Industrial Significance of the Kenya Forests (A Geographical Study in Location and Structure of the Forest-Based Industries)
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A Geographical Study in Location and Structure of the Forest-Based Industries

THE RAW MATERIAL RESOURCE

At the end of 1963, about 3.5% of the land surface of the Republic of Kenya was covered by forests of various categories. The 7,710.9 square miles of forestland consisted of the following forest types:

1. 3,520.3 square miles of dense forests,
2. 1,392.2 square miles of woodlands,
3. 725.0 square miles of bamboo forests,
4. 887.5 square miles of grassland forests,
5. 209.4 square miles of mangrove forests,
6. 793.7 square miles of private unclassified forests, and
7. 182.8 square miles of miscellaneous unclassified forests [2].

The end of 1963 also witnessed the results of extensive afforestation programme which accounted for about 4.1% of the entire forestland in Kenya. This programme, which started sometime in 1946, has resulted in organized plantations especially of the exotic softwoods, since indigenous hardwoods and softwoods grow slowly and are often unsuccessful [11]. From 1953 to the end of 1963, the area planted with exotic softwoods has increased from about 178.1 square miles to about 315.6 square miles.

The district boundaries of 1961 are shown in figure 1, which also gives the names of the districts as they were before the regions were created. This paper is based on the districts as they were in 1961. The other accompanying map (figure 2) shows the location pattern of the Republic's forests. Apart from the forest patches found at the Coast and elsewhere, the major forest areas of Kenya lie in the highlands which flank the Rift Valley. These forests occupy greater acreages west of the Rift Valley.

The forest belts coincide with those zones which receive comparatively higher annual rainfalls (of 50 or more inches). Some of the Republic's forests are, however, located in areas receiving annual rainfalls varying from 50 to 30 inches. Except in areas where either the watertable approaches the surface

Nairobi: Nairobi City, A1; District, A1.
Coast: Mombasa Town, BT1; Mombasa, B1; Kwale, B2; Taita, B3; Kilifi, B4;
Tana River, B5; Lamu, B6.
Rift Valley: Nakuru Town, CT1; Nakuru, C1; Eldoret Town, CT2; Uasin
Gishu, C2; Nandi, C3; Kitale Town, CT4; Trans-Nzoia, C4; West Pokot, C5;
Elgeyo-Marakwet, C6; Baringo, C7; Laikipia, C8; Naivasha, C9.
Central: Thika Town, DT1; Thika, D1; Kiambu, D2; Fort Hall, D3; Nyeri,
D4; Embu, D5; Meru, D6; Nanyuki, D7.
Nyanza: Kisumu Town, ET1; Central, E1; Kericho, E2; Kisii, E3; South, E4;
North, E5; Elgon, E6.
Southern: Narok, F1; Kajiado, F2; Machakos, F3; Kitui, F4.
Northern: Turkana, G1; Marsabit, G2; Samburu, G3; Isiolo, G4; Moyale, G5;
Mandera, G6; Wajir, G7; Garissa, G8.

Provincial Boundaries
District Boundaries
Scale |———| 100 miles
or where favourable conditions prevail especially along the river courses, Kenya forests do not thrive in places receiving annual rainfalls below 30 inches.

Although the Kenya indigenous forests are limited in extent, occupying as they do a very small percentage of the Republic's land surface, they, nevertheless, still contain moderately large quantities of utilizable raw material. This is true of the Masai Forest, which contains considerable quantities of good quality podo and cedar, but which is still somewhat inaccessible at present owing to lack of roads. It is estimated that its contents are sufficient to maintain Kenya's supplies of podo and especially cedar for several years [3]. On the other hand, indigenous softwoods (especially podo and cedar) have already been cut heavily, with the result that a decline in saw-log supplies of these species is imminent. Unless this situation is alleviated soon, a virtual disappearance of podocarpus timber may be forecast for about the end of this century. It would also appear that at the same time, sawn cedar may also be available only in reduced quantities and at much higher cost.

The Government of Kenya plans, however, to increase the area planted with exotic softwoods to about 550 square miles by about 1980. The chief areas earmarked for exotic softwood plantations are to be found in the neighbourhood of Nairobi, Londiani, Elburgon, Eldoret, Thomson's Falls, Nyeri, Fort Hall, Embu and Kitale. The Coast, Southern and Nyanza Regions (according to 1961 boundaries) are other areas included in the afforestation programme.

