PROJECT PROPOSAL
INTERNATIONAL TROPICAL TIMBER ORGANIZATION (ITTO)
Submitted by the Government of Indonesia

PROJECT ABSTRACT

Title: Properties, Processing and Marketing of Teak Wood Products of Community Teak Plantations in Java and Eastern Indonesia

Summary:
The project is a follow up of the ITTO Pre-Project PPD 121/06 Rev. 2(I) entitled “Development-value adding processes for small-diameter community teak plantations in Java and Eastern Indonesia”. Teaklogs from short-rotation community plantations have been characterized as having small diameters and low quality (low proportion of heartwood, more knots, short clear bole). Compared to teaklogs from plantations of longer rotation those from community plantations have lower product recovery and quality, market acceptability and lower value return to the tree growers. The current processing of teakwood from community-grown plantations in the small sized industries is mostly traditional and less efficient.

In pursuance of sustainable development of teak wood sector, the project aims to promote marketing of low quality teak wood produced in community-grown plantations by innovative processing technologies including heat/steam treatment, jointing and wood composite techniques. The major anticipated outputs are: wood quality assessment of short rotation and small diameter logs, appropriate processing methods for new products and capacity building among the stake holders by training and technology transfer programs.

Field : Industry
EXECUTING AGENCY : Faculty of Forestry Gadjah Mada University
COOPERATING GOVERNMENT : Forest Research and Development Agency
Ministry of Forestry, Government of Indonesia

DURATION : 36 months
APPROXIMATE STARTING DATE : To be determined

BUDGET AND PROPOSED SOURCES OF FINANCE

<table>
<thead>
<tr>
<th>Source</th>
<th>Contribution in US$</th>
<th>Local Currency Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITTO</td>
<td>468,504</td>
<td></td>
</tr>
<tr>
<td>GOI</td>
<td>140,200</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>608,704</td>
<td></td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

## PART I: CONTEXT

1. Origin ................................................................................................................................. 3  
2. Sectoral Policies ................................................................................................................ 3  
3. Programmes and Operational Activities............................................................................. 4

## PART II: THE PROJECT

1. Project Objectives .......................................................................................................... 6  
   1.1 Development Objective ............................................................................................... 6  
   1.2 Specific objectives ...................................................................................................... 6  
   1.2 Specific objectives ...................................................................................................... 6  
2. Justification ........................................................................................................................ 6  
   2.1 Problems to be addressed .......................................................................................... 6  
   2.2 Intended situation after project completion ................................................................. 6  
   2.3 Project Strategy .......................................................................................................... 8  
   2.4 Target beneficiaries .................................................................................................... 9  
   2.5 Technical and scientific aspects .................................................................................. 9  
   2.6 Economic aspects ..................................................................................................... 10  
   2.7 Environmental aspects ............................................................................................. 10  
   2.8 Social aspects ........................................................................................................... 11  
   2.9 Risks ......................................................................................................................... 11  
3. Outputs ............................................................................................................................. 11  
   3.1 Specific Objective 1 .................................................................................................... 11  
      Output 1.1 ..................................................................................................................... 11  
      Output 1.2 ..................................................................................................................... 11  
      Output 1.3 ..................................................................................................................... 11  
      Output 1.4 ..................................................................................................................... 11  
      Output 1.5 ..................................................................................................................... 11  
   3.2 Specific Objective 2 .................................................................................................... 11  
      Output 2.1 ..................................................................................................................... 11  
      Output 2.1 ..................................................................................................................... 11  
      Output 2.2 ..................................................................................................................... 11  
4. Activities ...................................................................................................................... 11  
   4.1 Output 1.1 .................................................................................................................. 11  
      Activity 1.1.1 ................................................................................................................ 11  
      Activity 1.1.2 ................................................................................................................ 11  
   4.2 Output 1.2 .................................................................................................................. 12  
      Activity 1.2.1 ................................................................................................................ 12  
      Activity 1.2.2 ................................................................................................................ 12  
   4.3 Output 1.3 .................................................................................................................. 12  
      Activity 1.3.1 ................................................................................................................ 12  
      Activity 1.3.2 ................................................................................................................ 12  
      Activity 1.3.3 ................................................................................................................ 12  
      Activity 1.3.4 ................................................................................................................ 12
4.4 Output 1.4 .................................................................................................................. 12
  Activity 1.4.1 ................................................................................................................. 12
  Activity 1.4.2 ................................................................................................................. 12

4.5 Output 1.5 .................................................................................................................. 12
  Activity 1.5.1 ................................................................................................................. 12
  Activity 1.5.2 ................................................................................................................. 12
  Activity 1.5.3 ................................................................................................................. 12

4.6 Output 2.1 .................................................................................................................. 12
  Activity 2.1.1 ................................................................................................................. 12
  Activity 2.1.2 ................................................................................................................. 12

4.7 Output 2.2 .................................................................................................................. 12
  Activity 2.2.1 ................................................................................................................. 12
  Activity 2.2.2 ................................................................................................................. 12

5. Logical Framework Worksheets ................................................................................. 13

6. Work Plan ....................................................................................................................... 15

7. Budget........................................................................................................................... 18
  7.1 Overall Project Budget by Activity ........................................................................... 18
  7.2 Consolidated Yearly Project Budget ......................................................................... 21
  7.3 Yearly Project Budget by Source – ITTO ................................................................. 22
  7.4 Yearly Project Budget by Source – Faculty of Forestry GMU ................................. 23

PART III. OPERATIONAL ARRANGEMENTS .................................................................. 24
  1. Management structure ............................................................................................... 24
  2. Monitoring, Reporting and Evaluation ...................................................................... 25
  3. Future Operation and Maintenance ........................................................................... 25

PART IV. THE TROPICAL TIMBER FRAMEWORK ......................................................... 26
  1. Compliance with ITTA 2006 Objectives ................................................................. 26
  2. Compliance with ITTO Yokohama Action Plan 2002-2006 ...................................... 26

ANNEXES
A. Profile of the Executing Agency ................................................................................. 27
B. Curricula Vitae of the Key Staff ................................................................................. 29
C. Term of Reference ...................................................................................................... 31
D. Bibliographic Consultations ....................................................................................... 33
PART I: CONTEXT

1. **Origin**

This project proposal is a follow up of the ITTO Pre-project PPD 121/06 Rev.2(I) titled “Development of Value-Adding Processes for Short- Rotation, Small-Diameter Community Teak Plantations In Java and Eastern Indonesia”. The outcomes of pre-project are as follows:

- Most of the community-grown teak plantations have low productivity and poor log quality due to the use of unimproved genetic planting stocks and poor silvicultural practices.

- Teaklogs from short rotation plantations have small diameters and much larger proportion of sapwood. These characteristics make them distinctively different from teaklogs from plantations of much longer rotations, in terms of processing methods and types of products suited for small logs, product recovery, product quality, market acceptability, and value return to the tree growers.

- The current processing of teakwood from community-grown plantations in the small sized industries is mostly traditional, less efficient and using simple and often traditional tools. There are a wide range of opportunities to improve the current wood processing to achieve high quality of teak wood products, including sawing technique, sawing machine selection, drying technique, improvement of colour appearance of sapwood, more efficient use of log, and product diversification.

- Training for farmers in the selection of planting material and stand management is needed. Training in the improvement technique of processing for small processors is also suggested.

The Thirty-first Expert Panels for Technical Appraisal of ITTO Project Proposals also endorsed the need for the above study addressing the problems of processing of community teak plantations.

