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Technical report: The development of Uganda's furniture and joinery industry in the PTA context*

Prepared for the Preferential Trade Area for Eastern and Southern African States (PTA)
by the United Nations Industrial Development Organization,
associated agency of the Food and Agriculture Organization
of the United Nations, which acted as executing agency for the
United Nations Development Programme

Based on the work of Pietro Borretti,
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ABSTRACT

Pietro Borretti, The Development of Uganda's Furniture and Joinery Industry in the PTA context - FAO/PTA/UNIDO, May 1990

The report reviews the status of Uganda's secondary wood processing industry with respect to market conditions, level of technology, product development and supply and utilization of plantation-based materials, in cross-reference with the situation in the PTA subregion and it outlines opportunities for exchange of experience within the PTA. The report also provides terms of reference of proposed technical assistance activities to be undertaken at subregional and national level aimed at increasing the operative efficiency of the sector. Annexed is a check list of woodworking factories in other PTA countries whose operation could be of interest to furniture and joinery manufacturers in Uganda.

ACKNOWLEDGEMENTS

The consultant is greatly indebted to the following officials of the Forest Department who assisted in the implementation of the mission by providing information, advice and facilities:

- Mr L. S. Kiwanuka Chief Forest Officer
- Mr J. Carvalho, Senior Utilization Officer
- Mr P. Kityo, Utilization Officer

INTRODUCTION

1. Title of mission:	Survey of Uganda's secondary wood-processing industry in the PTA context
2. Mission carried out by:	Pietro Borretti Consultant in Secondary Wood Industry
3. Period of mission:	Four and a half working days from 16 to 21 Nov. 1990
4. Title and number of project:	Intra-regional Cooperation in Development of Plantation-based Forest Industries - RAF/87/117(UNDP-funded Regional Project), P.O.Box 30563, Lusaka, Zambia
5. Executing Agency:	Food and Agricultural Organization of the United Nations (FAO)
6. Cooperating Agency:	United Nations Industrial Development Organization (UNIDO)
7. Sub-regional institutional relationship:	Secretariat of the Preferential Trade Area for Eastern and Southern African Stated (PTA) Headquarters: P.O.Box 30051, Lusaka, Zambia
8. Objectives of the mission:	(a) To undertake a survey of existing furniture manufacturing enterprises, (b) To cater information on supply and demand of furniture, (c) To recommend how rationalization and future investment plans in the sector can be implemented (d) To evaluate priorities for rehabilitation, modernization and expansion
9. Main institutional contacts:	- Mr L. S. Kiwanuka Chief Forest Officer, Forest Dept. - Mr J. Carvalho Senior Utilization Officer, Forest Dept. - Mr p. Kityo Utilization Officer, Forest Dept., who accompanied the consultant in all factory visits - Mr V. C. Magno, CTA of FAO Forestry Training Project

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SUMMARY AND CONCLUSIONS

1 The market for wooden furniture and joinery is expanding rapidly in Uganda in the context of the overall economic recovery trend begun in 1987 which saw the reversal of the negative GDP growth to a positive 4.5 per cent. A contribution to the favourable climate is represented by the increase of development assistance receipts from bilateral and multilateral sources from US$ 276 million in 1987 to an estimated US$ 550 million in 1989.

2 The main spin off of the positive economic situation is the lively resumption of building construction activities, especially in urban areas after nearly two decades of stagnation.

3 Uganda's urban population, which provides the major scope for furniture and joinery produced in the formal manufacturing sector, represented, in 1987, 10 per cent of the total population of 15.7 million. Demand for urban housing and related furniture also results from the presence of an increasingly large foreign community related to aid projects.

4 Urban population can be projected to grow from 1.8 million in 1990 to 2.9 million in 2000, meaning an estimated formation of about 238,000 new urban household units and a corresponding demand for housing units and furniture, without considering the backlog of unfulfilled demand which has built up throughout the years. As for institutional furniture, the bulk of demand is expected to consist mainly of school furniture based on the country-wide need for 58,900 new classrooms for 40 students each in the decade.

5 As with the industrial sector as a whole, the secondary wood-processing industry had been established in the 1950's and 1960's. The production facilities progressively deteriorated from 1972 onward as a result of the disruption of the economy due to internal and external factors and the expulsion of Asians from the country. In fact, in the last 20 years, there has been hardly any renewal of equipment in the sector and no modern plants have been established with the exception of the Roko joinery factory.

6 The bulk of Uganda's woodworking sector consists of micro-scale woodworking enterprises. Those of them visited during the mission showed signs of great vitality. Because the promotion of small production units is seen as a means to help develop smaller urban areas in most PTA countries, it is recommended that a seminar of sub-regional scope be conducted in order to strengthen their potential in the development of the woodworking industry (see Objective no. 5 in Recommended Follow-up Chart on page.50).

7 Few existing medium-scale furniture and joinery plants are interested in improving and expanding their production facilities in view of the favourable market conditions. It is crucial in this respect that the sector be provided with

technical assistance to help develop adequate know-how on important aspects of plant design, selection of equipment product engineering and plant operation consistent with the industrial system rather than with traditional artisanal methods. Of major importance is the capability of selecting appropriate machinery in order to avoid the costly mistake made in PTA countries such as Kenya and Ethiopia, of acquiring unnecessarily sophisticated equipment bound to end up in wasted investment resources. It is recommended, in this context, that "eye opener" seminars be conducted for the benefit of the secondary wood processing industry of the PTA sub-region as a whole (see Objective no. 1 in Recommended Follow-up Chart on page 47). In addition, Uganda should also be provided with ad-hoc technical assistance for the rehabilitation and expansion of selected, existing furniture and joinery plants in major urban centres (see Objective no. 3 in Recommended Follow-up Chart on page 48).

8 One of the major causes of high operating cost, inferior quality of finished wood products and high reject rate of raw material is the nearly total absence in the industry of proper tool maintenance equipment and tool maintenance know-how, and the lack of preventive machine maintenance. Recommended follow-up in this respect includes a specialized, short term training course to be undertaken as a PTA exercise (see Objective no.4 in Recommended Follow-up Charts, page 49) and the setting up of a pilot tool maintenance servicing and training centre within the Research Unit of the Forest Department in Kampala to complement the new sawdoctoring centre already being established (See Objective no. 7 in Recommended Follow-up Chart on page 52).

9 The development of the secondary wood processing industry is seriously hampered by the technical training institutions being badly equipped, in terms of machinery and training material, to generate woodworking skills relevant to the actual needs of the industry. Recommended follow-up in this respect includes actions to be taken at PTA level (see Objective no.2 in Recommended Follow-up Chart , on page 47).

10 There seems to be no prospect for the foreseeable future to utilize, to a significant extent, sawn wood from plantation species in the secondary wood processing industry and in building construction as a means of reducing pressure on natural tropical forests which so far have remained the predominant source of raw material supply to the sawmilling industry. In fact, although Uganda's softwood plantation resources permit a sustained yield of about 220,000 m3 of logs a year, the input capacity of existing sawmilling and pitsawing operations which are geared to process softwood plantation species amounts to only 13,000 m3 of round wood a year. On the other hand, the demand for sawn wood required for new rural houses alone (furniture included) has been estimated at 112,000 m3 of round wood a year.

11 Nor is there any prospect of Uganda becoming self-sufficient in the foreseeable future in the supply of furniture-grade wood-based panels - the bulk of which is imported from Kenya - because the only board manufacturing plant in operation in the country produces only utility plywood and is plagued by very serious operating problems.

12 Success in promoting the acceptance of softwood plantation species in the manufacturing of wood products depends to a large extent on the capability of preventing degrade risks and adopting appropriate wood processing techniques. It is recommended that exchange of experience be promoted in this respect within the PTA (see Objective no. 6 in Recommended Follow-up Chart on page 51). Of particular interest to Uganda's woodworking industry and building construction sector will be information on the extended utilization made of Eucalyptus in other PTA member states, such as roof trusses made of Eucalyptus poles in Ethiopia and furniture components made of edge-laminated Eucalyptus boards in Malawi.

CHAPTER II - FINDINGS

1 The development climate

Uganda's economy experienced a prosperous period from independence in 1962 to 1970 which saw real GDP grow at an annual rate of 4.8 per cent, giving an increase of 2 per cent in per capita income; trade balance; and a substantial development made possible by public revenue increasing faster than recurrent expenditures.

This development trend, however, came to an end in 1971 with the takeover of the military government and the intervening economic mismanagement, political uncertainties and consequent internal wars. With it came, in 1972, the sudden expulsion in 90 days from the country of all Asians, a population group that had traditionally dominated all of the country's industrial and trading activities. Thus began a long, painful downturn in the economy resulting in the following: rapid deterioration of the once booming industrial sector; 59 per cent drop in the GNP per capita income in the period 1965-87; 95.2 per cent growth in the average annual rate of inflation in the period 1980-87 as compared to a 21.2 per cent growth in the period 1965-80.

A rehabilitation programme was launched in 1981 to stabilize the economy and stimulate its growth. As a result, the GDP grew by 5 per cent in 1984 coupled with a reduction in the inflation rate and budget deficit. However, the recovery trend came once again to a halt in 1985 because of renewed internal strife.

With the security situation in the country having been greatly improved, the government of the National Resistance Movement (NRM) launched a new economic recovery programme in May 1987 which has already reversed the trend of negative GDP growth to a positive 4.5 per cent in 1987, and a general climate of stability and confidence. In fact, receipts from official development assistance, from bi-lateral and multi-lateral sources, doubled from US$ 276 million in 1987 to an estimate US$ 550 million in 1990. Announcing the 1987-88 budget, the Finance Minister stated that "Uganda now has adequate funds for key development areas"1/.

2. Demand and supply

2.1 Present status

As a spin off of the favourable economic climate, housing building activities are being revived especially in the urban areas for the first time since the economic downturn emerged in the early 1970's. With it a substantial demand is developing for main joinery items such as solid-wood doors, flush doors, window frames, shutters as well as for furniture of low, medium and high value types. According

1/ Source: The Africa Review, 1988

to the managers of the furniture and joinery enterprises visited by the consultant during the mission, the demand for furniture and joinery has grown by at least 20 per cent since 1987, putting a strain on the inadequate and run-down production facilities.