As larger logs of exotic softwoods (mainly conifers, especially pines and cypresses) become available, they will be used (instead of the expensive indigenous softwoods) owing to their lower prices. As a consequence, the demand for both podo and cedar will naturally decline. Since indigenous species either do poorly or are unsuccessful in plantations, the very slow process of natural regeneration is now largely relied upon. There remain, however, large quantities of over-mature cedar unsuitable as sawlogs but, otherwise, invaluable in the manufacture of such fabricated timber products as hardboard, soft-board and a host of other similar fabricated products. The over-mature cedar supplies are probably adequate to last for the next 80 to 100 years, provided they are properly utilized, and also if demand does not suddenly shoot to the ceiling, in which case a shorter period may be forecast for the exhaustion of the supplies.

Estimates of timber likely to be available from a given plantation (or natural forest) are difficult to arrive at, but forest experts recently gave just such estimates [3]. These are given as possible quantities, in tons of exotic timber, for the years indicated in table I. The supplies are, of course, in addition to those from indigenous forests.

### Table I


<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lopped tons of exotic softwood logs</td>
<td>258,000</td>
<td>338,000</td>
<td>429,000</td>
</tr>
<tr>
<td>Expected recovery true from lopped</td>
<td>55%</td>
<td>55%</td>
<td>60%</td>
</tr>
<tr>
<td>Sawn timber (in tons of 50 cu.ft)</td>
<td>142,000</td>
<td>186,000</td>
<td>257,000</td>
</tr>
</tbody>
</table>

Source: [8].
Fig. 2. — Major forests of the Republic of Kenya.

Scale | 80 miles
From about 1970 onwards, the afforestation programme should begin yielding substantial results by appreciably increasing the volume of available exotic softwoods. Because the conifers cultivated in Kenya grow twice or three times as fast as those cultivated in Scandinavia, and reach comparatively great heights (80 ft.-120 ft.) and fair diameters (1 ft.-2 ft.) in about 20 years, the planned big increases in exotic softwoods (mainly pines and cypresses) should ultimately provide about 50% of all exotic softwood supplies. If the present rate of afforestation is either maintained or increased, it could be forecast that the forest-based industries are unlikely to run short of raw materials in the foreseeable future. It is, however, difficult to be absolutely certain, for there is always the possibility that development, in Uganda especially, may be faster than the estimates, with consequential higher demands on the Republic's timber output. This situation is, however, bound to be shortlived if it ever occurred. Table II indicates briefly the productivity of Kenya's forests in selected primary forest products for the six years from 1958 to 1963. In a normal year, the output from the forests is about 7 million cu.ft. excluding some 1 1/2 million cu.ft. from private forests.

**Table II**

**Production of Timber, 1958-63**

<table>
<thead>
<tr>
<th>Year</th>
<th>Indigenous softwoods (podo and cedar)</th>
<th>Exotic softwoods (pines and cypresses)</th>
<th>Total softwoods</th>
<th>Indigenous hardwoods</th>
<th>Total soft and hardwoods</th>
<th>Fuel sales in thousand stacked cubic feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958</td>
<td>4,484</td>
<td>1,526</td>
<td>6,010</td>
<td>1,298</td>
<td>7,308</td>
<td>7,287</td>
</tr>
<tr>
<td>1959</td>
<td>4,198</td>
<td>1,586</td>
<td>5,784</td>
<td>1,133</td>
<td>6,917</td>
<td>6,459</td>
</tr>
<tr>
<td>1960</td>
<td>4,414</td>
<td>1,691</td>
<td>6,105</td>
<td>1,485</td>
<td>7,590</td>
<td>7,210</td>
</tr>
<tr>
<td>1961</td>
<td>2,349</td>
<td>1,068</td>
<td>3,417</td>
<td>649</td>
<td>4,066</td>
<td>6,386</td>
</tr>
<tr>
<td>1962</td>
<td>2,529</td>
<td>1,789</td>
<td>4,318</td>
<td>585</td>
<td>4,894</td>
<td>7,620</td>
</tr>
<tr>
<td>1963</td>
<td>2,152</td>
<td>2,091</td>
<td>4,243</td>
<td>496</td>
<td>4,739</td>
<td>5,897</td>
</tr>
</tbody>
</table>

*Source: [2].*

**The Major Forest-Based Industries**

The forests of Kenya have been introduced from the raw material resource viewpoint. We next proceed to consider the industrial significance of the Kenya forests by studying in some detail some aspects of the industries which use the forest raw materials. This is essentially a geographical study in location and structure of the four processing industries listed below.

In the more industrially advanced countries (such as Canada, Scandinavia, United States, etc.), the four industries whose raw materials are derived from the forests are:
The Sawmilling Industry

The Pulp, Paper and Paper Products Industry,

The Furniture and Fixtures Industry, and

Miscellaneous Wood Products Industry.

