Enhancing key elements of the value chains for plantation-grown wood in Lao PDR

**Project number**
FST/2010/012

**Period of report**
1 May 2014 – 30 April 2015

**Date due**
31 May 2015

**Date submitted**
2 June 2015

**Prepared by**
Assoc. Prof. Barbara Ozarska

**Co-authors/contributors/collaborators**
Alf Said (ANU), Ken Boer, Dr Hilary Smith, Stuart Ling, Richard Laity, Stephen Midgley, Adam Redman, Gary Hopewell, Henri Bailleres (DAFF), Dr Benoit Belleville (UoM), Assoc. Prof. Latsamy Boupha and her team (NUoL).

**Approved by**
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1 Progress summary

The project mid-term review was conducted by ACIAR Forestry RPM on 16 September 2014 in Luang Prabang which provided a good mechanism to review the project progress with the project team. The overall finding was that “The project is progressing very well against many of the planned activities, with strong evidence of good collaboration across the team and between partners”.

The project research activities conducted within four objectives are progressing well with significant achievements made which have been documented in reports and conference papers and disseminated at the project workshop and training courses tailored for smallholders and the industry. Some of the research studies are summarised below:

A study on mapping and stratification of plantation teak areas using high resolution remote sensing imagery in a geographical information system is well advanced. The study utilises rapid field survey and remote sensing interpretation techniques to enable detailed mapping of over 2 million hectares. It provides area and stratification for inventory of standing volume and yield forecasting.

A comprehensive study was completed which assessed the legal barriers to smallholder plantation owners and the associated timber value chain by describing, deconstructing and mapping the institutional and regulatory environment for the value chain for smallholder timber plantations and wood processing. Recommendations with respect to improving the efficiency and effectiveness of the regulatory process and for removing barriers to participation were made.

Opportunities for transaction cost mitigation have been investigated, building on earlier stages of the project which have been focussed on describing and contextualising the plantation transaction costs regime in Lao PDR and the issues associated with its application and administration.

A review of voluntary verification and involuntary regulatory compliance systems was undertaken to determine what forms of group certification are feasible and sustainable, and will improve returns to smallholder plantation growers in Lao PDR. The study considered mechanisms which operate internationally and those that operate, or could operate, within Lao PDR. Emphasis was placed on the feasibility of these mechanisms in regards to the value chain for smallholder plantation growers in Lao PDR.

A log grading system for grading plantation round and square logs in Laos was revised and finalised through a series of industry trials and a workshop with Laos PDR government department and standards committee representatives. The grading system has been translated into Lao language and disseminated to industry for comments.

Initial sawing studies have been completed at six companies across Vientiane and Luang Prabang. A specialised ‘jig’ was designed and built at NUoL, and tested at a sawmill, resulting in a 41% decrease in thickness variation, 11% increase in green sawn recovery and an 8% increase in saleable board recovery. It is envisaged that the use of the jig by sawmills in Laos would significantly increase the wood recovery.

Kiln drying trials have been conducted at the Industry Cluster sawmills providing valuable data on drying characteristics of plantation material in Laos. Recommended simple drying improvement has reportedly resulted in a reduction of the drying time by 50%; doubling the productivity of the kiln.

The purchase, installation and commissioning of veneer peeling lathe and ancillary equipment was completed. The equipment will open opportunities for Lao timber industry for utilisation of small dimension plantation timbers by applying new technologies and producing new products for domestic and export markets.
A comprehensive glue testing program was completed at NUoL Wood Technology Laboratory on various adhesives used for high value appearance wood products. The aim of the study was to gain an understanding of the relationship between wood property, wood preparation, and adhesive application factors on the shear strength of glue joints of teak (*Tectona grandis*) and river red gum (*Eucalyptus camaldulensis*). Recommendations for optimal gluing conditions as well as surface preparation parameters and methods have been provided.

Wood recovery studies in manufacturing processes were carried out at the Industry Cluster’s furniture companies which provided data on wood recovery rates, the amount of waste and recommendations for waste reduction and utilisation. The study identified which practices and value-added manufacturing technologies would increase the value recovery of small dimension, inferior quality plantation wood and facilitate early improvements from dry feed stock to marketable products.

A strong focus has been placed on the training activities with an increased number of training courses which were provided to Farmer Group Enterprises, NUoL researchers and students, and the industry members. In addition, nine project researchers from NUoL were trained in Australia on wood processing and furniture manufacturing technologies.

**Acronyms**

ANU | Australian National University  
DAF | Department of Agriculture and Fisheries (from February 2015)  
DAFF | Department of Agriculture, Fisheries and Forestry  
DOF | Department of Forestry  
FLEGT | Forest Law Enforcement, Governance and Trade  
FOF | Faculty of Forestry  
FSC | Forest Stewardship Council  
GoL | Government of Laos  
LFA | Lao Furniture Association  
LFTP | Lao Forest and Trade Platform  
LPTP | Luang Prabang Teak Program  
MAF | Ministry of Agriculture and Forestry  
MoIC | Ministry of Industry and Commerce  
MoNRE | Ministry of Natural Resources and Environment  
NUoL | National University of Laos  
UoM | The University of Melbourne  
VALTIP2 | Researchers involved in the current ACIAR project
## 2 Achievements against project activities and outputs/milestones

### Objective 1: To address inefficiencies in the value chain (harvest to sawmill stages) that limit returns to smallholder growers

<table>
<thead>
<tr>
<th>No</th>
<th>Activity</th>
<th>Outputs/ milestones</th>
<th>Completion date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Characterise smallholder planted tree resource in Luang Prabang region</td>
<td>1. Establish partnership arrangements and negotiate access to remotely-sensed imagery</td>
<td>31-12-12</td>
<td>Completed. Suitable current imagery has been identified through NGD and a request has been made through NUoL for free access as GoL in-kind contribution. A reduced price was negotiated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Develop methodologies and ground-truth for sample of imagery</td>
<td>31-12-13</td>
<td>Completed. A Lao GIS assistant has been recruited and training has commenced May 14, allowing finalisation of project methodologies, including ground-truthing.</td>
</tr>
<tr>
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<td>3. Delineate, map and communicate extent of Luang Prabang teak resource</td>
<td>30-09-14</td>
<td>In Progress. Delayed due to data availability. Data expected to be available mid 2015. Mapping expected to be completed by 30/06/16.</td>
</tr>
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<td>4. Map and communicate age class distribution of resource</td>
<td>30-03-15</td>
<td>In Progress as part of mapping. Extension required to 30/12/15.</td>
</tr>
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<td></td>
<td>5. Establish and communicate protocols for ongoing monitoring and reporting</td>
<td>30-03-16</td>
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</tbody>
</table>
### 1.2 A.
Identify and test how barriers to legal registration of smallholder planted trees can be addressed