2. **Sectoral Policies**

In the Asia Pacific Region, forest plantations and agroforestry sectors, including small woodlots (FAO 1999), will emerge as sustainable sources of industrial roundwood and timber products, apart from logging and mill residues as well as recycled products, that will relieve pressure on tropical natural forests. Of late in Indonesia and many tropical producer countries, small scale-private sectors and small timber holders including rural communities / farmers play a significant role in industrial supply of forest products which will be processed by small and medium-sized entrepreneurs.

Indonesian current forest sector policy is guided by the Forestry Act (UU) No. 41/1999, and other forestry related regulations including UU No. 32/2002 on decentralization and Government Regulation (PP) No. 25/2000. The Minister of Forestry of the new government has determined five top priorities for immediate action (SK.456//Menhut-II/2004), namely combating illegal logging, revitalization of forestry sector especially forest industry, rehabilitation and conservation of forest resources and improving the economy of people living in and around the forest and gazetting the permanent status of forest area. Further, the Ministry of Forestry has set up a strategic plan for 2005-2009 (RENSTRA 2005-2009) as
mandated by UU No. 25/2004. Indonesian forestry sector policy for the year 2005-2009 will focus on the following targets:

- Combating illegal logging and illegal wood trade;
- Implementing the principals of sustainable forest management, among others establishing at least one Forest Management Unit in every province;
- Developing 5 million ha of forest plantations and rehabilitating of 5 million ha of degraded forest and land;
- Setting up 20 units of national park;
- Improving the income of communities in and around the forest;
- Gazetting the permanent status of forest area.

This five-year plan aims to institutionalize local forest management and has a strong emphasis on empowering local people. Its successful implementation will inevitably require technical support. As communities have already embraced growing trees, ongoing technical support addressing specific problems will not only provide socio-economic benefits to smaller growers and their communities but also directly contribute to the success of the government’s decentralization program.

3. Programmes and Operational Activities

In Indonesia, there is increasing shortage of teakwood supply due to the increasing demand and declining teak forest productivity, particularly the teak forest in Java managed by PERHUTANI (a state owned forest enterprise). In Java, only 10% of the demand for teakwood furniture industries can be met by PERHUTANI (State-owned Forest Corporation) while 20% of the requirement is met from the community based forest plantations.

- Teak in the community forest is generally grown in mixture with other tree species and harvested at relatively young age of around 20 years.
- With increasing wood price and teakwood demand, as well as the introduction of genetically improved planting materials, there is a widespread practice of teak growing in private lands.
- Premium teak is the most sought-after tropical hardwood for prestige furniture, shipbuilding and decorative use in construction. Indonesian exports of teak furniture accounted for US$800 million in 2001.
- There are thousands of furniture-making enterprises in Java employing 6 million people or 6% of the total population, providing a range of livelihoods (CIFOR News 2003).

Contribution of the community based plantations to the teakwood sector, as a sustainable option, has been increasing in recent years and expected to play a significant role in furniture manufacture and glue-laminated and jointed structures from small dimensional timbers. Teakwood has become an important commodity in most community based forests in Java, and Eastern Indonesia (Nusa Tenggara and South and South-East Sulawesi) for a long time and contributed to at least 20% of the economic revenue in those regions.

The recent survey conducted on community-grown teak plantations during the Pre-project period (PPD 121 /06 Rev. 2 (I)), revealed the following major problems:
Teaklogs harvested from short-rotation community plantations have small diameter, more frequent bends, knots and other visual defects including heart rots compared to the conventional long rotation teak plantation timbers.

The proportion of heartwood in the logs is low with possible low durability/natural decay resistance and inferior mechanical properties.

Farmers do not get good prices for their logs because of poor log quality. And the situation becomes worse when farmers do not share the profit generated in the log processing due to the involvement of middle men in the wood chain.

Most teakwood-based processors are small and medium-sized companies, which do not have efficient modern equipments and the maintenance of processing machines is also inappropriate in addition to the low level education of the workers (Suharisno, 2000).

Because of lack of knowledge of the importance of genetic source of planting materials among the community growers, many plantations raised were of low yield and inferior log quality.
PART II: THE PROJECT

1. Project Objectives

1.1 Development Objective

Promote marketing opportunities for low quality wood products of community teak plantations by value addition through appropriate wood processing technology for developing new and innovative products from small dimensional timbers.

1.2 Specific objectives

1.2.1 To develop appropriate/innovative technology for processing the small dimensional timbers of community-grown teak plantations.

1.2.2 To organize technology transfer programs among the stakeholders.

2. Justification

2.1 Problems to be addressed

Based upon the results of ITTO Project PPD 126/06 Rev.2 (I) the existing problems in the area are summarized below:

Insufficient data on wood properties of community plantations

In Indonesia comprehensive studies investigating the properties and processing techniques and utilization of young, small-diameter teak logs from community-grown plantations are lacking. Such research is much needed as it aims to improve the end use of these plantation resources so that the products from short-rotation, small-diameter teak logs become more acceptable and suitable for major domestic applications. This could alleviate the pressure on small timber supply and illegal logging of natural forests in Indonesia and improve the income levels of small-teak growers of rural communities as sustainable option.

Although, teak has world-wide reputation as high quality tropical hardwood, knowledge of properties and processing techniques for quality wood products of short-rotation community plantations is inadequate. For quality sawlogs, it is important to consider minimizing the timber defects such as fluting, bole taper, knots, etc. right from the stage of seed selection (appropriate provenances / genetically superior individual trees/ clones as a part of breeding program for planting material at grower’s level. This would save considerable efforts, energy and resource at processing stage to overcome the timber defects for high quality products. Teak seems to have potential to meet sawn wood requirements from relatively short rotation plantations in view of maturity of timber strength and often durability within a period of 20-30 years as reported from India (Bhat et al. 2005). However, there has been a lack of studies aiming to understand these aspects and to find efficient ways to utilize these resources.

Lack of appropriate processing technology

Teak logs from short rotation plantations have small diameters and much larger proportion of core-wood/ juvenile wood. These characteristics make them distinctively different from
conventional teak-logs of long rotation plantations, in terms of processing methods, types and quality of end products, market acceptability and value return to the tree growers. However, no appropriate processing methods are employed due to the tiny nature of the industries and their age-old designed machineries, although opportunities do exist for developing new innovative processing methods including steam treatment, jointing and wood composite technologies for processing small dimensional timbers.

**Insufficient training/capacity for processing and value-addition**

Because of lack of awareness and knowledge of the importance of selecting appropriate site and seed source/genetic planting materials, productivity of many community teak plantations is very poor with low yield and inferior quality of logs with numerous defects.

There are thousands of teakwood-based processing units in Java, most of them are operated by small and medium-sized companies, irrespective of their products for domestic or export markets. These companies are important to local communities because they employ more than 6 millions of local workers (6 % of the total population of Java) as most wood processing is done manually. This processing condition has been producing a low yield, low grade of wood products including high proportion of non-durable sapwood, and finally resulting in high cost of production and low level of business development.

Therefore there is a clear need to enhance the capacity of the stake holders including growers, processors and traders. The summary of stakeholder analysis is presented in Table 1.

