

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

ITTO

PROJECT PROPOSAL

TITLE	HANDBOOK ON TREE AND WOOD IDENTIFICATION OF 100 LESSER-USED AND LESSER-KNOWN TIMBER SPECIES FROM TROPICAL AFRICA WITH NOTES ON ETHNOGRAPHY, SILVICULTURE AND USES
SERIAL NUMBER	PD 44/98 Rev.2 (I)
COMMITTEE	FOREST INDUSTRY
SUBMITTED BY	GOVERNMENT OF GHANA
ORIGINAL LANGUAGE	ENGLISH

SUMMARY

The project will promote better and more effective identification of 100 lesser-used and lesser-known timber species which are likely to form the bulk of tomorrow's raw material for the timber industries of tropical Africa. Herbarium and wood samples of 130 species including the 100 under-exploited and virtually unexploited species will be collected from the vegetational zones of Ghana. The dendrological and wood identification characteristics will be studied and compiled into an identification handbook with notes on ethnography, silviculture and uses. A workshop for stakeholders will be convened to guide them on how to use the book.

EXECUTING AGENCY	FORESTRY RESEARCH INSTITUTE OF GHANA (FORIG) SWISS FEDERAL INSTITUTE OF TECHNOLOGY (SFIT)	
COOPERATING GOVERNMENTS	GOVERNMENT OF GHANA GOVERNMENT OF SWITZERLAND	
DURATION	2 YEARS	
APPROXIMATE STARTING DATE	AS SOON AS POSSIBLE	
BUDGET AND PROPOSED SOURCES OF FINANCE	Source	Contribution in US\$
	ITTO	197,549.00
	SFIT	108,000.00
	FORIG	56,250.00
	TOTAL	361,799.00

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PROJECT TITLE:

HANDBOOK ON TREE AND WOOD IDENTIFICATION OF 100 LESSER-USED AND LESSER-KNOWN TIMBER SPECIES FROM TROPICAL AFRICA WITH NOTES ON ETHNOGRAPHY, SILVICULTURE AND USES.

PART 1 CONTEXT

A RELEVANCE TO ITTO

1. Compliance with ITTO objectives

The project proposal seeks to enhance description, identification and effective utilization of lesser-used (LUS) and lesser-known species (LKS) of Tropical Africa. It is consistent with the following objectives in Article 1 of the International Tropical Timber Agreement (ITTA) of the United Nations, 1994:

- (b) To help expand and diversify international trade in tropical timber and improve structural conditions in the market;
- (e) To improve marketing and distribution of producers' export of tropical timber; and
- (h) To encourage national policies which aim at sustainable use and conservation of tropical forests and their genetic resources.

2. Compliance with ITTO criteria

The project aims to make use of findings from past and present research to improve sustainable use of Tropical Africa timbers and to generate more economic benefits to both producer and consuming countries. The objectives conform to all the five ITTO criteria set out in Article 23.6 of the Agreement as follows:

- Production and use of industrial tropical timber;
- Benefit to the tropical timber economy as a whole and relevance to both producing and consuming countries;
- Maintain and expand the international trade in tropical timber;
- Offer reasonable prospects for positive economic returns in relation to costs; and
- Make maximum use of existing research institutions and avoid duplication of effort to the maximum extent.

3. Relationship to ITTO Action Plan and Priorities

The project meets the following priorities of ITTO Committee on Forest Industry:

- Delivery of trial volumes of new species and other approaches to facilitate acceptance in selected foreign markets;
- Support for marketing of new species;
- Support for laboratory research on new species; and

- Research and development on tropical timber use in construction, especially on new species; improved timber durability; innovative designs; product performance in use; and appropriate product standards and building codes.

B. RELEVANCE TO NATIONAL POLICIES

1. Relationship to Sectoral Policies and Subsectoral Aims and Programmes

The project which will culminate in production of a handbook on timber description and identification, conforms with Ghana's Ministry of Land and Forestry's policy which put emphasis on promotion of sustainable utilization of LUS and tertiary processing of value added high finished products.

2. Institutional and Legal Framework

The Ministry of Land and Forestry (MLF) created out of the Civil Service Law 1993 (PDNC Law 327) is responsible for the formulation of broad policies for the Forestry and Land Sector of Ghana. One aspect of the sectoral policy enshrined in Ghana's Vision 2020, is to advance the wood industry from the current level of log and sawntimber export to high quality value-added finished products using increasingly the lesser-used (LUS) species in place of the endangered traditional commercial species. MLF is also committed to the year 2000 objective of the ITTO. The Forestry Research Institute of Ghana (FORIG), which is the sole Government institution established to do forestry research will collaborate with the Department of Forestry, the Forestry Commission, the Timber Export Development Board, the Forest Products Inspection Bureau, the Ghana Timber Millers Organisation and other subsector institutions of MLF to implement the project.

PART II: THE PROJECT

1. ORIGIN

This project proposal is a contribution to finding a lasting solution to dwindling forest resource of tropical Africa and in particular Ghana; gradual extinction of major commercial timbers; poor identification of tomorrow's species for the wood industry; low productivity and poor quality of finished wood products. ITTO fellowship (061/96A) was consequently awarded for a 3-month research visit to Swiss Federal Institute of Technology (SFIT) in Zurich. The proposal is the result of discussions and understanding held with the Chair and specialists of the Wood Science and Technology Department of SFIT in Zurich.

2. PROJECT OBJECTIVES

2.1 Development Objective

The development objective of this project is to promote sustainable utilization of 100 LUS and LKS species from tropical Africa through publication of a timber tree description and wood identification handbook with special notes on silviculture, ethnography and commercial as well as traditional uses.

2.2 Specific Objectives

- To collect botanical and wood samples of the selected species to increase national herbarium and xylarium collections at the Forestry Research Institute of Ghana.
- To prepare, study and compile the wood identification features of the species.
- To study and compile tree identification (dendrological) features of the species.
- To compile notes on silviculture, ethnography, traditional and commercial uses.
- To publish an identification handbook of the 130 timber species.
- To launch the handbook at a workshop and educate interested stakeholders on its use.

3. PROJECT JUSTIFICATION

3.1 Problem to be Addressed

Ghana's forest industry like most other tropical countries, is characterised by a dwindling resource; a gradual extinction of the major traditional commercial species; over exploitation of few traditional species; a low productivity; an exporter of primary (logs) and secondary (sawntimber) products; and poor quality of finished products. It is the Ghana Government's policy and indeed the intentions of many national governments in tropical Africa to replace timber species which face extinction with under-utilized promotable lesser-used and lesser-known species. Further to this is a policy to advance the wood processing industry to production of high-quality finished products on sustainable basis.

Three projects funded by ITTO and executed at FORIG have addressed some of the problems. It is time to consolidate these and other research findings into easy-to-read and understand handbooks for use by sectoral stakeholders and decision makers. These books will

- = assist them in finding suitable alternatives to the dwindling major commercial timbers and to produce high quality value-added finished products on sustainable basis.

Sustainable utilization should start first with identification of tomorrow's timber for the industry which will be made up of the promotable LUS and the LKS. Proper identification should be followed by efficient processing of logs into sawntimber and then into high quality finished products. Therefore, two books on identification and technological properties are proposed. To date existing books and electronic data bases have only dealt with well-known major commercial species many of which are facing serious extinction.

This first proposal addresses publication of a handbook on tree description and computer-aided macroscopic identification of 130 timber species from tropical Africa with special reference to 100 LUS and LKS selected from the forests of Ghana.

3.2 Characteristics of the Area

One tree each of the 130 species will be selected from the wet evergreen, the moist evergreen or the moist and dry semi-deciduous forest of Ghana. Where a species occurs in more than one vegetational zone, samples of species will be collected from all the other zones. The annual precipitation in this closed-canopy forest ranges from 1,500 to 2,500 mm with a temperature range from 20 to 33°C. The soil of the evergreen forests is oxysols type which is highly leachable, yellowish, very acidic with poor nutrient while that of the deciduous forest is characterised by the ochrosols which is less leachable, reddish, slightly acidic and better supplied with nutrients (Hall and Swaine, 1981).

3.3 Other Relevant Aspects of Pre-Project Situation

Failure to address the problem of timber identification of LUS and LKS may lead to continuous misidentification of timbers, under-utilization, inefficiency and wastage at the timber mills which will undermine the purpose of previously sponsored ITTO projects (PD 179/91 and PD 74/90), ITTO Fellowship (061/96A) and various governments' action programmes on the timber industry.

3.4 Intended Situation After Project Completion

National herbarium and xylarium collections will be increased. In addition dendrological and wood identification features of the LUS and LKS species will be assembled into an identification handbook. This book will be used as a reference book by the stakeholders of the forest and wood industry in tropical Africa who still have to consult many sources for data on a species which are not always correct. It will be used to run a series of workshops for the inspectorate and extension divisions of the Forestry Departments and related institutions. The publication will assist in reducing the number of public enquiries on timber identification which have averaged about 200 annually in Ghana including enquiries from foreign companies.