Albeit rudimentarily developed in Kenya, the four groups are, nevertheless, distinguishable although the second group appears, at present, to be the most undeveloped from the viewpoint of local raw material. The remainder are comparatively well represented, especially groups 1 and 3. The local production of rayon from woodpulp has not yet started, consequently all the rayon used in the Kenya textiles industry is imported from abroad. Figures 3 and 4 which are specially designed to show the structure of the sawmilling, furniture and fixtures and miscellaneous wood products industries, also show, in a general way, the location of the three industries on a district basis, according to the 1961 boundaries. These maps could advantageously be used together with figure 2, which shows the location pattern of the major Kenya forests [12]. Table II gives a summary of timber sales by the Forest Department to the various timber-utilizing industries, especially the sawmills.

THE LOCATION PATTERN, INDUSTRIAL STRUCTURE AND VIABILITY OF THE FOREST-BASED INDUSTRIES

The Sawmilling Industry.

Figures 3 and 4, which give a general location pattern of the sawmilling industry, indicate the Rift Valley Province as the most favourable location. Out of the Republic's 171 sawmilling establishments of 1964, some 48.5% (that is, 83 establishments) employing 54.8% of the labour force in this industry were located in the Rift Valley Province, half of these being located in the Nakuru District alone; 20.5% (that is, 35 establishments) were in the Nairobi District, all, except one establishment, being located in the City itself. The Nairobi District accommodated 14.9% (or 993 persons) of the Republic's sawmilling employees. Central Province, with 27 establishments employing 632 persons and the Coast Province, with 15 establishments employing some 686 persons, both appeared to indicate less development and concentration of this industry. Nyanza and Southern Provinces respectively had establishments employing 400 persons and establishments employing 41 persons. No sawmilling establishments were located in the Northern Frontier District.

Taken together, the significant urban centres such as Nairobi, Mombasa, Nakuru, Kisumu, Eldoret, Thika and Kitale accounted for 41.0% of the establishments and 32.3% of persons employed in the industry. Thus, in Kenya, the sawmilling industry, in 1964, was mostly located outside the main urban centres. Those establishments located in the urban centres were, according to available information, the smaller re-sawmills.

The Kenya sawmilling industry is characterised by a fairly rapid turn-over of firms. About 33% of factories operating in 1957 had ceased to operate in 1961 and about 33% of those operating in 1961 had been started in 1957. Some of the factories operating in 1961 were in the process of closing down.

The Inspector of Factories' Reports of 1961, 1962 and 1963 respectively recorded the following numbers of factories: 183, 181 and 179 [13]. Field investigations
Fig. 3. — Industrial structure by factories.

Sawmilling industry
Miscellaneous wood products industry
Furniture and fixtures industry

Scale of factories

Scale ———— 80 miles
FIG. 4. — Industrial structure by employment.

Sawmilling industry
Miscellaneous wood products industry
Furniture and fixtures industry

Factory employee scale

Scale | 80 miles
carried out in 1964, however, gave the figure of 171 factories, analysed as follows:

**Table III**

**Size of Factories by the Number of Employees, 1964**

<table>
<thead>
<tr>
<th>Employee establishment-size category</th>
<th>Establishments</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>% of Total</td>
</tr>
<tr>
<td>1-4</td>
<td>9</td>
<td>5.3</td>
</tr>
<tr>
<td>5-19</td>
<td>71</td>
<td>41.5</td>
</tr>
<tr>
<td>20-49</td>
<td>51</td>
<td>29.8</td>
</tr>
<tr>
<td>50-99</td>
<td>25</td>
<td>14.6</td>
</tr>
<tr>
<td>100 and over</td>
<td>15</td>
<td>8.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>171</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Source: Author's Survey, 1964.*

The table indicates three popular factory sizes in the sawmilling industry, namely, those factories employing between 5-19 persons, 20-49 persons and 50-99 persons, in that order. Fewer factories were of the sizes '1-4' and '100 and over, types. Although only 15 in number, the factories employing 100 or more persons accounted for 37.6% of the 6,398 sawmilling employees and were then followed by the two medium types of factories which employed nearly equal numbers of persons. The two smaller types of factories, although they accounted for 46.8% of the establishments only employed 11.9% of the labour force in the industry.

In 1961, a Census of the sawmilling factories employing five or more persons was taken. Out of the 183 factories quoted in the 1961 Inspector of Factories' Report, only 163 employed five or more persons, and out of these, the Census concentrated only on 66. However, out of the 6,648 persons employed by the industry in 1961, the 66 factories selected accounted for as much as 74.6% of these employees, although the 66 factories represented only 49.5% of the factories employing five or more persons that year, and only 36.1% of the 183 establishments reported that year. The 66 factories selected for the Census were, on the average, the larger ones.