**Table 1. Summary of stakeholder analysis**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Problem</th>
<th>Interest in the project</th>
<th>Linkage/influences</th>
<th>Potential participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Forestry GMU</td>
<td>Lack of applied technology for innovative processing technology for small diameter teaklogs</td>
<td>Develop innovative processing technology for small diameter teaklogs</td>
<td>Executing agency</td>
<td>Contribute (in-kind) budget, research scientist and other facilities</td>
</tr>
<tr>
<td>Forestry Research and Development Agency/FORDA</td>
<td>Lack of applied technology for innovative processing technology for small diameter teaklogs</td>
<td>Develop innovative processing technology for small diameter teaklogs</td>
<td>Collaborating agency</td>
<td>Contribute (in-kind) budget, research scientist and other facilities</td>
</tr>
<tr>
<td>Local Government</td>
<td>Low productivity and poor quality of community-teak plantations, low utilization of small-diameter teaklogs, low tax and revenue for government</td>
<td>Increase productivity and quality of community teak plantation, as well as increase utilization of small-diameter teaklogs, increase tax and revenue for government</td>
<td>Supervision in teak growing and wood industry</td>
<td>Provide advice and support in the implementation of activities</td>
</tr>
<tr>
<td>Teak growers</td>
<td>Low productivity and poor quality of community-teak plantations</td>
<td>Increase productivity and quality of community teak plantation</td>
<td>Involved in executing team activities</td>
<td>Participate in training/workshop for improving teak plantation</td>
</tr>
<tr>
<td>Teakwood processors</td>
<td>Low utilization of small-diameter teaklogs</td>
<td>Increase the utilization of small-diameter teaklogs</td>
<td>Involved in executing team activities</td>
<td>Participate in training/workshop for teakwood processing</td>
</tr>
</tbody>
</table>
2.2 Intended situation after Project Completion

Advances made in processing technologies for steam/heat treatment, jointing and glulams in the project will allow the use of smaller and younger trees of community plantations. For instance, in Europe, North America, Japan and Oceania processing machines have been developed to efficiently process and utilize small diameter logs for finger-jointing and glulams that could find application in both structural and non-structural uses such as joinery, furniture, etc. Though the manufacturing cost would be higher, the quality of wood products manufactured from small-diameter trees is generally expected as good or better than that manufactured from the traditional timber resource (Bhat 2000). After making pilot trials, appropriate processing equipments can also be designed and transferred to small-scale processors.

Training and capacity building among the growing communities and processors along with market research is anticipated to yield better results of development of high-value products to capture the market for the relatively low quality timber of community plantations.

2.3 Project Strategy

The present multidisciplinary project, though implemented by the Faculty of Forestry of Gadjah Mada University (GMU), cooperation from other faculties and Civil Engineering Department of the University will be sought so that all activities planned in the project can be effectively performed with wide range of expertise available in the GMU.

The project offers opportunities for assessment of not only the log quality parameters for efficient grading of logs but also envisages the assessment of intrinsic wood properties such as natural durability, stability and mechanical strength of short rotation teak wood. This will also test the hypothesis that the quality of wood products manufactured from small-diameter
trees is generally expected as good as that manufactured from the conventional teak timber resource of long rotations (Bhat 2000).

The project is designed in such a way that the outputs will be beneficial to all stakeholders from growing stage to marketing of the products. The results achieved will be disseminated to teak growers, processors and traders by holding at least three training workshops, besides the frequent local awareness programmes for selection of appropriate and planting material, during the project tenure of 3 years. This will facilitate not only the quick dissemination of research findings and transfer of technology to the relevant stakeholders but also derive the benefits from the interaction among different communities.

2.4 Target beneficiaries

The following are the direct and indirect beneficiaries of the proposed project:

- The community-teak growers in teak growing areas, particularly in Java and Eastern Indonesia through improvement of teak log quality and hence achieving better log prices at both domestic and export markets.
- Local wood industries for readily available supply of high quality teakwood and better processing wood technologies of small-diameter teak logs;
- Local government for the increase in tax revenues and decrease in social tension due to improved employments;
- Local communities in the teak growing areas for the improvement in job opportunities;
- Traders for the availability of quality teak log and new products;
- Local and national consumers for the availability high quality products derived from locally-processed timbers and international consumers for the access to the high value teakwood products;
- Scientists, and students for opening up the opportunity of expanding their knowledge in teakwood quality and processing technologies.

The information derived from the project output will be disseminated through trainings, publications and workshops, particularly to community-teak growers and small teakwood-based processors.

2.5 Technical and scientific aspects

Timber quality of fast grown teak

Given the fact that the main criteria of the market price of teak timber are appearance (color, grain and texture) and durability, it is a challenge to teak growers to achieve the quality in fast-grown short rotation teak to cope with the sort of prices commanded by old-growth teakwood. However, the recent results (Bhat 2000; Bhat et al., 2001; Bhat et al. 2004) offer scope for timber quality improvement in the following lines:

- Fast-growing provenances/clones can be selected for teak management without compromising the strength of the timber.
- Without altering timber strength, plantation managers can also aim to produce logs with higher yields of naturally durable heartwood per individual tree by accelerating tree growth in short rotations with judicious site selection, fertilizer application and genetic improvement programmes.
• The juvenile wood of teak from 21-year-old trees is not necessarily inferior to mature wood in properties such as density and strength and the maturation age is attained around 20-25 years.

• Teak wood from drier sites have better market value with more desired color/grain (wood figure) and more decay resistance than wet sites although log size and sawn wood yield/recovery are greater in later.

Teak wood processing

The mill studies from Thailand report about 51% of sawn wood recovery from 20-year-old teak trees with a diameter range of 9-20.5 cm (Sangkal 1995). Sawing trials on small timber for furniture stock and strips gave satisfactory results in plantation grown teak of Ivory Coast (Durand 1983). The study (Tan et al. 1992) on gluing with phenol formaldehyde adhesive for both interior and exterior structural glue-lamination showed that relatively young wood from plantations was acceptable for interior structural applications according to the Malaysian Grading Rules. Pramono et al. (2007) stated that first thinnings (age 10 years plantation from the Forest State Enterprise, Perhutani’s plantation) were successfully glued with urea formaldehyde to produce glulam focusing on shear failure. The same study using the same materials concluded that this 10 year teak trees thinning glulam passed the practice or actual dimension bending test (Bahri et al. 2007).

Another study on gluing (Pramono 2007) using thinning logs from 10 year-old plantation of Perhutani showed that the young wood was successfully glued with urea formaldehyde to produce glulam focusing on shear failure. Further the glulam was also passed the actual dimension bending test (Bahri 2007).

The tests on physical and mechanical properties of particle boards also showed satisfactory results. The feasibility of fabricating technically sound cement-bonded particle board from 10-year-old juvenile teak wood grown in Nigeria has been shown by Badejo (1989). Modified equipments have been suggested for production of sawnwood and veneer for many plantation grown teak wood (Bhat, 1999). The plenary paper on processing technology for value-added teak by Ebdon (2003) in the international conference on teak urged that the wood workers need to be educated on the importance of timber drying for the manufacture of superior quality products for export purpose.

The technical consultation of some of the documents/scientific publications cited in ANNEXURE C provided a solid background for developing this project proposal.

2.6 Economic aspects

As the project aims at better marketability of small dimensional timber of community-teak plantations, the results achieved will have direct relevance in improving the economic well being of rural communities which contributes to the sustainable development of many rural districts, particularly in Java and Eastern Indonesia.

2.7 Environmental aspects

The project envisages to develop more environmentally friendly processing methods such as high temperature treatment and jointing techniques. It is also envisaged that more hydrophilic compounds are used to replace the formaldehydes in the adhesive for laminated/composite structures to comply with future environmental regulations.
2.8. **Social aspects**

Community teak plantations are mostly grown in Java and eastern Indonesia characterized with high population density. The teak logs harvested from the community plantation are mostly processed locally. The implementation of the project will create some positive social impact in the project areas and on the target beneficiaries including teak growers, traders and processors. The project will not only generate employment opportunities, but it will likewise improve technical skill of small-sized wood processors.