3.5 Target Beneficiaries

In addition to personnel of wood industry and institutions in tropical Africa, other specific beneficiaries in Ghana will be the utilization division of the Forestry Department, the Timber Export Development Board, the Forest Products Inspection Bureau, the Forest Commission and similar national institutions in tropical Africa. Other institutions are the staff and students of the Wood Industry Training College, the National Forestry School and the Institute of Renewable Natural Resources of the University of Science and Technology in Kumasi. These institutions should find the interactive computer-assisted identification handbook a useful teaching tool.

3.6 Project Strategy

3.6.1 Reasons for Selection

All the 130 species selected from the forests of Ghana, reach a minimum diameter-breast-height of 70 cm and occur at a frequency of more than one tree per square kilometre. Besides Ghana, the selected species should also occur in at least one other country in West or Central Africa. The 130 species listed in Appendix 1 include some 15 major commercial species which are currently over exploited, some to the point of commercial extinction; 15 commercial species exploited at sustainable levels, 45 lesser-used species which are currently under-exploited and are being promoted as commercial species in Ghana and about 55 unexploited lesser-known species. The 15 major commercial species are included for comparison only.

3.6.2 Lessons Drawn from Past Evaluation

An authoritative book on identification of the LUS and LKS is needed in the forest industry sector of Ghana (and tropical Africa) to assist stakeholders to fully realise the impact of previously sponsored ITTO projects on LUS and LKS timbers from tropical Africa. Data from relevant projects and publications will be evaluated and used if found necessary and appropriate without re-inventing the wheel.

3.6.3 Technical and Scientific Aspects

The book will have an introductory page which will explain all anatomical and dendrological terms and test procedures used in compiling the book. The wood description will be based on a revised description of qualitative and quantitative macroscopic, physical and miscellaneous features (Appendix 2) determined with the naked eye aided and assisted with a hand lens as described in Brunner *et al* (1994). Experience drawn from previous publications by Oteng-Amoako (1990 and 1991) will also be useful. There will be two independent tools provided for the identification: a conventional synoptic table and a versatile computer programme on a disk with CD ROM option. The computer software will be interactive and will allow identification features of a species to be changed and at the same time allow inclusion of new species.

The tree description will put emphasis on dendrological features of the leaves, flowers and fruits as compiled by Hawthorne (1990) with notes on stem and bark characteristics. The

ethnography and silviculture of each species as well as their commercial and traditional uses will also be compiled. A typical page content on a species *Albizia africana* will be as shown in Appendix 3.

Prior knowledge of identification will not be a prerequisite to use the book since all the identification features and terminologies will be described and illustrated in details.

3.6.4 Economic Aspects

Correct identification of a timber species and efficient processing are very crucial to conservation of biodiversity which may not be quantified in monetary terms. Although misidentification in Ghana timber sector has not been quantified, it is reported that misidentification of timbers of commerce and its consequential under-utilization in a similar tropical country have been estimated to cost more than 10.8 million dollars annually (Oteng-Amoako, 1990). Furthermore, sustainable utilization of LUS and LKS through correct identification will assist in promotion of industrial trade, employment creation, generate increased revenue from taxes and improve the well being of the local people.

3.6.5 Environmental and 3.6.6 Social Aspects

Only chainsaws will be used to selectively fell a single tree of a species from a vegetational zone and will not be an ongoing activity. It is therefore not expected to radically affect the dynamics of the different fauna communities in the area of influence.

3.6.7 Management Aspects

The proposed joint project will be undertaken by Forestry Research Institute of Ghana (FORIG) and the Wood Science Department of Swiss Federal Institute of Technology in Zurich (SFIT). A Project Management Structure (Fig. 1) has been evolved to ensure maximum coordination and cooperation between the two institutions.

3.7 Reasons for ITTO Support

3.7.1 ITTO Aspects

The proposal is within ITTO mandate both in terms of the objective and the criteria of the Agreement and is consistent with the activities and priorities of ITTO Action Plan. It also addresses the national government's priority programme and builds upon relevant results of previously sponsored ITTO projects especially PD 179/91 at FORIG. Pre-project proposal was sponsored by ITTO in a fellowship tenure at SFIT during which Activities 1 and part of 3 and 4.1 were completed. Further ITTO funding is needed to do thorough sampling of species and bring the entire project to a successful end.

= 3.7.2 Relationship to Relevant Actions Supported by Other Donors

Based on available information, there is no other potential donor supporting this kind of project. Other donors have previously supported compilation of identification features of the major commercial species from Africa which do not include most of the promotable LUS and LKS timbers of tropical Africa selected for this project. Published data on species selected for this study if available shall be noted and compared with findings from the present study.

3.8 Risks

Both FORIG (Ghana) and SFIT (Switzerland) are very much committed to the project as evidenced in the pre-project sponsored by ITTO at SFIT. It is considered therefore that there are no institutional risks that could hinder the successful implementation of the project.

4& 5 OUTPUTS, ACTIVITIES, PLACE AND INPUTS BY COOPERATING INSTITUTIONS

OUTPUT AND ACTIVITIES	PLACE	INPUTS		
		TOTAL MAN-MONTHS (MM)	INSTITUTIONAL COMPONENTS	
			FORIG	SFIT
<p>Output 1: Essential literature collected and species selected</p> <p><u>Activities</u></p> <p>1.1 Literature survey</p> <p>1.2 Selection of species in consultation with stakeholders</p>	<p>KSI/ZRH</p> <p>KSI</p>	<p>1.0</p> <p>0.5</p>	<p>0.5 (L)</p> <p>0.5 (L)</p>	<p>0.5(A)</p> <p>-</p>
<p>Output 2: About 300 herbarium and wood specimens collected</p> <p><u>Activities</u></p> <p>2.1 Sample collection and preparation</p>	<p>KSI</p>	<p>4.0</p>	<p>4.0 (L)</p>	<p>-</p>
<p>Output 3: About 300 macrophotographs of species prepared</p> <p><u>Activities</u></p> <p>3.1 Preparation of samples for macrophotography</p> <p>3.2 Macrophotography</p> <p>3.3 Development and printing of macrographs</p>	<p>ZRH</p> <p>ZRH</p> <p>ZRH</p>	<p>1.25</p> <p>1.25</p> <p>1.5</p>	<p>-</p> <p>-</p>	<p>1.25(A)</p> <p>1.25(A)</p> <p>1.5(A)</p>
<p>Output 4: Wood identification features of 130 spp. compiled</p> <p><u>Activities</u></p> <p>4.1 Review of standardised identification features</p> <p>4.2 Description and measurement of identification features</p> <p>4.3 Burning of splinter test</p>	<p>KSI/ZRH</p> <p>KSI/ZRH</p> <p>KSI</p>	<p>1.0</p> <p>9.0</p> <p>1.0</p>	<p>0.5(L)</p> <p>5.0(S)</p> <p>1.0(L)</p>	<p>0.5(A)</p> <p>4.0(S)</p> <p>-</p>

OUTPUT AND ACTIVITIES	PLACE	INPUTS		
		TOTAL MAN MONTHS (MM)	INSTITUTIONAL COMPONENTS	
			FORIG	SFIT
<p><u>Output 5:</u> Identification of 130 spp. using synoptic table and computer data bank tested.</p> <p><u>Activities</u></p> <p>5.1 Preparation and testing of synoptic table and dichotomous key</p> <p>5.2 Preparation of data bank on comuter</p>	<p>KSI</p> <p>ZRH</p>	<p>1.0</p> <p>1.0</p>	<p>1.0(L)</p> <p>-</p>	<p>-</p> <p>1.0(A)</p>
<p><u>Output 6:</u> Tree identification features compiled and drawn.</p> <p><u>Activities</u></p> <p>6.1 Description of dendrological features</p> <p>6.2 Drawing/sketching/photography of dendrological features</p>	<p>KSI</p> <p>KSI</p>	<p>5.0</p> <p>5.0</p>	<p>5.0(S)</p> <p>5.0(S)</p>	<p>-</p> <p>-</p>
<p><u>Output 7:</u> Data on silviculture, ethnography and uses compiled</p> <p><u>Activities</u></p> <p>7.1 Compile data on silviculture</p> <p>7.2 Compile data on ethnography and uses</p>	<p>KSI</p> <p>KSI</p>	<p>2.0</p> <p>2.0</p>	<p>2.0(S)</p> <p>2.0(S)</p>	<p>-</p> <p>-</p>
<p><u>Output 8:</u> Identification handbook compiled</p> <p><u>Activities</u></p> <p>8.1 Glossary and methodology</p> <p>8.2 Writing, typing, editing and corrections S30/page</p> <p>8.3 Layout and design</p>	<p>KSI/ZRH</p> <p>KSI/ZRH</p> <p>ZRH</p>	<p>1.0</p> <p>2.0</p> <p>0.5</p>	<p>0.5(L)</p> <p>1.0(S)</p> <p>-</p>	<p>0.5(A)</p> <p>1.0(S)</p> <p>0.5(A)</p>