The Kenya sawmilling industry was in a depressed and run-down state in 1961 owing to the decline in the demand for its products—a decline caused by reduced investment in both the agricultural and the building (or general construction) sectors. The production of £1,213,000 in 1961 as compared with that of £1,599,000 of 1957 indicated a fall of 24%. Labour and material costs together with other industrial costs amounted to some £890,000. Nineteen percent of total cost was due to expenditure on materials used; the other two cost items each accounted for 49.5% of total cost. Since the Kenya timber millers generally obtain their timber by the payment of royalties and not by direct purchase, the 1961 figures for material cost reveal an unusual cost structure with a comparatively low cost for materials. Owing to the use of mechanical saws and electric generators, fuel costs tend to be high, as do also transport costs. The 66 establishments, however, realised £1,121,800 in sales of timber and made a profit of 21.6% of the value of sales.
Changes in the type of sawmill used will be of comparatively minor importance, so long as the Republic continues to mill timber from the indigenous forests. The scattered nature of the forests characterised by a very low yield per acre, results in the comparatively small sawmills being the most economic. For the most part, the small sawmills produce an average of 100 tons sawn timber per month. There are some larger mills capable of producing up to 400 tons of sawn timber per month, although these are rather exceptional. The optimum mill size for this type of sawmilling may, however, increase somewhat owing to the development of more efficient logging equipment. Few improvements have, however, been made following those of the 1951-55 period and equipment appears to have been allowed to run down to a very low level. There is therefore need for heavy replacements if the sawmilling industry is to thrive. Many of the existing mills will perhaps disappear and be rebuilt to better plans, slightly larger and much more efficient. On the other hand, startling changes are unlikely for the production of sawn timber from the indigenous forests, since very efficient mills close to the optimum for these circumstances are already in operation.

During 1959 and 1960, reductions in overheads became vital and supervisory staff was somewhat reduced. Unfortunately many sawmillers are non-professionals and this is worsened by the fact that some sawmills are frequently operated as part of other enterprises. Quite often accounts are mixed and true production costs are difficult to obtain.

The 1959-60 period also witnessed the consolidation of the improvements introduced in the period 1951-1955. Such improvements included, *inter alia*, felling by saw close to ground level, power extraction units, and the increased use of band saws. However, there is need for skilled wood-workers in Kenya. This demand can only be satisfied if wages are improved in proportion to the work done. Current production per man in Kenya sawmills is, unfortunately, extremely low, being only 2½ tons per man-month or a sawn volume of 62 cubic feet, during the period of 1956-61. This gives rise to relatively high production cost despite the low wages paid.

The picture is quite different when we examine the milling of exotic softwoods from plantations. It would appear that those operators attempting to convert plantation timber in mills designed for handling indigenous logs are unlikely to remain in business for long unless they install the right type of mills. Fortunately, the bulk of plantation timber is being processed in mills specially designed for the purpose. The mills use circular breakdown saws, log double-edges, frame saws and cross-cutting machines. Some of the mills are equipped with multiple-edges for trimming boards and scantlings. The amount of handling equipment available at present is, however, small.

Although the mills currently operating are comparatively small, the optimum mill size is likely to increase considerably as greater quantities of plantation timber become available. It may be mentioned, in passing, that the volume of timber logs available from the log-catchment area in a given timber plantation, in Kenya, is very much greater (for instance, timber production per acre of logs from plantations is ten to twenty times greater than that from an acre of indigenous forest). It is this volume of available timber which ultimately determines the optimum mill size. The greater the volume of timber logs the greater the amount of handling equipment necessary and therefore the larger the mills.

Moreover, milling is bound to be carried to finer margins; speed of throughput will be greater and milling greater; motion and time study will be significant and the training of operators will be of great importance. Besides, management will also operate within finer limits, so that successes or failures are bound to become more conspicuous.
Despite the financial difficulties associated with the changeover, the forecast evolution in the sawmilling industry is inevitable and the installation of large semi-automatic sawmills will tend to decrease costs or at least prevent them from rising.

### Table IV

**Exports of Timber in 1957 and 1961 (£'000)**

<table>
<thead>
<tr>
<th>Destination</th>
<th>Softwoods</th>
<th>Hardwoods</th>
<th>Poles</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda ...............</td>
<td>69</td>
<td>26</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Tanzania .............</td>
<td>63</td>
<td>24</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>United Kingdom ......</td>
<td>12</td>
<td>16</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Netherlands ..........</td>
<td>—</td>
<td>13</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Iraq .................</td>
<td>4</td>
<td>—</td>
<td>12</td>
<td>—</td>
</tr>
<tr>
<td>Republic of Somalia</td>
<td>13</td>
<td>2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Others ..............</td>
<td>14</td>
<td>47</td>
<td>10</td>
<td>36</td>
</tr>
<tr>
<td><strong>Total ............</strong></td>
<td><strong>175</strong></td>
<td><strong>128</strong></td>
<td><strong>44</strong></td>
<td><strong>55</strong></td>
</tr>
</tbody>
</table>

Source: [5].

