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INTRA-REGIONAL CO-OPERATION IN DEVELOPMENT
OF PLANTATION-BASED FOREST INDUSTRIES

DU/RAF/87/117

Technical report: The development of Kenya'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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* This document has not been edited.

ABSTRACT

Pietro Borretti, The Development of Kenya's Furniture and Joinery Industry in the PTA context, FAO/PTA/UNIDO, February 1990.

The report reviews the status of Kenya's secondary woodprocessing 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. It outlines opportunities for increased export opportunities and 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 and/or products could be of interest to Kenyan manufacturers.

INTRODUCTION

1. Title of mission: Survey of Kenya's secondary woodprocessing Industry in the PTA context.
2. Mission carried out by: Pietro Borretti
Consultant in Secondary Wood Industry
3. Period of mission: 29 Oct. to 14 Nov. 1989
4. Title and number of project: Intra-regional Cooperation in Development of Plantation-based Forest Industries - RAF/87/117 (UNDP-funded Regional Project)
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 States (PTA). Headquarters: Lusaka, Zambia
8. Objectives of the mission:
 - (a) To undertake a survey of existing furniture manufacturing enterprises;
 - (b) To provide 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:

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Ministry of Planning
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Objective 2

To provide a basis for an increased role of technical institutions in the development of the industry

Objective 3

To provide a decision-making basis for the rehabilitation of unutilized machinery

Objective 4

To provide a basis for improvement in tool maintenance

Objective 5

To provide a basis for an expanded role and improved performance of the micro-scale woodworking enterprises.

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CHAPTER I - SUMMARY AND CONCLUSIONS

- 1 The importance of Kenya's woodworking sector in the PTA context is indicated by the country rating second only to Zimbabwe in the production and consumption of sawnwood and wood-based panels; while the local market potential for furniture can be gauged by the fact that Kenya has the second largest urban population and total population next to Ethiopia.
- 2 As is the case of the PTA subregion as a whole, Kenya's secondary woodprocessing sector consists of a large number of small workshops of artisan type scattered throughout the country and mechanized plants in the "modern" sector located in urban areas. The main plants are to be found in Nairobi.
- 3 Kenya leads in the PTA in the integration of primary and secondary woodworking activities which facilitates the utilization of residues from one process, as raw material inputs for the manufacture of other products. One particular enterprise, the Timsales Co., combines the manufacture of sawnwood, plywood, fibreboard, flush doors and solid wood doors, plywood chair components, window frames, prefab units, roof shingles, etc.
- 4 Furniture is produced in a variety of styles and designs, from reproduction types to simple utility pine and cypress furniture of IKEA inspiration. Elaborate and

conservative types of furniture and dark finishes are preferred by consumers in the medium and high income sector of the market. Cypress furniture of innovative and bold design is produced by the furniture factory of the Economic Housing Group. However, there is little concern for a periodical renewal of designs and there isn't, in the market, any modular, panel-based furniture designed for serial production and suitable for a variety of storage requirements.

5 Kenya is a net exporter of wood products, the main item being wood carvings (the only product with overseas export destinations), followed by wood-based panels and furniture which, at present, are exported almost exclusively to neighbouring PTA countries and the Sudan.

6 The performance of the furniture/joinery industry as well as of the primary wood-processing sector has been negatively affected since 1984 by the downturn in dwelling construction activities - inspite of an increased demand for residential buildings - compounded by higher furniture selling prices due to the increased cost of materials. On the other hand, the industry has yet to mount an organized market promotion drive towards stepping up exports to nearby PTA countries such as, for example, Uganda, where furniture demand exceeds production capacity, and Ethiopia which cannot meet the demand due to a severe shortage of raw materials.

7 Although mechanized, many of the older Kenyan furniture plants produce furniture on an individual basis rather than taking advantage of serial production in order to benefit from the economy of industrialized production. The more dynamic among the newer plants are, however, oriented towards the line production of standard furniture.

8 Some of the Kenyan furniture plants are equipped with machinery which is among the most modern available in the PTA subregion. However, difficulties have been encountered in utilizing for actual line production the more sophisticated of such equipment.

9 At the other end of the industrialization spectrum, the micro-scale, "Jua Kali", woodworking enterprises are showing interest in integrating the traditional labour-intensive methods with the utilization of basic wood machining equipment, and in extending cooperative service opportunities - a trend and a priority which is widely shared in the subregion as a whole.

10 Indigenous hardwood species have traditionally proved the main source of sawnwood supply to the furniture industry. However, the restrictions posed on the felling of these species is bound to oblige the sector to gradually shift to exotic softwood plantation species, mainly *Pinus patula*. Kenya already operates one of the very few furniture factories in the PTA, the KIST

Carpentry Production Unit, producing exclusively pinewood furniture. The country has developed the largest forest plantation resources in the PTA (mainly pine, cypress, and eucalyptus) and is expected to maintain a surplus of saw logs and ply logs of exotic plantation species up to the year 2000. Thus Kenya has the basis to expand its trade potential in wood products within the PTA subregion.

11 Unlike other PTA countries such as Malawi and Ethiopia, Kenya has yet to expand the utilization of eucalyptus (a multi-use species with a greater growth rate than pine and cypress) in the primary and secondary woodprocessing industry. On the other hand, Kenya is one of the only three fibreboard-producing countries in the subregion. By introducing a type of fibreboard with a decorative surface and upgrading its production facilities, the Timsales Company has laid the ground for an expanded use for fibreboard in the furniture and joinery industry both in Kenya and the subregion.

12 Taking into account Kenya's record population growth rate of 4% per year and the resulting need for expansion of agricultural and fuelwood-plantation land areas, it is expected that, in the long term, wood-based panels (particleboard, fibreboard, and blockboard) will become the dominant furniture-making material to the detriment of sawnwood. This is because timber plantation resources suitable for the manufacture of panels are not only more

easily generated than those for sawnwood , but are also converted with a much higher recovery rate.