OUTPUT AND ACTIVITIES	PLACE	INPUTS		
		TOTAL MAN-MONTHS (MM)	INSTITUTIONAL COMPONENTS	
			FORIG	SFIT
<p><u>Output 9:</u> 1,000 copies of identification handbook published.</p> <p><u>Activities</u></p> <p>9.1 Publishing - \$15/book</p> <p>9.2 Laison with publishers and proof reading \$10/page</p>	KSI/ZRH	Subcontract 1.0	- 0.5(L)	- 0.5(A)
<p><u>Output 10:</u> Identification handbook launched.</p> <p><u>Activities</u></p> <p>10.1 Advert, invitations, workshop and proceedings</p> <p>10.2 Attendance of IUFRO conference in Malaysia</p>	KSI Malaysia	Subcontract -	- (L)	- (A)
<p><u>Output 11:</u> Project monitored and evaluated to a successful end</p> <p><u>Activities</u></p> <p>11.1 Local administration, monitoring and evaluation</p>	KSI/ZRH	10	6(L)	4(A)

LEGENDS

KSI = Kumasi
 ZRH = Zurich
 L = Project Leader
 A = Project Adviser
 S = Project Specialist

6. LOGICAL FRAMEWORK WORKSHEETS

PROJECT ELEMENTS	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	RELEVANT ASSUMPTIONS
<p>1. <u>Development Objectives</u></p>			
<p>To promote sustainable utilization of 100 lesser-used and lesser-known species through publication of a timber identification handbook.</p>	<p>Identification book be published within 24 months.</p>	<ul style="list-style-type: none"> • Published book to be available to all stake-holders and at the libraries of FORIG, SFIT, ITTO and the University in Kumasi, Ghana. • Progress Reports 1, 2, 3 and 4. • Copy of books be sent to relevant countries of tropical Africa, SFIT and ITTO. 	<p>Full project sponsorship from ITTO with assistance from SFIT and FORIG.</p>
<p>2. <u>Specific Objective</u></p>			
<p>1. To collect herbarium and wood samples of selected species to increase herbarium and xylarium collections.</p>	<p>Collections entered and inventorised within 6 months.</p>	<ul style="list-style-type: none"> • Increase in number of herbarium and xylarium collections. • Project Report 1 	<p>Transport availability.</p>
<p>2. To prepare, study and compile their wood identification features.</p>	<p>20 spp. to be compiled each month and completed by the end of 15th month.</p>	<ul style="list-style-type: none"> • Compile data filed. • Project Report 2 and 3. • Increase in number of xylarium collections 	<p>Availability of xylarium samples.</p>
<p>3. To study and compile tree dendrological features</p>	<p>20 spp. to be studied and compiled every month and completed by the 12th month.</p>	<ul style="list-style-type: none"> • Compiled data in project file. • Project Report 2 • Increase in number of herbarium collections 	<p>Availability of xylarium samples</p>
<p>4. To compile notes on their phenology, silviculture, ethnography, traditional and commercial uses.</p>	<p>Data on silviculture, ethnography and uses assembled by the end of 12th month.</p>	<ul style="list-style-type: none"> • Data on project filed. • Project Report 2 	<p>Transport availability and adequate funding for field work.</p>

PROJECT ELEMENTS	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	RELEVANT ASSUMPTIONS
5. To publish an identification handbook of the 130 timber species.	1,000 copies of identification book published by 20 th month.	<ul style="list-style-type: none"> Copies of handbook distributed to stakeholders in Ghana and ITTO member countries in Africa. Project Report 4 	Timely completion of objectives 1 to 4
6. To launch the handbook at a workshop and educate stakeholders on its use.	Advertisement and invitation sent to stakeholders at least one month before workshop.	<ul style="list-style-type: none"> Copy of advertisement and list of invitees on project file and computer. 	Timely completion of objective 5.
<u>Output 1:</u> Essential literature collected and 130 species selected.	References compiled and names of 130 selected species filed and stored on project computer and project file by the end of 5 th month.	<ul style="list-style-type: none"> Project file and computer Project Report 1 	Adequate funding and timely release of funds.
<u>Output 2:</u> Herbarium and wood samples collected and added to herbarium and xylarium collections.	Data filed and stored on computer by the 6 th month.	<ul style="list-style-type: none"> Project file and computer. Project Report 2 	Transport availability and timely release of funds.
<u>Output 3:</u> Macrophotographs of 130 spp. prepared.	Macrophotographs completed and assembled in project album and stored on computer by end of 12 th month.	<ul style="list-style-type: none"> Project album and computer. Project Report 2 	Availability of all xylarium samples of species.
<u>Output 4:</u> Wood identification features of 130 spp. compiled.	Identification features entered in project computer by end of 12 th month.	<ul style="list-style-type: none"> Project file and computer. Project Report 2. 	Availability of all 130 collected xylarium samples.
<u>Output 5:</u> Identification of species using synoptic table and computer data bank prepared and tested.	Synoptic table tested and filed. Data bank stored on computer by 18 th month.	<ul style="list-style-type: none"> Project file and computer. Project Report 3 	Timely completion of output 4.
<u>Output 6:</u> Tree identification features compiled, drawn and photographed.	Data entered in project file and stored on computer by the 12 th month.	<ul style="list-style-type: none"> Project file and computer Project Report 2 	Availability of 130 herbarium samples of species
<u>Output 7:</u> Complete species of data on silviculture, ethnography, traditional and commercial uses.	Data on project file and computer by the 12 th month.	<ul style="list-style-type: none"> Project file Project computer Project Report 2. 	Availability of 130 herbarium samples of species.

PROJECT ELEMENTS	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	RELEVANT ASSUMPTIONS
Output 8: Identification handbook of 130 spp. compiled.	Details of handbook typed and stored on computer and on file by end of 18 th month.	<ul style="list-style-type: none"> Project computer Project file Project Report 3 	Timely completion of outputs 1 to 7.
Output 9: Identification handbook of 130 spp. published.	Copies of handbooks with ISBN number distributed to stakeholders in Ghana and all ITTO member countries by end of 22 nd month.	<ul style="list-style-type: none"> ISBN number of handbook. Available copies with stakeholders and ITTO member countries. Project Report 4. 	Timely completion of output 8.
Output 10: Identification handbook launched and published at a workshop.	Advert and invitation issued at least 2 months prior to workshop and by the end of 23 rd month.	<ul style="list-style-type: none"> Copy of advert and invitations on project file. Project Report 4. 	Timely completion of output 9.
Output 11: Project closely monitored and evaluated.	Issue of project report at the end of every six months. Steering committee meeting at the end of 1 st year.	<ul style="list-style-type: none"> Project Reports 1 to 4. Report by Steering Committee. 	Achievement of outputs 1 to 10.

7. WORKPLAN

OUTPUT/ACTIVITIES	RESPON -SIBLE PARTY	YEAR 1												YEAR 2														
		01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12			
<u>Output 1: Essential literature on project reviewed and species selected.</u> <u>Activities</u> 1.1 Literature survey 1.2 Selection of species in consultation with stakeholders	KSI/ZRH KSI	X X																										
<u>Output 2: Herbarium and wood samples collected</u> <u>Activities</u> 2.1 Sample collection and preparation	KSI		X	X	X																							
<u>Output 3: Macro photographs of all species pared</u> <u>Activities</u> 3.1 Preparation of samples by sanding 3.2 Macro photography of sanded samples 3.3 Development and printing	ZRH ZRH ZRH						X	X		X																		
<u>Output 4: Wood identification features compiled.</u> <u>Activities</u> 4.1 Review of standardised identification features 4.2 Description and measurements of identification features 4.3 Burning splinter test	KSI/ZRH KSI/ZRH KSI																X		X	X	X							
<u>Output 5: Identification using synoptic table and computerised data prepared and tested.</u> <u>Activities</u> 5.1 Preparation and testing of synoptic table and dichotomous key 5.2 Preparation of databank on computer	KSI ZRH																											X X

8. INSTITUTIONAL ARRANGEMENTS FOR EXECUTION AND OPERATION

8.1 Management Structure

The joint project will be accomplished by specialists from FORIG and SFIT. Some aspects of the activities will be done either in Kumasi or Zurich while others will be completed simultaneously at FORIG (Kumasi) and SFIT (Zurich).

The project will be under the administration of FORIG Director and the Chair of Wood Science at SFIT. The day to day execution of the project will be the responsibility of the Project Leader at FORIG. The Project Leader shall be advised by a 5-member Advisory Committee consisting of the Chair of Wood Science at SFIT, the Director of FORIG, the SFIT Adviser, a representative from ITTO and a representative of the Ministry of Lands and Forestry. Project Adviser from SFIT will coordinate activities at SFIT who shall report to SFIT Chair of Wood Science. An Advisory Committee meeting will be arranged during the visit of SFIT Adviser to take part in the forest expedition and during the visit of SFIT Director to take part in the workshop to launch the book. Project specialists from FORIG and SFIT shall perform specialist duties under the Project Leader and SFIT Adviser respectively. Figure 1 shows Administrative and Management Structure for the project.