It will be noticed from table IV that the over-all decline in exports to Uganda and Tanzania was so great as to offset the slight increase in export to the countries outside East Africa. The export of timber has been encouraged through a 50% rebate on royalties, but the long term downward trend in world prices, the long rail haul to Mombasa and the poor state of the sawmilling industry, in 1961, all worked against any rapid increase in exports. The quantities of timber exported that year were equivalent to 612,000 round cu.ft. of softwoods and 146,000 round cu.ft. of hardwoods.

Kenya still imports certain woods, mainly better quality hardwoods, although the factors responsible for the 1961 slump in the home sawmilling industry also caused a sharp reduction in timber imports. In all, the equivalent of 7,000 round cu.ft. of hardwoods were imported mainly from Tanzania and Uganda and to a small extent from outside East Africa. Some 286,000 cu.ft. of softwoods were also imported mainly from Tanzania.

**Pulp, Paper and Paper Products Industry.**

In 1964, Kenya had 14 establishments in this industry as compared with the 9 in 1961. Apart from one establishment located at Thika (which, apart from importing pulp, also processes some from local waste-paper and manufactures wrapping and cardboard paper, etc.), the remaining establishments are mainly manufacturers of paper products. The 14 establishments together employed 563 workers in 1964. Six out of the 14 establishments are located in Nairobi. These six accounted for 37% of workers in the industry. Only 4 of the 14 establishments employed more than 50 workers each, but the 4 establishments provided work for 66.3% of the entire labour force in the industry. Six
of the establishments are at the Coast, either in or close to Mombasa. These
six provided work for 44.8% of the 563 workers in the industry. Apart from
the Thika establishment mentioned earlier, the remaining factory is at Kericho.

There is, as yet, no large scale pulp and paper mill in Kenya, although
a new approach to pulp and paper mill projected at Broderick Falls follows the
recommendations of the United Nations Food and Agriculture Organization
that Kenya's pulp will find a ready export market in Europe [6].

Although originally planned for a production of 80 tons a day, with an
average capital expenditure of £6.5 million, the Broderick Falls Paper Mill is
now expected to absorb a capital of some £12 millions and is to be designed for
a daily output of 300 tons. The future success of the mill is based on a careful
survey of Kenya's timber resources and the realization, albeit at a much later
date, that Europe's sources of timber cannot keep pace with her increased
demand for pulp and paper.

Behind this idea, lies the special Kenya's climatic advantage which encour-
grages the exotic softwood timber trees to grow nearly three times as fast as in
the temperate countries such as Scandinavia.

When the plant comes into operation, it will supply the East African market
with all its pulp and paper requirements, and will thereby save the present
annual import of some £1.1 million of kraft type papers supplied to us mainly
by Scandinavia and to a lesser extent by Central Europe and North America.

However, the home market is insignificant, and it is hoped that some 90% of
the output will be exported to the already surveyed European Market. The
remainder is likely to be exported to the markets of the Near and Far East.

It is anticipated that supplies of pulpwood materials in Europe will have
reached saturation point from about 1970 onwards owing to the large expansion
of the industry since 1954. One of the largest sources — Russia — has put in
a very large number of pulp mills and is, therefore, not in a position to supply
the rest of Europe, particularly Scandinavia. With this main source cut off,
unless Europe's millers can find alternative production methods capable of
producing more pulp from less timber, they will have to look to other parts of
the world for supplies.

The establishment of a mill of the anticipated £12 million proportions will be
a tremendous boost to the economy of Kenya. Broderick Falls could well
become the new Kenya "boom town", since the mill is designed to employ at
least 450 skilled and semi-skilled operatives, all of which will require training.
Moreover, an industry of this size and character usually attracts ancillary
industries. It is estimated that the mill will provide, directly or indirectly,
employment for between 3,000 and 4,000 people.

With these highlights relating to the developments envisaged for the Brode-
rick Falls project given, the author next examines briefly some production and
cost aspects of the Pulp, Paper and Paper Products industry according to the
1961 Census of Manufacturing [5].

Total cost (including labour, material and other industrial expenses)
amounted to £1,016,600 of which labour charges accounted for 12.9%, cost of
materials 76.5%, and the rest (10.6%) was incurred in other industrial expenses
(mainly tools, electricity and diesel, contract and transport). The products of
the industry realised £1,246,300 in sales and there was a profit of £229,700.

The principal products of the industry in 1961 were cardboard boxes (worth
approximately £712,000), paper bags and sacks (£384,300) and small quantities
of articles such as writing paper, grease proof paper, toilet paper, drinking
straws, exercise books and suitcases were worth some £150,000.