Uganda's urban population, which provides the major scope for furniture and joinery produced by the formal manufacturing sector, represented in 1987 10 per cent of the total population of 15.7 million (World Bank Development Report, 1987). According to the World Bank, the urban population in Uganda grew at an average annual rate of 5 per cent from 1965 to 1987. Increased demand for urban housing and related furniture also results from the presence of a numerous foreign community related to the ever expanding bilateral and multilateral aid projects.

2.3 Future development

Assuming a continuation in this decade of the 5 per cent annual growth, Uganda's urban population can be projected to grow from 1,817,000 in 1990 to 2,960,000 in 2000; meaning an estimated formation of about 238,000 new urban household units (each with an average of 4.8 family members) in this decade, and the formation of a corresponding demand for housing units and furniture.

With respect to institutional furniture, the bulk of the demand is expected to consist mainly of school furniture based on the projected country-wide need, for the period 1990-2000, for about 32,000 new primary school classrooms and

26.900 new secondary school classrooms, each classroom having a capacity of 40 pupils. By applying the urban/total population ratio of 10 per cent estimated for 1987 by the World Bank, the total demand for new school furniture in urban areas in this decade would correspond to about 5,900 new classrooms.

3. Review of production facilities

3.1 General data

As with the industrial sector as a whole, most of the secondary wood processing enterprises had originally been established by Asian entrepreneurs in the 1950's and 1960's and then taken over by the Ugandans in 1972 following the expulsion of the Asian community from the country. Currently all the commercial furniture/joinery plants are private with the exception of the furniture/joinery production facilities at the Kiira Sawmill/Plymill, which is a parastatal body.

Uganda's secondary woodworking sector comprises a large number of small artisanal or semi-mechanized workshops and a limited number of enterprises equipped with a full range of basic woodworking machines and operating on a semi-industrial basis. A survey of industrial establishments carried out recently by the Ministry of Industry, as part of a UNIDO project, gives as 502 the total number of manufacturers of furniture and fixtures. Details of furniture and joinery workshops in operation in the main districts are given below:

Urban centres	No. of enterprises	No. of employees
Kampala	219	1,495
Masaka	102	797
Jinja	37	453
Mukono	58	214
total	417	2,959

Some furniture and joinery manufacturing facilities are integrated with primary wood processing operations,such as the Kiira Plymill and Sawmill Complex and the Jinja Construction and Joinery Ltd., both located in Jinja. A parquet-floor production line, including kilns has been purchased for use in integration with the Budongo sawmill, but is yet to become operational.

A pencil plant is operated by the Moon Enterprises Ltd. in Kampala. It produces 200 gross/day, out of a capacity of 300 gross/day, with an input of 128 M3 of sawn wood a year. Its annual value of sales is US$ 480,000. Timber species used in this connection is Nkago Funtumia latifolia which is preferred to pinewood. There are two match factories: one in Jinja owned by the Associated Match Co., Ltd., which at present is not in operation; and a second established near Jinja by the Match International. Maesopsis eminii and some pine wood will be utilized in this particular project.

According to Kasirye (1989), there are 17 wood treatment plants in Uganda. However, only 8 are currently in operation,

7 of which are for treatment with copper-chrome-arsenate preservatives and one for creosote treatment.

The primary wood processing sector consists of:

- 17 sawmills out of 30 in operation up to 1972,
- 1 plymill at Jinja,
- 1 particleboard plant at Budongo which is not in operation conditions,
- 1 cement-bonded particleboard plant not yet in operation completed recently at Mbarara for the utilization of softwood plantation in the Bugamba area.

3.2 The Mc Crae's Ltd., Furniture Factory

Of all the furniture factories visited by the consultant during the mission in Uganda, the Mc Crae's plant emerged as having the best development potential. Established in 1969 by a British resident, the factory has a work force of 70, 10 of which are in the machining section. Its main line consists of household furniture of reproduction type, dining, living room and bed room furniture sets. The plant serves the needs of the foreign residents and the upper end of Ugandan customers. All furniture is produced on order from a wide portfolio of standard designs or on the basis of designs selected by the customers from magazines.

The main inputs utilized in manufacturing include mahogany and mvule sawn wood, and mahogany-veneered blockboard and plywood panels.

The factory is equipped with a set of basic woodworking equipment including: two bandsaws, two circular saw benches, a combined jointer/thicknesser planer, a spindle moulder, two boring machines, a stroke belt sander and a semi-automatic turning lathe, which is the only new piece of equipment.

With the exception of the turning lathe, all the machinery is as old as the plant itself. In spite of the available machinery, much additional hand work is made necessary subsequent to the wood machining of furniture parts because of the lack of proper production aids such as jigs, of proper cutting tools and of proper tool maintenance facilities. In fact, the only sharpening machine available is an old inefficient knife grinder; while the sharpening of all other cutting tools, including bandsaw and circular saw blades, is done by hand.

The Mc Crae's plant is, together with the Roko joinery plant, one of the only two woodworking factories in Uganda to adopt the modern technique of dowel jointing. However, Mc Crae's has been more successful in the use of the technique in that it imports from Europe proper ready-made wooden dowels of accurate diameter; whereas the Roko plant produces its own dowels but finds it very difficult to control the uniformity of their diameter, with negative effects on the performance of wood joints.

Mc Crae's drawback in the use of the dowel joint is the absence of a multi-spindle boring machine which prevents the utilization of the dowel joint technique in the manufacture of casegood furniture. Also lacking is a routing machine - a piece of equipment of critical importance for the type of

furniture manufactured by this particular company. Other main operative problems are:

(a) high labour turnover;

(b) impossibility of obtaining properly trained wood machinists, let alone woodworking supervisors, from technical institutions;

(c) lack of kiln drying facilities (a solar kiln might be installed with the assistance of the Forest Department)

(d) lack of credit lines for upgrading the production facilities;

(e) difficulty in obtaining foreign currency for importing spares and supplies, especially upholstering material.

(f) lack of furniture design engineered for industrial production.

PTA context: before embarking on the improvement and expansion of the production facilities, the Mc Crae's technical manager should visit the following two furniture factories in Zimbabwe which manufacture on an efficient basis furniture items of design similar to those produced in the Mc Crae's plant:

(a) Adam Bede Furniture Ltd., Harare, Zimbabwe,

(b) Harlequin Furniture Manufacturers Ltd., Harare, Zimbabwe

Address of the two companies are given in Annex V.

Figure 1. Furniture by the Mr. Crae's factory.

3.3 The Bwambale Wood Works Ltd., Furniture Factory

Established at Jinja in 1977, this small-scale furniture pant is representative of the very few woodworking enterprises whose operation was started by Ugandan entrepreneurs subsequent to the sudden exodus from the country of Asian industrialists in 1972. The plant has a total manpower of 28, 18 of which are skilled workers. About 80 per cent of sales consists of household furniture. The main items are wardrobes, beds and lounge furniture. The plant caters mainly for the demand of aid projects and government projects. In most cases, furniture is produced on order from a range of standard designs illustrated in a colour catalogue.

Sawn wood consumption amounts to an average of 7 m3 per month and the main species utilized is mahogany. However, some furniture items made of cypress are now also being produced for the lower end of the market. The plant is equipped with only four basic machines (a surface planer, a bandsaw, a circular saw bench and a mortiser) all of which are old and in bad operating shape.

Beside sharing in general the same operative problems experienced by the Mc Crae's plant, the Bwambale Wood Works' main operative problems in terms of cost efficiency and quality of products are caused by the absence of tool maintenance equipment. In fact, all cutting tools, including circular saw blades and bandsaw blades, are sharpened free-hand on a bench grinder, resulting in horror-type saw-tooth

profiles (see figure below), consequent low quality of cuts and shortened life span of expensive imported tools.

PTA content: In order to acquire valuable information on the use of softwood species in furniture manufacture, it is recommended that the owner/manager of the Bwambale Wood Works be given the opportunity to visit the following furniture factories in Kenya:

(a) The Economic Housing Group (EHG) furniture factory which specializes in cypress furniture, and

(b) the Pilot Production Unit of the Kiambu Institute of Science and Technology which specializes in 'Ikea' type pinewood furniture.

The addresses of the two plants are given in Annex V.

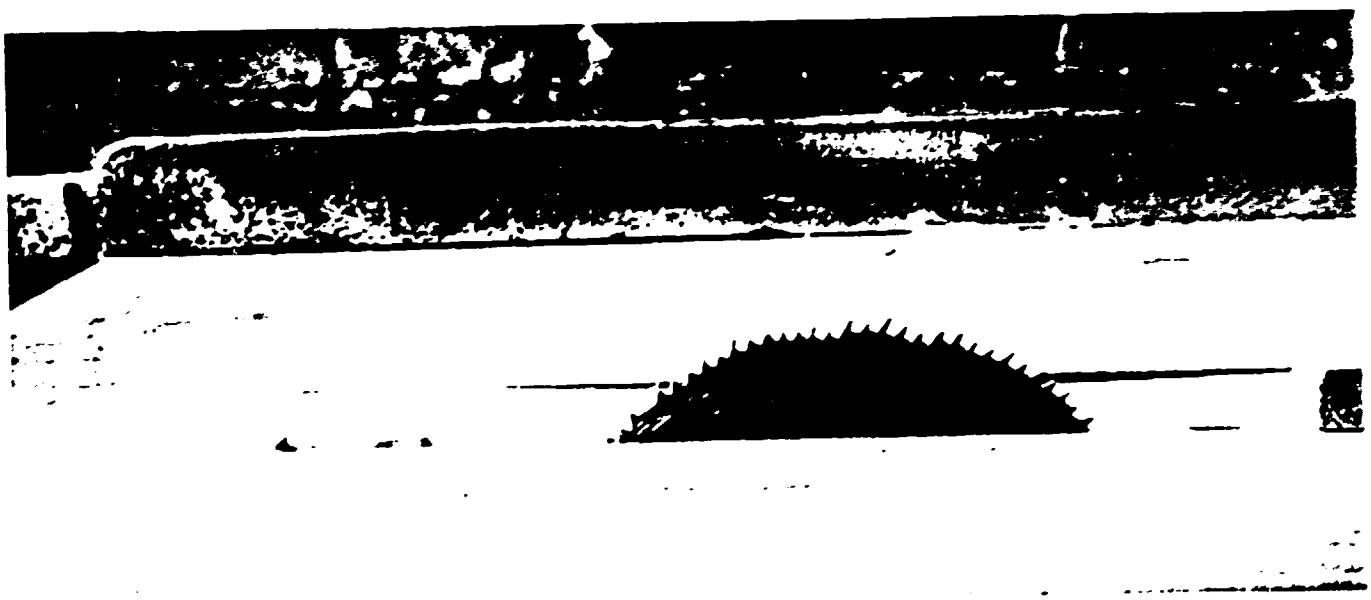

Figure 2 Circular sawblade in use at the Bwambale Wood Works. The 'wild' teeth profile results from the blade being sharpened free-hand on a rudimental bench grinder.

