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**SECONDARY WOOD PROCESSING IN THE EASTERN AFRICAN COUNTRIES**

**Background Paper\*\***

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4/9

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\*\* The views expressed in this document are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. This document has not been edited.

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## INTRODUCTION

This survey of secondary wood industries was made in mid 1989 in conjunction with a rather similar survey for the Preferential Trade Area of East and Southern Africa. In fact all the countries surveyed are PTA members except Madagascar, whose membership is being considered.

The eight countries surveyed have many similarities. All have significant plantation forests and in all, the indigenous forest is more or less exhausted as an industrial resource, although varying quantities are still available. All countries had their plantations established initially under colonial control and in most of them national staff have continued and extended the work started by the colonists. Most of them have severe shortages of hard currency which hampers foreign travel for marketing and training, purchase of adhesives and specialised hardware and particularly purchase of new machinery and spares for existing plants.

The problems in the region are remarkably similar, differing only in degree and in local perception from country to country. They are therefore discussed together in this introductory section, with short country profiles following. In this report the word "region" is taken to mean the eight countries of Southern and Eastern Africa covered viz Ethiopia, Kenya, Madagascar, Malawi, Swaziland, Tanzania, Zambia and Zimbabwe.

## INDIGENOUS FORESTS

When colonisation of the region began in the late 19th century there were considerable quantities of excellent quality timber available. This was distributed on a climatic basis generally softwoods (podocarpos, juniper, cedar) in cool moist uplands, hardwoods in warmer areas ranging in type from jungle in moist zones to open savannah forest. These were all widely exploited.

Because of ready availability of durable, stable clear timbers, often of great beauty, extremely high acceptance standards grew up. Also, because the region was fortunate in having several extremely durable species construction practices which would not be tolerated in less fortunate parts of the world came to be accepted. This refers particularly to moisture entry details which could be ignored when such durable wood was readily available also the use of excessively heavy members which was hardly a problem when wood and labour were cheap.

Through most of the region these indigenous forests are nearly exhausted, and even where vestiges remain these are generally in inaccessible areas. Nevertheless, supplies of indigenous timbers are still available. Even where conservation measures are enforced there is often considerable illegal felling and conversion.

A result of this early availability of top quality timbers is that the standards applied to them are transferred to the plantation pines and eucalyptus species which have succeeded them as the wood resource, and of course the plantation species suffer badly in a one to one comparison. Indeed, much of the value of "valuable" species lies in the fact that careful processing, grading and skill in use is unnecessary. A species which requires preservative treatment, careful drying, stress grading and skilled carpentry techniques to match the performance of a "valuable" species is dismissed in the popular mind as worthless.

This is not a phenomenon which is unique to the region. All timber using countries have gone or will go through the same process. The only difference is in time scale. The problems facing the region in utilising their plantations are not new and there is a wealth of similar experience available for them to draw on.

## PLANTATIONS

The demise of indigenous forests was foreseen throughout the region at different times. In Ethiopia it was the Emperor Menelik who introduced exotic Eucalyptus species last century to provide a wood supply. In Ethiopia nowadays it is almost forgotten that this is an exotic species. In other countries notably Kenya and Madagascar eucalypts were planted to supply railway locomotive fuel. Since the passing of the steam engine these plantations are now largely used for domestic fuel. In Zambia eucalypts were planted to supply mining timbers but since the end of the copper boom this wood is available for other uses.

Pine plantations were established in the region at varying times in the past, up to 50 years ago in some cases. The most successful species appear to be *P. palustris*, *P. caribaea* and *P. kheyria*. *P. radiata* while showing excellent growth rates proved too disease-prone in Kenya. Small volumes of other pinus species are occasionally found. Generally the wood properties of all these species are quite similar and it is not necessary to distinguish between them. Thus all pine species in Zambia are marketed simply as "Zambia Pine".

In several countries extensive pine plantations were established for pulpwood. However, in Malawi, the proposed mill could not be financed and a large plantation resource remained unused. This had not been tended silviculturally for sawlog production and its utilisation remains a problem.

## FINANCE

All countries in the region except Swaziland are desperately short of hard currency. This has imposed major restraints on all aspects of the industry, managerial production processing and transport. The negative effects of this hard currency shortage can be seen in:

- (a) **Marketing.** Export marketing demands foreign travel for sales staff and can hardly exist without it. Restrictions on foreign currency for travel severely inhibit export market.
  
- (b) **Production.** Under utilisation of installed capacity is almost universal, and most of this is reported to be due to breakdown of either transport or production machinery. Repair is difficult, sometimes impossible without spares which cannot be purchased locally. Skilled maintenance workers are rare and even where they exist, frequently cannot give of their best.
  
- (c) **Processing.** Much timber manufacture and processing requires imported components. Examples are adhesives for plywood and particle board, wood preservative chemicals, abrasives, specialised hardware. Few of these are produced in the region. Constraints on the importation of these items obviously must limit the relevant production either in quantity, quality or both.