Most of these products are consumed in Kenya, although some are exported
to Uganda and Tanzania. Kenya still imports paper, paperboards and certain
allied manufactures. In 1961, these articles cost the Republic £2,609,000 (see table V). Nearly all the materials used in this industry are imported and cost £777,400 in 1961. About 92% (or £708,000) of the cost was due to purchase of paper and paper boards, about 1% of the cost was for purchases of packing materials and the rest (7%) was for purchasing miscellaneous materials such as chemicals, glue, etc.

Table V

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity (Tons)</th>
<th>Value (£'000)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1957</td>
<td>1961</td>
</tr>
<tr>
<td>Newssprint</td>
<td>1,850</td>
<td>3,347</td>
</tr>
<tr>
<td>Printing paper</td>
<td>2,445</td>
<td>3,000</td>
</tr>
<tr>
<td>Writing paper (in rolls and sheets)</td>
<td>705</td>
<td>1,994</td>
</tr>
<tr>
<td>Packing paper</td>
<td>1,722</td>
<td>4,375</td>
</tr>
<tr>
<td>Paper-board</td>
<td>3,470</td>
<td>4,048</td>
</tr>
<tr>
<td>Building board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bituminised paper</td>
<td>184</td>
<td>287</td>
</tr>
<tr>
<td>Vulcanised paper</td>
<td>566</td>
<td>958</td>
</tr>
<tr>
<td>Cigarette paper</td>
<td>86</td>
<td>119</td>
</tr>
<tr>
<td>Blotting and filter paper</td>
<td>7</td>
<td>40</td>
</tr>
<tr>
<td>Other paper and boards</td>
<td>199</td>
<td>258</td>
</tr>
<tr>
<td>Paper bags and boxes</td>
<td>3,070</td>
<td>2,931</td>
</tr>
<tr>
<td>Envelopes, paper in boxes, etc</td>
<td>356</td>
<td>322</td>
</tr>
<tr>
<td>Exercise books, diaries, etc</td>
<td>280</td>
<td>43</td>
</tr>
<tr>
<td>Other paper products</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,546</strong></td>
<td><strong>21,729</strong></td>
</tr>
</tbody>
</table>

Source: [5].

Furniture and Fixtures Industry.

The furniture and fixtures industry is largely concentrated in the urban areas. Nearly 74% of the 581 establishments in the industry in 1964 were located in the larger towns such as Nairobi, Mombasa, Kisumu and Nakuru. Nairobi alone accommodated 40.8% of all the establishments and these provided work for 45.5% of the labour force in the industry. Mombasa's share was 20.6% of the industry's establishments and 18.2% of its labour. The respective figures for Kisumu were 5.5% and 8.7% and for Nakuru, 6.7% and 3.5%. The four towns together provided work for 76% of the industry's labour force.

Figure 2 also shows that certain districts, for example, Nyeri, Thika, Uasin Gishu and Kericho have significant concentration of furniture and fixtures industry.

Table VI indicates that this is an industry composed of small establishments employing either 1-4 persons per establishment or 5-19 persons. The two size groups accounted for 94% of the establishments and 69% of the employees. The last two size groups employing, between 20-49 persons and 50-99 persons
Table VI

FACTORY SIZE AND EMPLOYMENT IN THE FURNITURE AND FIXTURES INDUSTRY IN 1964

<table>
<thead>
<tr>
<th>Establishment-size by number employed</th>
<th>Establishments</th>
<th></th>
<th>Employees</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>% of Total</td>
<td>Number</td>
<td>% of Total</td>
</tr>
<tr>
<td>1-4</td>
<td>302</td>
<td>52%</td>
<td>760</td>
<td>18%</td>
</tr>
<tr>
<td>5-19</td>
<td>242</td>
<td>42%</td>
<td>2,096</td>
<td>51%</td>
</tr>
<tr>
<td>20-49</td>
<td>30</td>
<td>5%</td>
<td>883</td>
<td>21%</td>
</tr>
<tr>
<td>50-99</td>
<td>7</td>
<td>1%</td>
<td>431</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>581</td>
<td>100%</td>
<td>4,170</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Author's Survey, 1964.

Each, only made up 6% of the establishments and provided work for only 31% of the industry's labour force. The significant establishment sizes in this industry, in terms of employment, are the 5-19 persons size and the 20-49 persons size. The 1-4 persons size is particularly characterised by the rapid turn-over of both the establishments and employment and tends to be unreliable as a group. The 50-99 persons size is the most stable type of establishments, but there are very few of them in the country and those in existence are almost entirely urban located.