Figure 3 Furniture produced at the Bwambale Wood Work

3.4 Joinery Plant of the Poko Construction Ltd.

The Poko joinery plant has the largest and best equipped secondary wood-processing facilities available at present in Uganda. It was established exclusively in support of the company's own building construction activities. In fact, the majority of its products consists of joinery items such as doors, windows, mouldings, panelling etc., whereas furniture production represents only 10 per cent of the total output. As with the other woodworking plants, Poko's ownership is 100 per cent Ugandian. However, the carpentry workshop manager is

a Swiss national, whereas the production supervisor is Filipino.

The production facilities consist of a rough mill where timber is cross cut, bandsawed, ripped and planed to rough dimensions; and of a machine shop for final wood processing to final dimensions of component parts before assembly into finished products. Polo is possibly the only woodworking plant in the country equipped with a dust extraction system and a multi-spindle boring machine. However, the benefit of having this type of boring machine is minimized by the difficulty of producing wooden dowels of precision diameter. Other constraints experienced by this particular plant include: little experience in the development and production of furniture, lack of appropriate wood finishing facilities and high labour turnover. The company has no plans for the time being of expanding the manufacture of furniture because of its increasing building construction projects.

Figure 4 Rough mill at the Polo Joinery Plant

3.5 Ssekkadde Furniture Makers Workshop

Established in Kampala 20 years ago, the Ssekkadde workshop is a micro-scale enterprise with a considerable potential for development as it is led by a very dynamic and capable entrepreneur. Its operation is based on the production service concept, consisting in machining furniture parts for further hand-processing and assembly into finished products by some 30 small artisanal workshops scattered around the Kampala area. In addition, the workshop also assembles some furniture for direct sales to customers.

Only two standard designs are produced: a lounge set and a bed design. The latter is available in a choice of three head-board profiles. The designs are of clean lines and based on the use of turned legs.

Figure 5 Illustration of the two standard furniture designs produced in components by the Ssekkadde Furniture Makers for assembly by artisanal workshops.

The workshop is operated by the owner/manager and four skilled workers. It is equipped with four old, underpowered hobby-type machines (see figures below), one of which (the turning lathe) was improvised by the owner. The working premises consist of a crowded room of about nine square meters and a small machine shade. Finished furniture is stored in the open on the sidewalk.

The type of production service adopted by the Ssekkadde workshop has a particular relevance in the context of the development of the small-scale woodworking industry in that it allows a sustained development of existing labour-intensive artisanal enterprises, while also contributing to the gradual introduction of an essential degree of industrialization in the secondary woodworking sector. It is therefore recommended that technical assistance and other incentives be provided in the improvement of existing operations of this type and in the establishment of new ones especially in smaller urban centres.

Figure 6 Hobby-type woodworking machine at the Ssekkadde Furniture Makers

PTA context: The promotion of micro-scale industries and of co-operative enterprises of production type, especially those related to the utilization of local natural resources, is a development priority of most PTA countries in view of their labour-intensive production techniques, suitability to help develop smaller urban centres and employment of simple technologies which are easy to adopt. It is therefore recommended that a seminar of sub-regional scope be organized and conducted by the FAO/PTA/UNIDO project to help develop the efficiency of the micro-scale furniture/joinery industry in the PTA member states. (see Objective no. 5 in Recommended Follow-up Charts) on Page 50).

A particularly interesting and effective production service enterprise of cooperative type is in operation in Lesotho under the Enterprise Development Corporation (BEDCO) to serve the needs of 15 micro-scale furniture and joinery making units located in the BEDCO industrial compound in Maseru. This particular operation could serve as a reference in the promotion of the micro-scale woodworking sector in Uganda; although serious doubts were expressed by the management of most of the workshops visited by the consultant in Uganda on the local applicability of the cooperative concept because of a deeply-rooted tribal attitude.

3.6 The Uganda Wood Peckers (joinery) Ltd.

Established in Kampala in the 1950's, the Uganda Wood Peckers specializes in joinery products such as solid-wood

doors, window frames, panelling, mouldings, flooring boards. On a complementary basis, it also produces contract furniture such as school furniture. It employs a total of 59 workers, 11 of which are in the machine shop. Sawn wood consumption averages 30 m3 a month. Main species utilized are mahogany (80 per cent), mvule (15 per cent), cypress, musizi and elgon olive. Wood Peckers is one of the very few woodworking plants equipped with a four-side moulder.

The plant is afflicted by most of the typical problems of Uganda's secondary wood processing industry, in particular safety hazards in the operation of equipment and lack of know-how in the proper dimensioning of furniture.

The management is interested in expanding the present joinery production activities and in obtaining assistance in identifying appropriate technologies and investment requirements for the manufacturing of the following products: flush doors, solid-wood doors, flooring blocks and wooden rulers.

Figure 7 Solid-wood door produced by Uganda Wood Peckers

3.7 Madudu Timber Dealers and Manufactures

(Integrated with pitsawing operation)

Established in 1981 and equipped with old, second-hand, hobby-type machines (surface planer, bench saw, bandsaw and home-made lathe), the Mududu workshop is a typical woodworking enterprise whose sawn wood input derives from its own pitsawing operation, based on the use of a chain saw and a two-man saw. In fact, the company also operates a timber yard, located on the same premises, for the sale of sawn wood. Main manufactured products include solid-wood doors, door frames, window frames, flooring boards and panelling. Ten per cent of its output consists of furniture, mainly chairs and wardrobes. Timber species utilized are: Nkoba (Lovoa spp.), Mvule (Chlorophora excelsa), Musizi (Maesopsis

Figure 8 Joinery/furniture workshop of the Madudu Manufacturers

Figure 9 Hobby-type, heavily damaged circular saw/surface planer at the Madudu Manufacturers' workshop

eminii), Npewere (Newtonia buchananii), and Eucalyptus. The first three species are preferred for furniture making.

The possibility should be investigated of assisting the Madudu enterprise to shift its pitsawing logging operation from natural forests to planted forests and equip itself for the efficient manufacture of joinery and utility furniture.

3.8 The Jinja Construction and Joinery Ltd.

The joinery plant located in Jinja is integrated to a sawmill operation (including logging) with an output capacity of 30 m3 of sawn wood a day, but with an actual output not exceeding 5 m3. The joinery unit provides employment to 33 workers and is engaged in the production of doors, windows, other joinery items and furniture in connection with building

construction contracts. The standard of casegood furniture is however very low from the point of view of design appeal, functionality and quality of construction (see figure below).

The company is at present concentrating its resources in consolidating the operation of a new sawmill established in a separate location in 1987 and involving an investment of US$ 500,000 in equipment alone. However, the company is also looking into the possibility of improving and expanding the existing joinery plant in connection with the expansion of its building construction activities. It is recommended that technical assistance be provided to the Jinja Ltd. in this respect to identify suitable technologies and investment cost.

Figure 10 Furniture made at the Jinja Construction and Joinery workshop

3.9 Joinery workshop of the Kapkwata Saw Mills Ltd.

The main purpose of the Kapkwata joinery plant in Kampala is to produce joinery items in connection with the company's own building contracting activities. Priority is given to the production of flush doors; other items include panelling, door and window frames, stairways, etc. The factory facilities include a drying kiln of 20 m3 capacity (one of the only two kilns in operation in Uganda) and a CCA wood treatment plant of 30' x 6' capacity. The annual sawn wood consumption was given by the management as 200 m3. Main species utilized are mahogany (60 per cent), Musizi (Maesopsis eminii) and Cypress.

Flush doors are produced by means of a simple, manually-operated cold press which is also utilized occasionally to press blockboard panels faced both sides with 3mm thick plywood. The rest of the production machinery is, however, old and inefficient. In particular, tool maintenance equipment is limited to a worn-out, knife sharpener with an extra spindle for free-hand sharpening of other types of cutting tools. Moreover, expensive imported carbide-tipped circular saws are not maintained but just let break down and disposed of.

In view of the promising prospects for the building construction sector, the management of the Kapkwata Saw Mills Ltd. is planning to expand considerably the joinery manufacturing operation. A new site of 1 hectare has already been acquired in this context. The new plant will also produce furniture on a side-line basis.

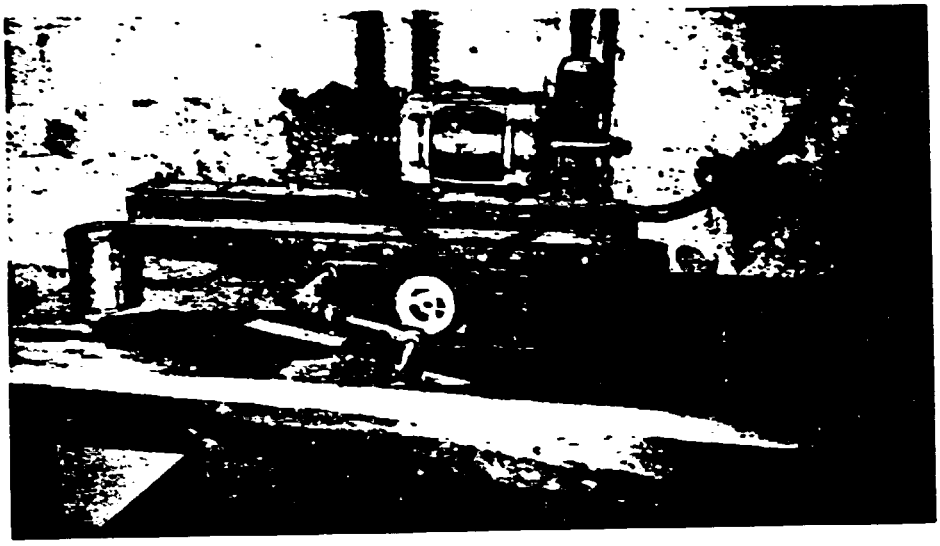

Figure 11 Illustration of the only type of rudimental tool sharpening equipment available in most furniture/joinery plants in Uganda. Kapkwata Joinery workshop

3.10 Wood treatment facilities

Uganda is better equipped than most other countries in PTA with respect to wood treatment. According to Kasirye (1989), there are 17 wood treatment plants in the country. However, only the following 8 are in operating conditions:

(a) Plants for treatment with copper-chrome-arsenate preservatives

	size of plant
- M.K. Corporation, Busaga	45' x 9'
- East African Sawmills, Kampala	30' x 6'
- Kapwata Sawmills, Kampala	30' x 6'
- Moon Enterprises, Kampala	15' x 2'
- P.M. Technical Services, Mbarara	24' x 3'
- NIFPA Mbarara	24' x 3'
- Kiira Sawmill, Jinja	30' x 6'

(b) Creosote plants:

- Uganda Electricity Board, Kampala

3.11 Kiln drying facilities

There are only two kiln drying plants currently in operating conditions in Uganda; one at the Kiira Sawmill at Jinja and the second at the Kapkwata Sawmill at Kampala.