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Establish partnership arrangements with responsible agencies and related projects at national and provincial levels</td>
<td>Completed: Early research into the legal framework identified numerous responsible agencies and identification of appropriate counterparts is continuing.</td>
</tr>
<tr>
<td>2.</td>
<td>Publish and communicate a Report outlining current and potential improved processes for legal registration of planted trees</td>
<td>Completed: Comprehensive overview of the legal framework for plantations and timber processing was issued in February and a summary presented at a meeting of the Project Contact Group. A policy brief summarising key findings has been provided in English and Lao.</td>
</tr>
<tr>
<td>3.</td>
<td>Identify acceptable improved processes and trial implementation with growers groups; adapt approach as necessary</td>
<td>In progress but delayed. Four options were identified and testing commenced in January 2015. Further extension requested to 30 June 2015.</td>
</tr>
<tr>
<td>4.</td>
<td>Publish and communicate a Report outlining experience of improved approach(es), and expand scope of implementation through relevant agencies</td>
<td>On schedule to meet extended milestone date 31/03/16.</td>
</tr>
</tbody>
</table>

### 1.2 B.
Identify and test how transaction costs in the sale and delivery of smallholder planted trees can be diminished?

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Map supply chain from forest to processor, and survey transaction and component costs at each stage.</td>
<td>Completed. An initial mapping was issued for discussion in May 2013 and a revised draft issued in late 2013, presenting transaction costs and points of incidence along the value chain.</td>
</tr>
<tr>
<td>6.</td>
<td>Publish and communicate a Report contextualising the issues and summarising results of this study, for discussion with government agencies and businesses comprising the supply chain</td>
<td>Completed. Incorporated in Milestone 3 report. However limited discussion with industry and government restricted to interactions with participants at project meetings and government / industry forum in Oct 13.</td>
</tr>
<tr>
<td>7.</td>
<td>Publish and communicate Report outlining proposals for reducing transaction costs.</td>
<td>Delayed, though now Completed. Draft reports issued progressively in May and Sept 14 including initial thoughts on options for mitigating the impacts of transaction costs. Final milestone 3 report now issued.</td>
</tr>
<tr>
<td>8.</td>
<td>Trial implementation of proposal(s) in conjunction with grower group(s) and other supply chain participants.</td>
<td>Anticipated completion by due date. Early discussion on consultation processes arranged.</td>
</tr>
</tbody>
</table>
### 1.3 Identify and test what forms of (A) grower organisation and (B) group certification are feasible and sustainable, and will improve returns to smallholders; and explore how can they be fostered

#### A.

1. **Establish partnership arrangements with responsible agencies at national, provincial and district levels, and with related projects and CBOs**
   - 31-12-12: *Completed: Partners undertaking the Action Research are National University of Laos (Vientiane), Souphanouvong University (Luang Prabang), and LPTP. Visits made to potential partner companies (e.g. Burapha, Oji Paper).*

2. **Publish and communicate a Report outlining rationale for, and feasible approaches to, development of growers groups; and recommending pathways for development of these groups.**
   - 31-12-13: *Completed. Reports were completed in both English and Lao language. The findings were presented at the “Consultancy Workshop for the future planning of LPTP” on 20th December, 2014 in Vientiane.*

3. **Implement recommended approaches adaptively in trial locations.**
   - 30-09-14: *Completed. Recommended approaches now implemented are: - establishing and training four farmer group enterprises (FGEs) of which one (Kok Ngiu) has invested in processing equipment. Two FGEs (Xieng Lom and Kok Ngiu) are now approved.*

4. **Publish and communicate a Report summarising experiences, and progressively implement successful approaches with more grower communities.**
   - 30-09-15: *Action Research Round 4 report has now been completed, which will contribute to this milestone report. It is requested to delay the publication of this report to 31-03-16, which is at the same time as 1.8: this will allow proposals for reducing transaction costs to be tested with grower group.*

#### B.

5. **Establish partnership arrangements with responsible agencies at national, provincial and district levels, with LFTP and LPTP and any related initiatives/parties, and with NUoL.**
   - 31-12-12: *Completed: Partners actively undertaking the Action Research are NUoL, LFTP, Burapha, Luang Prabang Sawmill Cluster and LPTP. 2 ACIAR funded research assistants were appointed to LPTP.*
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| 6. | Publish and communicate Report identifying options and pathways for cost-effective certification of teak smallholders. | 31-12-13
|   |   | Extended till 31-12-14 |
| 7. | Trial implementation of preferred option(s) with one or more growers groups, in conjunction with LFTP, LPTP, certifiers and any other relevant parties. | 30-09-14 |
| 8. | Publish and communicate Report summarising experiences, and progressively implement successful approaches with more grower communities. | 30-9-15
|   |   | Extended till 31-03-16 |
| 9. | Work with DoF, NUoL, LPTP and other relevant parties to develop and communicate proposed Code of Forest Practice appropriate to smallholder teak | 31-12-14 |

**Completed:** A report was disseminated in Dec 2014. However, a further updated version was issued in March 2015 incorporating results of further stakeholder and agreed activities.

**Being implemented progressively.** LPTP is now implementing preferred options for trialling. SME has been included in the grower groups. Burapha Agroforestry is using LPTP streamlined procedures for their certified group. PEFC is using lessons learnt for their pilot projects in SE Asia.