The Inspector of Factories' 1961 Annual Report gave the number of establishments in this industry as 233 (51.5% falling in the 1-4 employees group) and a labour force of 1,839. The 1961 Census of Manufacturing, however, concentrated on some 35% of the reported establishments, considering only those employing five or more persons. The 79 establishments included in the Census were the larger ones and provided work for 1,218 employees (that is, over 66% of the entire labour force in the industry).

The industry's cost structure was dominated by expenses on materials (£500,900), followed in order, by labour cost (£200,000) and other industrial expenses (£108,000). The sales totalled some £969,700. This left a favourable profit margin of £162,800.

The industry appears to have declined in 1957 partly because of the very sharp fall in the number of buildings completed and partly because of other causes (cf. Sawmilling). The greater part of the materials used came from the timber industry although the furniture industry included manufacturers of furniture in materials other than wood (e.g. metal). However, such manufacturers were few in number.

Exports of furniture (metal furniture included) rose from the 1957 figure of £49,000 to £59,000 in 1961. The chief customers were Uganda and Tanzania. There was also a small export market in Somalia.

Imports fell by about 52.2% from £127,000. Since imports are mainly complementary to, rather than competitive with, local production, the fall would appear to reflect a decline in expenditure rather than import substitution. The decline in imports seems to have been greater than that in production, suggesting that new buildings probably had a greater propensity to use imported furniture than the local type.
After the Pulp, Paper and Paper Products Industry is the second smallest forest-based industry. In the form in which it is examined in this paper, it does not include charcoal processing. The 1964 investigations show that the industry is mainly located in the Rift Valley Province with significant concentration, in terms of labour, in the former districts of Naivasha, Laikipia and Nakuru. Nairobi and Mombasa districts show further concentrations, since the City of Nairobi alone accounted for 13 of the 29 factories in this industry and 22.5% of its 1,123 labour force.

Apart from Uasin Gishu which has 2 establishments employing 38 persons and Trans-Nzoia (with one very small establishment employing only 3 persons), two other small establishments are located in the Central Province (one in Kiambu with 11 employees and the other in Thika Town with 8 employees).

The miscellaneous wood products industry is very poorly represented in Nyanza, for the only establishment, employing only 7 persons, is located in Kisii township. Table VII gives some analytical summary of the establishment and employment structure of the industry.

Table VII

<table>
<thead>
<tr>
<th>Establishment-size by employment</th>
<th>Establishments</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>% of Total</td>
</tr>
<tr>
<td>1-4</td>
<td>8</td>
<td>27.6</td>
</tr>
<tr>
<td>5-19</td>
<td>8</td>
<td>27.6</td>
</tr>
<tr>
<td>20-49</td>
<td>7</td>
<td>24.1</td>
</tr>
<tr>
<td>50-99</td>
<td>2</td>
<td>6.9</td>
</tr>
<tr>
<td>100 and over</td>
<td>4</td>
<td>13.8</td>
</tr>
<tr>
<td>Total...</td>
<td>29</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author's Survey, 1964.

This industry includes the manufacturers of such products as matches, pencil slats, carvings, boxes and crates, but excludes carpenters and joiners who belong to the furniture and fixtures industry.

In terms of employment, this industry is characterised by large establishments. The six large establishments accounted for 71.3% of the 1,123 employees in the industry. The two smaller sizes of establishments (that is, those employing between 5-19 persons and 20-49 persons each) are also significant since between them they provided work for 26.6% of the entire labour force in the industry. Moreover, they accounted for 51.7% of the establishments in the industry. The minimum sized establishments, though significant in terms of establishment number involved, are insignificant from the viewpoint of employment.

The 1961 Census of Manufacturing listed 11 establishments in this industry. They employed some 1,231 persons altogether. Total cost amounted to
some £178,700 of which other industrial costs (mainly transport, rent, electricity and/or diesel and tools) accounted for 35.4%, followed closely by labour costs (34.7%). Some 29.9% of the total cost was due to expenses incurred on materials. With sales standing at £207,700, the industry showed a profit of some £29,000.

This is an expanding industry whose principal products, by value, are matches, carvings and pencil slats, in that order. The 1961 Census of Manufacturing was in no way comprehensive for, although matches, carvings and pencil slats quoted to have been processed that year were valued at £49,000, £21,000 and £9,000 respectively, the export figures for the same year indicate, however, that pencil slats exported were actually valued at £56,000 and wood carvings realised £200,000. Obviously many important establishments in this industry were omitted in the Census. Wood carving, for instance, is normally a small scale handicraft industry, and the establishments included in the 1961 Census (and the 1964 Survey, for that matter) were the exception rather than the rule [10]. The 1961 Census gives the cost of materials used as £53,500, most of which represented timber purchases.