4 Training facilities

(St. Joseph Technical Institute)

In the course of the mission, the consultant had the opportunity to visit a representative technical school - the St. Joseph Technical Institute. The school, located near Kampala, was established by the Catholic Mission in 1911 and then taken over by the Ugandan government in 1975.

The school offers two-year courses in five crafts. The current joinery/furniture course is attended by 100 students. The entry standard corresponds to the O level. On completing the two-year course, the student sits for the Uganda Examinate Board Certificate (UNEB). The school also offers a further one-year course leading to the Advance Craft Certificate for those graduates who have spent two years in the industry.

The school is equipped with five machines: circular saw bench, surface planer, thicknessing planer, bandsaw and turning lathe. Of these, one is broken down and the remaining in very poor condition with the exception of the turning lathe. The main causes of this situation: the age of

equipment, lack of preventive maintenance, lack of foreign currency for spare parts. Moreover, the school lacks training hand-books dealing with critical wood processing subjects related to actual requirements of the secondary woodworking industry in Uganda.

The equipment problem experienced at the Joseph Institute seems to reflect the general conditions of institutional woodworking training as a whole. If this is the real situation, then a gradual replacement will be required of most of the woodworking machinery currently installed in technical schools across the country.

Figure 17 Furniture made at the St Joseph Technical School

PTA context: Because the lack of proper training material is a gap shared by most PTA member states, it is recommended that the FAO/PTA/UNIDO project help develop - in cooperation with the relevant training institutions - a set of training manuals dealing with those critical topics of furniture and joinery manufacture not adequately covered in current training programmes. This would serve to gear existing formal training institutions to fulfil on a long-

term basis the needs of the industry for skilled labour and supervisory personnel. (See Objective no. 2 in Recommended Follow-up Chart on page 47).

5 Wood products research facilities

The Forest Products Research Section of the Forest Department at Kampala, started in 1950, is the only institution in Uganda engaged in applied research work on all main wood properties, including physical, mechanical, seasoning, durability and working properties. The functions of the Section cover a wide range of wood utilization aspects. In fact, its facilities include the following:

- timber testing laboratory
- a sawmill and a general-purpose woodworking workshop
- sawdoctoring shop
- experimental wood preservation plant
- experimental timber drying kiln
- solar kiln
- woodwool machine
- charcoal laboratory.

The Research Section is also equipped with logging equipment and is responsible for the operation of a Research Forest Reserve consisting of natural forest and planted softwood research plots.

Work carried out by the Research Section on timber properties of hardwood species from natural forests is contained in the handbook 'Uganda Timbers' by Tack. In addition to the general physical, mechanical and wood processing properties, the book provides specifications on cutting tools geometry as required for the wood processing of various groups of timber species. Also given are required timber drying schedules for each species. The research work with regards to timber properties was conducted with the co-operation of the Princes Risborough Forest Products Laboratory,U.K.

Papers have also been produced over the years by the Research Section on the following aspects of wood preservation: hot and cold dipping; sap displacement methods: dip diffusion; and pressure impregnation. Permeability tests were also conducted on a number of species and results published by Plumptree and Kasirye in the 1970's.

With respect to wood processing, the Research Section has so far focused' its activities on the development of the sawmill industry in connection with the utilization of species from the natural forests. Time and method studies were carried out in this context in the Forest Department sawmill, together with training of sawmill machine operators and sawdoctors.

In an effort to help reduce pressure on the tropical forest resources, the Research Section is now planning to conduct studies aiming at the identification of proper sawmilling techniques as applicable to the utilization of softwood plantation species. The pilot sawmill plant of the

Forest Department is being rehabilitated in this context under a FAO country project. As part of the programme, a new complete set of sawdoctoring equipment will be provided for training and demonstration purposes.

It is strongly recommended that the Forest Department be assisted in launching a parallel programme aimed at providing tool maintenance services according to the needs of the secondary wood processing sector (See Objective no. 7 in Recommended Follow-up Chart on page 52).

PTA context: A number of research activities has been carried out in various PTA countries in connection with the utilization of plantation species in building construction as well as in furniture and joinery production. To date, however, no exchange or comparison has been made of experience gained individually by each country in this respect. It is recommended that a review be made under the FAO/PTA/UNIDO project of the various research activities conducted so far in the PTA and overseas on the utilization of main fast-growing plantation species - such a Pinus spp., Cupressus spp. and Eucalyptus spp. - as a basis for the preparation of reference manuals and further co-ordinated research work (See Objective no.6 in Recommended Follow-up Chart on page.51).

6 Utilization of raw materials

6.1 Natural Forest Resources

Of the country's total land area of 24.3 million hectares, about 13 per cent or around 3.16 million hectares consist of forests and national parks (Carvalho, 1987). According to a Lockwood/CIDA report (1973), the areas of the Tropical High Forests (THF) suitable for exploitation are estimated to total 480,000 ha or 66 per cent of the total reserved tropical forests. Such areas include: (1) areas readily accessible and under intensive exploitation (284,607 ha or 39% of the total reserved THF; (2) areas readily accessible but not yet under exploitation (76,156 ha or 10% of the THF); (3) areas with difficult accessibility (166,680 ha or 17% of the THF) where exploitation will be delayed until more accessible areas have been cut.

The natural forests on the plateau which dominated Uganda's topography and mountain ranges play a vital role in regulating stream flow and protecting the soil. It is therefore of crucial importance to introduce a widespread utilization of plantation species in the secondary wood processing industry and in building construction in order to reduce the pressure on natural forests. At the present, however, the country's sawn wood demand is met mainly by supplies from natural forests, In fact, over 80 per cent of sawn wood production derives from such forests resources.

Prime species groups from tropical high forests include: Khaya spp. (Mahoganies); Chlorophora excelsa (Mvule); Olea welwitschii (Elgon Olive); Podocarpus spp.; and Lovoa spp., especially Lovoa brownii (Nkoba). The long-term availability of these prime species was seriously affected by their over-

exploitation up to the 1950's. Thus the period between the mid 1950's and the 1970's saw forest management efforts directed towards wider species utilization.

However, the general decline of the sawmilling industry since 1972 and the increase in pitsawing activities brought about a reversal of this trend to the pre-1950 practice of concentrating on the extraction of prime species. The two main reasons were that the "price levels for utility hardwoods did not attract pitsawers and sawmillers, and the Forest Department lost its capability of managing and controlling the resource" (Carvalho, 1987).

6.2 Industrial plantation resources

The establishment of industrial softwood plantations began on a trial basis in the early 1940's in the light of the foreseen shortage in the supply of hardwood logs by the year 2000, and went on until the mid 1970's. However, the development of planted forest came to a virtual halt during the period of political turmoil and economic downturn which saw the ceasing of practically all planting, pruning and thinning operations.

The first major plantation consisted of Cupressus lusitanica, Pinus patula and Pinus radiata. Later Pinus caribea and Pinus oocarpa were also introduced. The planting of Pinus radiata was later discontinued because of disease.

The total area of reserved planted forests was estimated at 20,475 ha in 1973 (Lockwood 1973) and at 21,200 ha in 1986 (Neilsen-FIAG, 1986).

The distribution of softwood plantation areas by species is shown in the following table.

Species	Hectares	% of total
Cupressus lusitanica	4,621	35
Pinus patula	4,711	35
Pinus caribea / Pinus oocarpa	3,648	27
Other pines	401	3

Table 1 - Distribution of Softwood plantation areas by species

Source: Records of the Forest Department and World Bank, 1986

Estimated planted forest areas of other species include the following: 3,000 ha of Eucalyptus spp.; 3,300 ha of other hardwood species including Khaya spp., Olea spp., Fagara spp., and Tectona grandis; and 1,100 ha of mixed softwood species. According to Dhiwerera (1988), the main species planted for fuelwood and poles are Eucalyptus saligna, Eucalyptus robusta and Cassia siamea.

It has been estimated that some 23 per cent of the softwood plantations are over 25 years old and currently

ready for felling, 22 per cent will be ready for felling in the next 4 years and a further 36 per cent in the following 5 years. (Plumptre and Carvalho,1989).

PTA context: Kenya has the largest industrial forest plantation resources in the PTA with 165,000 ha followed by Zimbabwe with 100,000 ha, Swaziland (99,000 ha), Malawi (91,500 ha), Tanzania (65,300 ha), Zambia (60,000 ha), Uganda (21,200 ha), Burundi (19,000 ha), Seychelles (10,600 ha), Mauritius (9,000 ha), Rwanda (5,500 ha), and Somalia (1,000 ha).

6.3 Utilization of sawn wood plantation species

6.3.1 Cypress

Because of the ready availability of hardwoods from natural forests, very little use is made of plantation species in furniture and joinery manufacture. The plantation species which has found more acceptance than others is Cypress from either local sources in the West Nile, or imported from Kenya in areas of the country with no close local supply sources of hardwoods, such as in the Kabale/Mbarara area. Cypress is moderately durable to fungal attack and air seasons with little degrade, but is to be

treated with a suitable preservative if utilized in permanent structures or in areas of high fungal attack. Furniture made of Cypress can be attractively polished with semi-gloss nitro cellulose finish material. Cypress is also planed and moulded to a fine finish, provided machine cutting tools are of the appropriate cutting-edge geometry and are properly maintained. Because of the above mentioned aspects, it is recommended that Cupressus lusitanica be promoted as the main substitute for tropical forest hardwoods in both furniture and joinery manufacture.