13 The current downturn in the local demand for furniture provides the industry with a strong motivation and stimulus for attaining higher operating efficiency and product development standards. The challenge now faced by the furniture industry is centred on the need to increase the capability of efficiently manufacturing reasonably priced standard furniture, taking advantage of the economy of scale of serial production, as against individually produced products. There is no other alternative if the sector is to deal effectively with the furniture demand expected to be generated by the projected doubling of Kenya's urban population by the end of the decade. Increase in operative efficiency would also boost Kenya's furniture export potential within the PTA, which, in turn, would expand the scope for serial production.

14 With regards to promoting overseas furniture exports, the efforts of the industry should concentrate on developing carved furniture of contemporary design whose manufacture would involve traditionally hand-carved features as well as the use of wood-machined components.

15 The attainment of more progressive conditions in the performance of the industry calls for the expansion of know-how with regards to several aspects of plant

operation. A number of recommended technical assistance activities are listed in Chapter III of the report to help attain specific, immediate objectives in this respect. Most of the proposed programme activities reflect the needs of the secondary woodworking industry in the FTA as a whole. They have therefore been designed for subregional participation and for promoting the interchange of experience and ideas between the respective countries.

CHAPTER II- FINDINGS

1. Demand and supply of furniture and joinery and general performance of the sector

1.1 The present situation

The Kenyan market consists of three main target areas namely the indigenous population, some 80,000 Asians and 40,000 Europeans. The total population was estimated at 21.5 million in 1987.

Demand in furniture and joinery has decreased since 1984 due to the fall in the erection of new dwellings. Thus production capacity is under-utilized, the sector's employment level has declined since 1987 and steep competition is prevalent.

The share of new dwellings in aggregate investment, in the building and construction, fell from 42% in 1984 to 28% in 1988. The decline of more than one third in the private sector output of new dwellings in the monetary economy is a matter of great concern, given the present high demand, and accumulated backlog, for residential buildings. According to the 1989 Government Economic Survey the major factors may have been the high interest rates charged on housing loans by the mortgage institutions, and the increase by nearly 52% between 1984 and 1988 in the price of building materials.

Higher costs of all wood inputs has similarly contributed to higher selling prices of furniture. An

additional constraint has been posed on the performance of the sector by the market resistance in accepting furniture made of softwood species, following the restriction imposed by the Government on the exploitation of indigenous hardwood.

1.2 Future Development

The current downturn in the demand for furniture and joinery products is not expected to be rapidly reversed owing to the complexity of stepping up dwelling-building activities. On the positive side, however, this situation provides the industry with an opportunity and stimulus for attaining higher productivity and cost effectiveness, optimum utilization of raw material inputs, increased quality, higher product development standards, and a more aggressive marketing effort both locally and in the other PTA countries.

In any case, the process of modernization of the furniture/joinery industry must be hastened on account of the future demand generated by the projected doubling in the country's urban population from, an estimated 4.8 million in 1990 to 9.7 million in the year 2000. About 787,000 new dwelling units are estimated to be required in the same period to accommodate the corresponding number of new urban households (family units with an average of 6.2 members) expected to be formed in this decade.

With respect to institutional furniture, the bulk of the demand between 1990 and 2000 is expected to consist mainly in school furniture, based on the projected need for

about 57,000 primary school classrooms and nearly 50,000 new secondary school classrooms - each classroom having a capacity for 40 pupils. On the other hand, the demand for wooden office furniture is expected to remain low because of the availability of steel office furniture of international standard, mass-produced locally by the Mecol Company. Likewise, very little demand is expected to develop in urban areas for joinery items such as window frames which have traditionally been made of steel in Kenya as well as in PTA as a whole.

2. External trade in wood products

2.1 Present trends

In 1988 Kenya's exports of wood products amounted to Ksh 72.9 million (US\$ 3.5 million) as against imports valued at Ksh 28.8 million (US\$ 1.4 million). Main items exported include: wood carvings (Ksh 38 million or US\$ 1.8 million); wood-based panels (Ksh 12.5 million or US\$ 0.6 million); and furniture (Ksh 9.4 million or US\$ 0.4 million). Main wood-based panel items exported are plywood, blockboard and particleboard. The figure for wood-based panels includes also items such as doors and parquet flooring.

The origin of main imports is as follows: veneer, mostly from Taiwan, Singapore, Hong Kong and the United Kingdom; plywood, mostly from Taiwan, Finland, Singapore and Hong Kong; and furniture with the dominant origin being UK followed by Sweden, Italy and the USA.

PTA Context: With the exception of wood carvings, which are directed to overseas markets, the bulk of Kenya's wood product exports is absorbed by neighbouring countries of which all but one, Sudan, are PTA member states. Main destinations in the PTA area, with respect to furniture exports are: Uganda, Tanzania, Somalia, Rwanda, and Burundi.

2.2 Future development

Added opportunities for the supply of efficiently produced furniture are expected to develop in the decade ahead in PTA market outlets in view of the projected overall increase by 77% in the urban population in the PTA region.

An estimate in furniture demand growth in the sub-region can be based on the projected increase in urban population and the related formation of new household units. PTA member states with higher proportion and greater annual growth of urban population are as follows:

	Estim. Urban population		Estim. Urban households		
	<u>1/</u> 1987 ('000)	<u>1/</u> Average annual growth rate 1980-87 %	1990 ('000)	1990 ('000)	<u>2/</u> Average size
Tanzania	6,931	11.3	9,556	1,911	5
Ethiopia	5,376	4.6	6,152	1,308	4.7
Kenya <u>2/</u>	3,877	7.28	4,787	759	6.3
Zambia	3,816	6.6	4,622	943	4.9
Zimbabwe	2,340	6.3	2,810	511	5.5
Uganda	1,570	5	1,817	370	4.9
Malawi	1,027	8.6	1,315	268	4.9

1/ Source: World Bank Development Report 1989.

2/ Source: Government Development Plan 1989-1993 and Estimates and Projections of Urban and Rural Populations, UN, New York, 1982.

The value of Kenya's overall exports/imports within PTA rose by 14% and 34% in 1988 compared to 1987 to reach respectively Ksh 179 million and Ksh 47 million.

