree is used for building houses and for manufacturing furnitures as well. It is exported

from Port Tanga.

2-1-6 Mvule

With its water resisting qualities, this tree is utilized where resistence against water is required. It is produced in Tanga district as well as in the eastern and southern part of the coastal region. Though its lignin is comparatively hard, it could be used for furniture production. Its grain and other features are similar to those of Muninga.

2-1-7 Khaya Mahogany

Khaya Mahogany is an excellent timber material produced chiefly in Tanga and a few other districts. It can be utilized for manufacturing furnitures of superior quality with its anti-warping property. It is essentially a timber material for furnitures though it is used for building wooden vessels.

2-1-8 Teak

Teak is also found in Tanga district where it has been forested since 1959. It is one of the timbers most widely used throughout the world for the production of high class furnitures. Though some of the Teaks in this district are aged, most of them are small in size. Tanganyika's climate makes it commendable to give higher priority to the afforestation of Teak in the future.

2-1-9 Cypress

Afforestation of Cypress has been undertaken since 1930 in Arusha - Moshi - Lushoto districts, and its production since 1962 has amounted to 100,000 cubic meters per year. Because of its fast growing quality and soft lignin, it can be most readily utilized for the lumber industry. Cypress of Lushoto district is especially known for its excellent qualities. Due to the fact that most of the trees available in Tanganyika are of hard-lignin, this tree is also important as construction material. Expansion of afforested area will be necessary.

2-1-10 Pinus

Ranking with Cypress as useful soft-lignin tree, Pinus is produced in Moshi - Arusha - Lushoto districts. Pinus seedlings and seeds imported from Central America are planted in an area of 5,000 acres each year which the Forest Department hopes to increase to 7,000 acres.

Despite its climate which ranges from tropical to sub-tropical, Tanganyika is favoured with vast highlands along the foot of Mt. Kilimanjaro where natural forests are found. The highlands also provide ideal sites for the future afforestation. Planting of eucalyptus in the highlands area will be particularly useful because of its fast growing quality.

Timbers available in the natural forests are, unlike those produced in South East Asian countries, of excellent qualities. If these timbers are effectively exploited, the furniture industry, among other medium and small scale industries desired to be developed, will have a comparatively higher feasibility of development.

It is urged, for this purpose, that such measures be taken as a) the full utilization of the existing plywood factories and sawmills, and b) modernization of the felling method for the exploitation of forest resources, as well as c) introduction of modernized techniques to be applied to the entire wood working process from designing to the final finish.

It may as well be added that the utilization of Muninga, the most abundant timber material, is of the utmost importance in realizing the desired development of the furniture industry.

With regard to the afforestation, the field investigation revealed that, though the planted trees are generally growing satisfactorily favoured by the tropical climate, insufficient care caused presumably by the poor management is impeding their fast growth. As a whole, however, forests in Tanganyika, both natural and afforested, may be said to be quite promising.

"Qualities of Furniture Woods" are tabulated separately in appendix.

2-2 WOOD WORKING TECHNIQUE

2-2-1 Imara Plywood Ltd.

This is a medium scale factory located in Moshi district in the northern part of the country. Though their facilities cannot be regarded sufficient, they may be considered to be on the standard level of Tanganyika's plywood manufacturers. Materials used by them are mostly timbers produced in the north covering such species as Podocarpus, Grevillea, Newtonia, Macaranga, Fagaropsis, Khaya Nyasica, Pterocarpus Angloensis (Muninga), Entandrophranga Stolzii, Albizia Glabarescens and Cordia Holstii. With a factory newly established, their future development can be anticipated. Technically, however, they are needful of further improvement. Machines and tools installed at this factory were found to be mostly home made, but their new factory is equipped with modern machines including a West German made press. Plywood produced

by them range in size from 3 mm to 50 mm, their annual output amounting to about £70,000.

2-2-2 Sikh Sawmill Ltd.

Sikh Sawmill is an integrated wooden products factory run by an Indian proprietor. Established 15 years ago at the construction cost of £200,000, the factory now engages in the production of plywood, furnitures and sawn timbers. It employs 300 workers and is equipped with West German made machines and tools.

The plywood factory of Sikh Sawmill is equipped with excellent machines and tools including presses, drum sanders, rotary lathes, slicers, etc. which are employed to produce 3 - 15 ply plywood of the size ranging from 4 mm to 24 mm (width: 4' x length: 8') from Anflanis Africana. The market for their products is found chiefly in Tanganyika (60% of the total production), Kenya and Mauritius; and it was reported during the investigation that enquiries for their products had been received from Nyasaland. The average monthly wage of the worker is Sh.150 on the basis of 8 working hours a day.

The sawmill produces, apart from the materials consumed at their own plywood factory, sawn materials of mahogany and other timbers. Its production target for the calendar year 1964 is 225,000 cubic feet. Circular sawing machines operating with the steam engine are utilized for sawing up of timbers.

The furniture factory of Sikh Sawmill employs 20 workers and turns out wardrobes, doors, desks and chairs. Most of the machines installed at this factory are West German made. Its annual production amounts to Sh.500,000. The technical standard of this factory was noticed to be rather low and require improvement.

In addition to the above three factories, a repair shop equipped with engine lathes and other machine tools is established within Sikh Sawmill.

2-2-3 Virclare Ltd. (Flooring Factory)

This factory is located in Tanga on the east coast. 50 of its 150 workers engage in the felling of trees. The factory was previously owned by a German but is currently run by an Indian proprietor, and its monthly output now amounts to 5,000 cubic feet or 100 tons. The worker's wage averages Sh.150 per month. Its machines and tools are imported from Italy, U.K. and West Germany, and frame sawing machines are used for sawing up of timbers.

As there is reportedly no demand for their products in Tanganyika, all of their manufactures are exported to Denmark, Belgium, Germany and other European countries. The factory area is 10 acres.

With the proper and complete seasoning facilities and effective utilization of hard lignin timbers to be achieved by the application of modern machines and tools, the factory may be converted into a mosaic packet factory. Its future development can then be justifiably anticipated. Such radical improvement of the flooring industry as suggested above is recommendable from the viewpoint of the desired development of the lumber industry.

It was noticed that the machines and tools of this factory are rather old and needful of improvement.

2-2-4 Grewal Sawmills, Ltd.

Located amid the virgin forest in Lushoto district with the total area of 20 acres and 116 workers, this was found to be the largest of all the sawmills investigated. The average wage of the worker at this sawmill is Sh.100. The sawmill was established in 1944 and has a factory area of 10 acres. An integrated and continuous sawing process is adopted by this sawmill whereby trees like Podocarpus and Camphorwood are sawn into various timber materials by means of large circular sawing machines. The factory is comparatively well equipped. Its total output of 18,000 cubit feet, ranging in size from 0.5" - 3", finds its outlet not only in Tanganyika but also in Kenya and even Netherlands.

2-2-5 C.N. Emmanuel Wood Working Factory

Located in Dar es Salaam and with 25 workers, this factory engages in the production of furnitures. Their products are order-made furnitures of relatively high class, amounting in value to Sh.7,000 each month. The factory was established in 1921 at another place and moved to the present site in Dar es Salaam in 1949. The technical level of this factory may be said to equal that of a Japanese furniture factory of medium scale.

2-2-6 Kartar Furniture Factory

This factory produces chairs chiefly from Khaya Mahogany (70% of all the materials used). Both the techniques and mechanical facilities of this factory were found to be poor and needful of improvement.

2-3 PRESENT STATUS AND COUNTER PLANS

As already stated, Tanganyika produces various timber materials of fine quality. Their future exploitation is regarded quite important for the development of the wood working industry of Tanganyika. In this connection, attention is to be focussed on the following three points:

1. Effective utilization of Muninga for furnitures,
2. Modernization of the felling method in Tabora district where Muninga is produced, and
3. Exploitation of those timbers that are not suitable for plywood, furnitures or floor boards (for utilization of such timbers for the production of artificial fibre boards).

Acerose trees of soft lignin afforested in Moshi - Arusha districts can be utilized for the production of pre-fabricated houses by the factories suggested in this report to be set up in those districts.

For the effective utilization of Muninga and other hard lignin timbers, furniture factories are suggested to be set up in Moshi - Arusha districts for the production of furnitures, mainly chairs, to be put on the domestic as well as overseas market. In view of the present world-wide shortage of superior quality timbers, production of high class furnitures in Tanganyika is quite promising. From the same viewpoint, the export of Tanganyika-made furnitures would be possible not only to African countries but also to Europe and America.

Establishment of a floor board factory, particularly a mosaic packet factory, is recommendable for the effective utilization of hard lignin timbers. The quality of the mosaic packet largely depends upon its material. Since Tanganyika produces materials of diversified species in abundance, her mosaic packet products would not only meet the domestic demand but may also be exported.

Modernization of the sawing and transportation facilities for the exploitation of Podo in the north and Muninga in Tabora is urgently recommended so that these two timbers may be utilized fully to meet the domestic demand and exported in larger quantities than ever.

Factories suggested to be established in each district are:

Moshi - Arusha district	:	Furniture factory, pre-fabricated house factory
Tanga district	:	Furniture factory, floor board factory
Tabora district	:	Knock-down furniture factory (Mechanization of facilities in Tabora district is urged for the exploitation of Muninga)

2-4 STANDARD SPECIFICATIONS OF A MODEL FURNITURE FACTORY

(a) Construction site : Moshi - Arusha - Tanga districts

(b) Products : Furnitures centering upon chairs and tables (pre-fabricated furnitures)

(c) Materials : Muninga, Khaya Mahogany, and other timbers of hard and soft lignin

(d) Workers : 80 - 150 workers

(e) Factory area : 12,000 m^2 - 20,000 m^2

(f) Factory building : Floor space of 2,000 tsubo (approx. 6,600 m^2), Steel-framed, slate-roofed one-story building with concrete flooring

@¥45,000 per tsubo ¥90,000,000

(g) Factory facilities (Value in Thousand Yen):

..... 57,000

	Item	Q'ty	Unit price	Amount
1)	Power: Steam engine	1 unit, miscellaneous expenses inclusive	-	10,000
2)	Timber seasoning chamber, internal system, capacity 400 CFT	4 chambers	2,000	8,000
3)	Band sawing machine, 30"	2 pcs.	700	1,400
4)	Circular sawing machine, 16"	2 pcs.	400	800
5)	Rip sawing machine, 16"	2 pcs.	1,200	2,400
6)	Hand planer, 12"	2 pcs.	300	600
7)	Automatic planer, 24"	2 pcs.	700	1,400
8)	Super surfacer, 24"	1 pce.	800	800
9)	Circular sawing machine, 16" dia.	3 pcs.	150	450
10)	Spindle shaper	1 pce.	600	600
11)	High speed router	2 pcs.	300	600
12)	Horizontal boring machine	2 pcs.	900	1,800
13)	Copying machine	2 pcs.	3,500	7,000
14)	Compression press	1 pce.	3,000	3,000
15)	Automatic lathe	1 pce.	800	800

Item		Q'ty	Unit price	Amount
16)	Table boring machine	3 pcs.	150	450
17)	Belt sander	1 pce.	700	700
18)	Curved surface polishing device	1 unit	1,000	1,000
19)	Assembling machine	1 unit	1,200	1,200
20)	Spreader	1 unit	500	500
21)	Knife grinder	1 unit	2,200	2,200
22)	Painting facilities	1 unit	2,500	2,500
23)	Portable tools	1 unit	300	300
24)	Dust removing device	1 unit	4,000	4,000
25)	Upholstery facilities	1 unit	2,500	2,500
26)	Spare cutters & knives	1 set	1,000	1,000
27)	Miscellaneous expenses for factory facilities	-	-	1,000

h) Production target: 1,000 sets of tables and chairs - 32,000

****

3. WOODEN VESSEL INDUSTRY

3-1 PRESENT STATUS OF WOODEN VESSELS

Most of the wooden vessels in Tanganyika are fishing vessels. Approximately 1,800 of them are found engaging in fishing on Lake Victoria which yields 90% of the country's entire fish catch. The rest of about 300 - 400 vessels are found working in the coastal fishing on the Indian Ocean. While there are 13 shipyards established around Lake Victoria, there is only one on the eastern coast of the country. All these shipyards build wooden vessels.