PTA context: Cypress is Kenya's major utility, construction and joinery timber. Clear grades of this species have in fact been utilized on an extensive basis for the production of standard furniture by the Economic Housing Group plant. Pruned butt logs of Cypress have been used for the manufacture of sliced decorative veneer by the Rai Plywood plant. Because of over-exploitation, supply of Cypress sawn wood is becoming scarce in Kenya and the market is now obliged to take more of Pinewood instead. Therefore, it might be worthwhile to investigate the possibility of exporting Ugandan cypress sawn wood to Kenya.

6.3.2 Pinewood

Pinewood is encountering a greater acceptance problem than Cypress on account of its greater degrade risks (sap-stain fungus and wet-rot fungi) unless handled with particular care right from the felling stage. In particular, because sap staining takes place while timber is still wet at

a level of over 25% m.c., pine logs require rapid processing after felling and sawn wood must be promptly dried - the latter condition being difficult to attain during the hot season in humid climates such as that occurring in the Mafulga district (Plumptre and Carvalho, 1989). As for durability, Pine is perishable in damp conditions unless treated with pressure and diffusion preservatives. Pine is not as easy to machine as Cypress because the low-density central wood tends to be soft and results in woolly surfaces during planing and moulding operations.

Because of the great variation in density between the centre and the outside of the stem, immature pine should be restricted for uses such as the manufacture of boxes, crates, pulp and fibreboard. Mature Pine, on the other hand, is comparable in strength properties with Cypress and is suitable for utility furniture, joinery, plywood and general construction end-uses.1/

6.3.3 Eucalyptus

According to Plumptre -Carvalho, (1989), Eucalyptus timber is now becoming a competitor for the softwoods because of its higher strength, moderate durability, red colour appearance and ready availability in parts of West Uganda. However, the consultant saw little evidence during the mission of Eucalyptus being utilized in furniture and joinery plants visited in Kampala and Jinja. PTA context: because of its multi-use advantage and greater fast-growing

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1/ Source: C.C. Bengough, Kenya's Five Major Commercial Timbers, Kenya Forest Department, 1971.

characteristic compared with other plantation species, Eucalyptus might become on the longer term, a dominant plantation species in the PTA sub-region on account of anticipated substantial increase in population and timber demand coupled with a higher population density and an increasing need for agricultural and fuelwood plantation land areas.

Unlike Uganda, some other PTA countries have expanded the utilization of Eucalyptus in their timber industry and could therefore serve as a useful source of information in this respect. For example, in Ethiopia, this species is utilized as the raw material in the manufacture of particleboard and hardboard (by the ECAFAO and the ETHARSO companies, respectively) whereas in Malawi Eucalyptus is used by the ITG company as a raw material for the production of laminated boards for school furniture; laminated beams for building construction; experimental laminated external doors; blockboard core; and rotary-peeled veneer. Incidentally, Brazil, the world's second largest exporter of particleboard and fibreboard, utilizes almost exclusively Eucalyptus for the manufacture of these wood-based panels.

Furthermore, for decades Eucalyptus poles have been very effectively utilized in Ethiopia for the fabrication of roof trusses in practically all modern buildings of pitched roof design in urban areas, as well as in industrial buildings. The adoption of this technique in Uganda as in the PTA in general could, inter alia, contribute to bringing down the material cost of residential buildings.

It is recommended that activities be undertaken on a sub-regional basis in order to expand the utilization of Eucalyptus in the woodworking industry (see Objective .6 in Recommended Follow-up Chart on page 51).

6.4 Prospects for the supply of sawn wood to the secondary wood processing industry

The Ugandan sawmill industry is now producing an average of 23,400 m3 of sawn wood a year as compared to an estimated output of 70,000 m3 in 1971-1972. The present low level of output is due to a progressive deterioration of the available production facilities begun in 1971 which was brought about by the lack of managerial and technical skills, the difficulty in obtaining spare parts and the lack of logging and transport equipment.

The decline in sawmilling output has given way to a proliferation of pitsawing to make up for the demand difference of sawn wood. Although only 600 pitsawers registered in 1986, there are indications that as many as 2,000 to 2,500 may be in operation without licences within government forest reserves (J.P.Dhiwevera, 1988 and Plumptre, 1988) with an estimated annual output ranging between 40,000 to 50,000 m3 in the period 1980-1988 (Plumptree-Carvalho, 1989). Thus the combined annual sawn wood output by sawmills and pitsawyers can be estimated at 73,400 to 88,400 m3 made up almost entirely of species from natural forests.

The sawmill industry is now being rehabilitated in an

attempt to re-build its production capacity. However, most efforts are being focused on the capability to process species from natural forests, rather than softwood plantation species. In fact, although the softwood plantation resources in Uganda permit a sustained yield of about 220,000 m3 of logs a year, the input capacity of existing and projected sawmilling and pitsawing units, geared to the processing of softwood plantation species, has been estimated at 13,000 m3 and 63,000 m3 of round wood a year, respectively. On the other hand, the demand for sawn wood required for new rural houses alone (furniture included) has been estimated at 112,000 m3 a year (Plumptre and Carvalho, 1989).

In conclusion, because of the bottle-neck in sawn wood production capacity, there seems to be no prospect for the foreseeable future to utilize to a significant extent sawn wood from plantation species in the secondary wood processing industry and in building construction.

6.5 Utilization of plywood, particleboard and blockboard

At present, there is only one plywood plant in operation in the country, the Kiira sawmill/plymill complex in Jinja which is a parastatal enterprise and produces utility plywood without decorative veneer facing. The plant also produces flush doors and a minor quantity of blockboard. The raw material input consists exclusively of hardwood from natural forests because the plant is not equipped for processing small diameter softwood logs. In any case, there would be no

close softwood plantation from which to obtain raw material supplies.

According to the management, the installed capacity of the mill (based on one shift, eight hours a day, 300 days a year) is about 5,700 m3 a year or 19 m3 a day. However, actual output is only 30 to 35 per cent of the capacity or about 1,700 m3 to 2,000 m3 a year. On the basis of the standing orders, it has been estimated that the plymill can meet about 30 per cent of the current local demand for utility plywood amounting to about 6,000 m3.

The mill had undergone a rehabilitation programme between 1982-1984 involving an investment of US$ 3.5 million. However, it is now afflicted by so many major operating problems, such as lack of logging equipment, lack of foreign exchange to replenish supplies, high reject rate, low productivity and poor quality of finished products that the management has proposed a second rehabilitation programme.

At present, no particleboard is produced in Uganda, although a particleboard factory, integrated with the Budongo sawmill is waiting rehabilitation. The plant used to produce boards mainly out of Mahogany residues from the sawmill. The present owner is reluctant to re-invest in the complex because of the illegal pitsawing of Mahogany in its forest concession (Plumtree-Carvalho, 1989). In any case the plant is located too far away from the nearest softwood plantation area to use softwood timber as raw material input.

So far as the utilization of wood-based panels in building construction is concerned, a factory has recently been established at Mbarara for the manufacture of cement-

bonded particleboard from softwood plantations at Bugamba. The plant, which is possibly the only one of its kind in developing Africa, is yet to become operative.

PTA context: From the foregoing it appears that for the foreseeable future, the furniture and joinery industry shall have to continue to depend on imports from Kenya for the bulk of the wood-based panel supply. The majority of imported panel material consists of Mahogany-veneered blockboard panels 19 or 25 mm thick of Kenyan origin and some Mahogany-veneered 4 mm thick plywood from Europe. Decorative Mahogany veneer produced in Kenya derives from raw material imported from Uganda.

7 Priorities in the modernization of the furniture/joinery sector

7.1 Selection of machinery

The main priorities for expanded know-how in the selection of equipment are as follows:

(a) Development of specifications of power tools and basic machines for the introduction of an initial degree of mechanization in micro-scale workshops;

(b) Development of specifications for the introduction of intermediate type of machinery taking into account the conditions and requirements of the local industry.

The main aspects to be considered in the selection of equipment are as follows: output capacity requirements; co-ordinated relationship with other equipment in order to avoid production bottle-necks; ease of maintenance; and availability of accessories designed to increase the versatility of operation of given machines.

A similar urgency exists in the selection of proper tool maintenance equipment.

7.2 Selection of cutting tools

The need also exists for the introduction of machining tools of modern design as a means to increase the quality of

machined surfaces, simplify tool sharpening requirements and reduce safety hazards. A particular need in this respect is the adoption of tools of appropriate cutting edge geometry to help overcome surface quality problems encountered in the processing of plantation timber.

7.3 Interchangeability of parts

So far as the actual manufacturing process is concerned, the major challenge faced by the formal furniture/joinery sector in attaining a truly industrial basis - that is in fully benefiting from the economy of the industrial system - is to develop a capability to produce fully interchangeable wood-machined parts, thus avoiding the time consuming and costly practice of adapting machined parts one by one by hand to fit them together during assembly. The essential know-how to be mastered in this connection includes: engineering of products as applicable to industrial production; preparation of appropriate product/process documentation as a reference in manufacturing; adoption of appropriate quality control methods and instrumentation; design and utilization of jigs as a means for attaining accuracy of works well as for ensuring safety of operation.

7.4 Product design

The development priority with respect to product design refers to capability of designing furniture by taking into account the requirements and potential of industrialized

production. In particular, a radical shift is to be attained in the design of storage cabinets (wardrobes, bookcases, sideboards, etc.) from the current fixed-purpose concept followed in Uganda, to the modern, versatile modular system, whereby panel components of various standard sizes are assembled together according to various end uses as required by individual customers. The modular system allows to increase the size of production batches so as to optimize the benefits from serial production. See Annex IV

7.5 Tool and machine maintenance

Regular and proper maintenance of machine cutting tools serves not only to extend their life span - thus reducing foreign exchange requirements for tool replacement - but also to improve the quality of processed parts and to help reduce safety hazards in the operation of machinery. The main concern with regards to preventive machine maintenance should focus on the introduction of proper lubrication methods. In fact. the replacement cycle of critical machine parts such as high-speed bearings is sharply accelerated unless they are lubricated at given frequencies, varying from machine to machine, and with the appropriate amount and grade of lubricant, according to the requirements of each individual lubricating point. Rapid wear of bearings can also result from cutting tools, such as moulding cutters, made unbalanced by improper sharpening.