3. Review of production facilities

3.1 General status

Kenya's furniture/joinery manufacturing sector consists of a large number of small artisan workshops and some 165 establishments in the "modern" sector defined to include all those located in urban areas; of these only 22 plants having an employment of over 50 workers.

PTA context: The Kenyan furniture manufacturing sector is the most diversified in the PTA in terms of product styles, plant size, level of machinery and processing methods. It includes factories dated 40 years back; among the earliest established in The PTA.

Many of the largest and earliest plants, such as for example, Victoria Enterprises (with a total of nearly 300 employees), are equipped with basic and intermediate machinery but produce a wide range of elaborate types of furniture on an individual and semi-artisan basis. In fact, the Victoria Enterprises plant is also equipped with highly specialized machinery for the production of panel-based

furniture which, however, is not being utilized (see paragraph 4.1).

A number of newer medium size plants, such as for example, those operated by the Silentnight Ltd., the Economic Housing Group Ltd.(EHG), the Furniture Master Ltd., the Furniture International Ltd., and the KIST Production Unit are oriented instead towards series production of furniture.

3.2 The EHG plant

The furniture plant of the Economics Housing Group Ltd. (EHG), is integrated with the production of prefab building in pine and of both internal and external doors. The EHG has a total of 83 production workers, 40 of whom are engaged in furniture production. Its yearly raw material input includes about 1500 m³ of sawnwood, 5,000 sheets of ply and 6,000 sheets of hardboard. The EHG plant has pioneered the use of cypress in the production of standard furniture of bold, innovative designs which has found wide appeal in the local European community. The company plans to restructure its operation to produce a new furniture line based on fewer models and to extend its production of low cost doors.

3.3 The Furniture International Plant

The Furniture International plant is a leader in the manufacture of fully-upholstered quality chairs available in a wide range of designs, most of which are accurate reproductions of contemporary European models. Also produced

reproductions of contemporary European models. Also produced to a good quality standard are easy chairs of Louis XV inspiration with elaborate hand-carved features.

3.4 The Furniture Master Plant

The Furniture Master plant is one of the very few in Kenya equipped with a dry kiln and already producing some of its furniture in pinewood. It is also the only one which utilizes modern automatic equipment for the processing of round-end tenons (a technique also utilized in Ethiopia and Zimbabwe), highly suitable for high-quality chair construction. The plant is also equipped with a modern production line for panel furniture which is, however, only partially utilized (see heading No. 4.1).

3.5 The Silentnight plant

The Silentnight Ltd. plant, with a manpower of 32 and timber consumption of about 900 m³ per year, specializes in furniture made of solid camphor and has introduced a range of reproduction type furniture of wide market appeal. It also produces Scandinavian type furniture in cypress. The advantage of this particular enterprise is its diversification, in that it also produces spring beds and car seats on a highly mechanized basis. Of the plants visited, Silentnight is the only one equipped for the machining of dovetailed drawers.

3.6 The Dean's Works

A newly-established, small-scale furniture workshop, Dean's Ltd. is equipped only with minor and inadequate equipment and specializes in the production of highly elaborated hand-carved furniture of French period inspiration and particularly attractive folding screens of Indian inspiration. The promotion of this type of woodworking enterprise would boost Kenya's overseas export earning potential from wood-carved products which are now limited to US\$ 1.8 million. It is recommended in this context that assistance be provided to Kenya to develop furniture for export reflecting traditional woodcarving motifs and produced on a combination of hand-carved features and wood-machined components (see Objective 6 in Recommended Follow-up Charts).

3.7 Micro-industries, Jua Kali and cooperative enterprises

The bulk of Kenya's furniture and joinery enterprises consists of small workshops located both in rural and urban areas and operating mostly on an artisanal basis. The development of small-scale and Jua Kali (under-the-sun) manufacturing units, as well as of production co-operatives, has been assigned high priority by the government in view of their labour-intensive production techniques, suitability to help develop smaller urban centres and employment of simple technologies that are easy to adopt. Moreover, these enterprises tend to fare better than the formal sector under

conditions of market downturn. Leaders of Jua Kali co-operative societies have recently appealed to the government to equip Jua Kali with showrooms and machinery to improve the quality of their products.

The PTA context: The development of small-scale workshops and co-operatives is a development priority in most PTA countries. In fact, at least in one PTA member state the World Bank has contributed in developing a credit and saving scheme for micro-scale entrepreneurs organized in service co-operatives. Furthermore, co-operative enterprises have been established under bilateral aid projects such as the Common Woodworking Shop set up in Lesotho by BEDCO with the assistance of the Federal Republic of Germany. It is recommended that technical assistance be provided by the FAO/PTA/UNIDO project to strengthen the operative efficiency of micro-scale furniture/joinery enterprises and service co-operatives in the PTA member states (see Objective 5 in Recommended Follow-up Charts).

3.8 The KIST Production Unit

An interesting training/production arrangement has been introduced by the Kiambu Institute of Science and Technology (KIST) by operating at Kiambu both a formal training programme leading to the Final Craft Certificate in Woodworking and a commercial Carpentry Production Unit equipped with a wide range of modern Italian woodworking machines including a dry kiln and treatment plant obtained with DANIDA funds. The plant is the only one in Kenya - and

one of the very few ones in the PTA - specializing in the manufacture of pine from plantation forests. Two constraints experienced by Production Unit: lack of a multiboring machine - resulting in the frequent use of nails to assemble panel furniture - and lack of proper tool maintenance equipment.

PTA context: Because of its unique combination of production and formal training facilities, it is recommended that the KIST be considered as a choice for hosting a FAO/PTA/UNIDO Training Course for Plant Managers and Production Supervisors of the PTA countries, dealing with all critical aspects of furniture and joinery manufacturing (see Objective 1 in Recommended follow-up Charts).