As flagged at the Sept 14 mid-term meeting, there has been little progress in advancing CoP development by responsible agencies in Laos. *Discussion is proposed at Annual Meeting in 2015 on possible alternative approaches (e.g. LPTP/BAFCO management systems).*
**Objective 2: To increase returns to smallholders and processors through improved efficiencies of the wood processing sector (primary processing)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Outputs/ milestones</th>
<th>Completion date</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 2.1 | Identify and characterise current production practices and processing efficiency in Lao companies | 1. Formation of sawmilling and drying operation clusters.  
2. Detailed analysis of current production practices in Lao companies.  
3. Detailed analysis of current processing efficiencies in Lao companies.  
4. Workshop to present activity outputs. | 30-07-12  
30-01-13  
30-01-13  
30-03-13 | Completed. Ten companies were selected for the Industry Cluster according to the Selection Criteria developed within this project.  
Milestones 2 & 3: Completed. All companies were visited and their production practices & processing efficiencies were assessed and English report written. Lao PDR report completed.  
Completed. Combined workshops for Obj. 2 & Obj. 3 were held in conjunction with the Annual Meeting in October 2013 |
| 2.2 | Improve or implement log grading / segregation activities at the mill prior to processing | 1. “User-friendly” Manual on log grading and segregation rules used in sawmilling applicable to SMEs in Laos.  
2. Recommendation on strategies for improving log grading and segregation to meet optimal performance.  
3. Implementation of grading rules by members of Industry Clusters and possibly other companies. | 30-06-14  
30-06-14  
30-11-14 Extended till 31-12-15 | Literature review and in-mill log grading data gathering completed May 2014, English report completed and submitted with the annual report. Revised final version completed including diagrams and updated criteria (based on testing the rules and ministerial workshop) completed in April 2015. Lao translation completed May 2015.  
A one page rule sheet in Laos language has been developed and sent to industry cluster. NUoL staff has conducted in-mill training and adoption of the testing phase of the grading rules at selected companies. It is expected that willing companies will implement the rules by the end of 2015. |
| 2.3 | Conduct studies to optimise and improve sawing operations and recovery | 1. “User-friendly” Manual on best practice sawing operations used in sawmilling applicable to SMEs in Laos. | Initial 30-06-14 Extended till 28-8-15 |
| | | 2. Documented realisation of sawing operations and recovery improvements and proposed potential hardware modifications. | Initial 30-06-14 Extended till 30-07-15 |
| | | 3. Implementation of sawing operations by members of Industry Clusters and possibly other companies. | Initial 30-11-14 Extended till 28-08-15 |

User Manual delivery date has been revised until sawing studies completed, recommendations implemented and follow up studies completed (similar to activity 2.4). The user manual is reliant on results of this study.

Report detailing preliminary results and recommendations for improvements to techniques and existing equipment written. Data acquired from 6 factories willing to participate has been completed and analysis underway.

NUoL staff has conducted implementation of improved sawing operations at two factories, analysis underway. Activity 3 will be partly used to focus on installation, commissioning and conducting preliminary research trials and training using the veneer lathe installed at NUoL.

| 2.4 | Develop and/or improve drying operations to reduce degrade and costs | 1. Documented advice to cluster companies on how to improve drying best practices. | Initial 30-06-14 Extension required till 30-7-15 |
| | | 2. Documented improvements to drying operations and drying schedules for plantation species to improve dried quality and reduce costs. | Initial 30-11-14 Extension required till 30-9-15 |
| | | 3. Documented advice on cost effective upgrades to current drying equipment. | 30-11-15 |

A detailed assessment of drying operations, kiln conditions, and dried quality of 4 companies willing to participate has been completed. A report for each company (translated into Lao language) will be provided.

Recommended improvements to drying operations will be provided in the initial report. Follow up studies will be conducted at companies willing to improve and improvements reported.

Activities 3 and 4 are on track.
### 2.5 Develop and/or improve product grading rules systems and implement the rules in the Industry Clusters companies.

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<tbody>
<tr>
<td>2.</td>
<td>Documented recommended standardised grading, product and product waste segregation systems.</td>
</tr>
<tr>
<td>3.</td>
<td>Implementation of grading rules by members of Industry Clusters and possibly other companies</td>
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</tbody>
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<tbody>
<tr>
<td>30-06-15 Extension required 30-09-15</td>
<td></td>
</tr>
<tr>
<td>30-11-15</td>
<td></td>
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<tr>
<td>30-03-16</td>
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</table>

Current grading rules have been observed. No company seems to be actively grading dried material for quality, only length. A set of grading rules will be developed applicable to the Laos industry.

A global sawmill industry waste utilisation review will be completed by 30-07-15, and translated into Laos. This will be used to conduct a workshop with industry to discuss ‘best potential’ waste management systems for Laos.

The manual milestone date (1) needs to be changed as it is reliant on the results from the survey study above and should come after the report due 30-11-15. It will coincide with implementation of grading rules via training and testing.
<table>
<thead>
<tr>
<th>2.6</th>
<th>Provide impartial and independent advice and demonstration of appropriate primary processing equipment suited to Lao industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Report on findings for optimal processing equipment and potential product streams gathered from LIGNA exhibition, Germany 2013.</td>
</tr>
</tbody>
</table>
|     | **Initial** 30-10-13  
|     | **Extended till** 30-10-14  |
| 2. | Report on findings for optimal processing equipment and potential product streams gathered from woodworking machinery and furniture manufacturing exhibition, China 2014. |
|     | 30-10-14  |
| 3. | Documented review of successful small log sawmilling and veneering operations in developed countries and their applicability to the Laos industry. |
|     | 30-06-15  |
|     | 30-10-15  |
| 5. | Laos workshop detailing range of recommended processing equipment and layout options. |
|     | 30-10-16  |
|     | 30-12-16  |

**Activities**

**Completed.** Through the activity team’s knowledge of processing small plantation logs in SE Asia and Pacific countries, and by identifying potential product streams from the LIGNA exhibition; veneer processing and easily relocatable sawmills were identified as potential new processing streams relevant to the current Lao PDR wood processing climate. Review on portable sawmilling options available globally including recommendations for Laos completed 30-10-14 and translated into Laos.

Attendance to this exhibition was cancelled under a revised strategy to purchase, install equipment and run peeling trials at NUoL – see new activity 2.7. During lathe purchase in China in September 2014, a visit to the wood processing equipment company Raute, was conducted. Raute are newly established in China and are internationally recognised as a producer of high quality equipment.