2.9. **Risks**

The risks involved in the project, if any, are those largely relating to the general acceptance of the technologies by the stakeholders and their effective participation in the implementation of project findings for improving the marketability of low quality timbers of community plantations. The risk associated with middle men or brokers of wood from community teak plantations is expected to be negligible.

3. **Outputs**

3.1 **Specific Objective 1**

- **Output 1.1** Natural durability of small diameter teak log from community plantation investigated.
- **Output 1.2** Color variability of small diameter teak log from community plantation assessed.
- **Output 1.3** Steam treatment technology developed for processing of small dimensional timbers for high quality solid structures with improved color/appearance.
- **Output 1.4** Appropriate jointing techniques evolved for small timbers.
- **Output 1.5** Composite technology developed for glulams from small timber and particle board from waste of small-diameter teakwood processing.

3.2 **Specific Objective 2**

- **Output 2.1** The major stakeholders and target beneficiaries of teak wood chain of community plantations identified.
- **Output 2.2** Capacity/know how enhanced among the growers, processors and traders for better productivity, processing and marketing of the products of community plantations.

4. **Activities**

4.1 **Output 1.1**

- **Activity 1.1.1** Collect and prepare teak wood samples from various sites of community plantations for durability test
- **Activity 1.1.2** Laboratory investigation of natural durability of teakwood from community plantations
4.2 Output 1.2
   Activity 1.2.1 Collect and prepare teak wood samples from various sites of community plantations for color variability assessment
   Activity 1.2.2 Laboratory investigation of color variability of teakwood from community plantations

4.3 Output 1.3
   Activity 1.3.1 Exploring the methods/techniques available in other Asian countries for color/appearance improvement of small timbers.
   Activity 1.3.2 Design the steam treatment equipment and innovative methods for processing as appropriate to rural conditions.
   Activity 1.3.3 Testing the developed techniques for the small timber coming from different districts.
   Activity 1.3.4 Testing the durability, color homogeneity and dimensional stability of steam-treated teakwood.

4.4 Output 1.4
   Activity 1.4.1 Testing and assessment of different jointing techniques appropriate for rural processing.
   Activity 1.4.2 To develop new products including the steam-treated structures from the most appropriate jointing techniques.

4.5 Output 1.5
   Activity 1.5.1 Develop glulams from steam treated and jointed structures.
   Activity 1.5.2 Test the glulams for various engineering properties to assess their suitability for structural uses.
   Activity 1.5.3 Develop and test particle board from waste of teakwood processing

4.6 Output 2.1
   Activity 2.1.1 Short-term/exploratory socio-economics and market studies of teakwood from community plantations.
   Activity 2.1.2 Assessment of training needs of the stakeholders.

4.7 Output 2.2
   Activity 2.2.1 Organize awareness programmes for growers in adopting appropriate silvicultural and genetic aspects in raising plantations.
   Activity 2.2.2 Hold training/workshops for teak growers and processors in adopting appropriate planting techniques and timber processing techniques for better marketability of their products.
5. Logical Framework Worksheets

<table>
<thead>
<tr>
<th>Project Elements</th>
<th>Objectively verifiable indicators</th>
<th>Means of verification</th>
<th>Important assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Objective</td>
<td>Wood utilization of small-diameter teaklogs from community plantations increased (at least 15% in recovery and 20% in product quality)</td>
<td>Trade statistics, Industry reports</td>
<td>Acceptance of relevant processing technologies with market intelligence</td>
</tr>
<tr>
<td>Specific Objectives</td>
<td>Stem treatment, jointing and composite technologies adopted</td>
<td>Project report</td>
<td>Acceptance of the technologies by small-scale processors</td>
</tr>
<tr>
<td>1. To develop appropriate/innovative technology for processing the small dimensional timbers of community plantations</td>
<td>Workshops/trainings Conducted</td>
<td>Workshop proceedings, list of participants</td>
<td>Implementation as per the project schedules</td>
</tr>
<tr>
<td>2. To organize technology transfer programs among the stakeholders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outputs</td>
<td>Natural durability of small diameter teak log from community plantation assessed.</td>
<td>Natural durability of small-diameter teaklogs tested</td>
<td>Technical report, Project progress reports</td>
</tr>
<tr>
<td>Output 1.1</td>
<td>Color variability of small diameter teak log from community plantation assessed.</td>
<td>Color variability of small-diameter teaklog assessed</td>
<td>Technical report, Project progress report</td>
</tr>
<tr>
<td>Output 1.2</td>
<td>Steam treatment technology developed for processing of small dimensional timbers for high quality solid structures with improved color/appearance</td>
<td>Technology of steam treatment developed and available</td>
<td>Technical report, Project progress report</td>
</tr>
<tr>
<td>Output 1.3</td>
<td>Appropriate jointing techniques evolved for small timbers</td>
<td>Jointing techniques developed and available</td>
<td>Technical report, Project progress report</td>
</tr>
<tr>
<td>Output 1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output 1.5 Composite technology developed for glulams from small timber and particle board from waste of small-diameter teakwood processing</td>
<td>Composite technology developed</td>
<td>Technical report, Project report</td>
<td>Acceptance by processors</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Output 2.1 Identified the major stakeholders and target beneficiaries of teak wood chain of community plantations</td>
<td>Stakeholders and target beneficiaries identified</td>
<td>Project report</td>
<td>Availability of data on socioeconomic conditions</td>
</tr>
<tr>
<td>Output 2.2 Capacity/know-how enhanced among teak growers, processor and trader for better productivity, processing and marketing of the products of community-teak plantations</td>
<td>Teak growers, processors an traders from different places trained</td>
<td>Training/Workshop reports, list of participants</td>
<td>Active participation of stakeholders</td>
</tr>
</tbody>
</table>
### 6. Work plan

<table>
<thead>
<tr>
<th>Project Elements</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity 1.1.1 Collect and prepare teak wood samples from various sites of community plantations for durability test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity 1.1.2 Laboratory investigation of natural durability of teakwood from short rotation plantations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity 1.2.1 Collect and prepare teak wood samples from various sites of community plantations for color variability assessment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity 1.2.2 Laboratory investigation of color heterogeneity of teakwood from short rotation plantation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity 1.3.1 Exploring the methods/techniques available in other Asian counties for color/appearance improvement of small timbers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity 1.3.2 Design the steam treatment equipment and innovative methods for processing as appropriate to rural conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity 1.3.3 Testing the developed techniques for the small timber coming from different districts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Elements</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10  11  12</td>
<td>1  2  3  4  5  6  7  8  9  10  11  12</td>
<td>1  2  3  4  5  6  7  8  9  10  11  12</td>
</tr>
<tr>
<td>Activity 1.3.4 Testing the durability, color homogeneity and dimensional stability of steam-treated products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 1.4.1 Testing and assessment of different jointing techniques appropriate for rural processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 1.4.2 To develop new products including the steam-treated structures from the most appropriate jointing techniques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 1.5.1 Develop glulams from steam treated and jointed structures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 1.5.2 Test the glulams for various engineering properties to assess their suitability for structural uses.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 1.5.3 Develop and test particle board of waste from teakwood processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 2.1.1 Short-term/exploratory socio-economics and market studies of teakwood from community plantations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 2.1.2 Assessment of training needs of the stakeholders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Elements</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10  11  12</td>
<td>1  2  3  4  5  6  7  8  9  10  11  12</td>
<td>1  2  3  4  5  6  7  8  9  10  11  12</td>
</tr>
<tr>
<td>Activity 2.2.1. Organize awareness programmes for growers in adopting appropriate silvicultural and genetic aspects in raising plantations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 2.2.2 Hold training/workshops for teak growers and processors in adopting planting and timber processing techniques for better marketability of their products</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 7. Budget