7.6 Other modernization requirements

Other areas of required modernization include:

(a) Plant layout as a means of facilitating handling materials at given work stations, obtain a rational flow of work-in-progress, and ensure an organic relationship between manufacturing and service facilities.

(b) Introduction of Quality Standard Specification with regards to selected durability and performance requirements (as applicable to furniture, joinery and structural building components made of main plantation species) such as choice and strength of joints, toughness and wear of surface coating, wood treatment, selection of adhesives, minimum cross section of components as related to structural strength. dimensioning of furniture according to function, etc. The standards would provide consumers in local and regional markets, especially government institutions, with specification reference when placing orders and accepting products on delivery.

(c) Plant organization applicable to various sizes of furniture and joinery enterprises, as a means of defining essential functions, responsibilities and their organic relationship, and of facilitating production control and overall operating efficiency.

7.7 Training services

One of the main constraints faced in the development of the secondary wood-processing sector is that existing training institutions are not geared towards conducting programmes to cover the aspects of plant design and operation reviewed in the foregoing paragraphs.

PTA context: as the training gap is shared by most PTA member states, it is recommended that initial technical assistance of sub-regional scope be provided by the FAO/PTA/UNIDO project in this context to include the following:

(a) "Eye opener" seminars,

(b) Specialized seminars to cover particular subjects,

(c) Preparation of training and reference manuals dealing with those critical topics of furniture and joinery manufacture not adequately covered in an existing curricula of Polytechnic and Technical Schools.

Details of the above-mentioned programmes are given in chapter III of this report.

CHAPTER III - RECOMMENDED FOLLOW-UP

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
Objective 1 To expand the manufacturing know-how of an initial group of managerial staff in the furniture and joinery industry sector from Uganda and the other PTA countries aimed at optimizing the benefits of industrialized wood processing. (Refer to Modernization Priorities, pages 42 to 46)	Output 1.1 60 plant managers and production supervisors gained an appreciation of all critical aspects involved in the serial production of standard furniture and joinery, towards increasing productivity, quality standards and overall operative efficiency. The areas of expanded know-how include: selection of machinery; selection of cutting tools; inter-changeability of parts and quality control; product costing; tool and machine maintenance; general techniques of surface staining and coating; plant layout; product design as applied to industrialized production; quality standard specifications; plant organization.	Activity 1.1 To survey proposed host facilities in Kenya and Malawi 1/ in order to discuss Seminar arrangements, prepare a tentative Work Programme and specifications of production supply items (such as quality control instruments, jig accessories, special cutting tools, etc.) to be purchased under the project for seminar demonstration work. Activity 1.2 To prepare terms of reference for the Lecturers and final Work Programmes Activity 1.3 To conduct 2 General Seminars of two weeks each with 30 participants at each seminar in Kenya and Malawi respectively.	
Objective 2 To provide a basis for: (a) An increasingly relevant role on the part of Polytechnics and Technical Schools in Uganda and the other PTA countries in stimulating a proper transition of the furniture and joinery sector from artisan methods to the industrial system; and (b) A permanent reference source on plant operation for the management of furniture and joinery plants. (Refer to pages 27 and 46)	Output 2.1 Produced a set of woodworking Training/Reference Manuals covering the main topics dealt with in Output 1 above.	Activity 2.1 Collect and review woodworking text books dealing with industrial techniques, in use in Polytechnics and Technical Schools in the PTA. Activity 2.2 Adaptation of existing UNIDO woodworking manuals and preparation of new ones, as required, to cover the topics in Output 1.1 1/ Proposed hosting furniture plants: KIST Production Unit, in Nairobi, Kenya; and (2) WIDCO Furniture Plant, in Blantyre, Malawi	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
Objective 3 To enable selected, existing furniture and joinery factories in Uganda's main urban centres, with plans to rehabilitate and/or expand their production facilities, to adopt appropriate wood processing technologies.	Output 3.1 Detailed specification of new woodworking machines, ancillary equipment and spare parts with respect to selected, existing plants (Activity 3.1 refers). Output 3.2 New plant layouts for the rehabilitation and/or expansion of existing production facilities. (Activity 3.2 refers) Output 3.3 Guide-lines for further technical assistance (Activity 3.3 refers)	Activity 3.1 Six-week mission to: 1. Survey selected furniture and joinery plants in major urban centres; 2. Select new woodworking machines, cutting tools and ancillary equipment as required 3. Identify repair requirements for rehabilitation of existing machinery, including selection of spare parts Activity 3.2 Revision of existing plant layouts and preparation of new plant layouts for expanded production facilities (3 weeks) Activity 3.3 Identification of needs for further technical assistance (1 week)	Input 3.1 Woodworking expert (10 weeks) Input 3.2 Machine maintenance expert (six weeks)

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
Objective 4 To provide the basis for the improvement of tool maintenance methods of the furniture and joinery industry in Uganda and in the other PTA countries in order to attain: longer life span of costly imported machine cutting tools; quality improvement of machined parts; reduced safety hazards in the use of machinery; and reduced material reject rate. (Refer to page 44)	Output 4.1 Three Project Profiles on the setting up of tool maintenance units within small- and medium-scale furniture/joinery plants, or as self-contained Tool Maintenance Centres. The Profiles include: workshop layout; specifications and estimate cost of machinery, accessories and supplies for a two-year operation; specifications of storage arrangement for tools and supplies; lighting requirements, etc. (Activity 4.5 applies) Output 4.2 Trained 24 senior technicians in carrying out the maintenance of machine cutting tools in use in the furniture/joinery industry such as; planing knives, moulding cutters, routing cutters, standard circularsaw blades, carbide tipped circular saw blades, narrow bandsaw blades, blades for band resawing, mortising chains, square chisel mortiser bits, and boring bits. The participants would subsequently act as counterparts in similar courses to be conducted at a national level. (Activities 4.1, 4.2, 4.3, and 4.4 refer) Output 4.3 Extended the utilization of the Project Profiles and Data Sheets prepared for the training course for the benefit of the PTA furniture/joinery industry as a whole. (Activity 4.6 refers)	Activity 4.1 To survey the tool maintenance workshop of the Warca Furniture Factory and the WUARC Tool Maintenance Centre in Addis Ababa which, being representatives in the PTA of well-equipped tool maintenance facilities for the furniture and joinery industry, qualify for hosting the Tool Maintenance Training Courses. Activity 4.2 To prepare specifications of supplies and accessories to be purchased for the purpose of conducting the training courses. Activity 4.3 To prepare training Data Sheets and visual aids as a basis for conducting the maintenance courses. Activity 4.4 To conduct 3 training courses on Tool Maintenance Techniques of one month duration each for 8 PTA trainees at a time. Activity 4.5 To prepare Project Profiles as a reference on the setting up of tool maintenance units. Activity 4.6 To reproduce and distribute widely, in the secondary woodprocessing industry, the Project Profiles and Data Sheets prepared under the project.	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
Objective 5 To provide a sound basis for the establishment and operation, in Uganda and the PTA, of micro-scale furniture and joinery workshops and service cooperatives. (Refer to page 19)	Output 5.1 Produced 3 Project Profiles for the establishment of two typical micro-scale furniture/joinery enterprises and a typical service cooperative as follows: (a) Micro-scale workshop equipped with power tools and basic multipurpose woodworking machinery; (b) Wood-machining cooperative service workshop, of the type operated by BEDCO in Lesotho, with a full range of basic woodworking machinery for use by a number of micro-scale entrepreneurs. (c) Micro-scale workshop equipped with basic machinery for the production of bamboo furniture. The profiles include: detailed specifications and cost of equipment; details of workshop facilities; workshop layout; specifications of typical low-cost dining room, living room and bedroom furniture. (Activities 5.1 and 5.2 refer) Output 5.2 Produced a set of simple Reference Data Sheets on basic technologies as applicable to the operation of micro-scale woodworking enterprises, such as proper adjustment of machines, basic requirements in the sharpening of cutting tools, use of simple jigs and machine accessories, basic costing methods, etc.. (Activity 5.3 refers)	Activity 5.1 Survey of Seminar host facilities (BEDCO Woodworking Service Unit at Maseru, Malawi) in order to: - prepare detailed programme of Seminar and terms of reference of Lectures - select furniture/joinery items already produced by BEDCO entrepreneurs, and adapt them as required to serve for production demonstration sessions during the Seminar - prepare specifications of supplies to be purchased for the Seminar. Activity 5.2 To prepare 3 Project Profiles for the establishment of typical micro-scale enterprises for presentation and discussion at the Seminar, and for permanent reference of entrepreneurs and institutions concerned with the development of the sector Activity 5.3 To prepare Reference Data Sheets on basic woodworking technologies as applicable to micro-scale woodworking enterprises, for utilization at the Seminar and for permanent reference of entrepreneurs and training institutions. Activity 5.4 To conduct a two-week seminar at BEDCO for 30 PTA entrepreneurs of micro-scale woodworking enterprises and government officials responsible for the promotion of the sector.	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
- Objective 5 continued -	Output 5.3 30 government officials and entrepreneurs of the PTA member states gained an appreciation of critical factors to be considered in the promotion, establishment, and operation of micro-scale furniture/joinery enterprises and woodworking service cooperatives. Gain also derived from exchanging experience on the development of micro-scale enterprises. (Activities 5.1, 5.2, 5.3, and 5.4 refer) Output 5.4 Extended the utilization of the Project Profiles and the Data Sheets prepared for the Seminar for the benefit of the PTA furniture/joinery sector as a whole. (Activity 5.5 refers)	Activity 5.5 Reproduction of Project Profiles and Reference Data Sheets for wide distribution in the PTA.	
Objective 6 To expand the capability of efficiently utilizing, in Uganda and in the other PTA countries, fast growing plantation timber species (such as Pinus patula, Eucalyptus spp. and Cupressus Lusitanica) in the furniture and joinery industry as well as in building construction. (Refer to page 30)	Output 6.1 Report on the use of Eucalyptus in the PTA and overseas for the production of furniture, joinery, structural building components and wood-based panels. (Activities 6.1, 6.2, 6.3, refer) Output 6.2 Manual on standard wood treatment and wood processing requirements of Eucalyptus, Pine, and Cypress, to cover subjects such as: kiln drying; cutting speeds; cutting-tool geometry with respect to main wood machining operations; choice of surface coating material and methods; dipping against blue stain and pressure treatment of Pine; choice of adhesives for standard and structural applications; choice and dimensioning of joints in chair manufacture. The manual shall also propose a set of minimum quality standards for furniture intended for intra-PTA trade and for government contracts. (Activities 6.4 and 6.5 refer)	Activity 6.1 Review the experience gained by the International Timber Group in Blantyre, Malawi, in the manufacture of furniture components, joinery and structural building components made of laminated Eucalyptus. Activity 6.2 Review the experience gained by ETHAPSO and ECAFCO plants in Addis Abeba, Ethiopia in the manufacture of fibreboard and particle board made of Eucalyptus. Activity 6.3 Compile information on overseas experience in the utilization of Eucalyptus in the primary and secondary wood processing industry.	