Activities 3-6 will be partly used to focus on installation, commissioning and conducting preliminary research trials and training using the veneer lathe installed at NUoL. Selected NUoL staff and industry delegates were trained in veneer processing, sawing drying, adhesion, project management and lean manufacturing techniques at the Salisbury Research Facility in Brisbane, Australia in February 2015.
<table>
<thead>
<tr>
<th>2.7</th>
<th>Introduction of veneer peeling technology to Laos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Procurement of lathe to undertake research at NUoL 30-10-14 Completed 30-2-15</td>
</tr>
<tr>
<td>2.</td>
<td>Install and commission lathe. 30-02-15 Completed 30-05-15</td>
</tr>
<tr>
<td>3.</td>
<td>Perform initial trials and train staff 30-05-15</td>
</tr>
<tr>
<td>4.</td>
<td>Perform trials to investigate the recovery, grade quality and potential utilization of peeled plantation eucalypt and teak. 30-03-16</td>
</tr>
<tr>
<td></td>
<td>BSY company lathe, purchased, delivered and commissioned in May 2015. Veneer processing theory training completed in Brisbane between 16-27 February 2015 and during lathe commissioning at NUoL between 25-29 May 2015. Report in English and Laos will be written. This will act as a precursor for further development of veneer processing and product development for a potential VALTIP 3 project. Remark: part of the allocated time devoted to procure, install and perform relevant peeling trials is taken from other activities in objective 2</td>
</tr>
</tbody>
</table>
Objective 3: To improve the value and quality of wood products for domestic and export markets (secondary processing).

<table>
<thead>
<tr>
<th>3.1</th>
<th>Determine typical current recovery and productivity levels in Laos manufacturing facilities and identify and recommend improved efficiencies in-company and through co-operative cluster scenarios.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Formation of two Manufacturing Clusters.</td>
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<tr>
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<td>30-07-12</td>
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<tr>
<td>2.</td>
<td>Detailed analysis of the current wood recovery rate in production of high value wood products.</td>
</tr>
<tr>
<td></td>
<td>a) Cluster No 1</td>
</tr>
<tr>
<td></td>
<td>b) Cluster No 2</td>
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<td></td>
<td>30-01-13 30-06-13</td>
</tr>
<tr>
<td>3.</td>
<td>Detailed analysis of the current productivity levels in Lao manufacturing facilities.</td>
</tr>
<tr>
<td></td>
<td>a) Cluster No 1</td>
</tr>
<tr>
<td></td>
<td>b) Cluster No 2</td>
</tr>
<tr>
<td></td>
<td>30-01-13 30-06-13</td>
</tr>
<tr>
<td>4.</td>
<td>Recommendations for improving efficiencies in-company and through co-operative cluster scenarios.</td>
</tr>
<tr>
<td></td>
<td>30-07-13</td>
</tr>
<tr>
<td>5.</td>
<td>Workshop to present the activity outputs.</td>
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<td>30-07-13</td>
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<tr>
<td>6.</td>
<td>Yearly review of progress made by the companies on improving production efficiency and recovery rate.</td>
</tr>
<tr>
<td></td>
<td>Completed. Two Manufacturing Clusters were formed: Cluster 1 - four companies involved in the previous project, Cluster 2 – eight “new” companies.</td>
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<tr>
<td></td>
<td>Milestones 2 &amp; 3: Completed. Outputs 2 and 3: All companies were visited and their current recovery and productivity levels were assessed. A report on each company visited was written and discussed with company’s managers. A general summary on the assessment of the Lao furniture companies with recommendations for improvements and changes have been written and distributed to all project partners, relevant Government Departments and industry associations.</td>
</tr>
<tr>
<td></td>
<td>Completed. The results of the companies’ assessment formed the basis for the development of recommendations on the improvements of the industry capabilities. The report was completed jointly by the Lao and Australian team members.</td>
</tr>
<tr>
<td></td>
<td>Completed. The results were presented at the Annual Workshop in October 2013 and Advisory Committee Meeting jointly with the Objective 2 results.</td>
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<tr>
<td></td>
<td>Implementation and assessment visits to the Cluster companies are progressing according to schedule (approximately on 6-monthly basis).</td>
</tr>
<tr>
<td>3.2</td>
<td>Determine the most appropriate practices and equipment for furniture and joinery machining, bonding and finishing:</td>
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<tr>
<td>-----</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.</td>
<td>Laminating and finger jointing technologies.</td>
</tr>
<tr>
<td>2.</td>
<td>Improving quality of wood products through introducing optimal machining, joining and coating methods.</td>
</tr>
<tr>
<td>3.</td>
<td>Investigating various uses of wood waste and off-cuts.</td>
</tr>
<tr>
<td>1.</td>
<td>Laboratory testing of glue-bond strength for plantation species (report).</td>
</tr>
<tr>
<td>2.</td>
<td>Laboratory testing to assess the performance of various types of glues and joints in various conditions (report).</td>
</tr>
<tr>
<td>3.</td>
<td>Guidance on optimal gluing methods and types of adhesives for various products and service conditions for Lao plantation timbers.</td>
</tr>
<tr>
<td>4.</td>
<td>Specification on optimal machining parameters, tools and machining methods.</td>
</tr>
<tr>
<td>5.</td>
<td>Specification on joining methods for various types of components and products to maximise wood recovery and strength of products.</td>
</tr>
<tr>
<td>6.</td>
<td>Specification on most appropriate finishing methods and finishes for various products and service conditions.</td>
</tr>
<tr>
<td>7.</td>
<td>Detailed plan for wood waste reduction and waste utilisation.</td>
</tr>
<tr>
<td>8.</td>
<td>Recommendations for GoL, industry associations and stakeholders on major improvements and investment required to implement value-added manufacturing processes.</td>
</tr>
<tr>
<td>9.</td>
<td>Presentation of the activity outputs to project partners and stakeholders at the workshop.</td>
</tr>
<tr>
<td>10.</td>
<td>Training of Lao researchers and training instructors on the sub-activities 1-7</td>
</tr>
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<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>30-10-13</td>
<td>Completed: Laboratory testing of various types of glues for teak and eucalyptus for combined milestones 1 &amp; 2 has been completed.</td>
</tr>
<tr>
<td>30-07-14</td>
<td>Comprehensive report written with Executive Summary which is being translated into Lao language for distribution to the industry and relevant government departments.</td>
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<tr>
<td>30-04-15</td>
<td>Training for industry will be conducted in August – September 2015.</td>
</tr>
<tr>
<td>30-12-14</td>
<td>Completed: Laboratory testing to assess the performance of various types of glues and joints in various conditions (report).</td>
</tr>
<tr>
<td>31-12-15</td>
<td>The results of the above studies will be used as the basis to develop guidance on gluing and joining methods for Lao industry (Milestone 3 &amp; 5).</td>
</tr>
<tr>
<td>30-12-13</td>
<td>Completed: Report written.</td>
</tr>
<tr>
<td>30-12-14</td>
<td>Completed. One report was written. Joining methods will be also included in the Guidance developed within milestone No 3.</td>
</tr>
<tr>
<td>30-12-13</td>
<td>Completed. Report written.</td>
</tr>
<tr>
<td>30-03-14</td>
<td>Completed. Wood recovery studies in manufacturing processes were carried out in 9 companies which provided data on wood recovery rates, the amount of waste and recommendations for waste reduction and utilisation. Two report written.</td>
</tr>
<tr>
<td>31-12-14</td>
<td>Based on the outcomes of the industry assessment the recommendations have been developed and distributed to stakeholders (see activity 3.1.2 &amp; 3.1.3. Dialogue developed to see possible solutions to the industry improvements.</td>
</tr>
<tr>
<td>30-03-14</td>
<td>Workshop on wood recovery study will be held in the last week of June 2015 and on gluing in July 2015.</td>
</tr>
<tr>
<td>30-06-15</td>
<td>Training on gluing, machining and finishing was provided to Lao researchers and industry members. More training courses will be conducted till the project completion date.</td>
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<td>30-09-15</td>
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</table>
3.3 Improving quality of wood products and product design