## TRAINING

There is a very large need for training at all levels in the industry and among its customers. Particular areas identified include:

- (a) **Timber Engineering.** Specifiers are generally unaware of modern timber engineering concepts and processes, including grading, design stresses, preservation and design methods. Training of engineers and specifiers from throughout the region would benefit the industry by providing an informed nucleus of customers.
  
- (b) **Investment decisions for managers.** Senior managers are not up to date with modern analyses of investment decisions. Admittedly with the scarcity or even complete lack of investment capital this may appear rather academic but on the other hand when capital is occasionally available it is important that this scarce resource is used to best over all effect.

- (c) Marketing. Many executives acknowledge the lack of marketing skills at middle and senior levels. This applies to both domestic and export marketing. The hard currency constraint on export marketing has already been mentioned. Bearing this in mind it is most important that when funds for foreign travel do become available that they should be used to best effect in securing orders.
- (d) Maintenance. The maintenance problems arising from lack of spares have been described. There is an awareness that scheduled preventative maintenance can reduce breakdowns but it is admitted that there is almost complete ignorance of this practice among middle management at production unit management. Training in preventative maintenance operations would be welcomed.
- (e) Furniture Design. Several furniture factories wish to use panel products to replace solid wood, thereby extending the use of scarce hardwoods. They are aware that skilled design of such furniture is necessary but do not know how to go about it. They are also aware that furniture made from pine requires different techniques from hardwood, but again lack the necessary knowhow.

- (f) Sawdoctoring. With some notable exceptions, the general level of sawdoctoring leaves much to be desired. Refresher training for leading tradesmen would be welcomed. This would rectify bad practices which may have crept in since they last attended formal instruction, and could also lead to introduction of new technology, e.g. log bandsaws or TCT circular saws where desirable or appropriate.

#### NEW TECHNIQUES

Housing. Many of the countries surveyed have major housing shortages but a surplus of timber. At the same time apart from a small volume of prefabricated housing and shanties there is generally zero timber frame construction. The reasons for this have been examined in detail in the author's earlier report "On Increasing Timber Construction in Africa" (1) but some of these are summarised here:

- Lack of fire resistant linings
- Prohibition by building regulations
- Lack of carpentry skills
- General perception of low quality of timber housing
- Non availability of finance from lending institutions

(1) Francis, C R "On Increasing Timber Construction in Africa UNIDO Technical Report DP.ID/SER/.A/805 (1987)

These problems were discussed with housing authorities in several countries. The picture which emerged was that a piecemeal approach to the problem was unlikely to succeed. If only one or two demonstration houses were built, carpenters would not have the opportunity to learn much and importation of the small volumes of special materials necessary would be excessively expensive and complicated for the result. A large scale project of at least 20 houses would be required.

Possibilities discussed included staff housing associated with a major hospital or education scheme. The 20 (minimum) houses need not all be in the one estate, but should be built as one continuous contract.

A project of this size obviously requires considerable capital investment. It should not aim at the "low cost" market. The aim is to increase the consumption of timber, rather than to provide minimum standard housing. Only by building to the upper end of the housing market, houses which managers of lending institutions, city engineers and other senior decision makers would be happy to live in will some of the objections to timber housing start to diminish.

## FISHING BOATS

A large proportion of the fishing industry is carried out by artisanal level fishermen working from canoes. The traditional canoe is a dugout consuming a large well shaped log for each canoe.

The dwindling indigenous forest resource has resulted in a severe shortage of dugouts. In some areas suitable logs are simply not available; in others price competition with sawmillers puts them out of reach of the fisherman. In any case a dugout canoe is an extremely wasteful use of timber. The non-durable sapwood is retained while the generally more valuable heartwood is chipped out to waste or at best to firewood.

Alternative craft are urgently needed on lakes and at sea.

There are plywood factories in nearly all countries in the region, many making good quality plywood. Plywood has been a boat building material in developed countries for decades but appears not to have been considered in this region.

Fisheries officers were contracted in all countries with substantial lakes or sea coasts. All agreed on the dugout problem and most were receptive, some enthusiastic over the idea of plywood substitutes. There would be several problems. One is the lack of use of marine quality adhesive. In fact this is largely a matter of hard currency. The actual techniques of waterproof plywood manufacture are almost identical as for interior grade. Plywood factory managers consulted agreed that they could readily make marine quality plywood if the adhesive was available.

Finance could be a problem. In many cases dugout canoe manufacture is a largely non cash transaction, the boatbuilder being paid in kind by the fisherman. Cash financing would be necessary to pay for a factory material workshop constructed boat.

Initial resistance from the fishermen themselves could also be expected to such a radical change from traditional craft to an apparently flimsy new type. None the less an identical programme has been successfully instituted in Indonesia where the identical situation obtained.

## STATISTICS AND FURTHER INFORMATION

The industry statistics quoted at the start of each country profile are all taken from the 1987 "Yearbook of Forest Products" published by FAO, Rome. In many cases these conflict with other data presented by the PTA. However, the FAO figures covered a wider range than the PTA. It was felt desirable to have uniformity through this survey. Much more detailed breakdowns of many figures published by FAP Project "Intra Regional Cooperation in Development of Plantation-based Forest Industries", DP/RAF/87/117.