8.1.1 Arrangements for Execution and Operation

The Project Leader shall visit Zurich for the purpose of consultation, writing and finalisation of the book. The SFIT Adviser shall visit Ghana and take part in the forest expedition. The SFIT Project Director shall visit Ghana to take part in the workshop to launch the book. The administration of FORIG and SFIT will each manage the budget allocated for project activities in their respective institutions as shown in Appendix 4. Where an activity involves simultaneous investigation at the two institutions, the budget for the activity will be apportioned to SFIT and FORIG administration according to the magnitude of tasks to be performed and in accordance with specialist rates charged at respective institutions.

8.2 Future Operation and Maintenance

About 700 of the printed books will be kept in FORIG and sold to recover money which will be used for future revision and reprints of the book. 200 books will be sent to SFIT, 100 to ITTO and its member countries in tropical Africa.

8.3 Key Staff

The key project staff is the Project Leader with logistic support from the SFIT Adviser, the Chair of Wood Science at SFIT and Project Specialists – an ethno-botanist and silviculturalist. The Leader, Adviser, Chair of Wood Science and the ethno-botanist will be co-authors of the publication and in that order. The Curriculum Vitae of the Project Leader is attached as Appendix 5.

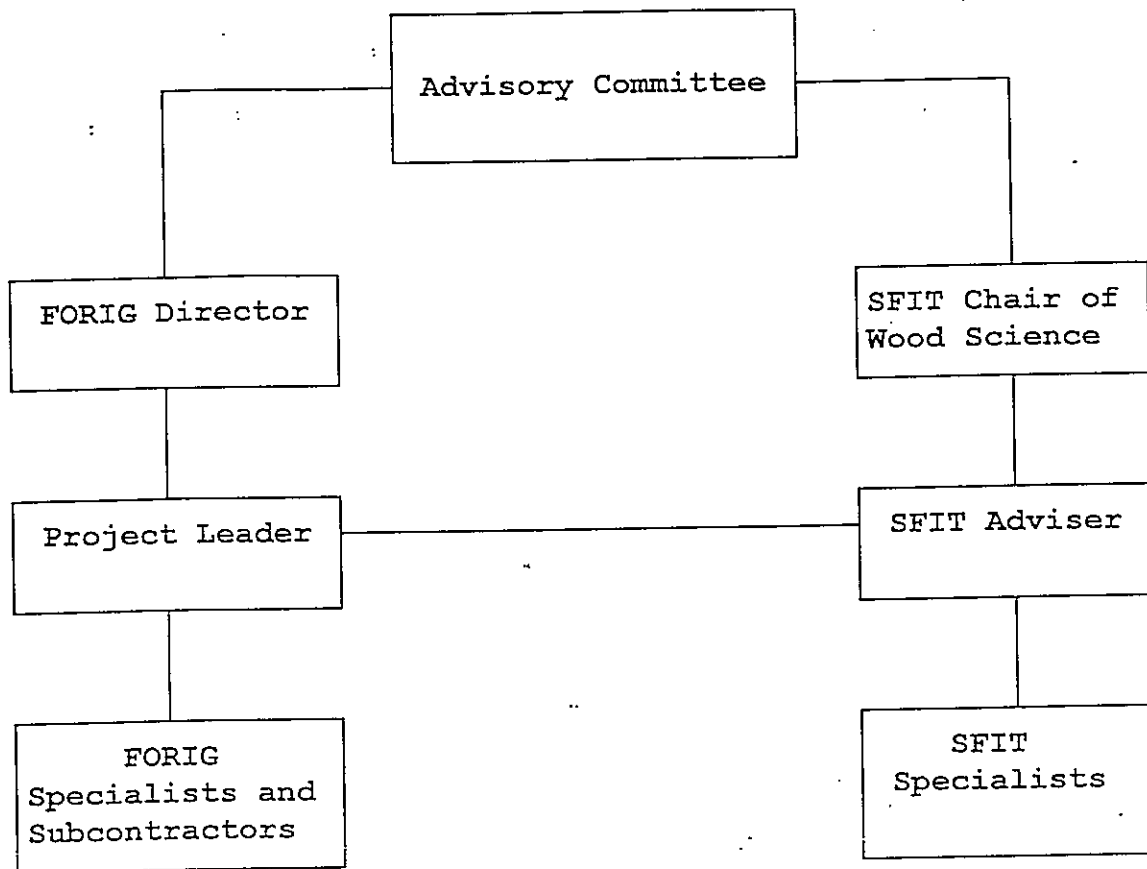


Figure 1: Project Administration and Management Structure

9. PRIOR OBLIGATIONS AND PREREQUISITES

Not applicable

10. POSSIBLE FUTURE ACTIONS

The book will be revised after five years with funding from the sale of the books.

PART III: MONITORING, REPORTING AND EVALUATION

11. PROGRESS AND COMPLETION REPORTS

Progress reports will be submitted every six months according to ITTO model and format. Upon project completion, a final report will be submitted according to ITTO format on "Project Completion Report".

12. ITTO MONITORING AND REVIEW

The follow-up and administration will be carried out by the 5-member Advisory Committee who will meet in Kumasi during forest expedition and during launching of the identification book.

13. EVALUATION

The project will be evaluated as required by ITTO Council or Secretariat according to their established procedures.

PART IV : BUDGET

The following assumptions are made in preparation of the budget:

- Project activities are charged at a rate of USD 2,500 in Kumasi (FORIG) 6,000 per manmonth in Zurich (SFIT) respectively.
- Project activities including project administration performed by Project Leader are funded by FORIG while those performed by SFIT Advisor are funded by SFIT.
- Project activities subcontracted to Specialists are charged to ITTO.
- Consumable items are charged to FORIG and SFIT while capital items are paid for by ITTO.

PART IV (A): OVERALL PROJECT BUDGET BY ACTIVITY (US DOLLARS) AND SOURCE OF FINANCE FROM ITTO, FORIG AND SFIT*.

OUTPUT/ACTIVITIES	BUDGET COMPONENTS					INSTITUTION COMPONENTS				
	PROJECT PERSONNEL	SUB CONTRACTS	DUTY TRAVEL	CAPITA L ITEMS	CONSUMABLE ITEMS	ITTO	FORIG	SFIT	GRAND TOTAL	
<u>Output 1: Pre-project preparation</u>										
<u>Activities</u>										
1.1 Literature survey	4,250	-	-	-	3,000	-	2,250	5,000	7,250	
1.2 Selection of species in consultation with stakeholder	1,250	-	1,000	-	1,000	-	3,250	-	3,250	
<u>Output 2: Forest expedition</u>	5,550	-	1,000	-	4,000	-	5,500	5,000	10,500	
<u>Activities</u>										
2.1 Sample of collection and preparation.	10,000	-	**10,700	25,000	1,500	35,700	11,500	-	47,200	
	10,000	-	10,700	25,000	1,500	35,700	11,500	-	47,200	
<u>Output 3: Preparation of macrophotographs</u>										
<u>Activities</u>										
3.1 Preparation of samples by sanding	7,500	-	-	-	6,000	-	-	13,500	13,500	
3.2 Macrophotography	7,500	-	-	5,000***	3,000	5,000	-	10,500	15,500	
3.3 Development and printing	9,000	-	-	-	6,000	-	-	15,000	15,000	
Page Total	24,000	-	-	5,000	15,000	5,000	-	39,000	44,000	
	39,500	-	11,700	30,000	20,500	40,700	17,000	44,000	101,700	

*Personnel charge rate is USD 2,500 for FORIG and USD 6,000 for SFIT for 1 man month.