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<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>“User-friendly” Manual on quality control methods used in wood processing and manufacturing applicable to SMEs in Laos.</td>
<td>30-06-14 Extended till 30-10-14</td>
</tr>
<tr>
<td>2.</td>
<td>Guidance on quality requirements for various types of wood products for various markets.</td>
<td>30-06-14 Extended till 30-10-14</td>
</tr>
<tr>
<td>3.</td>
<td>Proposal for national testing facilities for assessment of products quality and performance, incorporating testing methods and testing equipment</td>
<td>30-06-14 Extended till 30-10-14</td>
</tr>
<tr>
<td>4.</td>
<td>Recommendation on strategies for improving product design to meet market requirements in the medium and long term.</td>
<td>30-01-15</td>
</tr>
<tr>
<td>5.</td>
<td>Implementation of designs by members of Industry Clusters.</td>
<td>30-12-15</td>
</tr>
<tr>
<td>6.</td>
<td>Development of the Manual on wood manufacturing methods recommended for Lao wood manufacturing industry.</td>
<td>30-12-15 Extension required till 30/03/2015</td>
</tr>
<tr>
<td>7.</td>
<td>Publishing the final Manual which will combine wood processing and wood manufacturing methods recommended for Lao industry.</td>
<td>30-12-15 Extension required till 30/05/2015</td>
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</tbody>
</table>

Completed. Seven simple “check lists” were developed for Obj 3 quality control methods. Check lists for Obj. 2 in progress.

Completed. Report written which compiles international standards and specifications for various materials and final products.

Completed. The proposal is being translated in Lao and will be submitted to Lao MoIC.

Two training courses on furniture design were provided by Fac. of Architecture, NUoL, to researchers and industry members. Design Competition was developed & will be completed in June 2015. Prototypes of the best designs will be made for the industry implementation.

Extension is required in order to include all activities results in the Manual.

As the final Manual will combine manuals of Objectives 2 & 3 more time will be required to complete the final publication.
### Objective 4: To enhance the competitiveness and capacity of wood processing industries.

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Outputs/ milestones</th>
<th>Completion date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Developing an industry-led value-added timber market strategy.</td>
<td>1. Report on market analysis which will comprise market information on selected wood products. 2. Report on market trends including consumption, production and trade of the selected products. 3. Workshop involving stakeholders and Government representatives to brainstorm the findings and gather views on strategic directions. 4. Formation of industry led small groups to develop market strategy. 5. Analysis of Lao market situation and product research. 6. Identification of target markets for Lao timber industry based on the results of “3Cs” analysis. 7. Activity report or book “market strategy for Lao value-added timber industry”. Presentation to the project stakeholders at the workshop.</td>
<td>30-11-13 30-11-13 30-01-14</td>
<td>Milestones 1 &amp; 2: Completed. A comprehensive report has been written and distributed to stakeholders and government representatives. Milestone 3: Completed. Workshop was conducted in Vientiane on 20 May 2014. Milestone 4: Completed. A group led by the Dept. of Industry and Handicraft has been formed in May 2015. Milestone 5: In progress. Invitations have been sent to all committee members to meet and discuss about the development of a marketing strategy.</td>
</tr>
<tr>
<td>4.2</td>
<td>Developing short-term and long-term training programs</td>
<td>1. Assessment of current training programs for smallholder groups and timber industry, and identifying gaps according to the industry strategic directions. 2. Workshop to discuss the findings and possible solutions. 3. Development of training modules and training materials. 4. Workshop with key stakeholders and government to discuss the implementation plan. 5. Implementation of training programs.</td>
<td>31-12-12 30-01-14 30-04-15 Extension required till 30-12-2015 30-06-15 30-06-16</td>
<td>Completed. Results were presented at Annual Workshop in Oct. 2013. Milestone 3: In progress. Two modules for furniture design and one module for wood drying have been developed so far.</td>
</tr>
</tbody>
</table>
4.3 Enhancing educational and research capabilities

1. Assessment of current teaching programs with gaps and needs for changes and improvements identified.
2. Review of current research facilities.
4. Workshop with project partners and stakeholders.

Sub-activities 1-2:
- 30-03-13.
- 30-12-2013 Extended till 31-12-14
- 30-01-2014 Extended till 31-12-14.