### 7.1 Overall Project Budget by Activity

<table>
<thead>
<tr>
<th>Outputs / Activities + Non-Activity Based Expenses</th>
<th>ITTO Budget Components (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ITTO</td>
</tr>
<tr>
<td>Output 1.1 Natural durability of small diameter teak log from short rotation community plantation assessed.</td>
<td></td>
</tr>
<tr>
<td>Activity 1.1.1 Collect and prepare teak wood samples from various sites of short rotation-community plantations</td>
<td>5,400</td>
</tr>
<tr>
<td>Activity 1.1.2 Laboratory investigation of natural durability of teakwood from short rotation-community plantation</td>
<td>8,300</td>
</tr>
<tr>
<td>Output 1.2 Color variability of small diameter teak log from short rotation community plantation assessed.</td>
<td></td>
</tr>
<tr>
<td>Activity 1.2.1 Collect and prepare teak wood samples from various sites of short rotation-community plantations</td>
<td>5,500</td>
</tr>
<tr>
<td>Activity 1.2.2 Laboratory investigation of color variability of teakwood from short rotation-community plantation</td>
<td>9,300</td>
</tr>
<tr>
<td>Output 1.3 Steam treatment technology developed for processing of small dimensional timbers for high quality solid structures with improved colour/ appearance</td>
<td></td>
</tr>
<tr>
<td>Activity 1.3.1 Exploring the methods/techniques available in other Asian countries for colour/appearance improvement of small timbers</td>
<td>8,300</td>
</tr>
<tr>
<td>Activity 1.3.2 Design the steam treatment equipment and innovative methods for processing as appropriate to rural conditions</td>
<td>7,300</td>
</tr>
<tr>
<td>Activity 1.3.4 Testing the developed techniques for the small timber coming from different districts.</td>
<td>4,100</td>
</tr>
<tr>
<td>Activity 2.1.4</td>
<td>Testing the durability color homogeneity and dimensional stability steam-treated teakwood</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Output 1.4</td>
<td>Appropriate jointing techniques evolved for small timbers</td>
</tr>
<tr>
<td>Activity 1.4.1</td>
<td>Testing and assessment of different jointing techniques appropriate for rural processing</td>
</tr>
<tr>
<td>Activity 1.4.2</td>
<td>To develop new products including the steam-treated structures from the most appropriate jointing techniques</td>
</tr>
<tr>
<td>Output 1.5</td>
<td>Composite technology developed for glulams from small timber and particle board from waste of small-diameter teakwood processing</td>
</tr>
<tr>
<td>Activity 1.5.1</td>
<td>Develop glulams from steam treated and jointed structures</td>
</tr>
<tr>
<td>Activity 1.5.2</td>
<td>Test the glulams for various engineering properties to assess their suitability for structural uses.</td>
</tr>
<tr>
<td>Activity 1.5.3</td>
<td>Develop and test particle board of waste from teakwood processing</td>
</tr>
<tr>
<td>Output 2.1</td>
<td>Identified the major stakeholders and target beneficiaries of teak wood chain of community plantations</td>
</tr>
<tr>
<td>Activity 2.1.1</td>
<td>Short-term/exploratory socio-economics and market studies of community plantations</td>
</tr>
<tr>
<td>Activity 2.1.2</td>
<td>Assessment of training needs of the stakeholders</td>
</tr>
<tr>
<td>Output 2.2</td>
<td>Capacity/know how enhanced among the growers, processors and traders for better productivity, processing and marketing of the products of community plantations</td>
</tr>
<tr>
<td>Activity 2.2.1.1</td>
<td>Organize awareness programmes for growers in adopting appropriate silvicultural and genetic aspects in raising plantations</td>
</tr>
<tr>
<td>Activity 2.2.2.2</td>
<td>Hold training/workshops for teak growers and processors in planting adopting appropriate timber drying methods for better marketability of their products</td>
</tr>
<tr>
<td>Sub total activities</td>
<td>131,800</td>
</tr>
</tbody>
</table>
## Non-Activity Based expenses

<table>
<thead>
<tr>
<th>Description</th>
<th>Jan</th>
<th>Feb</th>
<th>Apr</th>
<th>Jul</th>
<th>Oct</th>
<th>Jan</th>
<th>Feb</th>
<th>Apr</th>
<th>Jul</th>
<th>Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fuel and Utilities</td>
<td>8,000</td>
<td>3,000</td>
<td>8,000</td>
<td>3,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Office supplies</td>
<td>15,000</td>
<td>6,000</td>
<td>15,000</td>
<td>6,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sundry</td>
<td>5,000</td>
<td>1,500</td>
<td>5,000</td>
<td>1,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Auditing</td>
<td>7,500</td>
<td>7,500</td>
<td>7,500</td>
<td>7,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub total non-activities: 0 0 0 0 0 0 0 0 23,000 9,000 12,500 1,500 0 35,500 10,500

Total: 131,800 0 15,000 0 48,000 0 55,000 97,200 49,000 9,000 69,500 34,000 0 368,300 140,200