3-1-1 Scale of Shipyards

Mwanza Shipyard on the shore of Lake Victoria , the largest in the country, is under the direct jurisdiction of the Fisheries Experiment Station which employs a British advisor specialized in fisheries. When compared with furniture factories which are quite efficiently managed by foreign capitals, Mwanza Shipyard was found to be extremely poor in its machine tool facilities. It was felt that there exists the shortage of Government funds and racial capital in Tanganyika. In the coastal region facing the Indian Ocean, there is only one wooden shipyard established on the sandy ground of Tanga. The shipyard employs 3 - 4 workers and manufactures canoue-type fishing vessels approximately 5 m in length, 2 m in beam, and sailing boats of about 10 m in length, 2 - 3 m in beam. There are no shipyards building steel vessels in Tanganyika. The only one which existed in Dar es Salaam has been closed for about two years.

Manufacturing and repairing of motor-boats and yachts is undertaken by an Englishman in Dar es Salaam who employs an Indian worker.

Considering the limited number of shipyards and their scale, the large number of wooden vessels found in Tanganyika leads to the presumption that most of them are home made.

3-1-2 Shipbuilding Method and Its Technical Level

Wooden vessels manufactured in Tanganyika can be classifed into 3 kinds, i.e., canoue-type vessels made from round timbers, boat-type fishing vessels, and sailing boats. Fishing vessels are manufactured by the same method as applied in Japan. Since the shipwright's tools are not available in sufficient quantities, sawn timbers and square timbers are utilized, and the vessels are so designed as would allow the use of straight square timbers for ribs.

Inefficiency due to the low technical level was noted among the workers who would need three months to build one fishing vessel which

the Japanese workers with normal techniques would require, if placed under the same condition, any more than a month to build. It should be emphasized, however, that if such measures as listed below are effectively taken, the present drawbacks on the part of the workers could be remedied and the production of all kinds of wooden vessels could be justifiably expected.

(a) Designing and supervision by qualified naval architects

(b) Improvement of machines and tools

(c) Establishment of efficiency wage system

The Chief of Fisheries Experiment Station in Mwanza is at present providing technical training on wooden shipbuilding at a secondary school near the Station. When 30 graduates from this training course become available in 1965 to the six wooden shipyards around the Lake, the technical level would be elevated than now it stands.

3-1-3 Cost and Number of Wooden Vessels

Wooden vessels in Tanganyika, mostly fishing vessels, are made from locally available Muninga material which costs about £10 per 10 cubic feet. Though the worker's wage is about 1/4 - 1/3 of the average wage of the Japanese worker, inefficiency of the workers and high material cost result in the finished vessels costing about 20% higher than the similar vessels in Japan. A fishing vessel of 5 m in length, 2 m in beam costs Sh.900 - 1,000, and a canoue-type fishing vessel or a sailing boat costs approximately Sh.800 - 900.

It was reported during the investigation that outboard motors were beginning to be installed on canoue-type fishing vessels. During a two day observation on the shore of the Lake, however, no canoue-type vessels with outboard motors were found. It was felt that the cost of the outboard motor which is Sh.1,000 - 1,200 is not a small amount for native fishermen to afford. Fishing vessels with outboard motors were noticed to be very few.

About 1,800 fishing vessels, mostly canoue-type vessels accomodating 2 - 3 persons and boat-type vessels of 5 m in length, 2 m in beam, were found engaged in fishing on Lake Victoria. These fishing vessels employ dip-net fishing method using fish-luring light.

Fishing Vessels on the Eastern Coast

Fishing Area	Fishing Method	Type & Size of Fishing vessel	No. of Crew	No. of Vessels
Tanga district	Gill-net fishing	Sailing vessels of 1 - 1.5 t., with/without outboard motor (5.5 hp)	2 - 3	Approx. 60
"	Pole & line fishing	Canoue-type vessels, 1 t., w/outboard motor	2 - 3	Unknown
"	Casting-net fishing	Canoue-type vessels, 1 t., w/outboard motor	3	"
Dar es Salaam	Diving catch	Canoue-type vessels, 0.5 - 1 t.	2	"
Bagamoyo district	Gill-net fishing	Sailing vessels, about 1.5 t.	4	Approx. 50
"	Basket-net fishing	Sailing vessels, 1 - 1.5 t. & Canoue-type vessels	2 - 3	"
"	Drag-net fishing	Sailing vessels, 2 - 5 t. rowed when fishing	16 - 18 per group	Unknown
Lindi district	Basket-net fishing	Sailing vessels, 1 - 5 t., & Canoue-type vessels	1 - 3	"
"	Gill-net fishing	Sailing vessels, 1 - 2 t.	2 - 5	"

All these vessels , presumedly 300 - 400 in number, engage in the coastal fishing within the fishing ground 10 - 20 miles from the fishing port.

3-2 LABOUR CONDITIONS, WAGE LEVEL AND LIVING STANDARDS

3-2-1 Labour Conditions

Of the total population of 9 million, 400 thousand are wage workers, and 9% of them are natives of Tanganyika. The majority of wage workers are employed by industries other than agriculture. An outstanding problem in the labour market which awaits solution is, as in the case of other developing nations, the shortage of skilled workers. Manpower of a large number of unskilled workers is not required at present when industries of various kinds are yet to be developed. Consequently, many of the wage workers are found out of employment in different districts of the country.

3-2-2 Wage Problem

As shown in the wage table below, wages differ by ability, kind

of work and by district. Wages are generally higher in urban districts than in rural districts. (Value in shillings)

	Unskilled worker (mostly natives)	Skilled workers (mostly Asiatics)	Management post (mostly Europeans)
Manager, supervisor, etc. of industries in urban districts	100 - 200	1,000 - 1,200	1,600 & up
Machine operator	80 - 100	600 - 1,000	-
Factory worker	-	500 - 1,200	-
Carpenter	80 - 100	600 - 800	-
Fisherman	100 - 200	400 - 800 (During the fishing season: Oct. - Mar.)	-

Native farm workers are employed with no written contract on the basis of one month or one day working period. Factory workers are also employed without written contract on the basis of monthly payment. About 15% of the unskilled adult workers are found to be employed under written contract which usually provides for six month working period, accomodation, provisions and transportation facilities.

Working hours of farm workers differ by district. They are paid by the actual amount of work they have performed by 4 - 6 o'clock in the evening (daily working hours ranging from 7 to 8 hours). The working hours of factory workers is on an average 8 hours a day. For those factory workers whose monthly income does not exceed Sh. 150, the working hours per week is limited to 48 hours. Regulations provide that the workers should be given a total of 24 hours of recreation each week and that for overtime working hours, 1.5 times the standard wage should be paid.

3-2-3 Secondary Industries Which Employ Native Workers

(a) Agricultural and forest products processing, and food industries

Bacon mfg., Bakery and confectionery, Coffee refining, Coconut fibre processing, Dairy products processing, Cooking oil

mfg., Dried fish mfg., Flour-milling, Canned food mfg., Milk sterilizing, Vermifuge Chrysanthemum drying, Kapok ginning, Rice polishing, Sisal fibre processing, Sugar mfg., etc.

(b) Mechanical and metal industries

Repairing of farm machinery and equipment, Assembly of air-conditioning equipment and refrigerators, Assembly and repair of automobiles and aluminium equipment, Construction and repair of fishing vessels, Mfg. of nails, sprigs, etc.,

Razor blade mfg.

(c) Chemical industry

Breweage, Hides and skins processing, Pharmaceutical industry, Soap mfg., Tanning, Paint mfg.

(d) Other industries

Mfg. of bricks, tiles, etc., Mica concentration, Furniture mfg.

As is readily conceivable from the above list, industries employing native workers are agricultural products processing industries and light industries which are still on the early developing stages.

3-2-4 Living Standards of Workers

It was noted that the income of farm workers is quite low. While their minimum living expenses is Sh.100, the average earning of the adult farm worker is Sh.80 for men and Sh.45 for women. Consequently, many farm workers are found constantly depressed by poverty. The per capita income of the fisherman ranges from Sh.100 to 200 per month which is about equivallent to that earned by city workers. However, if one takes into consideration the depreciation of vessels and expenditures for repairing fish gear, there shouldn't be much difference between the income of of fishermen and that of farm workers. In Bagamoyo district, the gill-net fishing during the best fishing season allegedly makes earnings amounting to as much as 1,200 shillings maximum. This, however, is to be considered an exception. Due to the lack of circulation and transportation system of commodities, the selling price of fish drastically drops during October - March season when the fish catch amounts to its peak. During another half of the year (June - September), fishing days are exceedingly limited due to the monsoon that causes heavy weather.

It has been noticed with regret that most of native workers, including machine operators, carpenters, unskilled workers, are suffering from poverty. Their houses are found congregated at places 2 - 3 km away

from the city district. Their zinc-roofed houses are structured with wooden frames, and walls are daubed with clay. It is often found that several families live under the same roof.

3-3 LIMIT OF ECONOMICAL UTILIZATION OF, AND EXPECTED DEMAND FOR, WOODEN VESSELS

3-3-1 Economical Limitations of Wooden Vessels

The Lake is presumed to contain a large quantity of Victoria Germ though it should of course be ascertained by water examination. Taking into account the corrosion of vessels caused by Victoria Germ and the present level of shipbuilding techniques, it would be advisable if the wooden fishing vessels are used for a period of three years at maximum. Utilization of wooden fishing vessels for a period exceeding five years does not count economically.

It is recommended to limit the size of the vessels to 10 m maximum in length in view of the fact that the larger they are in size, the more economical disadvantages they suffer. This is because the extension in size results only in less durability and higher cost. When the advanced foreign techniques are introduced, however, wooden vessels of 20 - 30 gross tons may be constructed economically.

3-3-2 Wooden Vessels on the Indian Ocean Coast

Durability of fishing vessels engaging in the coastal fishing on the Indian Ocean may be said to range from eight to ten years (maximum) if such preventive measures as listed below are taken.

(a) Regular singeing and cleaning of the bottom infested by ship-worms, serpulae, oisters, sea moss, etc.