Field Document No. 1 covers Kenya, Malawi, Tanzania, Zambia and Zimbabwe.

Field Document No 2. covers Burundi, Ethiopia, Mauritius, Rwanda, Somalia, Swaziland and Uganda.

Valuable information on Madagascar is contained in UNIDO document DP/ID/SER.A/651 "Rapport technique = Matériaux de Construction a base du Bois" by J. Niogret, UNIDO, novembre 1985.

Regrettably nearly all the information collected by these experts was lost by an airline on the last leg of the survey. This accounts for the frequent lack of precise detail, names and correct addresses.

COUNTRY PROFILE - ETHIOPIA

Area 125100 Km2

Population 43.5m

Per capita GNP US\$120  
US\$1

Currency 2.07 Birr =

Forest Industries

Industrial Plantations	50,000 ha
eucalyptus	
	14,000 ha
pine	
Total roundwood production	39,968,000 m3
Industrial roundwood	1,813,000 m3
Saw and veneer logs total	120,000 m3
Conifirous saw and veneer logs	78,000 m3
Hardwood saw and veneer logs	42,000 m3
Sawn wood and sleepers	45,000 m3
Sawn wood - conifirous	34,000 m3
Panels - total	15,000 m3
Plywood	2,000 m3
Particle Board	5,000 m3

Eucalyptus planting commenced in Ethiopia late last century, principally *E. camaldulensis*, *E. globulus* and *E. saligna*. These species have been so successful that nowadays eucalypts are regarded almost as native species. This is the main source of roundwood for fuel wood, building and utility poles and for fibre for particle board and fibre board plants.



Fuelwood and building poles are of such importance to survival that a Division of Wood Energy has been set up to distribute and market these products, together with small volumes of treated utility poles.

Indigenous podocarp and juniper species still form the bulk of Ethiopia's sawlog supply, but the resource is almost exhausted and the country is experiencing a severe sawn timber shortage.

Pine plantations were established in 1960 but only a small area is mature, and the annual yield of logs is at present only about 15,000 m<sup>3</sup>. Planting has proceeded steadily up until 1983. In 1984 felling overtook the planting rate and after a drop to 1274 ha in 1985 the plantation area has increased to 1903 ha in 1986 (latest figure available). Unless the planting rate is increased dramatically in the immediate future, Ethiopia will face an extreme timber shortage in the very near future, much worse than exists at present. Detailed projections and recommendations have been made by a Swedish forestry consulting group.

To learn about and demonstrate the use of the new pine resource, the Wood Utilisation and Research (WUAR) Division of the ministry of Agriculture has been established. WUAR is well equipped with drying, treating and manufacturing facilities. It is largely self-supporting through an attached veneer slicing plant. It also has a modern saw doctor shop well laid out for training purposes.

WUAR is doing an excellent job of demonstrating the use of well processed pine in furniture, joinery and construction. However, due to the excellent quality of the indigenous softwoods which are still available there is natural reluctance by the public to accept pine as either a furniture or construction timber, although the present wood shortage is now forcing increased use as the only option.

At the same time, this is only affordable by a small proportion of the population, and is generally limited by transport problems to the main production areas south west of Addis Ababa. The poverty of the bulk of the population limits the use of sawn wood to simple plank doors and window shutters, chair seats and table tops.

Most building construction uses only round eucalyptus poles. These are used in wattle and daub walls and as roof rafters. The only use of pine in building construction seen in Addis Ababa was as concrete shuttering and rough boarding on shanties. New roof construction on small buildings was with poles.

The sawmilling and furniture industry in Addis Ababa is suffering greatly from lack of investment. Machinery is antiquated and worn and spare parts unobtainable. Consequently even in mechanised workshops the bulk of the work is done by hand with resulting mediocre standards of fit and finish.

Some aid related modernisation and rationalisation of sawmills was reported but none in the furniture or joinery industries.

Numerous artisanal level furniture workshops exist in Addis Ababa, but the only machines observed were a few small circular saws. It was reported that many of these workshops are struggling due to the increasing price of timber. Apart from the pilot sized kiln at WUAR, no artificial drying facilities exist.

The wood industries in Ethiopia are in very poor shape. Massive afforestation is required to provide a resource to be followed by massive investment in sawmilling and woodworking plant and machinery. This would have to start almost from scratch since in the operations seen, only the land and a few of the buildings have any effective industrial value.

COUNTRY PROFILE - KENYA

Area 583,000 sq km

Population 21.2 m.