Milestones 1 & 2: Completed.
Milestone 3: Completed.
A document has been prepared by the FoF. A Committee was formed to overview the strategy. Workshop will be held in July 2015. Invitations were sent by FOF to stakeholders

Summary Progress to date:

Objective 1: To address inefficiencies in the value chain (harvest to sawmill stages) that limit returns to smallholder growers

Objective 1 encompasses a set of five projects grouped under three Activities. These projects address complex and challenging subjects covering resource mapping, plantation legality, plantation transaction costs, grower organisations and certifications. Although seemingly unrelated subjects, the projects are perhaps more inter-related than first anticipated – to give one example, better resource inventory (mapping) approaches can also lower the cost (transaction costs) and improve the uptake of plantation registration (legality) especially where growers themselves might be involved in the process (grower groups) and this can also link to improved verification and chain of custody processes (certification). A collaborative approach has therefore been developed across the projects and also with related ACIAR projects. Our research partners, particularly the Luang Prabang Teak Program and The Forests Trust have also provided great assistance in surveys and provision of training activities related to these projects.

Overall, the performance of the Objective 1 projects is very good with reports that are of a good quality and well regarded. There has been some minor slippage of project milestones and variation to four forward milestones is requested where delays have been experienced in the provision of necessary data or other inputs or to allow better coordination across projects. It is anticipated that all Objective 1 projects will be completed by the 30 June 2016 completion date for project FST/2010/012.

Major dependencies going forward include the timely provision of digital data to allow completion of the plantation resource mapping over all of Luang Prabang Province (this will need to be kept under close review with further consideration at the November 2015 annual meeting). As discussed in the 2014 annual report the ability to engage with government policy makers will be important in determining the ultimate effectiveness particularly of Activities 1.2A (legality) and 1.2B (transaction costs). A process for engagement with the key government agencies, as well as with industry, will be developed for implementation in conjunction with the November 2015 annual meeting.
Activity 1.1 - Characterise smallholder planted tree resource in Luang Prabang region.

The remaining 30% of the imagery is programmed to be captured by the National Geographic Department and be available by June 2015. Mapping, ground truthing and validation of the plantation teak resource is continuing and is expected to be complete by end September 2015 assuming the final data is available. Auditing, data analysis and report writing are expected to be completed in March 2016 as scheduled.

Approaches for stratifying the teak resource of the basis of age or size class have been developed and are being employed as an integral part of the mapping. Existing field data from plantation registration is being used to assist stratification. Although progress with early milestones was delayed, good progress is now being made.

Clarification as to specific outputs from this objective was determined at the annual review meeting in 2014, being mapped outputs of plantation extent and size class and does not involve extensive on ground inventory or volumation.

At the annual review it was requested that a case study of the mapping of the small area and scattered teak plantings be undertaken at two scales – detailed mapping of two villages and mapping of a larger sample area centred around Luang Prabang. In January 2015 mapping and field work was undertaken at the sample village level to test the efficacy of mapping these areas. Mapping of the larger sample area is still in progress.

Activity 1.2A - Identify and test how barriers to legal registration of smallholder planted trees can be addressed

In the second annual report a number of recommendations were made for the next phase of the legality research and numbers of these have been progressed, however others are outside the scope of the current project term and budget.

1. Convene a joint meeting of MAF, MoIC, MoNRE and MAF to discuss and clarify a range of issues including a) streamlining the plantation registration process, b) reviewing the purpose of, and requirements for, plantation registration; c) identifying scale and risk appropriate measures to regulate smallholders; and d) process clarifying agency responsibilities.

Progress: It has been proposed that a meeting is organised to coincide with the Annual meeting in November to examine these issues and others that have been identified by other project objectives.
2. With MAF, examine basic principles to differentiate smallholder plantations from industrial plantations and native forests. In particular review the concept of treating smallholder plantations as an agricultural crop.

   **Progress:** This will be reported on in the final Report for the Objective

3. Undertake further research into the use and traceability of plantation registration, timber harvesting/log tracking documents that may be used to demonstrate legality.

   **Progress:** This is on hold but may occur with the FLEGT-VPA process as they have indicated an interest in undertaking a case study on log tracking and transport.

4. Develop simple guidance (e.g. posters/diagrams in Lao) on the main ‘regulatory’ steps for farmers.

   **Progress:** This will be a project output.

5. Encourage the use of the Lao Gazette by Government agencies at all levels to keep legal instruments accessible and up-to-date.

   **Progress:** This was not an objective of the project, however the FAO legal compendium project have expressed interest in this.

6. Encourage legality verification programs to differentiate plantation smallholders and their wood from natural and industrial plantation sources.

   **Progress:** This concept will be discussed in the final Objective Report. However this issue has also been raised with FLEGT-VPA team.

Other issues/progress was identified during research undertaken since May 2014 and during field work in January/February 2015 including:

- The relationship between forest policy, farmer livelihoods, plantation type and willingness to register. To help inform this further, data was collected during interviews undertaken by FST/2012/041 however the data are not yet available.

- Small Plantings <0.16ha which may represent as much as 20-30% of the teak resource and how to ensure this is legally ready for the market when these farmers decide to sell or harvest. This will be addressed during 2015 through trialing village level registration with Notification #1374 to see if this is acceptable to PAFO.

- Teak in complex agroforestry (pasom pasan) may not be registered as part of the plantation registered process and is difficult to map but may represent a significant resource.

![Figure 2: Teak in complex agroforestry](image-url)
Activity 1.2B - Identify and test how transaction costs in the sale and delivery of smallholder planted trees can be diminished

Activity over the past year has focussed on identifying opportunities for transaction cost mitigation, building on earlier stages of the project which have been focussed on describing and contextualising the plantation transaction costs regime in Lao PDR and the issues associated with its application and administration.

Key sources were reviewed, in particular Presidential Decree 003, while the literature review was expanded. A key outcome was broadening the definition of transaction costs to also include opportunity costs faced by growers through participation in plantation production activity. Although a draft of the Milestone 3 report was issued for comment in September 2014, ahead of the project milestone, finalisation of the report was delayed while sourcing an English language translation of Decree 003 and also a further round of review of the second draft report.

The final Milestone 3 report identifies over 30 actions, for growers, industry, government and other participants in the plantation sector, grouped under four key activity themes: addressing existing inefficiencies and complexity particularly in the plantation regulatory environment, growers and industry taking full advantage of transaction cost mitigation opportunities available under the Lao PDR law, provision of education and training support and improved regulatory compliance so that laws and regulations are better implemented, and provision of industry facilitation to improve efficiency and moderate costs associated with market access.

Four key themes emerge:

- The need for reduced complexity and improved transparency and administrative efficiency of the policy regime;
- Improved organisational efficiency of growers and industry;
- Improved understanding and application of the policy framework; and
- Provision of appropriate and well targeted support for the plantation sector.