**Includes \$2,000 for airfare and \$1,000 subsistence for SFIT Advisor's visit to Ghana for forest expedition.

*** Stereophotomicroscope.

OUTPUT/ACTIVITIES	BUDGET COMPONENTS					INSTITUTION COMPONENTS				
	PROJECT PERSONNEL	SUB CONTRACTS	DUTY TRAVEL	CAPITA L ITEMS	CONSUMABLE ITEMS	I/TO	FORIG	SFIT	GRAND TOTAL	
Output 4: Wood identification features compiled Activities 4.1 Review of standardised identification features 4.2 Description and measurement of identification feature 4.3 Burning of splinter test	4,250 36,500 2,500	- - -	- - -	- - -	4,000 6,000 1,000	- 36,500 -	2,250 2,000 3,500	6,000 4,000 -	8,250 42,500 3,500	
Output 5: Identification using synoptic table and computer data bank tested Activities 5.1 Preparation and testing of synoptic table and dichotomous key 5.2 Preparation of data bank on computer	43,250 2,500 6,000 8,500	- - - -	- - - -	- - 3,500** 3,500	11,000 1,000 5,000 6,000	36,500 - 3,500 3,500	7,750 3,500 - 3,500	10,000 - 11,000 11,000	54,250 3,500 14,500 18,000	
Output 6: Tree identification features compiled Activities 6.1 Compilation of dendrological features 6.2 Sketching and drawing of features	12,500 12,500 25,000	- - -	- - -	- - -	1,000 2,500 3,500	12,500 12,500 25,000	1,000 2,500 3,500	- - -	13,500 15,000 28,500	
Output 7: Data on silviculture, ethnography and uses compiled. Activities 7.1 Compile data on silviculture 7.2 Compile data on ethnography and uses	5,000 5,000 10,000	- - -	- - -	- - -	1,000 1,000 2,000	5,000 5,000 10,000	1,000 1,000 2,000	- - -	6,000 6,000 12,000	
Output 8: Identification handbook (285pp) compiled Activities 8.1 Compilation of terms and procedure 8.2 Writing, typing, review and corrections \$30/pp 8.3 Layout and design	4,250 8,550 3,000 15,800 102,550	- - - - -	- - - 7,000 7,000	- - - - 3,500	4,000 6,000 3,000 13,000 35,500	- 15,550 - 15,550 90,550	2,250 2,000 - 4,250 21,000	6,000 4,000 6,000 16,000 37,000	8,250 21,550 6,000 35,800 148,550	

* Projects Leaders Airfare and 8-week subsistence to Zurich for consultation

** Laptop computer and accessories

OUTPUT/ACTIVITIES	BUDGET COMPONENTS				INSTITUTION COMPONENTS				
	PROJECT PERSONNEL	SUB CONTRACTS	DUTY TRAVEL	CAPITAL ITEMS	CONSUMABLE ITEMS	ITTO	FORIG	SFIT	GRAND TOTAL
Output 9: 1000 copies of identification book (285 pp) published.									
Activities									
9.1 Publishing of 1000 copies (\$15/book)		15,000	-	-	-	15,000	-	-	15,000
9.2 Liaison with publishers and proof reading \$10/page	4,250	-	-	-	1,000	-	2,250	3,000	5,250
Output 10: Identification handbook launched	4,250	15,000	-	-	1,000	15,000	2,250	3,000	20,250
Activities									
10.1 Advert, invitation, workshop and proceedings	-	10,000	*3,000	-	1,000	13,000	1,000	-	14,000
10.2 IUFRO conference in Malaysia	-	-	**8,000	-	-	8,000	-	-	8,000
11.1 Local project administration	-	10,000	11,000	-	1,000	21,000	1,000	-	22,000
Page Total	39,000	-	-	-	-	-	15,000	24,000	39,000
Sub Total	43,250	25,000	11,000	-	2,000	36,000	18,250	27,000	18,250
5.5% ITTO Administration cost	185,300	25,000	29,700	33,500	58,000	167,250	56,250	108,000	331,500
ITTO monitoring & evaluation fee	-	-	-	-	-	10,299	-	-	10,299
GRAND TOTAL	-	-	-	-	-	20,000	-	-	20,000
	-	-	-	-	-	197,549	56,250	108,000	361,799

* Airfare and subsistence for SFIT Director's visit to take part in workshop to launch the book.

** Airfare and subsistence for Project Leader and SFIT Adviser (or SFIT Director) to present joint paper at the conference.

PART IV(B): BUDGET BY COMPONENTS AND YEAR

COMPONENTS	UNIT/MANMONTHS	COST PER UNIT/MANMONTH	QUANTITY		TOTAL COST		Total Budget
			YEAR 1	YEAR 2	Year 1	Year 2	
10. Project Personnel							185,300
Project Leader	14.5	2,500	8.5	6.0	21,250	15,000	
FORIG Specialist	20.0	2,500	16.5	3.5	41,250	8,800	
SFIT Adviser	11.5	6,000	5.0	6.5	30,000	39,000	
SFIT Specialist	5.0	6,000	2.0	3.0	12,000	18,000	
20. Subcontractors							25,000
Publishers	1,000	15	-	1,000	-	15,000	
Workshop	1	10,000	-	1	-	10,000	
30. Duty Travel							29,700
Consultation-travel	3	-	1	2	1,000	13,000	
Sample collection by expedition team	14	550	14	-	7,700	-	
IUFRO Conference in Malaysia	2 (Leader + Adviser)	4,000	-	2	-	8,000	
40. Capital Items							33,500
4-Wheel Drive	1	25,000	1	-	25,000	-	
Photomicroscope	1	5,000	1	-	5,000	-	
Laptop Computer and Accessories	1	3,500	-	1	-	3,500	
50. Consumable Items	-	-	-	-	32,000	26,000	58,000
Page Total	-	-	-	-	175,200	156,300	331,500
5.5% ITTO Administrative Cost	-	-	-	-	-	-	10,299
ITTO Monitoring and Evaluation Fee	-	-	-	-	-	-	20,000
TOTAL BUDGET	-	-	-	-	-	-	361,799

- PART IV(C): BUDGET BY COMPONENTS AND SOURCE OF FINANCE FROM ITTO, FORIG AND SFIT.

COMPONENTS	FORIG	SFIT	ITTO	TOTAL
10. Project personel				185,300
FORIG Project Leader (14.5)	36,250		50,050	
FORIG Specialist (20)		69,000	30,000	
SFIT Adviser (11.5)				
SFIT Speacilists (5.0)				
20. Subcontracts				25,000
Publishers			15,000	
Workshop organizers			10,000	
30. Duty travel including subsistence and transportation	1,000	-	28,700	29,700
40. Capital items				33,500
4-wheel Drive			25,000	
Photomicroscope			5,000	
Laptop computer			3,500	
50. Consumable items include utilities and office supplies	19,000	39,000	-	58,000
Sub Total	56,250	108,000	167,250	331,500
5.5% ITTO Administration charges	-	-	10,299	10,299
Monitoring and evaluation fee (2 years)	-	-	20,000	20,000
GRAND TOTAL	56,250	108,000	197,549	361,799

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APPENDIX 1: LIST OF SELECTED SPECIES, ECONOMIC STATUS AND THEIR DISTRIBUTIONS IN TROPICAL AFRICA

BOTANICAL NAME	TRADE NAME	UTILIZATION STATUS	NATURAL DISTRIBUTION		
			WA	CA	EA
1. Afzelia africana	Afzelia	B	*	*	
2. Albizia adiantifolia	Albizia	C	*	*	X
3. Albizia ferruginea	Albizia	C	*	*	X
4. Albizia glaberrima	Albizia	D	*		X
5. Albizia zygia	Okuro/Albizia	C	*	*	
6. Allanblackia floribunda	Tallow Tree	D	*	*	X
Syn. A. parviflora	-	D	*	*	*
7. Alstonia boonei	Alstonia	C	*	*	*
8. Amphimas pterocarpoides	Yaya	C	*	*	X
9. Aningeria altissima	Aningeria	A	*	*	*
10. Anogeissus leiocarpus	Kane	C	*	*	*
11. Anopyxis klaineana	Kokoti	C	*	*	X
12. Antiaris toxicaria	Antiaris	C	*	*	X
Syn. A. africana	-	C	*		
13. Antrocaryon micraster	Antrocaryon	C	*	*	X
14. Aubrevillea polycarpa	-	D	*	*	X
15. Balanites wilsoniana	Balanites	D	*	*	X
16. Baphia nitida	Camwood/Odwen	D	*	*	X
17. Baillonella toxisperma	Baillonella	D	*	*	X
18. Belschmiedia mannii	Belschmiedia	D	*	*	X
19. Berlinia spp.	Berlinia	C	*	*	X
20. Bombax brevicuspe	Bombax	C	*	*	X
Syn. Rhodognaphalon brevicuspe	-	C	*		
21. Bombax buonopozense	Akata	C	*	X	X
22. Bussea occidentalis	Samantawa	D	*	*	X
23. Blighia sapida	Akye	D	*	*	X
24. Brachystegia mildbraedii	Brachystegia	D	*	*	*
25. Calpocalyx brevibracteatus	Calpocalyx	D	*	X	X
26. Canarium schewienfurthii	Canarium	C	*	*	*
27. Carapa procera	Crabwood/Carapa	D	*	*	X
28. Ceiba pentandra	Ceiba	C	*	*	X
29. Celtis adolphi-friderici	Celtis (a)	C	*	*	*
30. Celtis mildbraedii(Eng)	Celtis (z)	C	*	X	*
31. Celtis zenkeri	Celtis	C	*	X	*
32. Cleistopholis patens	Cleistophilis	D	*	*	X
33. Chidlowia sanguinea	Chidlowia	D	*	*	X
34. Chrysophyllum albidum	Chrysophyllum	B	*	*	*
35. Chrysophyllum perpulchrum	Chrysophyllum	B	*	X	*
36. Chrysophyllum subnudum	Akasa	D	*	*	*
37. Cola spp.	Watapuo/dodowa	D	*	*	X
38. Copaifera salikounda	Copaifera	C	*	X	X
39. Cynometra ananta	Ananta	C	*	X	
40. Cylicodiscus gabunensis	Okan/Denya	C	*		X
41. Corynanthe pachyceras	Corynanthe	C	*	*	X
42. Cordia spp.		D	*	X	
43. Dacryodes klaineana	Adwea	D	*		
44. Daniella ogea	Ogea	A	*	*	X
45. Detarium sengalense	Takyikyiriwa	D	*	*	X
46. Dialium spp.	Duabankye	C	*	X	X