3.9 Integrated woodworking

Kenya leads in the PTA in the integration of secondary and primary woodworking activities as a means to facilitate the utilization of residues from one process as raw material inputs for the manufacture of other products. In particular, the Timsales Company produces the most comprehensive range of wood products, including: sawnwood (9,700 m³/year); plywood (5,700 m³/year); fibreboard (2,800 m³/year), produced mainly with residues from the sawmill and plywood mill; blockboard; flush doors; window frames; pre-fabricated building units; chair seats and back of moulded plywood; pallets, etc. The Ray Plywood plant in Eldoret produces plywood (9,700 m³/year); particleboard (5,000 m³/year); blockboard (535 m³/year); flush doors (12,000 pcs/year); parquet flooring, and made-to-order furniture. In

addition, there are sawmills, such as the one operated by the Singh Brar Company, equipped for supplying kiln dried and treated timber and the production of wood mouldings.

3.10 Tool maintenance facilities

Kenya's sawmilling industry is generally better equipped in cutting tool maintenance than the furniture and joinery sector. In fact, the sawdoctoring Workshop of the Forest Industry Training Centre (FITC) in Nakuru is possibly the most modern of its kind in the PTA. In contrast many furniture plants in the "modern" sector, even some of those equipped with new woodworking machinery, do not fully appreciate the need for proper tool maintenance methods and equipment.

There are two Tool Maintenance Servicing Centres in Nairobi, one operated by Sandvik (Kenya) Ltd. and the second by the Gilfillan Company. The former, visited by the consultant, is geared mainly for maintenance of sawmill blades; its new Manager, however, expressed keen interest in introducing the necessary equipment to expand the servicing to the furniture and joinery industry.

4. Problems in the introduction of advanced machinery

4.1 Machinery for the production of panel-based furniture

Two furniture factories, Victoria Industries and Furniture Master, and a panel board manufacturing plant, Ray

Plywood, have each invested in an advanced range of machinery worth several hundred US dollars for the series production of panel furniture. The equipment includes: veneer preparation machines, hot press, glue spreader, automatic panel saw, automatic double and squaring machine, automatic multi-head boring machine, automatic edge binding machine, pneumatic case clamping machine, wide belt sander and dowel making machines. Some of this equipment is possibly the only of its kind in the PTA.

The equipment at Victoria Industries is of the more sophisticated type and was briefly utilized when bought four years ago. The equipment at Furniture Master is being used but only marginally and not for series production. The line available at Ray Plywood is at present partly utilized for squaring and lipping flush doors. The causes of this situation can be found in the absence of pre-investment studies; lack of panel furniture designs engineered for series production and styled to reflect local requirements; lack of experience in the operation and maintenance of the equipment.

PTA context: The proper utilization of the equipment could serve to provide a significant source of supply of standard furniture made of particleboard or blockboard panels and produced at low cost on the basis of economy of scale. This would help fulfil the need for reasonably priced quality furniture both in Kenya's own urban areas and in those of other PTA countries with smaller

markets and a less developed furniture industry, such as Uganda, or where the demand exceeds the supply due to a shortage of raw materials, such as in Ethiopia.

In view of the above and of the value of unutilized investment involved, it is recommended that ad-hoc technical assistance be provided as a basis for full utilization of the equipment (see Objective 3 in Recommended Follow-up Charts).

4.2 Machinery for the production of embossed furniture components

Another case of largely unutilized investment is represented by the set of embossing, carving and copying machines at the factory of Victoria Enterprises which includes: a heavy duty press equipped with a wide range of costly steel moulds for embossing carved features on chair components of Louis XV type; a multispindle carving machine; and an automatic multispindle copying lathe. The rehabilitation of this production facility would be particularly problematic. In fact, on the one hand there is no sufficient local demand for series-produced carved furniture of the Louis XV type; on the other hand, furniture with carved surfaces of embossed type would not be competitive in overseas markets because this production method is already industrially applied in exporting countries such as Italy and France.

5. Utilization of raw material in the context of the development of the furniture and joinery industry

5.1 Natural forest resources

Indigenous hardwoods from natural forest reserves have traditionally constituted the preferred raw material in furniture and joinery making. The main species are: Camphor (*Ocotea usambarensis*) which is utilized also for high grade furniture; Meru oak (*Vitex Keniensis*); Mule (*Chlorophora excelsis*); and Murundu (*Celtis Africana*). Also used is Mahogany imported from Uganda.

Because of exploitation abuses and the depletion of natural forests, a severe restriction has been imposed on the harvesting of indigenous hardwoods. The furniture industry has no choice but to gradually convert its demand to fast growing plantation species. The planting of indigenous hardwoods is being carried out mainly for conservation objectives.

5.2 Industrial plantation resources

Plantation forests commenced early in Kenya with the planting of *Eucalyptus saligna* as a source of fuelwood for the railways. Plantations of *Pinus patula*, *Pinus radiata*, *Cupressus lusitanica* and expanded areas of *Eucalyptus*, were established during the 1950-60's. *Pinus radiata* was later dropped because of disease.

At the end of 1987, 165,000 ha were planted with: Cypress (71,500 ha); Pines 62,780 ha); Eucalyptus (16,084 ha); and others (14,392 ha).

PTA context: Kenya has the largest industrial forest plantation resources in the PTA followed by Zimbabwe (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).

5.3 Predominant plantation species

There has been all along a strong preference in the market for cypress sawnwood because of its suitability in construction as well as in joinery and furniture production. Because of this trend and consequent overcutting, cypress sawnwood supply has become precarious and the market is being forced to take more and more pine.

The supply of cypress sawnwood is expected to improve by the end of the decade. In the meantime, pinewood might become, in Kenya, as in the PTA in general, the dominant sawlog and veneer log species for both the construction sector and the furniture/joinery industry on account of its shorter rotation compared to cypress, resulting in a more rational utilization of land area. An added advantage of pinewood is its multi-use characteristic, being also the main input for pulpwood production.

However, the efficient utilization of pinewood in the woodworking industry is dependent on the widespread

adoption of proper wood treatment and woodprocessing methods - a situation which is far from being attained in Kenya and in other PTA member states such as, for example, in Ethiopia. In fact, dipping to counteract blue stain, pressure treatment with preservatives, and kiln drying are yet to be widely adopted. This situation, especially the high incidence of blue stain, is responsible for the image pinewood has in the market. From the point of view of woodprocessing, the main problems encountered are rough surfaces of machined parts (due to a lack of cutting tools of the proper specification) and unsatisfactory surface coating and staining methods.