80. ITTO Monitoring, Evaluation and Administration Cost

81. Monitoring and Review Costs: 9,000 9,000

82. Evaluation Costs: 15,000 15,000

Sub total: 389,300

83. Programme Support Cost (8%): 31,144

90. Refund of Pre-Project Costs: 48,060

ITTO Total: 468,504 140,200
### 7.2 Consolidated Yearly Project Budget

<table>
<thead>
<tr>
<th>Budget Components</th>
<th>Total</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10 Project Personnel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. National Experts (36 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>111. Project Coordinator ($1,000/month)</td>
<td>36,000</td>
<td>0</td>
<td>12,000</td>
<td>0</td>
</tr>
<tr>
<td>112. National Expert in wood processing ($800/month)</td>
<td>28,800</td>
<td>0</td>
<td>9,600</td>
<td>0</td>
</tr>
<tr>
<td>113. National Expert in wood treatment ($750/month)</td>
<td>27,000</td>
<td>0</td>
<td>9,000</td>
<td>0</td>
</tr>
<tr>
<td>12. National Consultants (2 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>121. Structural test consultant ($1000/month)</td>
<td>2,000</td>
<td>0</td>
<td>1,000</td>
<td>0</td>
</tr>
<tr>
<td>122. Marketing consultant ($1000/month)</td>
<td>2,000</td>
<td>0</td>
<td>1,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>13 Technical staff</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>131. Research Assistants ($300/month)</td>
<td>10,800</td>
<td>0</td>
<td>3,600</td>
<td>0</td>
</tr>
<tr>
<td>132. Research Aidc ($200/month)</td>
<td>7,200</td>
<td>0</td>
<td>2,400</td>
<td>0</td>
</tr>
<tr>
<td><strong>14 Other labour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>141. Project Secretary ($250/month)</td>
<td>9,000</td>
<td>0</td>
<td>3,000</td>
<td>0</td>
</tr>
<tr>
<td>142. Project Accountant ($250/month)</td>
<td>9,000</td>
<td>0</td>
<td>3,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>19 Component Total</strong></td>
<td>131,800</td>
<td>0</td>
<td>44,600</td>
<td>0</td>
</tr>
<tr>
<td><strong>20 Sub-Contracts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Sub-contract Structural test</td>
<td>20,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>29. Component Total</td>
<td>20,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>30 Duty Travel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Daily Subsistence Allowance ($50/day)</td>
<td>18,000</td>
<td>0</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>32. International Travel</td>
<td>10,000</td>
<td>0</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>33. Transport Costs</td>
<td>12,000</td>
<td>0</td>
<td>7,000</td>
<td>0</td>
</tr>
<tr>
<td>39. Component Total</td>
<td>48,000</td>
<td>0</td>
<td>16,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>40 Capital Items</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Premises (Laboratories)</td>
<td>5,000</td>
<td>0</td>
<td>5,000</td>
<td>0</td>
</tr>
<tr>
<td>42. Capital Equipment</td>
<td>50,000</td>
<td>0</td>
<td>30,000</td>
<td>0</td>
</tr>
<tr>
<td>43. Office Space</td>
<td>0</td>
<td>54,000</td>
<td>18,000</td>
<td>18,000</td>
</tr>
<tr>
<td>44. Vehicles</td>
<td>0</td>
<td>43,200</td>
<td>14,400</td>
<td>14,400</td>
</tr>
<tr>
<td>59. Component Total</td>
<td>55,000</td>
<td>97,200</td>
<td>35,000</td>
<td>32,400</td>
</tr>
<tr>
<td><strong>50 Consumable Items</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Raw materials</td>
<td>10,000</td>
<td>0</td>
<td>4,000</td>
<td>0</td>
</tr>
<tr>
<td>52. Spares</td>
<td>16,000</td>
<td>0</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>53. Fuel and Utilities</td>
<td>8,000</td>
<td>3,000</td>
<td>3,000</td>
<td>1,000</td>
</tr>
<tr>
<td>54. Office Supplies</td>
<td>15,000</td>
<td>6,000</td>
<td>5,000</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>59 Component Total</strong></td>
<td>55,000</td>
<td>97,200</td>
<td>35,000</td>
<td>32,400</td>
</tr>
<tr>
<td><strong>60 Miscellaneous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Sundry</td>
<td>5,000</td>
<td>1,500</td>
<td>2,000</td>
<td>500</td>
</tr>
<tr>
<td>62. Auditing</td>
<td>7,500</td>
<td>2,500</td>
<td>0</td>
<td>2,500</td>
</tr>
<tr>
<td>61.1 Sundry</td>
<td>5,000</td>
<td>1,500</td>
<td>2,000</td>
<td>500</td>
</tr>
<tr>
<td>62. Auditing</td>
<td>7,500</td>
<td>2,500</td>
<td>0</td>
<td>2,500</td>
</tr>
<tr>
<td>Budget Components</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>10. Project personnel</td>
<td>44,600</td>
<td>44,600</td>
<td>44,600</td>
<td></td>
</tr>
<tr>
<td>20. Subcontract</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>30. Duty travel</td>
<td>16,000</td>
<td>16,000</td>
<td>16,000</td>
<td></td>
</tr>
<tr>
<td>40. Capital items</td>
<td>35,000</td>
<td>20,000</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>50. Consumable items</td>
<td>17,000</td>
<td>17,000</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>60. Miscellaneous</td>
<td>22,000</td>
<td>22,000</td>
<td>32,500</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal 1</strong></td>
<td>141,100</td>
<td>116,600</td>
<td>107,600</td>
<td></td>
</tr>
<tr>
<td>80. Monitoring and Review Costs</td>
<td>9,000</td>
<td>9,000</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td>82. Evaluation Costs</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>83. Programme Support Costs (8% of subtotal 2)</td>
<td>31,144</td>
<td>31,144</td>
<td>31,144</td>
<td></td>
</tr>
<tr>
<td>90. Refund of Pre-Project Costs</td>
<td>48,060</td>
<td>48,060</td>
<td>48,060</td>
<td></td>
</tr>
<tr>
<td><strong>ITTO TOTAL</strong></td>
<td>468,504</td>
<td>468,504</td>
<td>468,504</td>
<td></td>
</tr>
<tr>
<td>Budget Components</td>
<td>Total</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>10. Project personnel</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20. Sub-Contract</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30. Duty travel</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>40. Capital items</td>
<td>97,200</td>
<td>32,400</td>
<td>32,400</td>
<td>32,400</td>
</tr>
<tr>
<td>50. Consumable items</td>
<td>9,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>60. Miscellaneous</td>
<td>34,000</td>
<td>5,500</td>
<td>10,500</td>
<td>18,000</td>
</tr>
<tr>
<td>70. Executing Agency Management Costs (15% of Total of Overall Project Budget by Activity)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EXECUTING AGENCY/HOST GOVT. TOTAL</td>
<td>140,200</td>
<td>40,900</td>
<td>45,900</td>
<td>53,400</td>
</tr>
</tbody>
</table>
PART III. OPERATIONAL ARRANGEMENTS

1. Management structure

The project management will comprise Project Steering Committee (PSC), Project Executing Agency, and Project Coordinator. The PSC will consist of policy makers and scientists appointed by the Ministry of Forestry of the Government of Indonesia (GOI). The duties of the PSC are: (a) to approve program and budgets of the activities within the framework of the project as approved by ITTO; (b) to conduct annual reviews and evaluation of the project implementation; (c) to approve the progress reports before submission to ITTO and GOI. The PSC will be chaired by a high rank official of the Forestry Research and Development Agency (FORDA) Ministry of Forestry GOI.

The Faculty of Forestry Gadjah Mada University will be the Project Executing Agency (PEA). The PEA will be responsible for the implementation of the project and is accountable to ITTO for the quality and timeliness of the outputs, expenses and project implementation procedures. The PEA will appoint an experience a Project Coordinator for the day-to-day project management and also coordinate all activities with the help of national experts, consultant, and supporting staff.
2. Monitoring, Reporting and Evaluation

a) Project Progress Reports

Bi-annual progress reports of the project will be made available to ITTO, twice a year 4 weeks before intended date of monitoring visits and 2 months before the ITTO Council sessions.

The reports will conform to the standard format established in the *ITTO Manual for Project Formulation (1999)*. These reports will contain information on project performance for each activity and if possible, completed outputs.

b) Project Completion Reports

The project completion report will be submitted to ITTO within 3 months of the completion of the project. The Project Executing Agency will undertake this responsibility in compliance with the Project Agreement and *ITTO Manual for Project Monitoring Review and Evaluation (1999)*.

c) Project Technical Reports

Project technical reports will be submitted to ITTO whenever technical results are available or within 3 months of the completion of the project. The reports will be prepared in conformity with the *ITTO Manual for Project Monitoring Review and Evaluation (1999)*.

d) Monitoring, Review and Steering Committee’s Visit

The project will be subjected to monitoring by ITTO representatives according to ITTO’s guidelines. Monitoring visits by ITTO representatives may be fixed by the ITTO in consultation with the Executing Agency. Appropriate time for monitoring visit is February every year, and PSC meeting will be planned to coincide with this visit.