(b) Regular painting of the bottom

Frequency of the landing of vessels for such preventive measures should be decided by the precise sea water examination. It may be said, however, that four - six regular cleanings each year would be necessary. Vessels over eight - ten years old should be scrapped. With regard to the size, it is anticipated that the construction of fishing vessels of larger size will be made possible in the future by introducing advanced ship-building techniques. Such techniques should be freely employed by native workers since they are gifted with the destrity of hand. The demand by the future exploitation of marine resources will therefore be met with satisfactorily.

3-3-3 Expected Demand for Wooden Vessels

It can be safely said that if the forest resources of Tanganyika are effectively utilized, the fishing vessel building is quite a promising enterprise.

(a) Prospect of fisheries

The total fish production of Lake Victoria is about 60,000 tons a year (approx. £2.5 million in value) of which 42,000 tons is caught on the Tanganyika side of the Lake. This constitutes about 92% of the country's total fish production. From the viewpoint of proper fish preservation, the fishing on Lake Victoria is considered to have reached its limit. Unless appropriate measures are immediately taken for the effective preservation of the fish under a joint endeavours of the riparian countries, the Lake will eventually be confronted with a marked and definite decline in its fish resources. In enforcing the fish preservation policy, such individual measures as listed below should be taken.

(1) Restriction of fish catch

(2) Breeding of young fish

(3) Planned production of fishing vessels

(4) Improvement of fishing vessels

(b) Improvement and Expected Demand for Fishing Vessels

Fishing vessels in Tanganyika are, as already stated, classified into 3 kinds, i.e., canoue-type fishing vessels, sailing vessels and boat-type fishing vessels. Most of them catch fish by dip-net fishing using fish-luring light. For the future development of fisheries of Lake Victoria, efforts should be directed to the improvement of fishing vessels in parallel with the preservation of fish resources as well as rationalization of the fishing industry at large.

(1) If circumstances permit, canoue-type fishing vessels currently used should be scrapped and replaced by boat-type vessels.

(2) Outboard motors are to be installed on boat-type vessels.

(3) When boat-type fishing vessels are scrapped, new ones to replace them should have the length of about 10 m.

(4) Plans should be drawn up for cutting down the present number of fishing vessels by 40% to about 1,000 vessels, and the fish production by 20% to about 3,200 tons.

(5) Fisheries in Congo should be adopted to construct a number of wooden fishing vessels of 15 - 20 tons and steel fishing vessels of 20 - 30 tons. These vessels would serve as netting boats with fish-luring light (petroleum or electric light), thereby reducing the fishing cost and adjusting at once the fish catch on the basis of the expected demand.

Though no definite statement can be made until confirmed by the necessary water examination and quality test of timbers, it may be said that the maximum economical tonnage of both wooden fishing vessels and sailing vessels (with an auxiliary engine: freight vessels) would be 20 gross tons. If a sailing vessel (with an auxiliarly engine) is required to be more than 20 tons, the permissible gross tonnage would be economically limited to 30 tons. With regard to the wooden ferry-boat desired to be constructed by H.E. the Minister for Forestry, it is regrettable that such a boat cannot be utilized economically as it requires a hull of at least 100 tons.

3-3-4 Expected Demand for Wooden Vessels for the Coastal Fishing on the Indian Ocean

On account of the fact that the fresh water fisheries and the demand for new vessels for Lake Victoria have reached the limit, the future increase of demand for wooden vessels depends largely on the development of fisheries on the Indian Ocean.

(a) Expansion of fishing ground

According to the Japanese Survey Team for the Exploitation of Marine Resources that recently visited Tanganyika, the fishing grounds best fit for the development of the country's fisheries are found in the open sea 40 - 50 miles east to the islands of Zanzibar and Mafia rather than in the waters around these islands. Fisheries on the Indian Ocean should not be confined to the coastal fishing along the eastern coast or within the gulf, but should gradually be transformed into the off-shore fishing which should cover larger fishing grounds to be exploited by modernized fishing method and gear.

(b) Improvement of fishing vessels

Modernization of fishing vessels should also be given high priority for the development of the fisheries on the Indian Ocean.

As already recommended for the fisheries of Lake Victoria, the existing canoue-type vessels should, unless the present fishing operation is hindered, be scrapped as soon as possible and replaced by boat-type vessels preferably with outboard motors and larger in size (approx. 10 m in length).

It is urged that plans be prepared for the construction of fishing vessels for off-shore fishing comprising a) vessels for drag-net and fixed-net fishing of 10 - 20 tons and b) netting vessels with fish-luring light, about 20 - 30 tons.

Model wooden vessels proposed for coastal fishing on the Indian Ocean and for fishing on Lake Victoria

	Drag-net fishing vessel	Drag-net fishing and netting vessel, with fish-luring light	
Gross tonnage	Approx. 10	Approx. 15	Approx. 25
Length	12.50 m	13.50 m	18.00 m
Beam	2.90 m	3.50 m	3.95 m
Depth	1.30 m	1.40 m	1.80 m
Main engine power	60 shp	75 hp & up	90 hp & up
Kind of main engine	Diesel engine	ditto	ditto
Average speed	7.5 knots	7 knots	ditto
Capacity	10.00 m^3	13.00 m^3	20.00 m^3
No. of crew	About 6	About 6 - 8	About 8 - 10

Production of wooden vessels other than for fishing such as yachts and boats would be technically difficult at present. The present demand for such vessels is being met by imported ones. Demand for wooden freight vessels is very slight because the existing overland transportation facilities suffice to transport goods between Tanganyika and adjacent countries. It may be added, however, that judging from the quality of the water and timbers, freight vessels can be constructed with the maximum economical tonnage of 50 tons if they are to be built at all.

3-4 MEASURES FOR PROMOTING SHIPBUILDING INDUSTRY WITH PARTICULAR REFERENCE TO WOODEN VESSELS

The development of shipbuilding industry in Tanganyika depends upon and is directly connected with her fisheries promotion policies. In order that the the wooden vessel building be progressively developed, it is hoped that the introduction of foreign capital be effected and that privileges and protection be granted in connection with tariffs and others on the imported materials required for shipbuilding including main engines, outboard motors and so forth.

In order to further promote Tanganyika's fisheries, it will be necessary to materialize the plans proposed below:

a. The first and the most important will be to improve the labour conditions. In this connection, it is suggested that a credit loan system be established by the Government for the benefit of the workers.

b. Establishment of processing facilities on land.

c. Establishment of refrigeration and storage facilities on land. (b. and c. above will contribute to the balanced inter-relation between demand and supply within the country)

d. Increase of export of frozen lobsters and other frozen products, canned fish, and smoked and dried fish.

3-5 UTILIZATION OF TIMBERS FOR WOODEN VESSELS

3-5-1 Nomenclatures of main species suitable for wooden vessels

Muninga	: Used for manufacturing vessels and furnitures
Podo	: Soft lignin
Cupressus	: Soft lignin
Khaya Mahogany	: Not easily warped; produced in Tanga district
Pinus	: Similar to pine-trees; mostly young and not available in large quantities.

3-5-2 Substitute Timbers for Wooden Vessels

The majority of the wooden vessels in Tanganyika are built from Muninga material. Though this tree can be economically utilized for canoue-type vessels (5 - 10 m in length), it cannot be recommended as a main timber material for constructing improved fishing vessels. Its considerably high cost will lead to the high selling price of the finished vessels and consequently to less demand. It is therefore suggested that studies be made on the quality of other timbers with the view to substituting Muninga.

Studies are also suggested to be made to cover the possible defects of the substitute timbers, e.g., utilization of galvanized iron sheet or canvas sheet for the prevention of cracking in the deck covering that may be caused by the heat of the sun.

3-5-3 Recommendable Application of Timbers

Economical and effective utilization of timber for wooden vessels awaits the results of the tests on various timber materials brought back from Tanganyika. However, based upon the findings so far obtained, it can be safely said that timbers best fit for wooden vessels are Muninga, Podo, Cupressus Pinos and Khaya Mahogany. Similarly, from the knowledge hitherto obtained, a plan is proposed below as to which timber should be used to what part of the wooden vessel.

Muninga	: Keel handrail, outside planking below draught (for vessels to work on Lake Victoria)
Podo	: Decks, outer plating of cabins, handrails
Cupressus	: Fittings and fixtures
Khaya Mahogany	: Engine bed, stem, sternpost
Pinus	: Ribs, strake, beam, outside planking (for vessels to work on the Indian Ocean)

3-6 AFFILIATED INDUSTRIES

From the economical standpoint, it is recommendable to utilize imported materials unless they are produced by industries existing within the country.

List of Industries Existing in Tanganyika and Adjacent Countries

(Industry)	(Remarks)
Cement	Produced at Toror, Uganda
Construction material	Fastening nails produced
Plywood	Expected to be produced by factories to be set up in Moshi and in Uganda
Paint	Produced by factories in Dar es Salaam and in Nairobi, Kenya
Sisal hemp	Produced in Tanganyika; annual output amounting to 210,000 tons
Steel rolling	Rolling and smelting facilities for scrap iron being established in Nairobi
Timbers	Many species produced and utilized for furniture mfg., etc.

Nylon fishing net	Imported from Japan in sizable quantities; manufacturing factory (Toyo Rayon of Japan) is in Nairobi

Remarks: Main engines are mostly West German made. Repair shops are found in Dar es Salaam.

3-7 IMPORTATION OF WOODEN VESSELS

Wooden vessels have never been imported in the past, nor is it expected that they would be imported in the future on account of the climate of Tanganyika and the high import freight. Wooden vessels will therefore be produced within the country. As regards steel vessels, there are three boats in Tanganyika, i.e., a steel ferry-boat (300 tons), a passenger boat (200 tons) and a fisheries guidance boat (20 tons) which have been imported from West Germany, Italy, U.K. respectively and which are now operating on Lake Victoria.

3-8 STUDIES AND PLANS

3-8-1 Water examination

Examination should be conducted on the quality of the water of Lake Victoria as well as of the Indian Ocean whereby the maximum economical feasibility in utilizing wooden vessels will be clarified.

3-8-2 Quality Test of Timbers

Timber samples brought back from Tanganyika have been tested relative to their tensile strength and other properties (See appendix).

3-8-3 Establishment of Shipyard and Shipbuilding Technique to be Provided by Japan

It has been noticed that Indians and Europeans are most interested in investing in fisheries of Tanganyika. It may be worth mentioning that the fisheries examination shortly to be conducted under the sponsorship of Kanagawa Prefecture of Japan will hopefully result in the establishment of a shipyard and in providing Japanese shipbuilding techniques as well.

3-8-4 The designing of the fishing vessels will be decided in accordance with the results of the fisheries examination by Kanagawa Prefecture.

Remarks: See appendix for drawings of a model ship.

****

4. BEE'S WAX INDUSTRY

4-1 PRESENT STATUS OF BEE'S WAX INDUSTRY

The bee's wax of Tanganyika belongs to the excellent Apis Mellifira. The bee is of the European family which is divided into two kinds, black-coloured and yellow-coloured. The bee of Tanganyika is for the most part classified as the black-coloured kind. The features of this kind are the mild nature, the strong generative power of queen bee, and the little hiving-off. Besides, it commands a good gathering of honey as well as a strong power of resistence to disease.