Per capita GNP US\$300

Currency 21.5 Kshg =  
US\$1:00

**Forest Industries:**

Industrial plantations	164,000 ha
Total roundwood production	35,180,000 m3
Industrial roundwood	1,813,000 m3
Saw and veneer logs - total	423,000 m3
Coniferous saw & veneer logs	312,000 m3
Hardwood saw & veneer logs	121,000 m3
Sawn wood and sleepers	181,000 m3
Sawn wood - coniferous	113,000 m3
Panels - total	69,000 m3
Plywood	21,000 m3

Kenya has a well established timber industry dating back to last century when sawmills were established to work the rich indigenous resource. Trade in mangrove poles to the Yemen and Arabian Gulf dates back several hundred years

Productions forests in Kenya are of five main types:

- Eucalyptus plantations
- Softwood plantations
- Indigenous rain forests
- Mangroves
- Wattle

The eucalyptus plantations were originally established for railway fuelwood. They have continued to supply domestic fuel wood from coppice regrowth, also utility and building poles. Over the last 15-20 years, planting of eucalyptus has spread throughout the country to supply fuel for domestic use and for tobacco curing. This later planting is nearly all in small scale wood lots rather than large plantations

Softwood plantations were established some 40 years ago, mainly with cypress (*Cupressus lusitanica*) and various species of pine. Of the pinus species, *P patula* has proved to be the most successful. Unfortunately the proportions of cypress and pine have varied quite widely, due both to varying planting proportions and to fire and disease in some pine plantation. At present there is a shortage of cypress and relative abundance of pine, but industries have been established with the opposite situation. The earlier ready availability of cypress is not expected to recur for another 5 to 10 years. Kenya originally had abundant resources of high quality indigenous softwoods (*podocarpus* and cedar) and hardwoods on the high altitude hills. These have now been nearly exhausted and are being carefully conserved.

There is a large resource of mangroves and a flourishing industry exists in their exploitation. Ten years ago it was apparent that the resource was becoming depleted and strict controls were instituted. Mangrove pole production continues on a reduced scale as a profitable export industry.

Considerable areas of wattle were planted in the Rift valley for the production of tan bark. Although world demand is lower than when the plantations were established about 30 -35 years ago, wattle bark extract is still a profitable export.

#### Forest Industries

There are several large fairly modern sawmills located near Limuru and in the Rift Valley in the Nakuru area. The newest of these was installed 10 years ago. In addition there are 20 to 30 small antiquated sawmills. The numbers vary since several come in and out of production as wood becomes available. There are also a large number of pit sawyers operating on indigenous timbers wherever merchantable trees are found.

Good quality plywood and particle board are also manufactured, but only with interior quality adhesives at present. However, one plywood company is investigating the use of wattle bark tannin to produce exterior quality plywood adhesive.

Timber processing is relatively advanced. There are several pressure treatment plants in Kenya, and an adequate national standard. However, drying facilities are about non-existent. This is not the drawback it might be. In the Rift Valley temperatures are so high and humidity so low that air drying has to be carefully controlled to avoid degrade.

### Construction

The standard type of construction in Kenya is concrete or stone masonry with steel framed windows. Use of wood is confined to roofs, occasional parquet floors, doors and door frames. Even so, there are three active prefabricated timber house factories with considerable export sales to neighbouring countries. These are regarded as "temporary" in spite of the earliest units now being 30 years old and still in good condition. There is also a major perception of timber construction being a dangerous fire hazard. There are numerous timber slum dwellings with rooms partitioned off and lined with packaging cardboard. Cooking and lighting in these dwellings is by means of kerosene, and in these circumstances fires frequently result in fatalities. There are large deposits of gypsum in Kenya, but no plaster of Paris wall or ceiling boards are manufactured.



Timber engineering is taught at the University and there is some interest in glued laminated construction. One company has recently commenced the manufacture of nail plate connected prefabricated roof trusses. In spite of these examples, most roof construction is artisanal and is wasteful of both materials and construction effort. There is little demand for machine gauged timber for construction purposes, nor for treated construction timber despite the hazard of drywood and subterranean termites. The general attitude of builders seems to be that if naturally durable indigenous timbers are not available, then use should be made of steel and concrete rather than pressure treated pine.

The principle use of pine in building construction is for concrete shuttering. No plywood shuttering was observed in use, probably since exterior quality plywood is not available. At any rate, fair faced concrete appears unknown and the low quality finish is universally plastered over.

#### Furniture

There are several medium sized furniture factories in Nairobi and one large factory in Naivasha producing good quality furniture in traditional and modern designs. As well there are several hundred artisanal furniture workshops in Nairobi.

Many of the larger furniture factories are integrated through family connections with small sawmills, which guarantees raw material supply and retail shops. Designs are traditional and conservative, but the operations appear profitable. Their quality standards are several levels above artisanal produced furniture.

### Handcrafts

A major segment of Kenya's secondary wood industry lies in the production of tourist souvenirs. Tourism is one of the chief sources of Kenya's external funds and every effort is made to ensure that tourists buy Kenya souvenirs. Carved wooden articles are readily available in all qualities and price ranges and there are numerous cooperatives engaged in the production of these.

At the top end of the range these items are works of art and exquisite craftsmanship - at the bottom end they are junk, but regardless of workmanship the volume of timber consumed is considerable. Problems facing this industry are supply of suitable timber, and its drying down to a moisture content suitable for European homes, the ultimate destination of most of the souvenir items. The equilibrium moisture content (EMC) of wood in Kenya varies from about 12% to 18%. depending on the region, the EMC in a centrally heated European house is likely to be about 8%.