3. Future Operation and Maintenance

To ensure the sustainability of the project after the completion, the following future operation and maintenance activities will be undertaken:

a) Information on better silvicultural practices and wood processing technology developed from the project will be disseminated to the target beneficiaries through publications, media/internet, seminar-workshop and extension. All scientific information including all technical reports will be available at the Executing Agency (Faculty of Forestry GMU) and can be accessed freely by stakeholders. The steaming machine will be available for future research project.

b) The new project findings may be implemented by the national and local agencies for the benefit of stakeholders/NGOs, researchers, students and the Forest Districts Staff.

c) Increasing productivity and quality of community teak plantation due to implementing better silvicultural practices and the use of improved planting material will eventually increase revenues of teak growers, the added values gained by implementing new processing technologies will also increase the revenue of the processor. These conditions will generate further interests for growers and processors to product high quality teaklogs and end-products, which in themselves will ensure the sustainability of the project.
PART IV. THE TROPICAL TIMBER FRAMEWORK

1. Compliance with ITTA 2006 Objectives

The project is consistent with the requirements of ITTA, 2006 objectives (e), (f), (h), (i) and (m) of Article 1

(e) The project envisages the review and assessment of teak timber market in rural districts of Indonesia to promote the expansion and diversification of trade from sustainable sources of community plantation wood chains in improving market access. This is especially relevant for teak timber development through tropical plantations with the existing situation of producer member countries.

(f) To promote and support research and development with a view to improving forest management and efficiency of wood utilization as well as increasing the capacity to conserve and enhance other forest values in timber-producing tropical forests – As stated in earlier sections, the project outputs are anticipated to define more clearly about the needs and support of research and development plans of producer countries in general and those Asia in particular.

(h) To improve market information in order to achieve greater transparency of the timber market, including by collecting, compiling and disseminating trade data on teak timber.

(i) To promote increased and further processing of tropical timber from sustainable sources in producer member countries with a view to promoting their industrialization and thereby increasing their employment opportunities and export earnings. Currently, India is not only a major producer of teak but also is the major importer of teak from African countries. Further processing of timber from sustainable plantation management in producer countries is very crucial for international trade of processed timber and value-added products.

(m) To promote technologies and technology transfer, as well as technical cooperation with a view to achieving the objectives of ITTA, including under preferential terms, as was mutually agreed; This particularly relevant in developing training and technology transfer programmes in the production and processing chains of major teak wood producer countries.

2. Compliance with ITTO Yokohama Action Plan 2002-2006

This project is also in compliance with the two following goals set in the field of Forest Industry in ITTO Yokohama Action Plan:

Goal 1: Promote increased and further processing of tropical timber from sustainable sources:
   a) The project will open up new opportunities for domestic processing of timber from community plantations as sustainable options.

Goal 2: Improve industry’s efficiency of processing and utilization of tropical timber from sustainable sources
   a. The workshop/training programs planned in the project may facilitate the process of dissemination of existing information and recently developed knowledge on increasing utilization efficiency and reduction of losses and waste throughout the production chain.
ANNEX A. PROFILE OF THE EXECUTING AGENCY

1. The Expertise of the Executing Agency

The proposed project will be administered by the Faculty of Forestry Gadjah Mada University (GMU). The Faculty of Forestry GMU has highly qualified academic staffs engaging in a variety of research related to forestry. The Faculty of Forestry is one of the 19 faculties existing within the university.

The fields of expertise of the Faculty of Forestry GMU are among others, plantation silviculture, tree breeding, community and social forestry, wood science and technology as well as forest resources conservation. This has been demonstrated by various projects carried out by the Faculty of Forestry GMU in cooperation with the government, state forest and private companies, as well as international and foreign institutions. The following are the main projects conducted by the Faculty of Forestry GMU in the last three years:

- Tree improvement program on *Pinus merkusii* and teak funded by Perhutani – a state owned forest company;
- Silvicultural research on Dipterocarps funded by Kansai Electric Company of Japan;
- Development of Dipterocarp plantation funded by Ministry of Forestry;
- Development of intensive silviculture of teak plantation funded by Perhutani.
- Research on community forest funded by DFID
- Leveling of playing field for out-grower tree plantations funded by CIFOR and Cirad Foret.
- ACIAR Project on “Realizing genetic gain through water and nutrient management in plantation forest in Indonesia and Australia”

Whereas the project submitted to ITTO and received the funding are as follows:

- ITTO Project PD 106 (Increasing genetic diversity of *Shorea leprosula* and *Lophopetalum multinervium* for breeding and genetic improvement);
- ITTO Project PD 41 (Model development to establish commercial plantation of dipterocarps).
- ITTO Project PPD 121/06 Rev. 2(I) – Development of value-adding processes for short rotation, small-diameter community teak plantation in Java and eastern Indonesia.

2. The Infrastructure of the Implementing Agency

The Faculty of Forestry GMU has four departments, namely the Department of Forest Science, Forest Management, Wood Technology and the Department of Forest Resources Conservation. Each department is equipped with a complete set of buildings and laboratories. The following table presents the existing laboratories in each department:

<table>
<thead>
<tr>
<th>Forest Science</th>
<th>Forest Management</th>
<th>Wood Science and Technology</th>
<th>Forest Resources Conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Silviculture</td>
<td>• Forest biometry</td>
<td>• Wood anatomy</td>
<td>• Forest hydrology</td>
</tr>
<tr>
<td>• Tree Improvement and biotechnology</td>
<td>• Forest planning</td>
<td>• Wood chemistry and fiber</td>
<td>• Wildlife conservation and management</td>
</tr>
<tr>
<td>• Tree Physiology</td>
<td>• Forest economy</td>
<td>• Wood composite</td>
<td>• Urban forestry</td>
</tr>
<tr>
<td>• Dendrology</td>
<td>• Forest harvesting</td>
<td>• Wood drying and preservation</td>
<td>• Forest land conservation</td>
</tr>
<tr>
<td>• Forest Soil</td>
<td>• Forest mapping</td>
<td>• Non-wood product</td>
<td></td>
</tr>
<tr>
<td>• Phytopathology</td>
<td></td>
<td>• Bioenergy</td>
<td></td>
</tr>
<tr>
<td>• Entomology</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Faculty of Forestry GMU manages an educational and experimental forest (Wanagama) covering an area of 600 ha located 35 km from the campus. In addition the faculty manages two training facilities located in Ngawi, East Java (specializing in teak plantation forest management and silviculture) and in Jambi, Sumatra (specializing in tropical forest management and silviculture).

3. Budget

The following is the budget (US$) of the Faculty of Forestry GMU in the last three years:

<table>
<thead>
<tr>
<th>Activities</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>278,800</td>
<td>337,000</td>
<td>357,600</td>
</tr>
<tr>
<td>Research awards/grant</td>
<td>228,000</td>
<td>1,354,788</td>
<td>444,400</td>
</tr>
<tr>
<td>Duty travel</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Capital</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Consumable items</td>
<td>43,000</td>
<td>60,600</td>
<td>59,700</td>
</tr>
</tbody>
</table>

4. Personnel

The Faculty of Forestry GMU has 37 lecturers with Ph.D degree (Department of Forest Science: 17, Department of Forest Management: 9, Department of Wood Technology: 7, Department of Forest Conservation: 4), 31 lecturers with Master degree (Department of Forest Science: 10, Department of Forest Management: 9, Department of Wood Technology: 4, Department of Forest Conservation: 8). Each department has around 10 technicians and supporting staffs.
ANNEX B. CURRICULA VITAE OF THE KEY STAFF