The bee farms at Moshi, Arusha and Tabora were investigated. Among them, the Tabora district produces the four-fifths of the total bee's wax output of this country. The way of bee-keeping could not be observed so different from that of Japan. As a peculiar way to Tabora farms, it was noted that in places where plenty of ants inhabit, the adhesive material is applied to the foot of the stand of bee hives in order to prevent the ant's intrusion. In the case of the farming on the trees, the hives are covered by the barks made in the shape of cylinder, the both sides sheltered by wooden plates. From the small holes cut in the center of the wooden plates, the bees go in and out hives.

The beekeeping on a tree enables the worker bee to fly around freely and lets a good ventilation, moreover making possible for the farm owner to collect the honey easily. This method of farming is characteristic for the European bees in Africa. No hive base is used, and the wax is made out of this farming which is called "Geda Wax" feature of which is sticky as birdlime.

In the bee farms using the hive boxes, it appeared that the way of beekeeping might be very primitive compared to those in Japan. However, the collection of honey is conducted in the most reasonable manner and degree, and the wax refined out of it showed no degraded quality, enjoying the world-wide good reputation. There are established governmental offices here and there taking care of the beekeepers of the area. The interview with the officials in charge was much of help to the understanding in detail of the beekeeping practice in Tanganyika.

Visits were paid to the beekeeping officers listed below.

Mr. G. Ntenga	Beekeeping officer
Mr. S.W. Hubbert	Assistant beekeeping officer, Arusha
Mr. J. Kaal	Assistant beekeeping officer, Moshi
Mr. F. Akiley	Beekeeping officer, Tabora

At the laboratory of Messrs. Ntenga and Hubbert, the microscopic explanation was given on the native bee's body cells and especially on its organ that

forms wax. The rich documentary records were available for the progress of beekeeping in Tanganyika.

At Mr. Kaal's, a colour film produced by an English engineer was put on the screen, featuring the processing of the bee's wax, which was quite informative. The film was titled as follows.

Bees Film Used in Tanganyika
Tanganyika Bee's Wax Film, 800 ft.
Produced by Colour Film Service, Ltd.
22-25 Porhnan Close Baker Street, London.

Mr. Kaal has been studying the bee farming method by arraning various positions of hives. Most interesting was the experiment that the hive bases were positioned in a parallel row in the long hive. If this method proves to be successful, it might be even applicable for the Japanese beekeeping.

In Tabora, by the introduction of Mr. Akiley, the survey team visited the facilities of the Tabora Beekeeping Corporation Society (Mr. W. Van Body). Their processing is a little industrialized, and there were still observed several points in their way to be improved.

Also was visited the facilities of the Tabora Mpanda Ufica Farmer's Co., Ltd. Their refinery devices are fine but seemed not to be fully used. The fact was the wax refining was carried out by means of the natural sedimentation. In the technical point of view, they should take advantage of the modernized processing.

At present, the following trading concerns are handling the bee's wax of Tanganyika.

1) Kassal Jamal & Co.
2) Burman & Co.
3) Dalgty & Co.
4) Fidhusin & Co.
5) Tuter National Tradidng Co

It appeared that these Indian merchants controlled the market and that they put pressure upon the enterprising resident beekeepers in Tanganyika. The native beekeepers, however, had organized their association under the support of the Government. With the principal places of their association at Tabora and Arusha, they started their activity. More several years, and their efforts would be substantiated to such an extent the export of bee's wax should be able to be carried out through the organization. Under the present circumstances, it is most desirous that this association should be developed and strengthened. The business relations with Japan have been already established, and a certain amount of Tanganyika bee's wax has been consumed regularly in

Japan each month.

The total export records are:

at the year of 1962 ..... 286 tons

" 1963 ..... 467 "

In 1963, the individual exports are recorded as follows:

Destination	Lbs	Value (£)	Tonnage
U.K.	754,900	135,075	337
Japan	161,100	29,133	72
Netherlands	83,400	5,727	37½
Uganda	1,900	0.388	½
Other countries	47,100	7,065	20½
Total	1,048,400	177,388	467½

Concerning Japan, there has been shown an increasing trend in importing the Tanganyika's bee's wax year by year. If the improvement of the production system in Tanganyika should be achieved for the better outturn, the cost would become much lower.

According to the statistics of the association, the production records in the year of 1962 and 1963 are as follows.

	(1962)		(1963)	
	Q'ty	Value	Q'ty	Value
Month	Lbs	£	Lbs	£
1	42,100	7,083	70,900	13,998
2	49,900	8,273	48,500	9,308
3	65,800	11,076	73,800	14,285
4	81,800	13,589	157,800	29,950
5	35,400	5,888	89,800	16,476
6	10,900	1,853	86,200	14,667
7	75,000	12,261	171,600	29,316
8	55,900	9,521	55,900	7,900
9	55,600	9,712	50,000	7,500
10	50,000	9,000	39,600	5,500
11	60,000	9,500	76,600	14,461
12			77,900	15,100

Production records for 1962 & 1963 - Cont'd -

	998,400	177,388
Uganda & Kenya in crude honey wax	50,000	-
Total:	1,048,400	177,388

4-2 OPINIONS AND RECOMMENDATIONS

The ultimate aim of the beekeepers is to collect the honey as much as possible. Therefore, to increase the bees is required as the most fundamental prerequisite.

Meanwhile, the Tanganyika beekeepers import the hive bases for their farms. It should be most uneconomical. For a country proud of such a large output of bee's wax, the home production of hive base should be started by the beekeepers themselves.

As there are many kinds of bees in so many districts and natural conditions, the hive base has the various types according to the number of cells ranging from 5.5 to 6.5 per inch. The hive base now in use in Tanganyika is the one with 5.5 cells per inch as in the case with Japan. In this respect, Japan would become easily and willingly of assistance to the Tanganyika beekeepers in making hive bases for themselves in one way or other. The necessary machine for producing hive bases can be completed with comparatively simple equipments. It would, therefore, be desirous first of all for Tanganyika Beekeepers Association to set the immediate study as well as a feasible plan of the domestic manufacturing establishments for hive bases.

With all this activity, the strengthened organization will be gradually formed and able to make contributions to the expanded distribution order by returning the more profit ultimately to the individual member beekeepers.

Concerning the use, the bee's wax alone cannot be applicable for various fields, but the broader consideration should be paid to its versatility in divergent purposes. For instance, the bleached wax will be employed in quantities by the candle-making industry. As treated and mixed with other materials, the bee's wax would see its way open in the fields of cosmetics, drug-stuff (as ointment base), shoe-polish, carbon paper, car-polish, spinning yarn starch, and many glazing wax materials and so forth.

SUPPLEMENT #1

REPORT ON EXAMINATION

Item Examined: Tanganyika Bee's Wax (Sample)

RESULTS OF ANALYSIS

1.	Acid value	: 18.23
	Saponification value	: 93.50
	Iodine value	: 7.91
	Ester value	: 75.27
	Peroxide value	: 0.05
	Fusing point	: 62.5°C
	Stearin value	: 1.62 cc
2.	Ester of high grade alcohol	: 78.16%
	Glyceride	: 4.38%
	Sterol	: 1.10%
	Free acid	: 5.40%
	Hydrocarbon	: 8.44%
	Water content & impurities	: 2.52%

BLEACHING TEST

Bee's wax was resolved and active carbon was added. The resolved wax was heated and stirred. After a specific time of reaction, the resolved wax was filtered. The filterate was then added with H_2O_2, heated and bleached, and wash ed with oxalic acid. The wax which adhers to the active carbon during filtration was completely extracted, whereby 98.5% of the original test wax was obtained.

****

5. AGRICULTURAL CHEMICALS

5-1 OUTLINE

5-1-1 Consumption

Quantitative confirmation of the consumption of agricultural chemicals in Tanganyika is rather difficult since no statistical data to serve the purpose of defining the consumption volume are available. Inference was therefore drawn from the total domestic consumption and its value appearing in the trade returns of the year 1962 which shows the total consumption of chemicals amounting to 214,000 lbs. in quantity and £270,388 in value. These two figures are inclusive of the quantity and value of those chemicals consumed for environment sanitation relative to the extermination of mosquitoes and flies as well as disinfectants for live-stock. The two figures consequently cover a broader range of chemicals than is specified by the term "agricultural chemicals" which are for protection against, and elimination of, damages by blight and noxious insects. However, these chemicals closely resemble agricultural chemicals in their formulation and in many cases their ingredients are the same as those of agricultural chemicals. From the manufacturer's standpoint, therefore, all these chemicals may be classified under the same category.

When a total consumption figure such as is given above is provided as the only basis of estimation, the following method may be employed to determine which of the two figures, i.e., quantity or value, represents more accurately the actual consumption.

In the case of DDT, for example, one would note that it is classified into several kinds by its DDT content, e.g., 50% dressing powder, 25% miscible liquid, 10 - 5 - 2,5% dusting powder. It is to be noted that a mere summing up of consumption volumes of these formulated products which contain different percentages of DDT content would only give a misleading figure since the product with the lowest DDT content would naturally account for a larger portion of such a figure. Unless the consumption of each kind of DDT product is made available, no exact figure of consumption of DDT ingredient can be obtained. Unfortunately, however, no data is available to determine the consumption by the kind of formulated product.

It may as well be pointed out here that the price of DDT product is usually in proportion to its DDT content. For example, 50% dressing powder costs approximately 4 times as much as 10% dusting powder.

A presumptive figure of consumption can therefore be more justifiably obtained by value rather than quantity.

As already stated, the total value of chemicals amounts to £270,388 which is about equivallent to the total annual expenditure appropriated for agricultural chemicals to be consumed by a small prefecture in Japan like Nara or Kyoto. This leads to the conclusion that the annual consumption of agricultural chemicals in Tanganyika is exceedingly small.

5-1-2 Agricultural Chemicals Consumed in Tanganyika

According to the explanation and data provided by the experts of Agricultural Experiment Station at Tengeru and Coffee Experiment Station at Lyanmungu, the present status of consumption of agricultural chemicals could be summarized as follows.

Although the entire range of agricultural chemicals currently obtainable in Tanganyika are being tested and experimented by the above-mentioned two Experiment Stations, actual consumption is limited to several kinds of chemicals that are applied mostly to such cash crops as cotton, coffee and so forth, and hardly to other agricultural products.

Chemicals that are used in comparatively large quantities are:

a. Organic chlorides such as DDT, BHC, Aldrin, Diedrin (as insecticide)

b. Organic phosphides like Parathion, Malathion (as disinfectant)

However, disinfectants consumed in Tanganyika seem to be mostly copper derivatives, and this is supported by the report by Mr. P.T.Walker, titled, "Tropical Pesticide Research Unit (TPRU), Proton Report #261, Nov. 1963."

The above review is based on the survey made for the months of January and April 1962 on Custom Statistics of agricultural chemicals imported by Kenya. Though it can hardly be said that the above review is entirely free from any inaccuracy, the general trend of consumption in Tanganyika may be inferred since common custom code numbers are adopted in the East African countries.

5-1-3 Types of Agricultural Chemicals

Agricultural chemicals consumed in Tanganyika are for the most part emulsifiable concentrates and wettable powder which are diluted with water for sprinkling, whereas powder chemicals are used in a very

limited quantity. This may be attributable to the fact that in Tanganyika chemicals have been used by the large scale estate agriculture with complete irrigation facilities and that higher efficiency can be expected through the use of big sprinklers that are fit for diluted emulsifiable concentrate and wettable powder but not for dust powder. However, increase of dust powder consumption is foreseen as the comparatively small scale agriculture is expected to be developed by Tanganyika natives who would be in more need of dust powder and dusting equipment than sprinklers or diluted chemicals.