Consequently, even if Kenyan wooden souvenirs are completely air dried to local EMC, considerable further drying and shrinkage and probably splitting is likely to occur. A major need for this industry is artificial drying of carving blocks to well below the local EMC in order to reduce the incidence of splitting and customer dissatisfaction.

Carving blocks by their nature, are fairly massive. Current technology for check-free drying of massive wood is barely capable of solving this problem. Worse, the major focus of the souvenir carving industry is on the cost where the EMC is highest due to high coastal humidity. Possible solutions to this problem lie in preparation of carving blanks to minimise stresses induced by wastewood, and introduction of suitable artificial drying techniques, possibly de-humidification at low temperatures or even radio frequency vacuum drying which has proved effective in drying North American red oak furniture blanks. Whichever is chosen, it will require major capital investment to the order of one or two million dollars to cope with the volume of wood involved in this industry.

## Standards

The Kenya Bureau of Standards has prepared several standards relating to timber. The timber preservation standard has already been referred to. However, KBS acknowledges the need for new grading rules to be adopted and recommends a Preferential Trade Area standard for softwoods. A need is perceived for wider use of treated pine utility poles and consequently an appropriate standard since suitable eucalyptus is becoming scarce. Standards are prepared by committees representative of producers, consumers and specifiers.

COUNTRY PROFILE - MADAGASCAR

Area 587,000 sq Km

Population 10.6m

Per Capita GNP US\$230

Currency 1654

Malgash francs =

US\$1:

Forest Industries

Industrial Plantations  
eucalyptus

130,000 ha

127,000 ha pine

Total roundwood production

7250000 m3

Industrial roundwood

807000 m3

Saw and veneer logs

468000 m3

Coniferous saw & veneer logs - small volume

Hardwood saw & veneer logs

468000 m3

Sawn wood and sleepers

234000 m3

Sawn wood - coniferous

9000 m3

Panels - all types

1000 m3

Eucalyptus plantations were established early this century to supply railway locomotive fuel. They are now largely coppiced for domestic fuel wood, but some is also sawn, mainly for railway sleepers with a small volume for construction:

The sawmilling industry consists mainly of small rather primitive units employing horizontal frame saws and a few mobile circular saws. There are also a few mobile circular mills and numerous pit sawyers. Frequently these mills saw hand hewn cants.

There are also about 10 larger mills producing from 1000 m<sup>3</sup> to 4000 m<sup>3</sup> of timber per year. Two of these are quite modern and well equipped and are integrated with furniture, joinery and in one case glue lamination operations.

The major challenge facing the Madagascar timber industry is the imminent changeover from traditional high quality hardwoods to plantation grown pine. Accessible hardwoods are becoming rare and a stringent conservation policy has commenced. The price of palisander the preferred furniture timber has trebled over the last two years.

On the other hand, large volumes of plantation grown pine, particularly from Fanalamanga plantations near Moramanga, will very soon become available. Within two or three years it is reliably estimated that 200 m<sup>3</sup> per day of small logs will be available.

Pine has been on the Madagascar market for at least 10 years, but generally its market reception has been poor. This has been due to lack of processing skills and equipment, including tardy extraction of felled timber, inappropriate sawmilling equipment, lack of anti-sapstain treatment preservation treatment, kiln drying and machining facilities. This is not universal. Society Hazovat has excellent sawing and processing facilities and is an example of what is possible. However, its high quality production has been swamped by the much larger volume of poorly presented timber.

It also appears that hardwood construction and utilisation techniques have been adopted directly for pine with consequent failures in service, both in construction and in furniture and joinery. A major marketing and promotional campaign will be required by the pine producing industry in order to gain acceptance of this material by builders and manufacturers and also by the general public, the ultimate consumers.

#### PANEL PRODUCTS

Small quantities of plywood and particle board are produced by two manufacturers. Neither is of very good quality, and the price of the particle board is excessive. Only interior quality adhesive is used.

A factory producing wet-process hardboard from eucalyptus has recently ceased to function due to excessive corrosion caused by the acidic furnish. It is unlikely to recommence operations.

A proposal is being investigated to install a veneer slicing operation at Diego Surrez in the extreme north of the island. This would produce veneer only from locally available palisander and would extend the utilisation of this resource. This could be used to overlay the particle board being produced.

## CONSTRUCTION

House construction is almost exclusively masonry. Timber is used for roof construction, window and door joinery and for floors in traditional style two storey dwellings.

The roof constructions observed were of antiquated types using excessively heavy timbers. Although no detailed studies were made, it would appear that considerable economies in timber volume could be made by introducing modern trussed rafter techniques. However, this construction requires uniformly dimensional stress graded timber which is currently not available. However this could be possible with the imminent new production from the pine plantations referred to above. Again, a major marketing and instructional effort would be required. Fortunately the Housing Division of the Ministry of Public Works is receptive to innovative construction methods.

Joinery is manufactured to individual order, and there are no standards for dimensions of these items. Consequently there is no manufacture for stock and marketing of joinery. Establishment of norms would undoubtedly reduce costs by allowing longer production runs, and with the dwindling hardwood resource this will almost certainly be necessary when the demand can only be satisfied by the use of pine with its different and generally unknown properties.