Dr. Eko B. Hardiyanto

1. Name : Eko B. Hardiyanto
2. Date and place of birth : August 12, 1955, Malang, East Java, Indonesia
3. Nationality : Indonesia
4. Field and institution of graduation:
   - Ph.D majoring in Forest Genetics, Michigan State University (1989)
   - M.Sc majoring in Forest Genetics, Michigan State University (1986)
   - Ir. majoring in Silviculture, Gadjah Mada University (1980).
5. Field and institution of post-graduation:
   - Professional Attachment Awards, Australian Tree Seed Centre, CSIRO, Australia (1995).
   - Short Course in Best Linear Unbiased Prediction for Tree Improvement, CSIR, South Africa (1997)
   - ASREML Workshop for Forest Tree Improvement, Tasmania, Australia (2007)
6. Relevant work undertaken in the last 3 years:
   Dr. Eko B. Hardiyanto a senior lecturer in Tree Improvement and Plantation Silviculture at the Faculty of Forestry Gadjah Mada University. He has been involved in various research work related to tree breeding and silviculture, particularly for short-rotation forest plantations. He has been a team leader in the study on site management and productivity of Acacia mangium in South Sumatra (coordinated by CIFOR) since 1999. His current research activities include tree improvement, plantation silviculture and sawlog plantation of Acacia, Gmelina and teak. During the last 2 years he has been doing research in community plantation of Paraserianthes and teak. He was the Project Coordinator of ITTO Project PPD 121/06 Rev.2 (I), a consultant of ITTO Project PD 137/02 Rev.2 (F) and ITTP Project PD 386/05 Rev.1 (F).

Prof. Dr. T.A. Agus Prayitno

1. Name : T. Agus Prayitno
2. Date and place of birth : August 13, 1953, Klaten, Central Java, Indonesia
3. Nationality : Indonesia
4. Field and institution of graduation:
   - Ir. Majoring in Wood Science and Technology, Faculty of Forestry Gadjah Mada University (1978)
5. Relevant work undertaken in the last 3 years:
   Prof. T.A. Agus Prayitno a senior lecturer in the Department of Wood Science and Technology, Faculty of Forestry Gadjah Mada University. He has been involved in a variety of wood science research for the last 18 years. His area of research includes wood adhesive and quality control as well as wood processing. His current research is on bamboo technology for construction in cooperation of Civil Engineering Department GMU. He was a national expert in ITTO Project PPD 121/06 Rev. 2(I).
Dr. Ragil Widyorini

1. Name : Ragil Widyorini
2. Date and place of birth : June 14, 1972, Wonosobo, Central Java, Indonesia
3. Nationality : Indonesia
4. Field and institution of graduation:
   • Ph.D majoring in Wood Science and Technology, Kyoto University (2005)
   • MT majoring in Chemical Processing, Gadjah Mada University (1999)
   • ST. majoring in Chemical Engineering, Gadjah Mada University (1996).

5. Field and institution of post-graduation:
   • Guest research associate, Research Institute for Sustainable Humanosphere (RISH), Kyoto University, Japan (2005/11 - 2007/9).
   • Mission research fellow, Research Institute for Sustainable Humanosphere (RISH), Kyoto University, Japan (2007/10 - 2008/3)

6. Relevant work undertaken in the last 3 years:
   Dr. Ragil Widyorini is a junior lecture in the Department of Wood Science and Technology, Faculty of Forestry Gadjah Mada University. She has been involved in various research works related to development, characterization and manufacture of binderless board made from lignocellulosic materials, including the application of steam treatment. She was also involved in the research group of evaluation of aging and durability wood. Her current research as a mission research fellow at RISH, Kyoto University, is a part of the JSPS Global COE Program (E-04): “In Search of Sustainable Humanosphere in Asia and Africa”; with the topic is evaluation of biomass production of acacia plantation forest in tropical area.
Annex C – Term of Reference

1. Project Coordinator

Responsibilities:
- To manage and administer the administrative and execution of the project activities, the achievement of the objective and dissemination of the project outputs produced.
- To schedule the annual work plan and other plans as required by ITTO in cooperation with the national expert and consultant and technical staff;
- In consultation with ITTO to carry out the recruitment of national consultant and selection of independent auditor to audit project financial documents;
- In coordination with national experts and national consultant to make necessary arrangements to support the implementation of the project, such as testing, developing technology, collecting and analyzing data, carrying out the training/workshop, preparing reports/publications;
- To make necessary arrangement for the release of financial resources from ITTO in accordance with the approved Project Agreement;
- To review and submit progress report, annual report, completion report and technical report to ITTO, the Government of Indonesia.
- To represent the project at meeting, seminar, workshop as required.

Qualifications:
- Having a good track record in coordinating research projects
- Holding Ph.D degree in forestry

2. National expert in jointing, glulam and composite board

Responsibilities:
- Helped by technical staff to collect wood samples from community teak plantations in various regions.
- To develop processing techniques in jointing, glulam and composite wood;
- To provide advice and assistance to the Project Coordinator on the preparation of reports and publication to disseminate project results;
- In coordination with the Project Coordinator to conduct training/workshop on the newly developed processing techniques.

Qualifications:
- Ph.D degree in Wood Technology
- A minimum of ten years experience in conducting research and development on wood processing
3. **National expert in steam treatment techniques**

**Responsibilities:**
- Helped by technical staff to collect wood samples from community teak plantations in various regions.
- To assess color variability and to test durability of the wood sample;
- To carry out steam-treatment technique for improving color appearance;
- To provide advice and assistance to the Project Coordinator on the preparation of reports and publication to disseminate project results;
- In coordination with the Project Coordinator to conduct training/workshop on the newly developed processing techniques.

**Qualifications:**
- Ph.D degree in Wood Technology
- A minimum of three years experience in conducting research and development on wood processing/steam treatment

4. **National consultant in structural test**

**Responsibilities:**
- To provide advice and assistance to the Project Coordinator and technical staff to conduct testing and assessment of the developed jointing, glulam and composite board for structural uses.
- To prepare technical report on the results of structural test.

**Qualifications:**
- Ph.D degree in Civil Engineering
- A minimum of five years experience in conducting research and development on wood structure

5. **National consultant in marketing**

**Responsibilities:**
- To assist the Project Coordinator in identifying the status of teak logs production from community plantations and its product distribution and marketing.
- To collect data on log dimension and quality and its price along with its entire value chain.
- To collect data on the current price of end products of teakwood from community plantation.
- To prepare technical report on the results of marketing survey.

**Qualifications:**
- Ph.D degree in Forest Economics
- A minimum of 5 years experience in marketing research and analysis.
Annex D – Bibliographic Consultations

Bois et Forêts des Tropiques (1999-2000) 263 (1)3-31 (Le teck en France- Teak in France)
3. Le bois de teck 2000 Troisieme partie
5. H. Baillers, P.Y.Durand 2000 Non-destructive techniques for wood quality assessment of plantation grown teak
6. M.Vernay 2000 Le teck en France, pour quoi fair?

FAO 2000, Unasylva (Teak Issue)2002/2 Vol 51: 201:
2. B. Krishnapillay 2000. Silviculture and management of teak plantations
4. G. Maldonado and D. Louppe, 2000 Challenges of teak in Cote d’ Ivoire
5. C.T.S. Nair and O. Souvannavong 2000 Emerging research issues in the management of teak
6. T. Enters 2000 Teak, technology and productivity of teak plantations in Southeast Asia

FORSPA. 1999. Proceedings of Regional seminar on “site, technology and productivity of teak plantations in Southeast Asia, Bangkok

UFRO XXI World Congress, 2000, Kuala Lumpur, Technical sessions IUFRO 5.06.02 (Timber quality from teak plantations)

Kerala Forest Research Institute (KFRI) Research Reports/Publications


**School of Agricultural Sciences, Nagoya University, Japan**


**Kyoto University, Wood Research institute, Kyoto, Japan**


34