5.4 Surplus of plantation species

Kenya's sawnwood consumption was estimated at 210,000-220,000 m³ in 1988 (second only to Zimbabwe whose projected consumption for 1990 is about 239,000 m³) expected to grow to around 370,000 m³ by the year 2000. A surplus of veneer logs and sawlogs is expected to be maintained in Kenya up to 2000 from the plantation forest. The backlog of felling would start to be depleted rapidly thereafter unless new plantation areas are established in the meantime, in order to attain an increase of about 25 % over the current area, if Kenya is to sustain self-sufficiency in timber supply.

PTA context: The notion of carrying forward the surplus of undercut wood to meet the anticipated shortage beyond the 2000 is not entirely feasible as the plantation concerned would tend to deteriorate in the meantime. Thus there is the opportunity of utilizing these extra plantation

resources towards exporting pine sawnwood, pine-based panels and possibly furniture and joinery components to small markets in the region such as Reunion, the Seychelles, and the Comoros Island, where Kenya was already exporting sawnwood prior to the export ban, and possibly Ethiopia. Neither pine sawnwood, nor wood-based panels from Kenya would otherwise be competitive on the world market compared to softwoods from Chile and Europe.

5.5 Utilization of Eucalyptus

Of the main exotic, fast-growing plantation species, only pinewood and cypress have been utilized so far in Kenya in the forms of sawnwood for the manufacture of furniture and joinery; whereas the use of eucalyptus, a multi-use species with greater fast-growing characteristics, has been limited to pulpwood production, building poles, transmission poles and rotary veneer.

Because of its fast-growth advantage, eucalyptus might become on the longer term a dominant species both in Kenya and in other PTA countries, on account of the 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. Fuelwood provides more than 95% of Kenya's rural energy requirements and its current deficit of 9.8 million tons is expected to reach 30.6 million tons by the year 2000.

PTA context: Unlike Kenya, 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 ECAFCO 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 Kenya as in the PTA in general could contribute to bringing down the material cost of residential buildings.

It is recommended that activities be undertaken in order to expand the utilization of eucalyptus in the woodworking industry. (see Objective 7 in Recommended Follow-up Charts).

5.6 Scope for the utilization of hardboard

Limited use is made at present in the furniture industry of hardboard panels produced by the only hardboard plant in the country linked to the Timsales Sokoro

woodworking complex. A new matt-forming machine is now being added to the plant to improve panel quality and expand by about 25% its present capacity of 10 tons per day.

An interesting development with respect to the expanded use of hardboard in furniture and joinery production is that Timsales has successfully carried out an experiment to produce hardboard panels with an attractive decorative surface obtained by scattering pinewood straws on the outer face of the panel in the final pressing process.

Hardboard offers two advantages compared to plywood and particleboard. On the one hand hardboard does not require the use of adhesives (which are imported) in its manufacture. On the other hand, hardboard can be manufactured from timber residues, as is the case in the Timsales fibreboard plant where the raw material input is largely derived from residues from the sawmill and the plymill with which it is integrated.

PTA context: The hardboard plant in Kenya is one of the three such facilities in the PTA, the other two operating in Ethiopia (an obsolete plant with a 7 ton/day capacity) and Tanzania, respectively. The availability of good grade hardboard, especially of the decorative type to be manufactured by Timsales, could considerably expand the utilization of this material, in Kenya as well as in the PTA as a whole, for the manufacture of utility, low-cost furniture and joinery. For example, blockboard panels faced with decorative hardboard skins could be utilized as furniture components; or skins and core grids of hardboard could be utilized for flush doors as practised in Europe.

5.7 Utilization of particleboard, plywood and blockboard

Particleboard, blockboard and plywood are available in a choice of rotary-cut veneer facing or sliced veneer facing one or both sides. The veneer species are Pine (Radiata), Cypress (Lusitanica), Elgon Teak (Olea welwitschii), Mukangu, Blackwood (Acacia melanoxylon), Camphor and Mahogany which is imported from Uganda. Problems are reported by the furniture industry with respect to the quality of the blockboard available on the market.

PTA context: Although Kenya imports a limited amount of veneer and wood-based panels from overseas (main sources: Poland, Finland, Singapore, and Italy), it is a net exporter of panel items, even if destinations are limited to the surrounding countries of Rwanda, Uganda, Tanzania and Zaire in this order. Import/export figures in 1987 were Ksh 5.5 million and 16.8 million respectively. The continued availability of veneer logs of indigenous species, such as Camphor and Elgon Teak for the purpose of producing decorative veneer would be vital for retaining the existing PTA outlets while also serving to promote the export of quality panel-based furniture within the area. Alternatively, the industry shall have to extend its reliance on decorative veneer imported from overseas or on veneer logs from Uganda.

With respect to blockboard production it would certainly be of much interest to the technical managers of Timsales and Rai Ply to visit the facilities of the International Timber Group (ITG) in Blantyre, Malawi, which

are equipped with particularly efficient blockboard core-composer equipment.

6. Priorities in the modernization of the furniture/joinery sector

6.1 Selection of machinery

Apart from the problem encountered in the selection of machinery of advanced type, there is also scope for expanded know-how in the selection of basic and intermediate types of machines on the basis of aspects such as: versatility and availability of accessories; output requirements; co-ordinated relationship with other equipment in given process flows; easy maintenance; and introduction of modern processing methods, such as the use of dowel jointing and of shawing machines as substitutes to sanding of softwood furniture components. A similar urgency exists in the selection of proper and adequate tool maintenance equipment.

6.2 Selection of cutting tools

The need also exists for the introduction of machining cutting 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.

6.3 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: design and 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 work as well as for ensuring safety of operation.

6.4 Product costing

The current conditions of steep competition in the local market underscores the need not only for increased productivity but also for the adoption of appropriate product costing methods - cost estimating and accurate feed back on actual cost of processing operations - as a basis for

rational setting of selling prices. Of particular importance, in this respect, is the capability of calculating with accuracy standard times of individual woodprocessing operations - a know-how which is also essential for the purpose of production scheduling and control.