5-2 CONDITIONS FOR ESTABLISHING AGRICULTURAL CHEMICAL INDUSTRY

5-2-1 Introduction

It goes without saying that the promotion of agricultural productivity depends largely upon the effective utilization of fertilizers, agricultural chemicals, farm machinery and equipment, and other productive facilities and materials. General review of the agriculture in Tanganyika has revealed that the large scale estate agriculture co-exists with the self-supporting small scale agriculture of the Tanganyika natives. The former is found to be well advanced in the application of chemicals and fertilizers, which has been realized through the use of its complete irrigation facilities, while hardly any of such chemicals or fertilizers are being utilized by the latter, partly because of the shortage of funds and agricultural know-how.

On the other hand, it is noted that severe damages are caused by blight and noxious insects particularly in cotton cultivation which often suffers so heavy a damage that it leads to the inability to plant in some districts. With regard to coffee, it has been noted that the Coffee Experiment Station at Lyamungu has prepared a calendar for the elimination of of damages by blight insects. The calendar is being utilized to encourage the use of agricultural chemicals centering upon copper derivatives.

It is suggested that further efforts be made so that the agricultural chemicals will be utilized more positively and in larger quantities to elevate the productivity of Tanganyika's agriculture which forms the foundation of her economy.

5-2-2 Demand

Since the agricultural chemicals have been consumed in limited quantities in the past chiefly by the existing large scale agriculture, the current demand amounts only to approximately £300,000 in total.

However, Governmental subsidies and other types of assistance that have been extended to the Tanganyika native farmers through fostering cooperative unions since Tanganyika's independence, have now resulted in the steady progress of her agriculture and consequently increased her agricultural output. And yearly increase of 10 - 15% is expected in the consumption of chemicals by those natives engaging in agriculture in Kilimanjaro district. Outlook for future increase of demand for chemicals may therefore be said quite promising.

5-2-3 Raw Materials

Non-existence of chemical industries in Tanganyika renders it impossible to produce such ingredients as DDT, BHC, Parathion, etc. as they are synthesized from acids, alkalis, chlorine and benzole. However, establishment of the organic agricultural chemical industry to be based on an integrated and continuous manufacturing process, should be given high priority when the chemical industry at large has been fully developed within the country. At the present stage, therefore, establishment of a plant which manufacture chemicals from imported materials ought to be given the first priority.

Materials required for each product are:

Emulsifiable concentrate	:	Active ingredient, solvent, emulsifying agent
Wettable powder	:	Active ingredient, surface active agent, carrier
Dust	:	Active ingredient, carrier

Among the materials listed above, active ingredient, carrier, solvent, emulsifying agent, surface active agent will have to be imported from abroad, but efforts should be made towards utilizing, as carrier, materials like kaoline and talc which are produced within the country. Active ingredient and emulsifying agent constitute, in terms of weight, a relatively small percentage in the finished chemicals and their import freight amounts accordingly to a small sum, whereas solvent such as xyrole and carriers would, if imported, incur a considerable amount of freight. It is therefore recommended to utilize as far as possible materals available within the country or to import active ingredients and emulsifying agents from countries not in far distance.

5-2-4 Technicians

Save for those experts at the national laboratories and experi-

ment stations, there are very few technicians specialized in agricultural chemicals in Tanganyika. This fact calls for the service of foreign chemical technicians in such important field of production as factory management and quality inspection.

It is of course desirable to realize the production of agricultural chemicals in collaboration with plant pathologists and entomoligists. At the present stage, however, it would be more advisable to launch into the production of those kinds of chemicals presently demanded, keeping close contacts with the technicians of the competent authorities.

5-2-5 Labour Situation

Since no skilled workers are available in Tanganyika, unskilled workers will have to be employed and trained. As the school system of Tanganyika provides 8 years of primary education, new graduates can be employed and trained in large cities like Dar es Salaam. A comparatively short period will suffice to train the new employees for simple works.

5-2-6 Affiliated Industries

As already mentioned, non-existence of chemical industries makes it impossible to obtain raw materials required for the production of agricultural chemicals. It would also be difficult to expect the production of the necessary machines and equipments within the country.

Regarding packing materials including kraft paper, corrugated cardboard, containers (tins and bottles), manufacturing industries of these items are yet to be developed.

5-3 PRESENT STATUS OF AGRICULTURAL CHEMICAL INDUSTRY

Throughout the entire Tanganyika, there is only one agricultural chemical manufacturing factory. The factory, located in Dar es Salaam, imports the active ingredient of DDT and produces DDT dust powder by adding the carrier. The factory is reportedly equipped with the dust mixing facilities capable of daily output of one ton DDT dust powder. It has also been reported that the factory is planning to install facilities for the production of emulsifiable concentrates.

5-4 SUGGESTIONS AND PROPOSALS

5-4-1 Necessity of Developing Agricultural Chemical Industry

As is well known, Tanganyika's economy is supported by export-

ing her agricultural products. It follows therefore that the promotion of agricultural productivity is of utmost importance at the present stage. As already stated, the desired elevation of productivity can be most effectively materialized by utilizing agricultural chemicals which, it is to be pointed out, are being imported from abroad. It is therefore strongly recommended that efforts be directed towards developing the agricultural chemical industry within Tanganyika, whereby chemicals now being imported will eventually be replaced by home made products.

5-4-2 Establishment of Agricultural Chemical Factory

Prior to World War II, agricultural chemicals used to be composed mainly of inorganic compounds such as copper, sulphur, arsenic and botanical chemicals like nicotine. After the War, however, remarkable progress has been made in this field and at present most of them are complex compounds consisting of organic contents, resulting in the requirement of high techniques for the production of active ingredients.

In Tanganyika where no fundamental chemical industries exist, it would be most appropriate to start with the formulated products utilizing imported active ingredients which will not be produced within the country until the chemical industry at large has been fully developed. Advantage of the above proposal is that the funds required for setting up such a factory is relatively small and that no higher techniques are required. Another advantage that can be expected is that the workers will be provided with the fundamental knowledge and training on agricultural chemicals.

With regard to inorganic chemicals, copper derivatives for instance, no higher techniques are required to manufacture them. Production of inorganic chemicals is particularly recommendable not only because copper derivatives are widely used as disinfectant at coffee plantations but also because copper, the main raw material, can be readily imported from such neighbouring countries as Uganda, Rodesia, etc.

5-4-3 Scale of the Proposed Factory

The proposed factory is recommended to have the productive capacity of the entire range of agricultural chemicals inclusive of dust powder, wettable powder, emulsifiable concentrate as well as oil solution.

Based upon the estimated present demand, the daily production capacity is recommended to be 8 tons for dust, 5 tons for wettable powder and 2 tons for emulsifiable concentrate at the outset, to be extend-

ed in the future in accordance with the increase of demand.

The total sum required is estimated at approximately £100,000 including the cost of the plant and equipment, which can be broken up as follows.

£50,000 .....for dust
£30,000 .....for wettable powder
£10,000 .....for emulsifiable concentrate
£10,000 .....as other expenses

****

6. FOOTWEAR INDUSTRY

6-1 PRESENT STATUS OF SANDAL INDUSTRY

Investigations conducted with priority given to the sandal industry revealed that most of the footwears consumed in Tanganyika are sandals. This is regarded quite natural in view of the locational and meteorological conditions of the country which is situated in the tropical Africa and has comparatively little rainfall. The use of sandals in Tanganyika can also be explained by the fact that prices are lower than ordinary shoes and their relatively simple manufacturing method requires far less techniques and skill than in the case of ordinary shoes. One of the advantages of the sandal industry is, therefore, that it can be safely maintained by utilizing unskilled workers.

An unexpectedly large number of people was found to be wearing sandals in Tanganyika and it is estimated that the consumption will further increase in the future. It is to be noted that in the entire Tanganyika which has 11 million population, there exists only one full scale sandal maker (i.e., BATA Co.), though this company is quite powerful. Other makers of sandals, scattered all over the country, are small enterprises with employees ranging from two to three. BATA's output during 1963 of leather shoes and leather sandals marked 260,000 pairs; imports by the same concern of leather shoes and other footwears during 1961 and 1962 amounted to £128,392 and £117,425 respectively, which clearly indicates that there is a sufficient room for increasing the production of footwears in Tanganyika.

6-2 PROSPECT FOR ESTABLISHING A GOVERNMENT-SUPPORTED SANDAL FACTORY

The establishment of a highly productive and efficient sandal factory is considered quite useful, and it is anticipated that the fair competition between the products to be turned out by the proposed factory and those of BATA which enjoy monopolistic position in the market, will result in providing the consumers with products better in quality and lower in price. This will undoubtedly serve as an excellent shield against the outflow of the foreign currency reserve as well.

It is to be borne in mind, however, that the proposed factory will not be successfully operated without the due efforts to be exerted in the field of circulation of commodity including, of course, establishing of the sales route. Since the proposed factory is to be constructed in the face of the already established monopolistic position of BATA, it will be confronted, as a matter of course, with considerable difficulties in the sales of its products. Adequate

Government protection is therefore urged to be provided in establishing the selling system in each district of the country as well as in availing of the cooperative unions through which to sell its products at controlled selling prices. Without such measures, it would not be easy to overcome the expected sales difficulties which could be caused merely by the overwhelming reputation of BATA.

At any rate, no fair competition with BATA could be expected nor the desired end could be achieved without the support of the Government. It is therefore hoped that the Government take the lead in the progress to be made towards the early development of the proposed footwear industry.

****

III. CONCLUSION

The climate of Tanganyika is quite favourable with substantial rainfalls. The country produces plenty of agricultural products and is favoured with rich natural resources such as timbers, minerals, and so forth.

The investigations of this time have revealed that among a number of industries desirously to be developed in Tanganyika, the most promising are the ceramic and wood working industries. With regard to the agricultural chemicals and footwears, it has been noticed that these two industries would be placed under the direct influence of the East African Common Market. Their development would therefore be impossible unless special measures are taken to avert the influence of the Market to enable them to compete with the powerful European capitals such as BATA and ICI. No particular stress was therefore placed on these two industries in this report.

During the stay of the Survey Team in Tanganyika, it was made clear that the request for investigations on wooden vessels had been made for the purpose of effective utilization of the forest resources. Demand for wooden vessels should await the results of the studies to be undertaken in the future. In this report, therefore, test results are given on the timber materials that could be used for building wooden vessels to meet the present demand.

The Survey Team was informed, during the investigation, that the industries to utilize bee's wax are desired to be developed. Due to the foreseeable technical difficulties, however, no recommendations were made.