There are several well equipped joinery factories including Societe Hazovat and a pilot unit at Societe Fanalamanga producing pine joinery. However the bulk of production is at artisanal level, with its consequent comparatively low average quality and lack of uniformity.

#### FURNITURE

Nearly all furniture is produced from solid wood, with little use of panel products. In Antananarivo there are several well equipped furniture factories producing good quality products. A small amount is exported to neighbouring Indian Ocean countries. Society Fanalamanga and Societe Hazovat also produce a range of pine furniture of good quality, the first again on a pilot scale. However the bulk of furniture is produced at artisanal level. Again major changes will be required in this industry with the increasing scarcity of hardwoods and substitution by pine and major retraining and redesign efforts will be required with the introduction of the new material.

PERSONNEL

Reports and observation show that senior management is competent and capable. However middle management lacks many skills necessary for the efficient running of business. Reported lacks are in costing and design maintenance supervision and operator training. All industries interviewed reported these needs.

Skilled workmen are particularly scarce and machine operation and series production techniques have to be taught on the job.

COUNTRY PROFILE - MALAWI

Area 118,000 sq km

Population 7.4 m|

Per capita GNP US\$160

Currency 2.81 MKwacha =  
US\$1

Forest Industries

Industrial Plantations	softwoods	71,000 ha
	hardwoods	13,800 ha
Total roundwood production		6,946,000 m3
Industrial roundwood		320,000 m3
Saw and veneer logs		48,000 m3
Coniferous saw and veneer logs		23,000 m3
Hardwood saw and veneer logs		25,000 m3
Sawn wood and sleepers		23,000 m3
Sawn wood coniferous		11,000 m3
Panels - all types		4,000 m3
Plywood		2,000 m3

Pine plantations were established in Malawi about 40 years ago. Planting boomed in 1966-70 and again in 1976-80. Eucalyptus plantations are much smaller and are fairly steady at about 450 ha per year for the past 30 years.

Major plantations were established in the Biphya Mountains area with a view to supplying a pulp and paper industry. This has not eventuated due to financial restraints. A plywood mill and sawmill have been established but these consume only a small proportion of the available wood volume.

Malawi has a major shortage of fuel wood from indigenous sources. A Department of Wood Energy has been established to carbonise wood from the Viphya plantations to supply domestic fuel. Besides producing distributing and marketing charcoal, the Department has designed a very fuel efficient "jiko" or brazier. These are made on an artisanal basis and have proved so popular through their fuel efficiency that demand outstrips supply. This is one of the few bright spots in Africa's fuelwood crises.

The main problem with the Viphya plantations and industries is remoteness from population centres. Distance and transportation problems limit the volume of wood products which can be transported to the population centres of Lilongwe and Blantyre. Thus, while overall Malawi has a considerable wood surplus<sup>1</sup> there is an effective construction timber shortage in the population centres.

The major proportion of forest industries are government owned and operated through the Wood Industries Corporation WICO. This has its major operation in Blantyre which includes sawmilling, joinery and creosoted pole production. WICO has smaller operations at Zomba and in other areas. There are smaller privately owned industries in the Blantyre-Limbe area. These include a furniture and joinery complex utilising mainly indigenous hardwoods and a medium sized sawmill-plywood operation. This latter uses mainly eucalyptus saligna from its own plantations, but purchases pine logs from the Ministry of Forestry and Natural Resources plantations at Limbe when possible. It also manufactures stock length (12m) glued laminated E. saligna beams for export mainly to South Africa. Length is limited by transport considerations. The glulam and plywood are of good quality and exterior quality adhesive is used when specified.

A Wood Utilisation and Research Department exists at Zomba. This is severely hampered in its operations by lack of staff and laboratory space and equipment. Perceived research requirements are wood strength and preservation. External aid is being sought to assist in wood research. It was reported that the grading is not practised in Malawi and this greatly inhibits exports.

COUNTRY PROFILE - SWAZILAND

Area	17,363 Km <sup>2</sup>	Population	689,000
Per Capita GNP	US\$690	Currency	Emalageni 2.77 = US\$1

Forest Industries

Industrial Plantations	Softwood	74,731 ha
	Hardwood	26,791 ha
Total Roundwood production		2,223,000 m <sup>3</sup>
Industrial roundwood		1,663,000 m <sup>3</sup>
Saw and veneer logs		319,000 m <sup>3</sup>
Coniferous saw and veneer logs		319,000 m <sup>3</sup>
Sawn wood and sleepers		136,000 m <sup>3</sup>
Panels (plywood and block board)		8,000 m <sup>3</sup>

Swaziland has never had a large area of natural forest, most of the country lying in the "High Veld". The present natural woodland is less than the area of plantation. Three quarters of plantation area is pine, the remainder being mostly eucalyptus species with small areas of wattle. The wattle is regenerating as a domestic fuelwood resource.