While the key focus of the paper is on small-holder growers, many of the recommendations would be of benefit to the plantation sector as a whole.

Activity 1.3A - Identify and test what forms of grower organisation are feasible and sustainable, and will improve returns to smallholders, and how these can be fostered

Over the past year, the action research team has been implementing its recommended approaches (Milestone 3).

One key recommendation was to establish farmer (or grower) group enterprises (FGE’s) to supplement the grower groups. Starting with the four original LPTP farmer groups of Kokngiu, Ensavanh, Xianglom and Lak10, the action research team has initiated a process which has led to all four villages forming enterprises capable of purchasing teak from farmers and processing it at village level. The key question is now whether these FGE’s are improving returns to smallholders? The answer is that it is still too early to say, since firstly there has only been a small amount of wood sold, and secondly, ordinary group members are still waiting to see if the FGE’s can prove successful before they commit their own funds as shareholders.

The mid-term review of VALTIP2 project noted two points of relevance to activity 1.3A, being:

1. Activities 1.2.4, 1.2.8 and 1.3.8 are all delayed, leaving limited time to test and adapt the strategies with grower groups.
The action research team will support Activity 1.2.8 (Trial implementation of proposal(s) to reduce transaction costs in conjunction with grower group(s) and other supply chain participants) through another round of action research, to be held towards the end of 2015. This will necessitate a delay in the publication of the 1.3A final report (Milestone 4) from 30/9/15 to 30/3/16, which is the same deadline as 1.2.8.

2. There needs to be ongoing collaboration with the project team from FST/2012/041, particularly in relation to work on grower groups.

The action research team has now collected data from farmers on their contribution to the formation of sustainable farmer groups based on several indicators, and these will now be correlated with the socio-economic data collected by FST/2012/041 on transition pathways to determine the relationship between socio-economic status (family and village level) and the formation of sustainable farmer groups.

Figure 3: Representatives of the Luang Prabang Farmer Group Enterprises exchange experience with Vientiane furniture manufacturers in January 2015

Activity 1.3B - Identify and test what forms of group certification are feasible and sustainable, and will improve returns to smallholders, and how these can be fostered

Over the past year, through the finalisation of the certification report there has been multiple verification initiatives identified, in part driven by the changing market requirements, whereby with the current teak wood supply FSC was not in demand. This meant that the approach for group certification could include both 1) producer-based initiatives such as FLEGT legality verification and 3rd party non-accredited sustainability certification and 2) buyer-based mechanisms such as risk assessment and due diligence.

ACIAR supported research officers have now the capacity to implement and enhance the LPTP group certification approach. Although both LPTP and Burapha Sawmill maintain FSC certification, they are both now trialling legality and non-accredited 3rd party approach to group certification in case markets and supply do not require FSC.

ACIAR research findings have extended beyond Laos. ACIAR and LPTP hosted the project manager from Hue University of Vietnam responsible for a PEFC Group Certification Pilot project and Team Leader of Natural Resources Development Foundation of the Solomon Islands who have a FSC community group. Also, the ACIAR team with PEFC South East Asia has been active in sharing the findings with Thai, Indian,
Philippines and Vietnamese stakeholders embarking on group certification of smallholders.

Figure 4. Richard Laity (Middle Left), Stuart Ling (Middle Right), Aidan Flanagan (Front Right) and Burapha Staff during a field visit of Burapha Agroforestry in Hin Huep Vietiane Province. Lessons learnt from enterprise development and group certification have been shared with the sector.

Objective 2: To increase returns to smallholders and processors through improved efficiencies of the wood processing sector (primary processing)

A report describing and analysing the Industry Cluster companies’ capacities was finalised, translated into Lao language and sent to participating companies for comments.

A log grading system for grading plantation round and square logs in Laos PDR was revised and finalised in April 2015 through a series of industry trials and a workshop with Laos PDR government department and standards committee representatives. The grading system has been translated into Lao language and disseminated to industry for comments.

Initial sawing studies have been completed at six companies across Vientiane and Luang Prabang provinces. A specialised ‘jig’ was designed and built at NUoL, and tested at Phouthone sawmill (Luang Prabang), resulting in a 41% improvement in thickness variation, 11% increase in green sawn recovery and an 8% increase in saleable board recovery. The jig will be tested at other sawmill(s) within the cluster and its use encouraged. A report on initial trials will be prepared by the end of July 2015.
Figure 5: Mr. Phouloung Chounlamounty, VALTIP2 researcher, proudly shows the sawing jig he made.

Figure 6: Explaining the use of the sawing jig to Phouthone management and saw operators (left), and Phouthone band saw operators using the sawing jig (right)

Initial kiln drying trials have been completed at four sawmills providing valuable data on drying characteristics of plantation material in Laos. Recommended drying improvements (inserting air baffles) in a kiln at the Burapha company, has reportedly resulted in a reduction of the drying time by 50%; doubling the productivity of this kiln. Documented advice to companies to improve their drying operations will be completed by 30 July 2015.
Observation of the Industry Cluster sawmills indicates that dried product grading systems are not currently being used. A draft best practice grading system for dried product grading, applicable to SMEs in Laos will be prepared by 30 September 2015.

A draft global sawmill industry waste utilisation review has been produced and will be completed by 30 July 2015.

The purchase, installation and commissioning of veneer peeling lathe and ancillary equipment was completed at the end of May 2015. This is a new activity added to Objective 2. As a consequence some of the time allocated to other activities in objective 2.6 will be used for this purpose. For instance, a visit to a wood machinery exhibition in China was postponed and was used for visiting lathe manufacturer BSY in China with the intent to purchase a lathe and ancillary equipment to be installed at NUoL. The purchase has now been finalised.

A two-day workshop on wood drying fundamentals, technology, processes, quality assurance and best practice was held on 7-8 May 2015 provided by Adam Redman. There were 42 attendees including: 12 companies’ personnel (from the Industry Cluster), 4 Luang Prabang Teak Program (LPTP) personnel, 11 NUoL staff members, and 15 NUoL students. Professor CAC from CAXE Engineering, HCM Vietnam was invited to the workshop as a special guest to present on solar drying solutions relevant to the Laos industry and budget. Two Laos cluster companies have since contacted the CAXE company to provide solar kiln quotations.