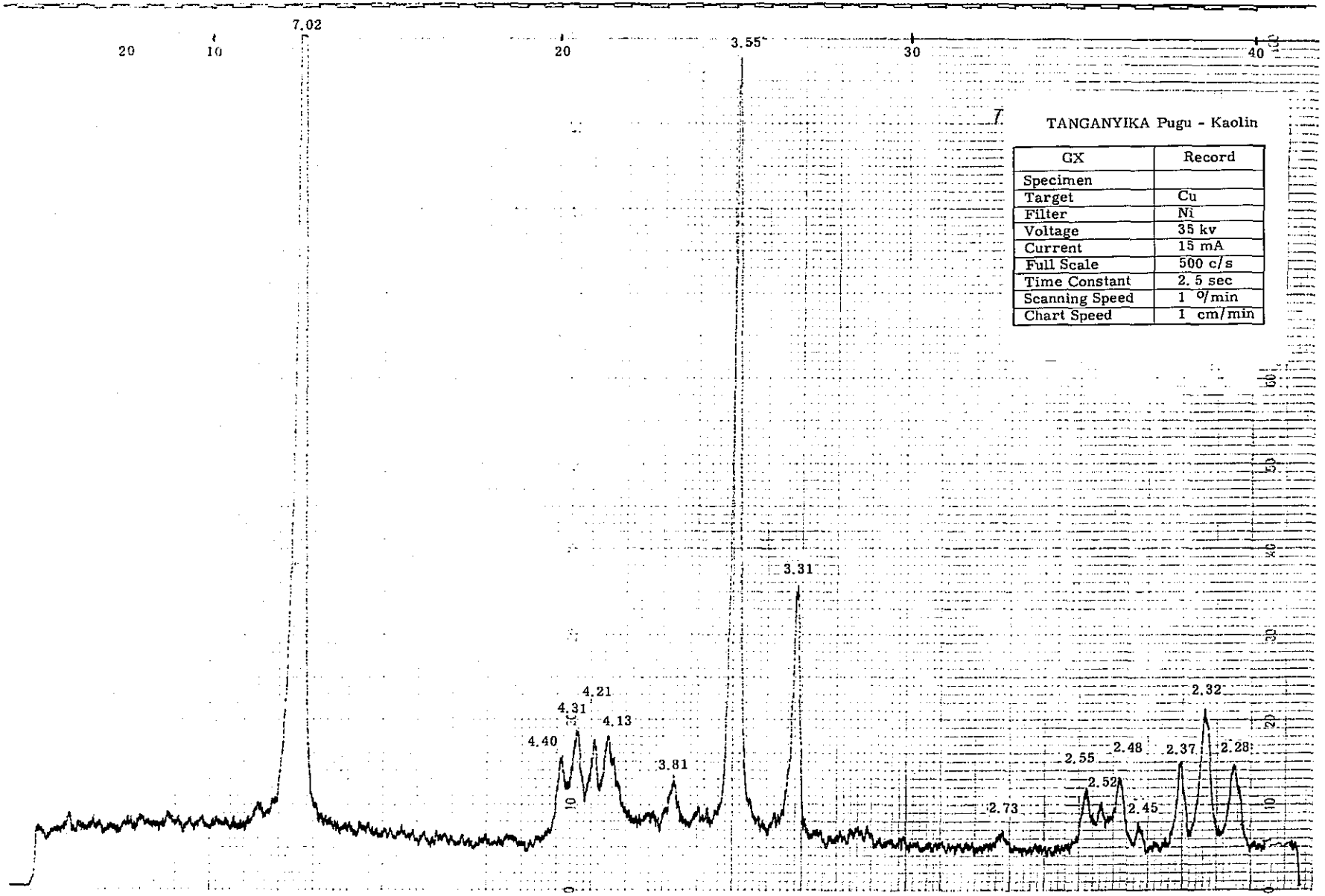
Industries suggested to be developed in Tanganyika can therefore be listed up as follows.

a. Ceramic industry in Dar es Salaam and vicinity for the production of porcelain, earthenwares and sanitary wares
b. Furniture industry in Arusha - Tabora districts for the production of high class furnitures for export
c. Chip board and pre-fabricated house industries in Lushoto - - Arusha districts.

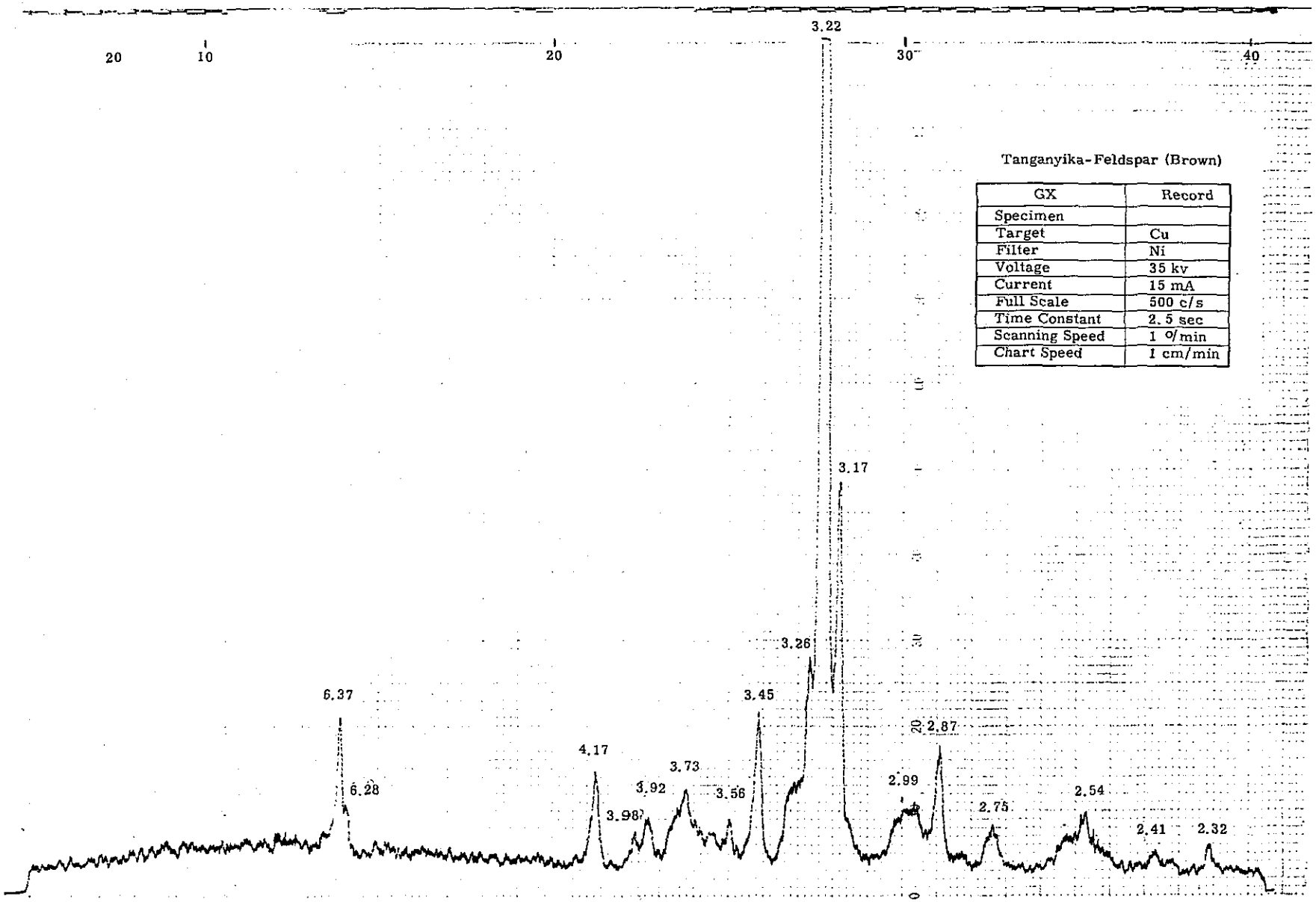
In completing this report, it is hoped that Japan's technical cooperation for medium and small scale industries in Tanganyika would serve the purpose of developing and stabilizing the economy of Tanganyika.

****

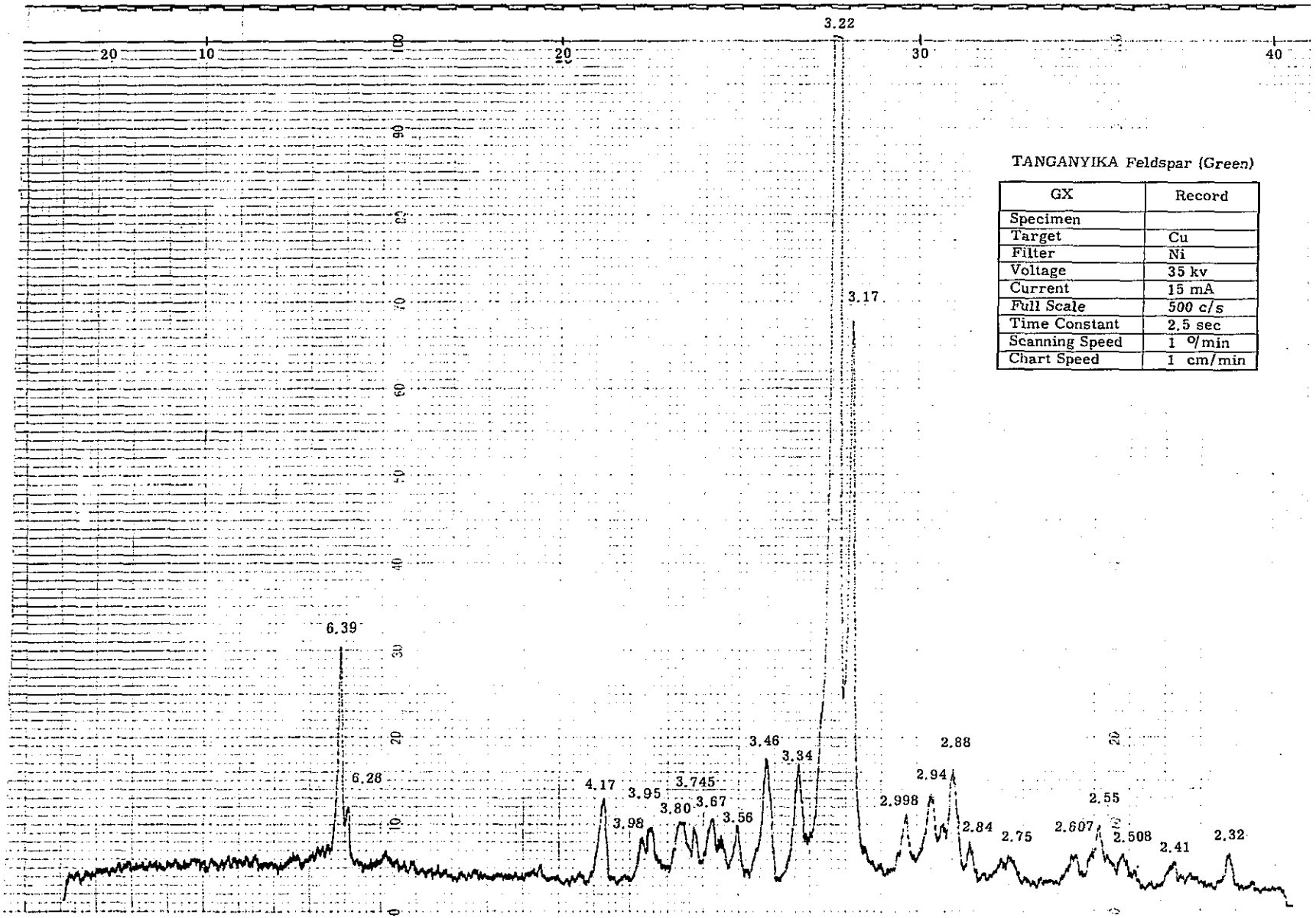
IV. APPENDICES


7.02
3.55
20
10
20
30
40
7
TANGANYIKA Pugu - Kaolin
GX | Record
Specimen |
Target | Cu
Filter | Ni
Voltage | 35 kv
Current | 15 mA
Full Scale | 500 c/s
Time Constant | 2.5 sec
Scanning Speed | 1 °/min
Chart Speed | 1 cm/min
3.31
4.40
4.31
4.21
4.13
3.81
2.73
2.55
2.52
2.48
2.45
2.37
2.32
2.28
100
50
40
30
20
10
0