Swaziland supports major export oriented forest industries including pulp and paper, sawn timber, mining timber, poles and furniture. Their importance to the economy may be judged by the fact that in 1978, plantation based forest industries contributed about 24% of the total export earnings.

The bulk of solid wood production is sold to South Africa, and South African dimensions and grading rules are applied. The major sawmills are foreign owned and managed by expatriates. However, middle management is mostly by nationals.

The facilities are modern and well equipped and maintained. There are few constraints on the importation of machinery and spare parts. The quality of production is high and quality control is strict. Operators are well trained and initial and refresher training courses are available in South Africa.

#### FURNITURE AND OTHER PRODUCTS

There are several furniture factories at Manzini. These were not visited but are reported to be well equipped. Almost all production is exported to South Africa. A few examples were seen in Mbabane. These were of simple design but well made and well finished.

Furniture and construction joinery is also manufactured at one of the Piggs Peak sawmills. Another sawmill has a large department manufacturing pallets and cable drums for export to South Africa.

#### MARKETING

No difficulty is found in marketing to South Africa and there are minimal restrictions on travel there. However, one company is seeking to expand its pine products to the USA and the Far East and would welcome assistance in this field.

#### SUMMARY

The Swaziland forest industry is flourishing. The limitation on production is raw material supply.

COUNTRY PROFILE - TANZANIA

Area 945,000 sq Km

Population 23m

Per capita GNP US\$250

Currency 250 T Sh =  
US\$1

Forest Industries

Industrial Plantations	hardwood	75,230 ha
	softwood	65,170 ha
Total roundwood production		24,754,000 m3
Industrial roundwood		1,537,000 m3
Saw and veneer logs		341,000 m3
Coniferous saw and veneer logs		123,000 m3
Hardwood saw and veneer logs		218,000 m3
Sawn wood and sleepers		105,000 m3
Panels - all types		4000 m3

Tanzania has a dwindling resource of indigenous softwood and hardwoods. Most of this with easy access has been cut out and supplies are scarce and expensive. It has large resources of softwoods and hardwood (mostly eucalyptus) plantations, some dating back over 40 years, but the bulk of eucalypts aged up to 12 years and softwoods mostly aged 12 to 30 years. This resource is only partially utilised, and massive investment is required if problems of over maturity in the softwoods are to be avoided.



The major concentrations of plantations are in the Sao Hills area in the south west, and in the high country round Moshi and Arusla in the mt Kilimanjaro area. These are remote from the main consumption area round Dar es Salaam and road communications to these areas are poor.

#### FOREST INDUSTRIES

The major production units are owned by Tanzania Wood Industries Corporations (TWICO) which was formed when the original privately owned industries were nationalised after independence. The main production units of TIWCO are eight sawmills, two plywood mills and a particle board plant. Besides the TWICO operations there are a few small mills and numerous pit sawing operators. Timber is generally in good supply.

The newest sawmill is at Sao Hills towards the border with Malawi and Zambia. This is a new pnone milling complex integrated with pressure treatment drying and planing operations. Also part of the complex is a prefabricated housing factory and a joinery factory.

The general quality of presentation was the highest seen in East Africa. About 80% of production is sold planed to dimension and a large proportion of that is pressure treated. However, timber stocks seen in merchants yards in Dar es Salaam had very little planed timber and the general sawing quality was poor.

The plywood and particle board seen on sale was of good quality, but only interior quality adhesive was used.

## CONSTRUCTION

Tanzania conforms to general East African construction practices with use of timber confined to roof structures and joinery. Prefabricated timber houses appear to be slightly better accepted than in other countries, but they are still a very small proportion of the total housing volume and transport costs and problems limit their wide distribution.

Manufacture of glued laminated components is undertaken at Tanga.

## BOATBUILDING

Fishing is a major Tanzanian industry and there are six boatyards either under the control or associated with the Fisheries Department of the Ministry of Agriculture. Three of these are on the coast, one being a training school and there are one each on the shores of Lakes Nyasa Tanganyika and Victoria.

These use traditional methods and hardwood timbers and are hampered in their operations by the high price and scarcity of suitable woods. They would be receptive to the introduction of modern materials, e.g. marine plywood and glued laminated members. Tanzania has the potential to produce these although marine quality adhesive would have to be imported.

## MARKETING

The importance of marketing is realised by senior members of the industry. Problems cited included the complete absence of any training in formal marketing skills and the extreme difficulty of obtaining foreign currency for travel. A project which they urgently wish to undertake is an end use survey of timber so that their production can be tailored better to customers' requirements. So far lack of expertise and funds have not permitted this survey to commence.

## STANDARDS

The Tanzania Bureau of Standards has numerous documents covering timber, including grading, preservation and joinery items. The Bureau of Standards laboratory and the University of Dar es Salaam between them are well equipped to undertake testing work necessary for the preparation of standards.

## TRAINING

The School of Forestry at Moshi concentrates on primary forestry but also undertakes some training in forest industries. It was reported that adequate and satisfactory training is given there to sawdoctors and timber graders. However, there is a perceived need for training of middle level management in marketing skills as described above and also in preventative maintenance techniques.