CHAPTER III - RECOMMENDED FOLLOW-UP CHART

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
- Objective 6 continued -	Output 6.3 Reference Manual on the design of standard roof trusses made of Pine and Cypress, and on the design and fabrication of roof trusses made of Eucalyptus poles as practiced in Ethiopia (Activities 6.5 and 6.6 refer)	Activity 6.4 Compile information from African and overseas research institutions, including Bureaus of Standards, on woodprocessing requirements and durability and performance standards as applicable to the use of Eucalyptus, Pine and Cypress in furniture and joinery production and structural building applications. Activity 6.5 Compile information from African research institutions and ministries of works on the use of Pine, Cypress, and Eucalyptus in the design and fabrication of roof trusses. Activity 6.6 To reproduce the report and manuals under outputs 6.1, 6.2, and 6.3 for wide distribution to the industry, wood research institutions, and ministries of work in the PTA.	
Objective 7 To enable the Research Section of the Forest Dept. to provide the following services to the secondary wood processing industry: 1. Regular tool maintenance services 2. In-service training on basic tool maintenance equipment	Output 7.1 Detailed specification of tool maintenance equipment suitable for providing tool maintenance services including maintenance of carbide-tipped blades Output 7.2 Detailed specification of basic tool maintenance equipment suitable for the micro-scale woodworking workshops Output 7.3 Installed the maintenance equipment at the Forest Dept. Output 7.4 Trained six technicians in the operation of the maintenance equipment	Activity 7.1 Two-week mission to survey workshop facilities at the Forest Dept., prepare specification of machinery and supplies and prepare layout of the maintenance workshop Activity 7.2 Ordering of equipment by Executing Agency Activity 7.3 Installation of equipment and training on tool maintenance equipment (3 months)	Input 7.1 Sawdoctoring expert (2.5 man/months) Output 7.2 Purchasing of non expendable and expendable equipment (US$ 45,000)

LIST OF PERSONS MET AND OF PLANTS/INSTITUTIONS VISITED

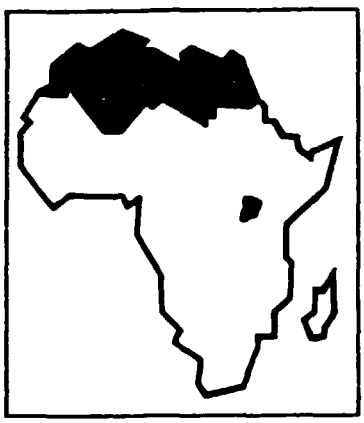
1	Mr V.C. Kiwanuka Chief Forest Officer	Forest Department P.O.Box 7124, Kampala
2	Mr L.S. Kimanuka Chief Forest Officer	"
3	Mr J. Carvalho Senior Utilizatin Officer	"
4	Mr P. Kityo Utilization Officer	"
5	Dr A.D. Monteiro Chief Technical Adviser	UNIDO Industrial Statistics Project P.O.Box 7184, Kampala
6	Mr B. Larsen JPO	UNDP/UNIDO P.O.Box 7184, Kampala Tel, 233440 Telex: 61255
7	Mr J. Johnsson Forestry Expert	Forest Department P.O.Box 7124, Kampala
8	Mr Z.A.Elijah Production Supervisor	Joinery Workshop of Kapkwata Sawmill P.O.Box 1134, Kampala FAX 235757
9	Mr E. Kisembo General Manager	Uganda Wood Peckers Ltd. (Furniture/joinery Workshop) P.O.Box 4014, Kampala Tel: 230413
10	Mr J. Mugisha Factory Manager	Mc Crae's Furniture Plant P.O.Box 6338, Kampala Tel: 2592918
11	Mr Goi-Goi Production Supervisor	"
12	Mr L. Bally Plant Manger	Roko Construction Ltd. (Joinery Plant) P.O.Box 172, Kampala Tel: 567305
13	Mr S.P. Wandera Commercial Administrator	"
14	Mr Mateo C. Celeste Production Supervisor	"

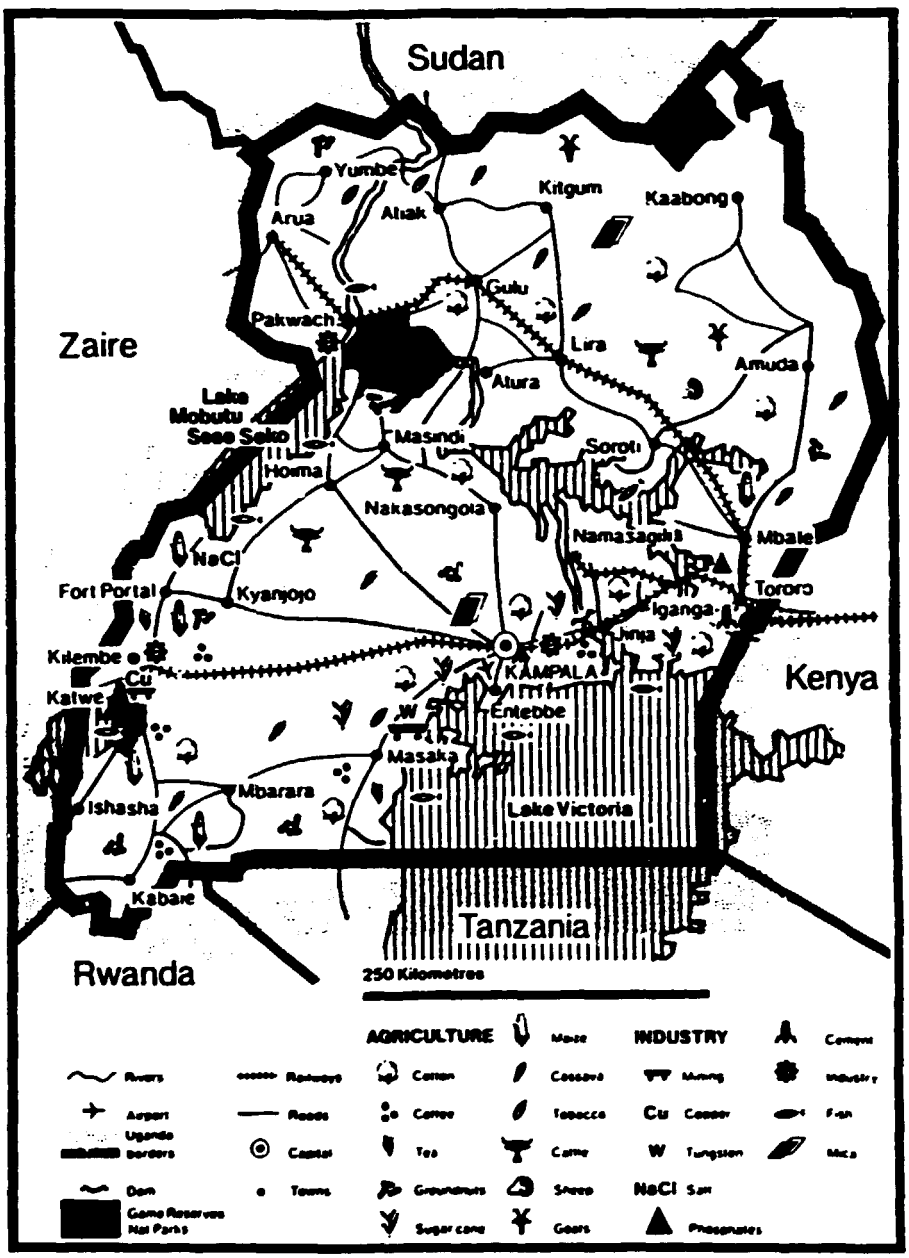
ANNEX I

15	Mr S. Salongo Sozi Manager	Madudu Timber Dealers (Joinery/furniture workshop) P.O.Box 10104, Kampala Bkiaise Bombo area
16	Mr F. Nyanzi Manager	Upholstery workshop P.O.Box 16340, Kampala
17	Mr E. Ssekkadde	Ssekkadde Furniture Makers Makerere 2 miles Bombo Rd Kampala
18	Dr M. Rwankote General Manager	Kiira Sawmill & Plymill P.O.Box 215, Jinja Tel: 21083
19	Mr J.K. Bwambale Owner/Manager	Bwambale Wood Work (Furniture workshop) P.O.Box 831, Jinja
20	Mr D.F. Wakudumira General Manager	Jinja Construction & Joinery Ltd. P.O.Box 364, Jinja Tel: 21838
21	Mr J. Sekaye Principal	St. Joseph Technical Institute
22	Mr G.A. Mukasa Supervisor Carpentry Section	"

MAP OF UGANDA

UGANDA





Area: 236,860 sq. km.

Population: 15.7 million (1987)

Capital: Kampala.

Principal Towns: Jinja, Mbale.

Date of Independence: 9 October 1962.

Government: Parliament is the supreme legislature and consists of the President and a National Assembly of 126 members.

Languages: English (official), Swahili and numerous local languages, the most widely spoken of which is Luganda.

Religion: Strongly Christian but also traditionalist and Muslim. The new constitution guarantees freedom of religion.