Diffraction in X-Ray Powder Examination,
Feldspar of Dodoma (brown), (Ref. p. 8, Ceramic Industry)


20
10
20
30
40
3.22
3.17
3.26
6.37
6.28
4.17
3.98
3.92
3.73
3.56
3.45
2.87
2.99
2.75
2.54
2.41
2.32
Tanganyika-Feldspar (Brown)
GX | Record
Specimen |
Target | Cu
Filter | Ni
Voltage | 35 kv
Current | 15 mA
Full Scale | 500 c/s
Time Constant | 2.5 sec
Scanning Speed | 1 °/min
Chart Speed | 1 cm/min

Diffraction in X-Ray Powder Examination,
Feldspar of Dodoma (green), (Ref. p. 8, Ceramic Industry)



TANGANYIKA Feldspar (Green)

GX	Record
Specimen	
Target	Cu
Filter	Ni
Voltage	35 kv
Current	15 mA
Full Scale	500 c/s
Time Constant	2.5 sec
Scanning Speed	1 °/min
Chart Speed	1 cm/min

Microscopic Photo (Ref. p. 8, Ceramic Industry)

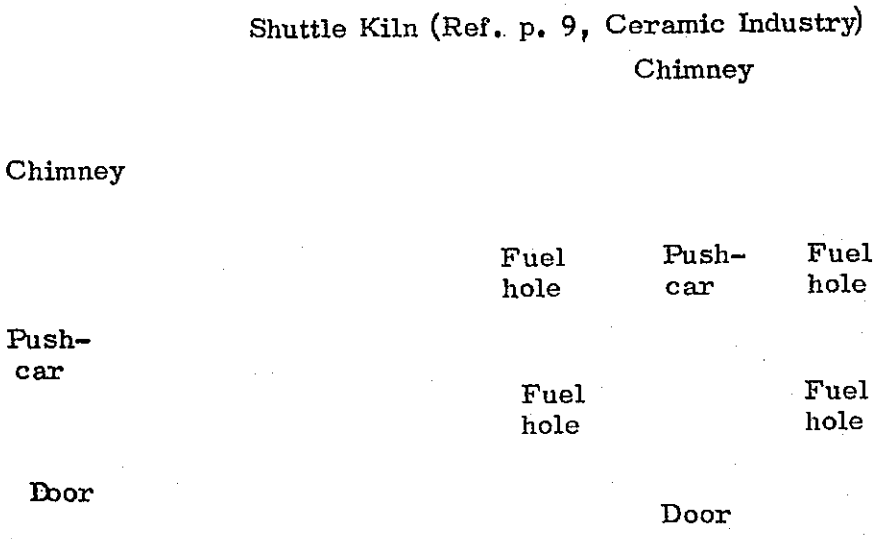
Feldspar of Dodoma, brown

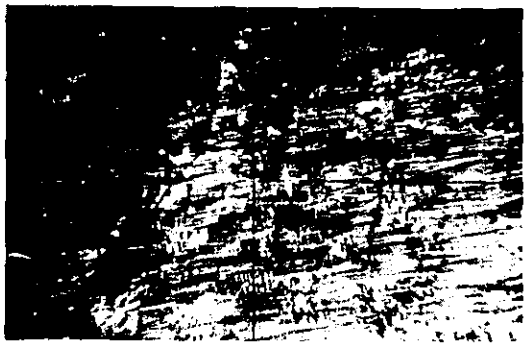
x20 on film

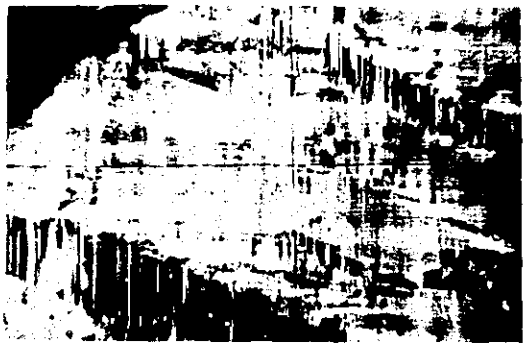
Feldspar of Dodoma, green

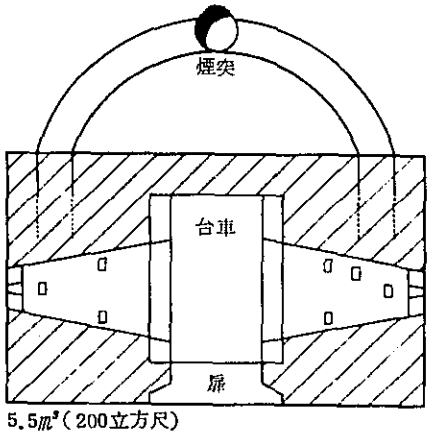
x20 on film

Shuttle Kiln (Ref. p. 9, Ceramic Industry)

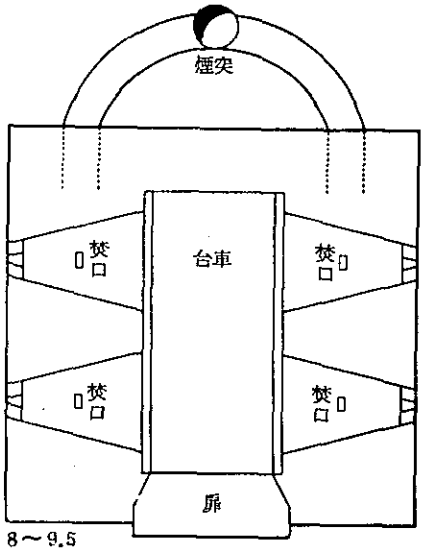




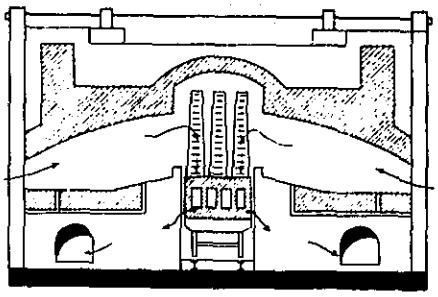


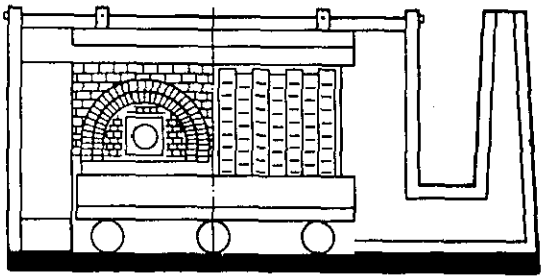


5.5㎥（200立方尺）



8～9.5
300～370

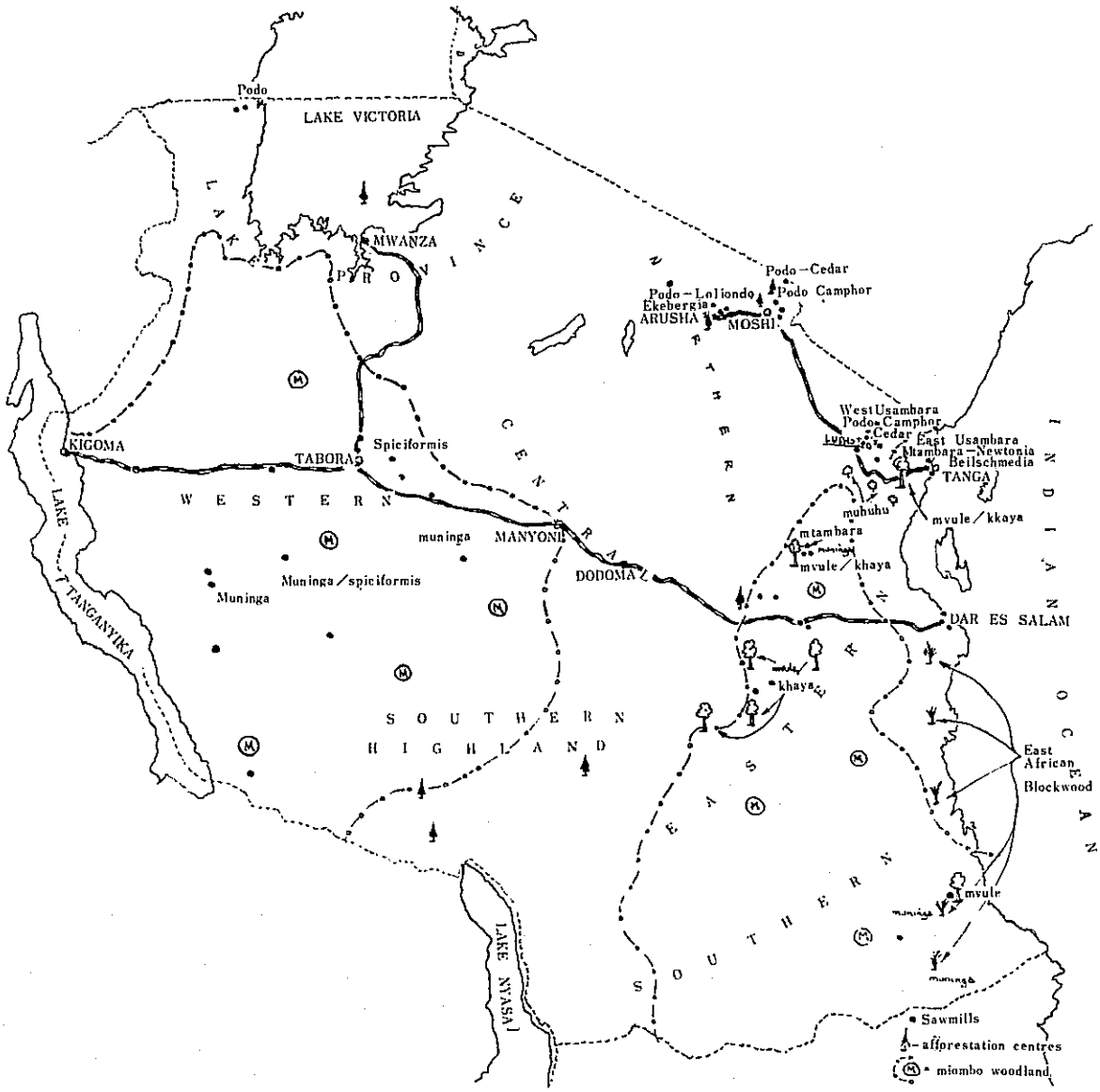




A4（210×297㎜）N鈑

＃1

Distribution Map of Forest Resources
(Ref. p. 18, Wood Working Industry)