BOTANICAL NAME	TRADE NAME	UTILIZATION STATUS	NATURAL DISTRIBUTION		
			WA	CA	EA
47. Dialium dinklagei	Ateenini	D	*	X	X
48. Diospyros kamerunensis	African ebony	B	*	*	X
49. Diospyros sanza-minka	Flintbark/Kusibiri	C	*	X	X
50. Distemonanthus benthamianus	Ayan	C	*	*	X
51. Drypetes principum	Drypetes	D	*	X	X
52. Enantia polycarpa	Duasika	D	*	*	X
53. Entandrophragma angolense	Geda-Nohor/Edinam	A	*	*	*
54. Entandrophragma candollei	Omu/Candollei	B	*	*	X
55. Entandrophragma cylindricum	Sapele	A	*	*	*
56. Entandrophragma utile	Utile	A	*	*	*
57. Erythrina mildbraedii	Erythrina	D	*	X	X
58. Erythrophleum guineense	Potrodom	C	*	*	*
Syn E. suaveolense	-	C	*	*	*
59. Faraga lepreurii	Faraga	D	*	*	*
60. Funtumia africana	Funtumia	D	*	*	X
61. Gilbertiodendron dewerrei	Gilbertiodendron	D	*	*	*
62. Guarea thompsonii	Guarea (black)	B	*	*	*
63. Guibourtia ehie	Ovengkol	A	*	*	X
64. Hannoa klaineana	Hotrohotro	D	*	*	X
Syn. Quassia undulata	-	D	*	*	*
65. Hallea spp.	Hallea	C	*	*	X
66. Heretiera utilis	Niango	B	*	*	X
Syn. Tarrietia utilis	-	B	*	*	*
67. Hexalobus crispiflorus	Duabaha	D	*	*	X
68. Holarrhena wulfsbergii	Osese	D	*	*	X
Syn. H. Floribunda	-	D	*	X	*
69. Homalium aylmeri	Homalium	D	*	*	X
70. Holoptelea grandis	Holoptela	C	*	X	*
71. Huntera ghanensis	Huntera	D	*	*	X
72. Hymenostegia afzelia	Kouekoue	D	*	*	X
73. Irvingia gabonensis	Abesebuo	D	*	*	*
74. Khaya anthotheca	Mahogany	A	*	*	*
75. Khaya ivorensis	Mahogany (African)	A	*	X	*
76. Khaya senegalensis	Mahogany	B	*	*	X
77. Klainedoxa gabonensis	Kroma	C	*	*	*
78. Lannea welwitschii	Kumanini	C	*	*	X
79. Lophira alata	Ekki/Kaku	B	*	*	*
80. Lova trichiliodes	African walnut	B	*	*	X
81. Mammea africana	African Appel	C	*	X	X
82. Manilkara multinervis	Berekankum	C	*	*	X
Syn. M. obovata	-	C	*	*	*
83. Mansonia altissima	Mansonia	B	*	*	X
84. Majidea fosteri	Majidea	D	*	*	X
85. Milicia excelsa	Iroko/Odum	A	*	*	X
Syn. Chlorophora excelsa	-	A	*	*	*
86. Milicia regia	Odum	A	*	*	*
87. Milletia rhodantha	Griffiana	D	*	*	X
88. Mitragyna stipulosa	Abura	C	*	*	X
Syn. Hallea stipulosa	-	C	*	*	*
89. Morus mesozygia	Difouwonton	C	*	*	X
90. Napoleana leonensis	Napoleana	D	*	X	X

BOTANICAL NAME	TRADE NAME	UTILIZATION STATUS	NATURAL DISTRIBUTION		
			WA	CA	EA
91. <i>Nauclea diderrichii</i>	Opepe/Kusia	A	*	*	*
92. <i>Nesögordonia papaverifera</i>	Danta	C	*	*	X
93. <i>Octoknema borealis</i>	Octoknema	D	*	X	X
94. <i>Ongokea gore</i>	Bodwe	C	*	*	X
95. <i>Pachypodonthium staudtii</i>	Pachypodon	D	*	*	X
96. <i>Panda oleasa</i>	Panda	D	*	*	X
97. <i>Parinari excelsa</i>	Afam	C	*	*	X
Syn. <i>Maranthes excelsa</i>	-	C	*		X
98. <i>Parkia bicolar</i>	Asoma	C	*	*	X
99. <i>Pentaclethra macrophylla</i>	Atta	D	*	*	X
100. <i>Pericopsis elata</i>	Afromosia	A	*	*	X
Syn. <i>Afromosia elata</i>	-	A	*	*	X
101. <i>Petersianthus macrocarpus</i>	Esia	C	*	*	X
Syn. <i>Combretodendron macrocarpum</i>	-	C	*	*	X
102. <i>Picalima nitida</i>	Kanwini	D	*	*	*
103. <i>Piptadeniastrum africanum</i>	Dahoma	B	*	*	*
104. <i>Prosopis africana</i>	Prosopis	D	*	*	*
105. <i>Pseudocedrela kotschyi</i>	Krubeta	D	*	*	*
106. <i>Pterygota macrocarpa</i>	Koto	A	*	*	X
107. <i>Pycnanthus angolense</i>	Illomba	C	*	*	*
108. <i>Ricinodendron heudelotii</i>	Erimado	C	*	*	*
109. <i>Sacoglottis gabonensis</i>	Ozouga	D	*	X	X
110. <i>Samanea dinklagei</i>	Samanea	D	*	X	X
111. <i>Scotellia klaineana</i>	Scotellia	D	*	*	X
Syn. <i>S. chivalieri</i>	-	D	*	*	X
112. <i>Sterculia oblonga</i>	Sterculia	C	*	*	*
Syn. <i>Eribroma oblonga</i>	-	C	*	*	*
113. <i>Sterculia rhinopetala</i>	Sterculia	C	*	*	X
114. <i>Stereospermum cuminatissimum</i>	Stereospermum	D	*	*	X
115. <i>Strephonema pseudocola</i>	Strephonema	D	*	X	X
116. <i>Strombosia glaucescens</i>	Afina	C	*	*	X
Syn. <i>S. pustulata</i>	-	C	*	*	X
117. <i>Syzigium guineense</i>	Syzigium	D	*	*	*
118. <i>Tetrochidium didymonstemum</i>	Abogyedua	D	*	*	*
119. <i>Terminalia ivorensis</i>	Emire	P	*	*	X
120. <i>Terminalia superba</i>	Afara/Ofram	B	*	*	X
121. <i>Tetrapleura tetraptera</i>	Tetrapleura	B	*	X	X
122. <i>Tieghemella heckelii</i>	Makore/Baku	D	*	*	X
123. <i>Triplochiton schleroxylon</i>	Obeche/Wawa	A	*	*	X
124. <i>Trichilia spp.</i>	Tanduro/Awonkuruwa	A	*	X	X
125. <i>Trilepisium madagascariensis</i>	Trilepisium	C	*		
126. <i>Turraecanthus africanus</i>	Avodire	D	*	*	X
127. <i>Uapaca guineensis</i>	Uapaca	C	*	X	X
128. <i>Xylopia quintassi</i>	Xylopia	D	*	*	X
129. <i>Xylia evansii</i>	Abobabema	D	*	X	X
130. <i>Zanthoxylum lepricurii</i>	Zanthoxylum	D	*	X	X
Syn. <i>Faraga lepricerii</i>	-	D		X	X

LEGENDS

- WA - WEST AFRICA (Cameroon, Nigeria, Togo, Benin, Ghana, Ivory Coast, Liberia, Sierra Leone, Guinea, Senegal)
- CA - CENTRAL AFRICA (Angola, Congo, Gabon, Equatorial Guinea, Zaire)
- EA - EAST AFRICA (Uganda, Kenya, Tanzania, Zambia)

- A - Over-exploited Major Commercial Species (15)
- B - Sustainably Exploited Commercial Species (15)
- C - Under-exploited Minor Commercial (LUS) (45)
- D - Unexploited Non-Commercial (LKS) (55)

- * - Species present in region
 - x - Species absent in the region
 - .
- Species being promoted by the Forestry Department.