6.5 Tool and machine maintenance

The operational cost efficiency of the sector could be significantly improved by adopting proper tool maintenance and preventive machine maintenance methods. A requirement particularly important, taking into account the constraints imposed by the government on the granting of foreign exchange for importing spares and supplies. For example, the life of expensive items such as carbide-tipped circularsaw blades is drastically shortened unless they are promptly sharpened (with a frequency normally not exceeding 10 working hours) before tips become too blunt and tend to chip off. 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 frequency 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.

6.6 Other modernization requirements

Other areas of required modernization include:

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

(b) Product design as a means of developing furniture which attains formal appeal while also taking into account potential and limitations of machinery, processes and material.

(c) 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.

(d) 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.

6.7 Training services

One of the main concerns voiced by the management of practically all the furniture plants visited by the Consultant is the lack of technicians of supervisory level and skilled labour with a formal training background covering critical woodworking know-how, such as indicated in the foregoing paragraphs and applicable to actual requirements of the industry.

PTA context: as the training gap is shared by most PTA member states, it is recommended that besides conducting "Eye opener" Seminars and Specialized Short-term Courses, the FAO/PTA/UNIDO project also help developing - in co-operation with the relevant training institutions - a set of training manuals in addition to those already published by UNIDO dealing with critical topics of furniture and joinery manufacture not adequately covered in current curricula. This would serve to gear existing formal training institutions to fulfil on a long term basis, the needs of the industry for supervisory personnel, without having to set up ad-hoc training institutions. The expanded curricula would also allow part-time, in-service training of personnel already employed in the industry. (see Objective 2 in Recommended Follow-up Charts)

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>Objective 1</p> <p>To expand the manufacturing know-how of an initial group of managerial staff in the furniture and joinery industry sector from Kenya and the other PTA countries aimed at optimizing the benefits of industrialized wood processing. (Refer to Modernization Priorities in section 6, page 27)</p>	<p>Output 1.1</p> <p>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. (Objective 1 and Activities 1.1 to 1.3 refer)</p>	<p>Activity 1.1</p> <p>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.</p> <p>Activity 1.2</p> <p>To prepare terms of reference for the Lecturers and final Work Programmes</p> <p>Activity 1.3</p> <p>To conduct 2 General Seminars of two weeks each with 30 participants at each seminar in Kenya and Malawi respectively.</p>	<p>- 32 -</p>
<p>Objective 2</p> <p>To provide a basis for:</p> <p>(a) An increasingly relevant role on the part of Polytechnics and Technical Schools in Kenya and the other PTA countries in stimulating a proper transition of the furniture and joinery sector from artisan methods to the industrial system; and</p> <p>(b) A permanent reference source on plant operation for the management of furniture and joinery plants. (Refer to paragraph 6.7, page 31)</p>	<p>Output 2.1</p> <p>Produced a set of woodworking Training/Reference Manuals covering the main topics dealt with in Output 1 above. (Activities 2.1 and 2.2 refer)</p>	<p>Activity 2.1</p> <p>Collect and review woodworking text books dealing with industrial techniques, in use in Polytechnics and Technical Schools in the PTA.</p> <p>Activity 2.2</p> <p>Adaptation of existing UNIDO woodworking manuals and preparation of new ones, as required, to cover the topics in Output 1.1</p> <p>1/ Proposed hosting furniture plants: KIST Production Unit, in Kiambu, Kenya; and (2) WIDCO Furniture Plant, in Blantyre, Malawi</p>	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>Objective 3</p> <p>To provide a decision-making basis for the rehabilitation of Kenya's existing production lines for the manufacture of panel-based furniture in view of their potential PTA regional complementary role. (Refer to Section 4 page 17)</p>	<p>Output 3.1</p> <p>Produced two reports with an appraisal of the constraints preventing the full utilization of the existing sets of panel-line machinery at the plants of Victoria Enterprises and Furniture Master. The reports are also to provide details and cost of corrective steps to be taken to rehabilitate the equipment which is not in operating conditions. (Activity 3.1 refers)</p> <p>Output 3.2</p> <p>Produced a pre-feasibility study for setting up a typical self-contained furniture manufacturing operation based on the type of panel-line equipment available at Victoria Enterprises and Furniture Master. The study will include: survey of general market conditions; definition of typical products to be produced; material input requirements; general factory building requirements; general ancillary equipment needs; manpower requirements; general assessment of financial viability; details of further technical assistance requirements. (Activities 3.1 to 3.5 refer)</p>	<p>Activity 3.1</p> <p>To conduct a survey of the panel-line machinery of the Victoria Enterprises and Furniture Master and provide a full inventory of the machinery and accessories available.</p> <p>Activity 3.2</p> <p>To collect and analyse the local data necessary for the preparation of a pre-feasibility study.</p> <p>Activity 3.3</p> <p>To adopt, for the purpose of preparing a pre-feasibility study, a typical panel-based modular furniture system suitable for a wide range of uses (wardrobes, bookcases, living room and dining room cabinets etc.).</p> <p>Activity 3.4</p> <p>To prepare a typical pre-feasibility study on the basis of the above.</p> <p>Activity 3.5</p> <p>To elaborate details of technical assistance required by the Victoria Enterprises and Furniture Master plants to start regular serial production of panel-based furniture.</p>	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>Objective 4</p> <p>To provide the basis for the improvement of tool maintenance methods of the furniture and joinery industry in Kenya 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 paragraph 6.5, page 29)</p>	<p>Output 4.1</p> <p>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)</p> <p>Output 4.2</p> <p>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)</p> <p>Output 4.3</p> <p>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)</p>	<p>Activity 4.1</p> <p>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.</p> <p>Activity 4.2</p> <p>To prepare specifications of supplies and accessories to be purchased for the purpose of conducting the training courses.</p> <p>Activity 4.3</p> <p>To prepare training Data Sheets and visual aids as a basis for conducting the maintenance courses.</p> <p>Activity 4.4</p> <p>To conduct 3 training courses on Tool Maintenance Techniques of one month duration each for 8 PTA trainees at a time.</p> <p>Activity 4.5</p> <p>To prepare Project Profiles as a reference on the setting up of tool maintenance units.</p> <p>Activity 4.6</p> <p>To reproduce and distribute widely, in the secondary woodprocessing industry, the Project Profiles and Data Sheets prepared under the project.</p>	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>Objective 5</p> <p>To provide a sound basis for the establishment and operation, in Kenya and the PTA, of micro-scale furniture and joinery workshops and service cooperatives.</p> <p>(Refer to paragraph 3.7, page 14)</p>	<p>Output 5.1</p> <p>Produced 3 Project Profiles for the establishment of two typical micro-scale furniture/joinery enterprises and a typical service cooperative as follows:</p> <p>(a) Micro-scale workshop equipped with power tools and basic multipurpose woodworking machinery;</p> <p>(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.</p> <p>(c) Micro-scale workshop equipped with basic machinery for the production of bamboo furniture.</p> <p>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)</p> <p>Output 5.2</p> <p>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)</p>	<p>Activity 5.1</p> <p>Survey of Seminar host facilities (BEDCO Woodworking Service Unit at Maseru, Malawi) in order to:</p> <ul style="list-style-type: none"> - 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 - to prepare specifications of supplies to be purchased for the Seminar. <p>Activity 5.2</p> <p>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</p> <p>Activity 5.3</p> <p>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.</p> <p>Activity 5.4</p> <p>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.</p>	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>- Objective 5 continued -</p>	<p>Output 5.3</p> <p>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)</p> <p>Output 5.4</p> <p>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)</p>	<p>Activity 5.5</p> <p>Reproduction of Project Profiles and Reference Data Sheets for wide distribution in the PTA.</p>	
<p>Objective 6.</p> <p>To provide the initial basis for extending Kenya's overseas woodcarving export potential from traditional decorative hand-carved items to carved furniture in order to increase foreign currency earning and expand the utilization of traditional indigenous skills. (Refer to paragraph 3.6, page 14)</p>	<p>Output 6.1</p> <p>Produced designs and working drawings of six knock-down furniture items incorporating traditional wood-carving patterns. The production of furniture is to include both hand carving and wood machining operations. For ease of marketing, the furniture will be of the occasional type, that is, furniture which need not be part of a set, such as bookshelves, coffee tables, telephone tables, bar cabinets, etc. (Activities 6.1, 6.2 and 6.3 refer)</p> <p>Output 6.2</p> <p>One set of prototypes of the six furniture designs developed under output 6.1. (Activity 6.4 refers)</p>	<p>Activity 6.1</p> <p>Visit Kenya's wood carving areas in the Bombassa district and the Lama island to study traditional wood-carving patterns.</p> <p>Activity 6.2</p> <p>Visit the ETTC furniture plant in Addis Ababa and the Wilson plant in Zimbabwe, where traditional woodcarving features have been utilized for the manufacture of contemporary furniture. Visit the Panache furniture plant in Mauritius where high-class carved furniture is produced in an optimum combination of hand work and wood machining.</p> <p>Activity 6.3</p> <p>Develop a range of contemporary wood-carved furniture designs.</p>	