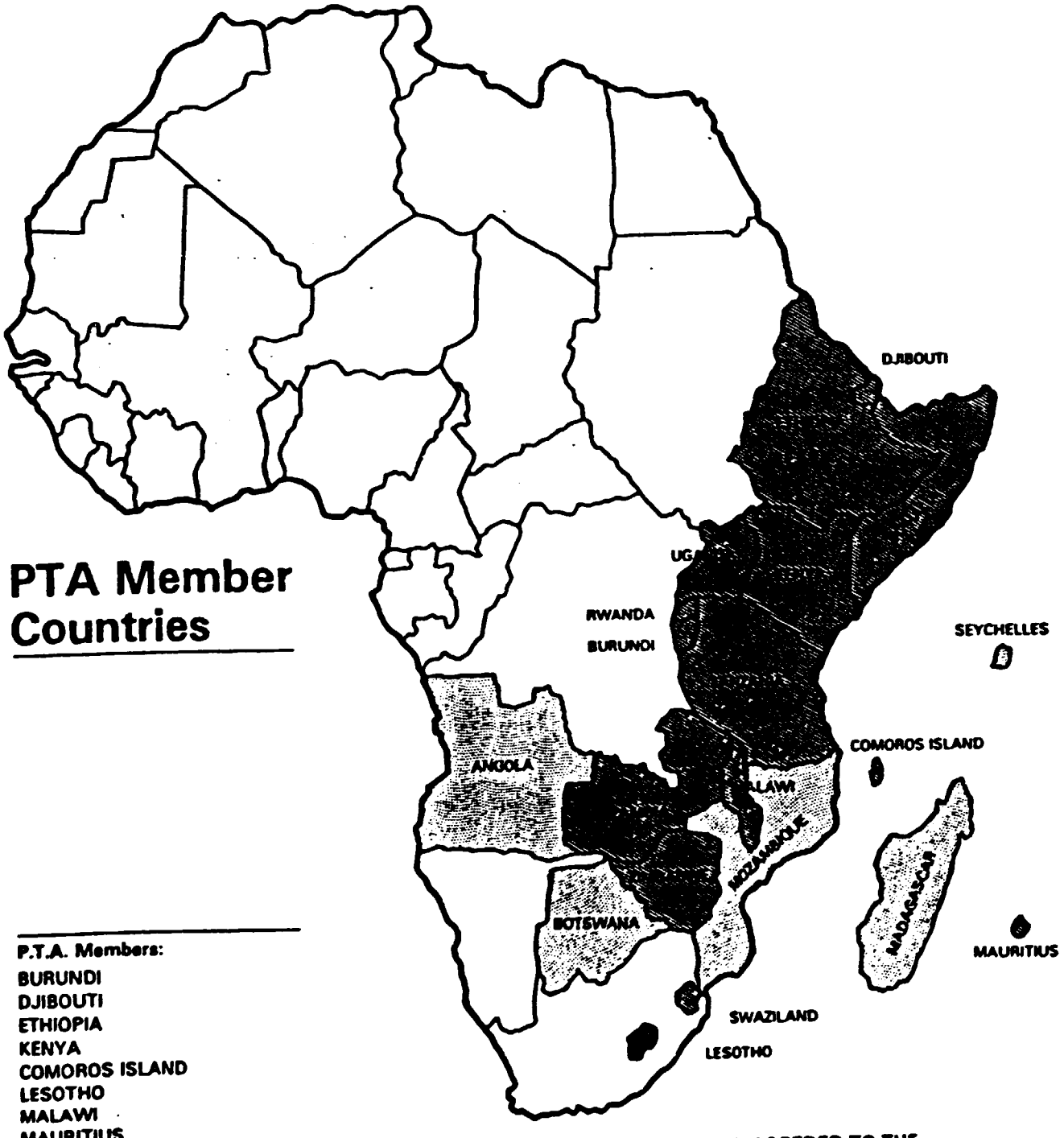
Currency: Uganda shilling.

GENERAL INFORMATION

Geography: Much of the country forms a plateau at between 900 and 1,500 metres above sea level. Nearly a fifth of its total area is a swamp and open water. The White Nile, flowing out of Lake Victoria, traverses much of the country. The south of Uganda is thickly forested and heavy with banana plantations, and the north largely savannah with some semi-desert in the north-east.

People: Ethnically, Uganda is complex. The three major linguistic groupings are the Bantu, the Nilotic and the Nilo-Hamitic. In the far south-west in the Ituri forests are pygmies.

MAP OF THE PTA MEMBER STATES



P.T.A. Members:

BURUNDI
DJIBOUTI
ETHIOPIA
KENYA
COMOROS ISLAND
LESOTHO
MALAWI
MAURITIUS
RWANDA
SOMALIA
SWAZILAND
TANZANIA
UGANDA
ZAMBIA
ZIMBABWE
MOZAMBIQUE

HAVE NOT YET ACCEDED TO THE TREATY BUT ARE EXPECTED TO DO SO SOON

MADAGASCAR
ANGOLA
THE SEYCHELLES
BOTSWANA

The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations Industrial Development Organization.

Check list of woodworking factories in PTA countries whose operation and products could be of interest to Ugandan manufacturers

1 MAURITIUS

1.1 Reunion Ltd & Partner (Panache)
Products: High class furniture of Louis XV type manufactured by combining hand-carved with efficient woodmachining methods.
Address: Industrial zone - Saint Pierre, Mauritius
Telex 4246 DIVIDEN IW, Tel: 534111

1.2 Mauricarvers Ltd
Products: Reproduction furniture of Louis XV and Victoria type. High labour intensive.
Address: P.O.Box 744, Bell Village, Mauritius

2 LESOTHO

2.1 BEDCO Servicing Centre for micro-scale furniture enterprises
Services: Common woodmachining shop; provison of timber supply at wholesale prices and on credit; marketing of products
Address: BEDCO Industrial Estate, Maseru

2.2 Foli Furniture Ltd
Products: Innovative type of contemporary furniture made of glue-laminated components.
Address: BEDCO Industrial Estate, Maseru

2.3 Lesotho Furniture Manufacturers Ltd
Products: Pine furniture. The most modern furniture plant in Lesotho.

3 Malawi

3.1 Wood Industries Co-operation Ltd (WICO)
Products: Pine furniture manufactured in a plant equipped with new, modern machinery. Exports pinewood shelving components to the U.K.
Address: P.O.Box 30359, Blantyre 3

3.2 International Timber Group (ITG)
Products: Furniture panels and structural building components made of finger-jointed and laminated eucalyptus with modern processing methods; plywood; blockboard (eucalyptus); flush doors; pallets; etc.
Address: P.O.Box 5050, Limbe

4 Zimbabwe

4.1 Adam Bede Furniture Ltd

Products: High class solid wood and upholstered furniture of reproduction type manufactured with modern methods and machinery. Exports.
Address: 9 Edison Crescent, Salisbury
Tel: 760198

4.2 Harlequin Furniture Manufacturers Ltd
Products: High class solid wood/upholstered furniture of reproduction type. Good use made of stained pinewood. Exports.
Address: P.O.Box 3809, Harare
Tel: 63495/6

4.3 J.W. Wilson Ltd
Products: Modern type of furniture hand carved with traditional design features. Exports
Address: New Ardbeunie, Salisbury

4.4 KLEKO Ltd
Products: Pinewood kitchen furniture; pine batten boards, for export; pallets crating; prefab units of temporary type; etc.
Address: P.O.Box 2304, Salisbury
Tel: 760551

4.5 MIRCO Ltd
Products: Elaborate occasional type of furniture such as bar cabinets. Exports to the USA.
Address: P.O.Box 542, Bulawayo
Tel: 60242

4.6 Laminating Plant (Forestry Commission)
Products: Structural building components made of finger jointed and laminated pine. Output of over 6,000 m3 per year. Exports
Address: P.O.Box 322, Mutare

4.7 Border Timbers Ltd
Products: Plywood, blockboard, batten doors, flush doors, blockboard shelving.
Address: P.O.Box 2037, Harare
Tel: 6781

4.8 Bakke Industries Ltd
Products: Mass-produced low-cost furniture in pine; crating; pallets; etc. Exports.

5 Swaziland

5.1 Swazi Pine Industries
Products: Pinewood chairs of "Captain type" mass-produced in a modern plant for export to Europe and Australia. Furniture is shipped individually packed in knock-down form, either unfinished or poliuretane-coated for glueing up by the customers themselves.
Address: P.O.Box 107, Kwaluseni
Tel: (0194) 84255/6/7

6 KENYA

6.1 Kist production Unit

Kimabu Institute of Science and Technology

Products: Standard furniture and joinery made entirely of pinewood in a recently established modern plant.

Address: P.O.Box 414, Kiambu
Tel. Karuri 22236

6.2 EHG Furniture and Prefab Factory

Products: It specializes in standard cypress furniture and prefab building units in pinewood.

Address: P.O.Box 18128, Nairobi
Tel. 20174

6.3 Timsales Co. Ltd. (Integrated Woodworking Enterprises)

Products: Sawnwood, plywood, hardboard (produced mainly from plymill and sawmill residues), blockboard, flush doors, window frames, chair components of moulded plywood.

Address: P.O.Box 18080, Nairobi
Tel. 559511
Telex. 24059 TIMSALES

6.4 Rai Plywood (Kenya) Ltd

Products: Plywood, particleboard, blockboard, flush doors and made-to- order furniture

Address: P.O.Box 241 Eldoret
Tel. 33811/2/3
Telex. 35093

7 Ethiopia

7.1 WARKA Furniture Plant

Products: Serial-produced modern furniture of Scandinavian type. Good range of equipment including a simple, very effective round-end tenoning attachment for spindle moulder. Good tool maintenance facilities

Address: P.O.Box 3086, Addis Ababa

7.2 Ethiopian Chipwood and Furniture Co. (ECAFCO)

Products: Particleboard produced with eucalyptus raw material; prefab building units

Address: P.O.Box 2738, Addis Ababa
Tel: 160675, Telex ECAFCO 21063

7.3 ETHARSO company

Products: Fibreboard produced with eucalyptus as a raw material

Address: P.O.Box 5516, Addis Ababa
Tel: 201488

Timber Type	Volume	Destination
Mahogany	553.10m^3	U.K.
	351.51m^3	Kenya
	227.21m^3	Egypt
	3.71m^3	Burundi
	1135.53m^3	
Mvule/Iroko	999.85m^3	Kenya
	109.65m^3	UK
	62.14m^3	Egypt
	1171.64m^3	
Maesopsis eminii	2.47	Burundi
Cypress	46.47	Rwanda
Pine	15.03	Burundi
TOTAL	2371.14m^3	

Table 2 Timber exports from Uganda from November, 1987 to December, 1988

Source: Plumtre-Carvalho, 1989