Podo
LAKE VICTORIA
LAKE
MWANZA
PROVINCE
NORTHERN
Podo – Cedar
Podo – Loliondo
Podo Camphor
Ekebergia
ARUSHA
MOSHI
West Usambara
Podo Camphor
Cedar
East Usambara
Mtambara – Newtonia
Beilschmedia
TANGA
KIGOMA
TABORA
Spiciformis
CENTRAL
WESTERN
muninga
MANYONI
DODOMA
muhuhu
mvule / kkaya
mtambara
mvule / khaya
Muninga / spiciformis
Muninga
DAR ES SALAM
LAKE TANGANYIKA
khaya
EASTERN
INDIAN OCEAN
SOUTHERN HIGHLAND
East African Blockwood
mvule
muninga
SOUTHERN
LAKE NYASA
Sawmills
afforestation centres
miombo woodland

Amount of Wooden Material Production
(Ref. p. 18, Wood Working Industry)

AMOUNT OF WOODEN MATERIAL PRODUCTION
IN TANGANYIKA

as of 1960 & 1961

cu. ft

YEAR	1961				1960	
SPECIES	AMOUNT					
	SAWMILLS	OTHERS	TOTAL	% of TOTAL	TOTAL	% of TOTAL
Muninga	221,600	120,500	342,100	19.3	599,200	23.9
Brachystegia Spiciformis IIS	152,700	70,900	223,600	12.6	196,400	7.8
Podo	210,500	8,100	218,600	12.3	38,600	15.2
Eastafrican Camphorwood OOD	121,300	49,500	170,800	9.6	149,900	6.0
Mvule C	99,300	51,300	150,600	8.5	289,600	11.5
Khaya Mahogany NY	94,700	24,000	118,700	6.7	150,500	6.0
Muhuhu	91,000	-	91,000	5.1	85,000	3.4
Cephalalosphaera	90,000	-	90,000	5.1	102,400	4.1
Cypress	60,000	500	60,500	3.4	41,300	1.6
Newtonia	41,300	-	41,300	2.3	73,800	2.9
Grevillea	20,000	-	20,000	1.1	30,000	1.2
Loliondo	20,000	-	20,000	1.1	(UNDER 20,000 cu. ft)	
Albizia Spp.					29,700	1.2
Beilschmedia					27,400	1.1
Aningeria/Chrysophyllum UM					25,000	1.0
Isoberlinia Schlefferi		UNDER 200,000 Cubic Ft. In 1961			24,300	1.0
Parinari Spp.					23,000	0.9
Afzelia					22,400	0.9
Other Species under 20,000 cubic feet	153,400	71,600	225,000	12.9	257,800	10.3
Total (Exclude E. A. Black wood)	1,375,800	396,400	1,772,200	100.0	2,510,300	100.0

Qualities of Furniture Wood
(Ref. p. 20, Wood Working Industry)

QUALITIES OF FURNITURE WOODS

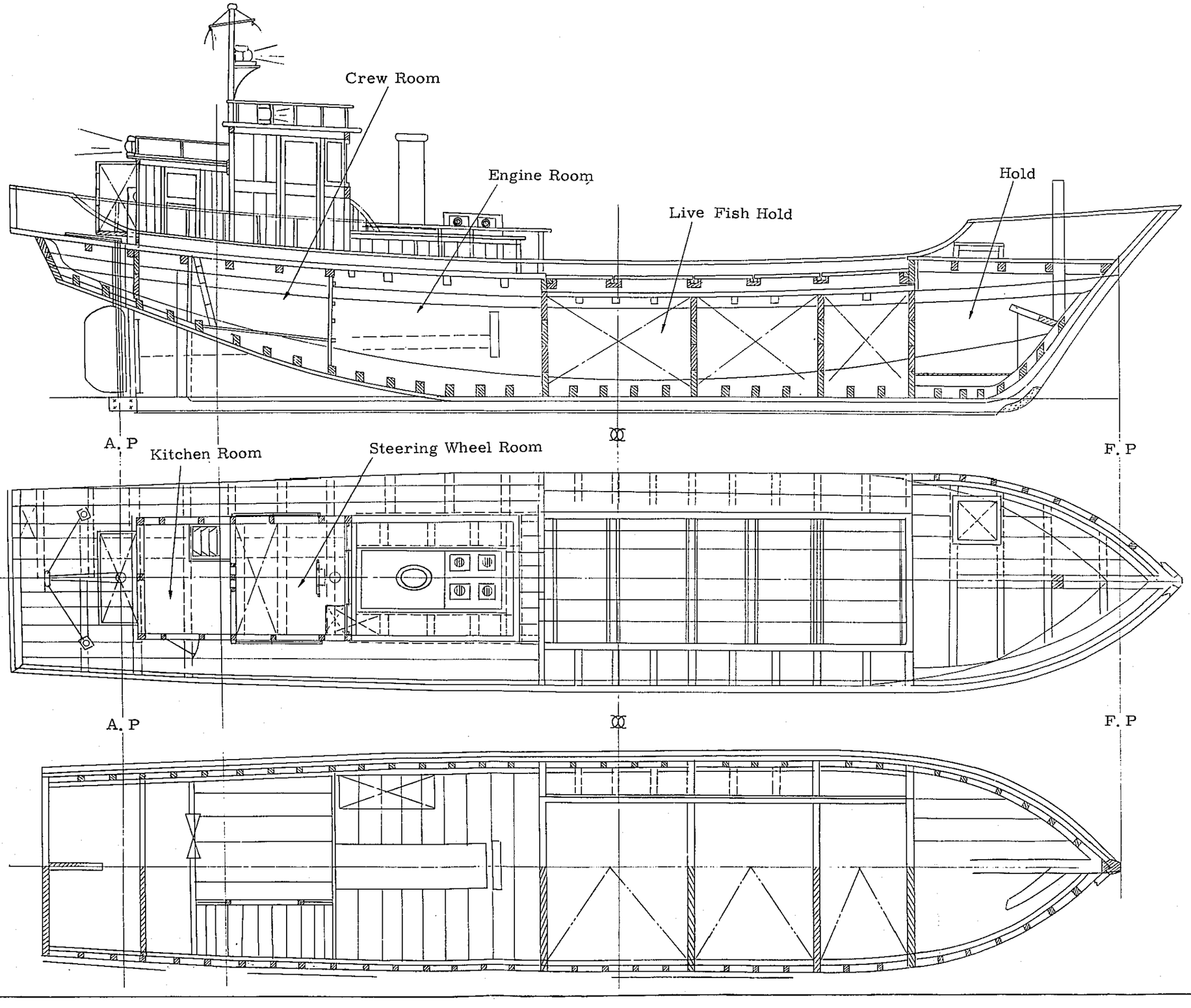
	HARDNESS	DENSITY lb/cu.ft.	SHKINKAGE	STABILITY
Dterocarpus Angolensis (Muniga)	Medium (1480)	41	R. 1.0 % T. 1.5 %	Very Stable
Ocotea Usambarensis (E. A. Camphorwood)	Soft (930)	37	R. 2.5 % T. 4.0 %	Stable
Khaya Nyasica (Mahogany)	Medium (1145)	36	R. 1.6 % T. 3.6 %	Moderate
Chlorophora Excelsa (Mvule)	Medium (1260)	41	R. 1.5 % T. 2.0 %	Fairly Stable
Afzelia Quanzensis (Pod Mahogany)	*Moderately* Hard (1770)	50	R. 1.0 % T. 1.5 %	Very Stable
Fagaropsis Angolensis (Mafu)	Medium (1370)	43	R. 2.1 % T. 3.7 %	Moderate
Ficalhoa Lauriolia (Mkuka)	Medium (1170)	42	R. 5.0 % T. 8.5 %	Moderate
Podocarpus	Medium (1270)	32	R. 1.6 % T. 3.6 %	Poor
Millettia Stuhlmanii (Panga Panga)	Fairly Hard	50	Not known	Stable
Pines	Soft	33	R. 2.5 % T. 5.5 %	Stable
Cupressus Lusitanica (Cypress)	Soft	29	R. 1.7 % T. 3.1 %	Stable

Quality Test of Timbers

(Ref. p. 37, Wooden Vessel Industry)

COMPARATIVE TEST RESULTS OF TIMBERS

Species	Place of origin	Average annual ring	Specific gravity (no moisture content)	Moisture content at the time of test	Shrinkage (from live timber) (from live timber) α_o	α_r	α_t	α_v	Flexion strength kg/cm^2	Flexibility index 10^3kg/cm^2	Compression strength kg/cm^2	Shearing strength kg/cm^2	Tensile strength kg/cm^2
Japanese cypress	Honshu of Japan, Formosa		0.33-0.38-0.49		0.4	2.1	4.9	7.5	400-660-860	52-93-132	330-390-440	62	
Cypress	Iran, Asia Minor, Greenland		0.55		0.2	3.5	4.8	8.8	550		420-540-630		
Cinnamonum camphara	Sub-tropical East Asia, Northern tropical zone		0.38-0.41-0.51		0.2	2.0	6.8		300-320-350	29-45-72	170-345-420	57	
Quercus crispula	Japan proper and Chishima Is.		0.67-0.74-0.83						570-950-1300	47-81-113	330-460-630	100	440-970-1460
Cercidiphyllum *japonicum*	"		0.41-0.44-0.50		0.2	4.5	6.3	11.4	310-590-850	57-71-114	260-400-580	51-70-83	
Fagus sieboldi	Sub-tropical East Asia		0.55-0.59-0.64		0.4	4.7	10.3	16.0	570-920-1250	57-92-129	350-430-550	70-80-120	340-850
Onigurumi	Japan proper		0.43-0.53-0.71		0.3	4.4	6.3	11.3	400-620-1250	57-64-172	250-460-800	90	450-330-1300
Makamba	Central Honshu of Japan		0.57-0.61-0.69						600-730-820	54-114	470-510-630		
Camphor			0.50-0.51-0.51	19.6-26.1-34.9					315-436-578	49-51-54	301-333-368		
Mvole			0.57-0.58-0.61	10.9-11.1-11.3					914-974-1066	105-111-122	605-619-643		
Podo carpus			0.54-0.57-0.59	14.3-16.4-18.8					756-878-1003	62-66-69	410-469-513		
Cypress		5.0-5.3-6.0	0.48-0.50-0.51	9.8-10.7-11.5							366-384-423		
Podo			0.43-0.45-0.48	12.3-12.9-13.5							388-429-454		
Muninga		4.0	0.56-0.57-0.57	9.4-10.1-10.6							628-680-708		



Items	
L	13, 00 M
B	2, 80 M
D	1, 30 M
L/B	4, 64
L/D	10, 00
B/D	2, 15
LBD	47, 32
B/2 + D	2, 70
G. T	
Main Engine	D 60 PS

Model Fishing Boat

General Plan
Scale: 1/50

Item	
L	13, 00 M
B	2, 80 M
D	1, 30 M
L/B	4, 64
L/D	10, 00
B/D	2, 15
LBD	47, 32
B/2 + D	2, 70
G . T	
Main Engine	D 60 PS

Model Fishing Boat
Sheer Drawing Scale: 1/50