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>- Objective 6 continued -</p>	<p>Output 6.3</p> <p>Report on the selection of power and airtools and basic woodworking machines to complement hand-carving tools for the manufacture of the furniture designed under output 6.1. (Activity 6.5 refers)</p>	<p>Activity 6.4</p> <p>Assist a representative wood-carved furniture workshop, such as the one operated by Dean's Ltd, Nairobi, in the production of prototypes of the designs developed under the project.</p> <p>Activity 6.5</p> <p>Select a range of basic, essential woodworking equipment as a complement to the hand-carving process in the production of the furniture designed under the project.</p>	
<p>Objective 7</p> <p>To expand the capability of efficiently utilizing, in Kenya and in the other PTA countries, fast growing plantation timber species (such as Pinus patula, Eucalyptus spp. and Cypress Lusitanica) in the furniture and joinery industry as well as in building construction. (Refer to paragraphs 5.3 and 5.5, pages 21 and 23, respectively)</p>	<p>Output 7.1</p> <p>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 7.1, 7.2, 7.3 and 7.6 refer)</p> <p>Output 7.2</p> <p>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 7.4 and 7.6 refer)</p>	<p>Activity 7.1</p> <p>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.</p> <p>Activity 7.2</p> <p>Review the experience gained by ETHARSO and ECAFCO plants in Addis Abeba, Ethiopia in the manufacture of fibreboard and particle board made of Eucalyptus.</p> <p>Activity 7.3</p> <p>Compile information on overseas experience in the utilization of Eucalyptus in the primary and secondary wood processing industry.</p>	<p>- 37 -</p>

OBJECTIVES	OUTPUTS	MAIN ACTIVITIES	INPUTS
<p>- Objective 7 continued -</p>	<p>Output 7.3 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 7.5 and 7.6 refer)</p>	<p>Activity 7.4 Compile information from African and overseas research institutions, including Bureau of Standards, on woodprocessing requirements and durability and performance standards^{1/} as applicable to the use of Eucalyptus, Pine and Cypress in furniture and joinery production and structural building applications.</p> <p>Activity 7.5 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.</p> <p>Activity 7.6 To reproduce the report and manuals under outputs 7.1, 7.2, and 7.3 for wide distribution to the industry, wood research institutions, and ministries of work in the PTA.</p> <p>^{1/} Timber-related standards being currently developed by the Kenyan Bureau of Standards are listed in Annex II</p>	