APPENDIX 2: SUGGESTED LIST OF WOOD IDENTIFICATION FEATURES

Vessel Visibility

1. Distinct to the naked eye eg. *Cylicodiscus gabunensis*
2. Indistinct to the naked eye eg. *Picralima nitida*

Vessel Arrangement

3. Exclusively solitary eg. *Picralima nitida*
4. Solitary and radial multiples or clusters eg. *Homalium spp*
5. Exclusively radial multiples or clusters eg. *Aningeria robusta*
6. Radial multiples of one size eg. *Entandrophragma angolenses*
7. Radial multiples of different sizes eg. *Lonchocarpus spp.*
8. Radial multiple of 2-4 vessels eg. *Heretiera utilis*
9. Radial multiples of more than 4 vessels eg. *Manilkara multinervis*
10. Clusters of 2-4 vessels eg. *Entandrophragma cylindricum*
11. Clusters of more than 4 vessels eg. *Entandrophragma cylidricum*
12. Tangential pattern eg. *Tectona grandis*
13. Diagonal pattern eg. *Cylicodiscus gabonensis*

Vessel Content

14. No vessel inclusions eg. *Nauclea diderrichii*
15. Tyloses present eg. *Entandrophragma cylindricum*
16. Other inclusions present eg. *Milicia excelsa*

Vessel Distribution per square millimetre

17. Few: Less than 5 vessels eg. *Lophira alata*
18. Moderate: 5 - 20 vessels eg. *Khaya ivorensis*
19. Fairly numerous: 21-40 vessels eg. *Picralima nitida*
20. Numerous: Above 40 vessels eg. *Celtis zenkeri*

Vessel Diameter(mm)

21. Small: ≤ 0.1 eg. *Picralima nitida*
22. Medium: 0.1-0.2 eg. *Homalium spp.*
23. Large: 0.2-0.3 eg. *Entandrophragma angolense*
24. Very large: More than 0.3 eg. *Cylicodiscus gabonensis*

Proportion of Solitary Vessels (%)

25. Few: Under 33 eg. *Lophira alata*
26. Moderate: 33- 66 *Hexalobus cripiflorus* vessels
27. Numerous: 67-89 eg. *Celtis zenkeri*
28. Predominant: Over 89*eg *Daniella ogea*

Axial Parenchyma Visibility

29. Distinct to the naked eye eg. *Amphimas pterocarpoides*
30. Indistinct to the naked eye eg. *Ricinodendron heudelotii*

Axial Parenchyma Pattern/Types

31. Absent/Not visible with hand lens eg. *Ricinodendron heudelotii*
32. Apotracheal eg. *Nauclea diderrichii*
33. Diffuse eg. *Nauclea diderrichii*
34. Diffuse-in-aggregate eg. *Heretiera utilis*
35. Paratracheal eg. *Gilbertiodendron limba*
36. Scanty eg. *Gmelina arborea*
37. Vascentric eg. *Samanea dinklagei*
38. Aliform eg. *Gilbertiodendron limba*
39. Confluent eg. *Distemonanthus benthamianus*
40. Unilateral eg. *Terminalia superba*
41. Scalariform eg. *Pachypodonthium staudii*
42. Reticulate eg. *Diospyros kamerunensis*
43. Marginal eg. *Guibourtia ehie*
44. Banded eg. *Guarea thompsonii*
45. Not as above

Types of Banded Parenchyma

46. Regularly spaced * eg. *Celtis mildbraedii*
47. Irregularly spaced * eg. - *Irvingia gabonensis*
48. Parenchyma in wavy bands eg. - *Irvingia gabonensis*
49. Parenchyma in straight bands eg. *Pachypodonthium sp*

Width of Banded Parenchyma (mm)

50. Very narrow: Width of parenchyma band less than 0.1 eg. *Hymenostegia afzelii*
51. Narrow: Width of parenchyma band 0.1 to 0.2 eg. *Entandrophragma candollei*
52. Wide: Width of parenchyma band more than 0.2 eg. *Amphimas pterocarpoides*

Distance between Parenchyma bands (mm)

53. Less than 0.5 eg. *Irvingia gabonensis*
54. More than 0.5 eg. *Guibourtia ehie*

- Width of Parenchyma bands compared to Fibre tissue.

- 55. Smaller than fibre tissue bands eg. *Guarea cedrata*
- 56. Larger than fibre tissue bands eg. *Sterculia rhinopetala*

Proportion of Ground Tissue Fibres (%)

- 57. Low: Below 20 eg *Celtis zenkeri*
- 58. Average:20-40 eg *Cordia mellenii*
- 59. High:40-60 eg *Terminalia superba*
- 60. Very high: Above 60 eg *Balanite wilsonia*

Ray visibility at Transverse Section

- 61. Distinct to the naked eye eg. *Erythrina mildbraedii*
- 62. Indistinct to naked eye eg. *Albizia ferruginea*

Width of Rays

- 63. Ray width of uniform size * eg. *Daniella ogea*
- 64. Ray width of 2 or more sizes * eg. *Enantia polycarpa*
- 65. Ray width less than 1/4 of vessel size eg. *Albizia ferruginea*
- 66. Ray width between 1/4-1/2 of vessel size eg. *Khaya senegalensis*
- 67. Ray width between 1/2-full size of vessel eg. *Homalium spp*
- 68. Ray width equal to or larger than vessel size eg. *Erythrina mildbraedii*
- 69. Ray width less than 0.05 mm eg. *Distemonanthus benthamianus*
- 70. Ray width between 0.05 to 0.1mm eg *Amphimas pterocarpoides*
- 71. Ray width more than 0.1mm eg *Erythrina mildbraedii*

Ray Frequency (%)

- 72. Few: Less than 15 eg. *Erythrina mildbraedii*
- 73. Medium: Between 15-30 eg. *Lovoa trichiliodes*
- 74. Numerous: Between 30-50 - eg. *Garcinia afzelii*
- 75. Very numerous: Above 50 eg. *Hymeriostegia afzelii*

Conspicuousness of Rays on Radial Surface

- 76. Rays conspicuous * eg. *Erythrina mildbraedii*
- 77. Rays inconspicuous * eg. *Manilkara multinervis*

Visibility of Growth Rings

- 78. Growth ring boundaries indistinct or absent eg. *Khaya anthotheca*
- 79. Growth ring boundaries distinct eg. *Blighia sapida*

Demarcation of Growth Ring Boundaries

- 80. Demarcated by thick-walled fibres or radially flattened fibres * eg. *Blighia sapida*
- 81. Demarcated by differences in vessel diameter * eg. *Tectona grandis*

- 82. Demarcated by marginal (terminal or initial) parenchyma * eg. *Cedrela odorata*
- 82. Demarcated by absence of pores* eg *Ongokea gore*

Porosity

- 84. Diffuse Porous * eg. *Khaya anthotheca*
- 85. Semi-ring Porous * eg. *Cedrela odorata*
- 86. Ring Porous * eg. *Tectona grandis*

Storied Structure

- 87. No storied structure eg *Pycnanthus angolense*
- 88. Rays storied.
- 89. Axial parenchyma and or fibres storied eg *Sterculia oblonga*

Density (kg/m³)

- 90. Very Low: Up to 399 - Float with no more than 1/4 covered eg. *Erythrina mildbraedii*
- 91. Low: 400-599 Not more than 1/2 covered surface eg. *Antiaris toxicaria*
- 92. Medium: 600-799 About 3/4 covered eg. *Albizia ferruginea*
- 93. High: 800-999 Float but fully covered eg. *Petersianthus macrocarpus*
- 94. Very High: Above 999 Sinks instantly in water eg. *Dialium aubrevillei*

Heartwood Colour

- 95. No difference between heart and sapwood eg. *Celtis mildbraedii*
- 96. Heartwood darker than sapwood eg. *Mansonia altissima*
- 97. Heartwood basically brown or shades of brown eg. *Dialium aubrevillei*
- 98. Heartwood basically copper coloured or shades of copper
- 99. Heartwood basically red or shades of red eg. *Khaya ivorensis*
- 100. Heartwood basically yellow or shades of yellow eg. *Sterculia oblonga*
- 101. Heartwood basically white to grey eg. *Ceiba pentandra*
- 102. Heartwood with streaks eg. *Terminalia superba*
- 103. Heartwood colour none of above

Lustre

- 104. Dull eg. *Dialium aubreville*
- 105. Lustrous eg. *Canarium schweinfurthii*

Odour

- 106. No distinct odour eg. *Albizia adianthifolia*
- 107. Distinct odour eg. *Copaifera salikounda*
- 108. Aromatic/Fragrant odour eg. *Cedrela odorata*
- 109. Foetid/unpleasant odour eg. *Petersianthus macrocarpus*

Miscellaneous features

- 110. Canal present eg *Antiaris africana*
- 111. Included phloem present
- 112. Oil or mucilage cells present

Burning Splinter Test

- 113. Splinter burns to charcoal eg. *Albizia adianthifolia*
- 114. Splinter burns to full bright white ash eg. *Celtis mildbraedii*
- 115. Splinter burns to full yellow-brown ash eg. *Allanblackia floribunda*
- 116. Splinter burns to full ash colour different from above eg. *Azelia africana*
- 117. Splinter burns to partial ash with gritty feeling eg. *Erythrina mildbraedii*
- 118. Splinter burns to produce crackle or bright sparks eg. *Entandrophragma cylindricum*
- 119. Splinter burns to exude coloured compound eg. *Alstonia boonei*

DISTRIBUTION

- 120. West Africa (at least found in one country of the region)
- 121. Central Africa (" " " " ")
- 122. East Africa. (" " " " ")

APPENDIX 3: TYPICAL PAGE CONTENT ON A SPECIES (*AFZELIA AFRICANA*) FOR THE IDENTIFICATION BOOK

Scientific Name and Family: *Azelia africana* Smith (Caesalpinaceae)

Trade Name: Papao, Afzelia

Status: Commercial Timber

Distribution in Ghana

Dry semi-deciduous forest (DS) and Southern marginal forest (SM)

Distribution in Africa:

West and Central Africa from Coast of Guinea to Ghana, Angola and Uganda especially in Ivory Coast, Nigeria, Cameroon, Gabon and Congo.