## FUTURE EXPANSION

Tanzania has a very large surplus of timber which could be a valuable export commodity. It is surrounded by neighbours with mild or major wood shortages, including Burundi, Rwanda, Kenya and Uganda. Factors inhibiting exports include:

Lack of marketing skills and difficulty of  
foreign travel

Poor communications and shortage of trucks

Conversion machinery operating well below  
capacity largely due to maintenance  
problems

Very high import duties, up to 50% in some of  
the above named countries



ZAFFICO operates over a dozen mobile sawmills and has two major sawmills located at Kaleyū and Kafubu, both in the Kitwe area. These service several sales depots in the copper belt.

Both mills were constructed with bilateral Scandinavian aid. The larger at Kafubu has a large creosoting plant for the production of posts and poles and has an attached joinery and furniture workshop where simple joinery and furniture are manufactured. It is acknowledged that expertise is lacking in this field and furniture design and manufacturing expertise is being sought.

The treatment plant is being expanded by the installation of a CCA/creosote plant. Treatment quality is good and export orders within the PTA region have been secured. Transport is a major problem in servicing export orders.

There is still a considerable volume of indigenous hardwood being milled by pit sawyers and this largely satisfies the small and artisanal level furniture industry.

#### Particle Board

A modern privately owned particle board mill exists at Mdola. This produces good quality panels for export and local consumption. It is integrated with sawmilling furniture and DIY component manufacture. These products are manufactured in volume and are attractively packaged and presented. They are aimed at the European market and the quality seen was certainly adequate for Europe. It was admitted that expertise was required in factory planning and product design and assistance is being sought in these fields. Transport costs are a major problem.

## Construction

Some timber housing is being built in Zambia although the bulk is, like the rest of Africa, built in masonry construction. However the official attitude is more receptive to timber construction than in most African countries. There is a fair sized market for rusticated weatherboards, but the standards of finishing carpentry could be considerably improved. Lack of correct hardware is one problem here which could be overcome by local manufacture, for which resources exist.

## Associated Industries

There is a growing awareness in Eastern and Southern Africa for the need for timber preservation. The metals required for timber preservation salts production are mined in Zambia and Zimbabwe although it is not known whether arsenic is recovered at smelters. The volume of salts being used could possibly support a preservation salt manufacturing industry and it is suggested that an investigation into the potential of such an industry is warranted.

## Summary

The forest industries in Zambia have considerable potential for development. Most equipment is relatively new and wood is abundant. Major inputs of expertise are required. Allocation of foreign exchange for maintenance is essential if the present good state of equipment is not to deteriorate.





The division of ownership of plantations is approximately two thirds private and one third Government. The forest industries are progressive and technically competent but sorely hampered by lack of foreign exchange for equipment and spare parts purchases.

The major concentration of softwoods industries is centred on Mutare which has a pulp and paper mill and several major processing units including a plywood mill and a particle board mill. Also located there is a substantial saw and knife maintenance facility which draws work from as far away as Bulawayo.

#### Sawmilling

The sawmills seen were frame saw mills handling small logs. The operations were technically efficient and conversion factor fairly high at nearly 40% but was continually halted due to breakdowns of ancient and worn out machinery. Looking at the equipment one could only be full of praise for the management which kept such machinery running. In any developed country it would long ago have been consigned to the scrap heap.

A large proportion of Zimbabwe's softwood cut is kiln dried and export timber is graded to South African standards. However, kiln equipment is also nearing the end of its life. Major re-equipping will be required in the near future to keep these mills operating.

### Plywood

Good quality plywood is also manufactured in Mutare but the equipment is antiquated and downtime is excessive. Considerable increases in production and export earnings could be realised if modern machinery was installed.

### Manufacturing

A variety of products are manufactured both in Mutare and Harare. These include glued laminated beams, beverage crates and wire bound boxes. Again productivity and quality suffer from worn out machinery. Spares are no longer available and the machines are under repair more time than they are working.

### Construction

Like most other African countries the use of timber in construction is confined to roofs and joinery. Stock size flush doors are readily available. Investigations are in hand for the setting up of a plant in Harare to manufacture prefabricated trussed rafters.

### Infrastructure

The industry infrastructure is well developed. The Timber Council of Zimbabwe acts as an industry coordinating and publicity forum. Independent quality control of grading glulam and plywood is carried out by the Zimbabwe Bureau of Standards from its Mutare office and laboratory. This too is hampered in its work by lack of hard currency to purchase even such simple equipment as dial gauges for mechanical stress graders.

### Indigenous Timber Industry

There is still a moderate volume of indigenous hardwood milled in the Blantyre area. Time and travel constraints did not allow this to be inspected. This industry supports a furniture and joinery industry making good quality products, evident by stock in Harare shops. The availability of this furniture is such that there has been little development of a furniture industry based on pine.

### Summary

The Zimbabwe timber industry has considerable potential for developing both quality and range of products and in increasing efficiency. Management is eager to do this but is continuously frustrated in its efforts by the extreme scarcity of hard currency necessary for modernisation and expansion into new products.