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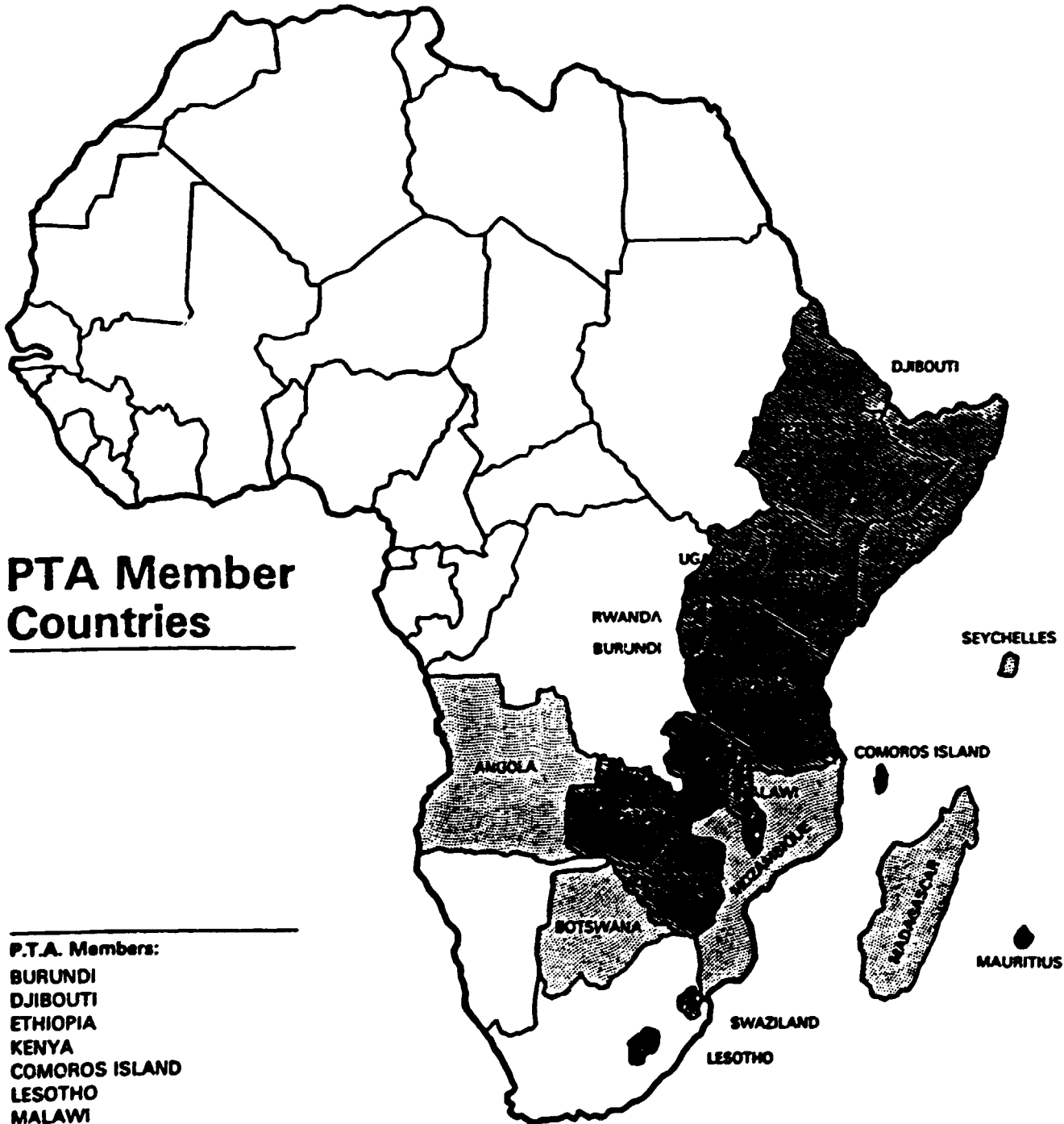
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Timber-related Standards expected to be produced by the Kenya Bureau of Standards from 1989 to 1991.

KS 02- No.	STANDARD TITLE
1	" Pt. 1 Moisture content for wood
2	" Pt. 2 Density of wood
3	" Pt. 3 Test compression perpendicular to grain of wood
4	" Pt. 4 Ultimate tensile of wood in static bending
5	" Pt. 5 Ultimate tensile stress paralleled to grain of wood
6	" Pt. 6 Ultimate shearing stress paralleled to grain of wood
7	" Pt. 7 Impact bending strength of wood
8	" Pt. 8 Modulus of elasticity in static bending
9	Pt. 10 Resistance to impact identification
10	Pt. 11 Ultimate stress in compression paralleled to grain in wood
11	Specification for fibre hard boards
12	Specification for fibre insulation boards
13	Specification for woodwool for general purposes
14	Code of practice for maintenance of wood poles
15	Specification for veneer decorative plywood revision of KS02-94
16	Code of Practice for fire retardant treatment of timber
17	Code of Practice for seasoning of timber
18	Methods for testing small clean timber specimens
19	Method of test for nail jointed timber trusses

- 20 Specification for braced and battened timber doors
- 21 Code of Practice for rail jointed timber construction
- 22 Specification for logs for plywood
- 23 Methods of testing timber connectors
- 24 Methods of static tests of timber structural sizes
- 25 Specification for veneered particleboards
- 26 Code of Practice for timber floors
- 27 Code of Practice for nailed laminated timber beams
- 28 Code of Practice for construction of timber ceilings
- 29 Code of Practice for fire retardant treatment of timber
- 30 Specification for preservative treated plywood
- 31 Timber engineering code
- 32 Moisture content for wood
- 33 Density of wood
- 34 Co-ordinating sizes for doorsets, external and internal (ADOPTION)
- 35 Timber poles (treatment)
- 36 Assessment of surface resistance to cold liquids - Furniture



PTA Member Countries

P.T.A. Members:

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

HAVE NOT YET ACCEDED TO THE TREATY BUT ARE EXPECTED TO DO SO SOON
MOZAMBIQUE
MADAGASCAR
ANGOLA
THE SEYCHELLES
BOTSWANA

ANNEX IV

Check list of woodworking factories in the PTA countries whose operation and products could be of interest to Kenyan 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; provision of timber supply at wholesale prices and on credit; marketing of products

Address: BEDCO Industrial Estate, Maseru

2.2 Fali 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 band 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, Kwaluseui
Tel: (0194) 84255/6/7

6 Ethiopia

6.1 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

6.2 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

6.3 ETHARSO company

Products: Fibreboard produced with eucalyptus as a raw material

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