The match factory at the Coast was established in 1961 in the hope that it would use a certain amount of local wood and thereby reduce match imports. However, these hopes have not been entirely fulfilled, for it has been found necessary to import most of the wood used for match sticks, in particular. Import of matches has therefore tended to continue. A considerable quantity of local wood is increasingly being used for match boxes. In 1961, about 80,000 gross boxes of matches were manufactured in Kenya against 425,000 gross boxes imported that year.

Some Conclusions Drawn from the Study of Forest-Based Industries

Table VIII, which is based on the 1961 Census of Manufacturing, gives a statistical summary of the most outstanding aspects of the four forest-based industries. In 1961, 20.7% of all Kenya’s manufacturing establishments were devoted to the forest-based industries. These four industries employed 16.2% of all Kenya’s manufacturing workers in 1961. Sawmilling was the best employer of the four and furniture and fixtures had most of the establishments.

On a national basis, the forest-based industries were, comparatively, less profitable in 1961 because they contributed as little as 4.4% of the national profits from all the manufacturing industries censured in that year.

Table IX facilitates limited comparison of the 1961 and 1964 figures in terms of factories and employment. The 1961 Census of Manufacturing took no account of factories employing less than five persons and comparison with the 1964 Survey, which included all factories, is not possible at the level of such small establishments. The 1964 Survey, however, gives some picture of the part played by the small establishments in terms of employment. It is observable that the small factories are not very significant in terms of employment.

Although the 1961 Census of Manufacturing suggests that the forest-based industries are comparatively less profitable, the Census appears much less comprehensive and cannot give the full picture.

The 1964 Survey indicates, however, that these industries are expanding. Moreover, the raw materials for the industries are more than likely to remain in good and increasing supply, especially as indigenous species are increasingly replaced by larger supplies from the exotic softwood plantations.

Fields in which future expansion of the forest-based industries may take place include the manufacture of fabricated timber products such as blockboard,
### Table VIII

**Significance of the Forest-based Industries in Relation to All Kenya's Manufacturing Industries, 1961**

<table>
<thead>
<tr>
<th>Forest-based industries</th>
<th>Establishments</th>
<th>Employment</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>% of Total</td>
<td>% of Kenya's manufacturing establishments</td>
</tr>
<tr>
<td>Sawmilling ........</td>
<td>66</td>
<td>40.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Pulp, paper and paper products</td>
<td>9</td>
<td>5.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Furniture and fixtures</td>
<td>79</td>
<td>47.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Miscellaneous wood products</td>
<td>11</td>
<td>6.6</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Total ....</strong></td>
<td><strong>165</strong></td>
<td><strong>100.0</strong></td>
<td><strong>20.7</strong></td>
</tr>
</tbody>
</table>

*Source: [5].*

### Table IX

**Establishments and Employment in All the Forest-based Industries in 1961 and 1964**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Establishments size by employment</th>
<th>Establishments</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1961</td>
<td>1964</td>
</tr>
<tr>
<td>Sawmilling ........</td>
<td>less than 5 employees i.e. &lt; 5</td>
<td>Not available (N.A.)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>5 or more employees i.e. 5 or &gt; 5</td>
<td>66</td>
<td>162</td>
</tr>
<tr>
<td>Pulp, paper and paper products</td>
<td>&lt; 5</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td></td>
<td>5 or &gt; 5</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Furniture and fixtures</td>
<td>&lt; 5</td>
<td>N.A.</td>
<td>302</td>
</tr>
<tr>
<td></td>
<td>5 or &gt; 5</td>
<td>79</td>
<td>279</td>
</tr>
<tr>
<td>Miscellaneous wood products</td>
<td>&lt; 5</td>
<td>N.A.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>5 or &gt; 5</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total ........</strong></td>
<td></td>
<td>165</td>
<td>795</td>
</tr>
</tbody>
</table>

*Source: [5] and Author's Survey, 1964.*
hardboard, soft-board, building-board, pulp, paper, pencils, plywood and possibly plastics, cellulose rayon, and several other chemical by-products.

The evolution of the present transport system into one of high efficiency and possibly lower freight rates would greatly assist these industries especially from the viewpoint of exports abroad.

Local fabricated timber in all its forms is more likely to compete effectively with foreign substitute materials with the result that it may regain some of the lost ground in the past thirty or forty years.

Difficulties which lie ahead are more likely to arise from the inability of these industries to make full use of available opportunities rather than lack of opportunity. The industries may, however, experience difficulties brought about by shortage of capital, technical staff and skilled manpower.

A timber industry co-operative designed to assist in the systematic growth and development of the forest-based industries would be of great value, particularly if supported by some form of a timber industry finance corporation.

BIBLIOGRAPHY