Botanical Features

Tree medium to large, 12-15m high, in open forest but 25-30 metres in closed forests. Bole seldom straight with diameter 0.8-0.1 metres, branch free up to 8-10m with short buttress in older trees. The crown is spreading and irregular in shape with heavy branches. Bark is grey, peeling in large irregular flakes. The slash is hard, outer bark dull, red-brown or pinkish; inner bark light brown and granular. Leaf paripinnate, opposite. Leaflets glabrous, 4-5 pairs, entire, 5" x 3" broadly elliptic. Flowers small, with 4 sepals, greenish white fragrant petal, superior ovary with one carpel. Fruits 7"x 3" diameter, black hard woody pod with black seeds.

Ecology, Phenology and Silviculture

Tree is deciduous December to April, but seldom leafless. Flushing starts in January, flowers produce in July and August, also January and February in Coastal savannah marginal forests. It is resistant to fire and dominant in savanna woodland. It is light demanding but seedling can withstand some shade. Seed viability is high, germination epigeal large quantities produce may be eaten on ground by rodents. Growth is slow, stored seed viable up to 1 year with germination period of 12-24 days germination rate of 90. Transplant by stump of 2-year old.

Physical features

Non lustrous, no smell, medium to high density timber. Heartwood is reddish-brown with pale sapwood. Growth rings distinct demarcated by marginal parenchyma cells.

Macroscopic features

Vessels visible, solitary and short radial multiples, few clusters, inclusions present. Vessel diameter medium and sparsely distributed.

Parenchyma visible, aliform, confluent and widely spaced narrow marginal parenchyma bands.

Rays visible, narrow, same size, no ripple marks, medium frequency

and high in height.

Proportion of fibre tissue average.

Other features

Splinter burns to full grey ash exuding coloured compounds.

Plant Uses

The ashes of burnt pods is used for soap making. Seeds are aromatic used by Ibos of Nigeria as a seasoning in soap; leaves used as cattle fodder. Powdered root in millet beer is used for curing hernia in Ivory Coast while a root decoction with pepper is drunk as a cure for gonorrhoea and stomach troubles. The bark decoction is drunk for constipation in Ghana. Ashes from the bark made into soap with sheabutter are used for rubbing lumbago. The ashes of the pod is said to be rich in potassium salts and when mixed with millet is used as a veterinary medicine.

Wood Uses

Exterior and interior joinery, heavy construction including docks, bridge, sleepers, flooring, chemical rats, handles, decking vehicle bodies and doors.

Coded identification features and distribution (based on standard identification feature of Appendix 2).

1, 4, 6, 8, 16, 18, 22, 26, 29, 35, 37, 38, 39, 43, 46, 49, 50, 54, 55, 58, 61, 62, 65, 66, 74, 77, 79, 82, 84, 87, 92, 93, 97, 104, 106, 116, 119, 120, 121, 122

Synonyms

Afzelia africana Pierre

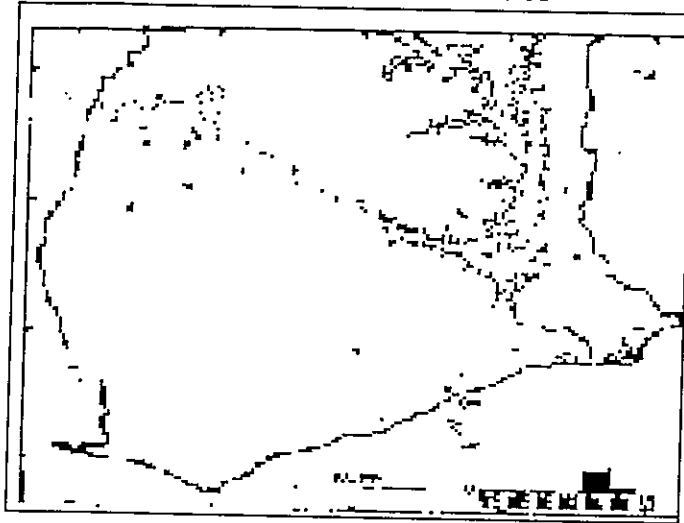
Pahudia africana (Sm) Prain

References (based on 50 references compiled for the project).

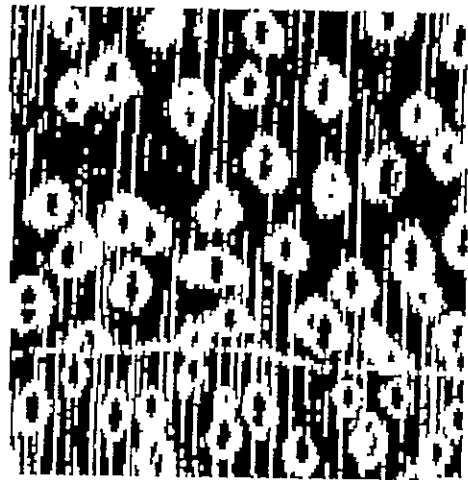
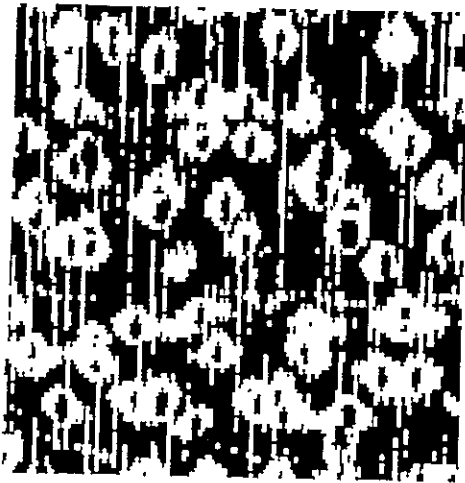
4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17, 18, 19.

Afzelia africana Smith (Papao/Afzelia)

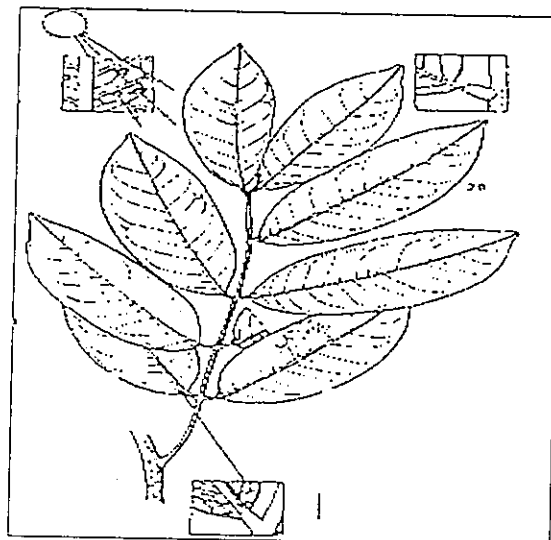
DISTRIBUTION IN GHANA



WOOD MACROSCOPIC FEATURES



BOTANICAL FEATURES



- APPENDIX 4: BUDGET COMPONENT TO BE MANAGED BY FORIG, SFIT AND ITTO.

COMPONENTS	FORIG	SFIT	ITTO	TOTAL
10. Project Personnel				185,300
.Project Leader	36,250	-	-	
*FORIG Specialists	-	-	50,050	
+SFIT Adviser	-	69,000	-	
*SFIT Specialists	-	-	30,000	
20. Subcontracts				
*Publishers	-	-	15,000	
*Conference Organizers	-	-	10,000	25,000
30. Duty travel				29,700
*Forest Expedition	-	-	-	
. Local consultation	1,000	-	7,700	
* Oversea consultations	-	-	13,000	
*IUFRO Conference	-	-	8,000	
40. Capital items				33,500
* 4-Wheel drive	-	-	25,000	
*Photomicroscope	-	-	5,000	
*Laptop computer	-	-	3,500	
50. Consumable items				58,000
. FORIG	19,000	-	-	
+ SFIT	-	39,000	-	
*5.5% ITTO Administration fee	-	-	10,299	10,299
*ITTO Monitoring and Evaluation	-	-	20,000	20,000
TOTAL	56,250	108,000	197,549	361,799

- * Budget component funded by ITTO
- + Budget component funded by SFIT
- . Budget component funded by FORIG