Objective 3: To improve the value and quality of wood products for domestic and export markets (secondary processing).

A comprehensive glue testing program was conducted at NUoL Wood Technology Laboratory on various adhesives used for high value appearance wood products. The aim of the study was to gain an understanding of the relationship between wood property, wood preparation, and adhesive application factors on the shear strength of glue joints of teak (*Tectona grandis*) and river red gum (*Eucalyptus camaldulensis*). The shear strength in compression loading of joints made from both species was assessed using four types of non-structural adhesives used in high value appearance wood products used in indoor applications: cross-linking polyvinyl acetate emulsion; polyvinyl acetate emulsion; polyurethane; and epoxy. The prepared joints were then submitted to four different exposure conditions before being tested in accordance with an international standard. Other factors such as wood properties, timber preparation and adhesive application were
also considered. The results and recommendations for optimal gluing conditions as well as surface preparation parameters and methods have been documented in a research report. A conference paper was also written which will be presented at International Scientific Conference on Hardwood Processing in Quebec City, in September 2015. A workshop on gluing and joining methods for workers and factory managers has been scheduled for July 2015.

Figure 8: Glue application on wood specimens and samples preparation

At present, wood recovery and productivity in Lao wood manufacturing companies are low and a substantial amount of waste is generated. Therefore, an important activity within Objective 3 has been focused on developing wood waste reduction and waste utilisation program to prevent or minimize the production of residues.

A study was conducted at nine Industry Cluster companies with the aim to determine how much wood is recovered, by assessing each manufacturing step to be able to rank priorities and identify the elements that require immediate intervention as part of a continuous optimisation cycle. Prior to the company visits, full day training on wood recovery methodology was provided to FoF researchers. Following the training, two manufacturing companies (i.e. Kongsa Furniture and Lao Furniture Company) have been assessed by the University of Melbourne and FoF researchers to demonstrate to the researchers how the recovery study assessment should be conducted. As the result, the researchers were able to conduct the assessment on their own for the remaining companies. At the end of the study, data was analysed and individual recovery rate determined. An action plan containing recommendations will be provided to each company at the end of June 2015. Some of the findings of the study have been included in the Wood waste and wood utilisation report. Two personalised reports for both Kongsa Furniture and Lao Furniture Company were written. A scientific paper on the study is in progress. In addition, a report was written which provides information on the various uses of wood waste and off-cuts for the Lao wood processing and manufacturing industry. After implementation of the recommendations, the recovery will be assessed again and compared with the previous results to measure if any improvements have been made.

Executive summaries for the above reports are being translated into Lao language and will be distributed to the industry.
Within the Activity 3.3.1 on improving quality of wood products, simple “user friendly” quality control procedures for various stages of wood manufacturing were developed. In total seven quality control “check lists” were developed for: wood gluing, finishing, machining (for operators and quality controllers) and OHS machining (for machine operators and supervisors). The check lists have been translated by NUoL researchers into Lao language for distribution to the industry.

The review of international standards and specifications related to furniture and furniture production at SMEs has been completed and the results presented in a report. The aim of the report was to collate international standards, methods and specifications related to furniture production methods, quality control and requirements for furniture materials, components and final products. The data and information will help the furniture companies in Laos to understand what quality requirements need to be met for various international markets.

A proposal to The Ministry of Industry and Commerce was written with recommendations to establish The Furniture Testing Laboratory in Laos. The laboratory would help companies to assess the quality of their products and understand what improvements need to be made to meet international quality criteria and requirements for various products.

A Furniture Design Competition has been initiated with the aim to identify good designers and to link them with furniture companies. A detailed brief has been developed which describes the conditions of the competition. The competition includes two categories of designers: professional designers and students. The assessment of the designs will be done in June 2015. Attractive awards for the winners in each category will include one week training course in furniture design in Melbourne, Australia. An application for additional funding was submitted to The Crawford Fund, and was successful, to support the training course in furniture design for the winners of the Design Competition in Laos and Vietnam (within ACIAR project FST/2008/039).

Two training courses on furniture design were provided to researchers and industry members by the Faculty of Architecture, NUoL

Objective 4: To enhance the competitiveness and capacity of wood processing industries.

4.1 Developing an industry-led value added timber industry

On October 27th, 2014, a letter has been sent by Tony Bartlett, ACIAR Forestry Research Program Manager, to Mr Thongdam Khounoudom, director of Products Standards Division at the Department of Industry and Handicraft, Ministry of Industry and Commerce,
regarding the leadership of the marketing strategy development activity. Dr Latsamy Boupha and Dr Kaisone Phensopha met with Mr Khounoudom and Mr Manohak, DG of Wood Industry Department, in March 2015. The objective of the meeting was to ensure a mutual understanding regarding the work on market strategy that needs to be done and discuss the action plan. It was agreed that a formal committee should be appointed by the Minister of MoIC to develop a timber market strategy. The department is now sending letters to concerned agencies to nominate their representatives for the committee and organise the first meeting. Agencies involved are: the Department of Industry and Handicraft; the Department of Import and Export; the Department of Domestic Trade; the Lao Wood Industry Association; the Lao Furniture Association; and the Faculty of Forestry. The committee members have been approved in May, 2015, and the meeting will be held in June or July 2015.

4.2: Developing short-term and long-term training programs

So far three training modules have been developed. The 1st furniture training module was developed by experts from the Faculty of Architecture and Faculty of Forestry, NUoL. The module aims to introduce wood furniture designers to technical drawing techniques and to the importance of knowledge of wood properties. The 2nd module was developed to provide basic knowledge on furniture design process and introduce trainees to designing steps and computer tools (i.e. Computer Assistance for Designing and Computer Assistance for Manufacturing). The second module includes theory and practical laboratories. A wood drying module was also developed by a team composed of Australian, Lao, and Vietnamese experts. The objective of this 3rd module is to develop kiln drying operator skill for workers from the Lao wood processing industry and students from the FoF. The module includes theory on most common types of kiln, wood drying fundamentals, wood drying process, grading rules, and best drying practices. A schedule of future training courses for Objectives 2 and 3 was proposed in January 2015 by the FoF team:

1. Wood properties: to provide the Lao wood processing and manufacturing industry with knowledge on wood shrinkage, density, and mechanical properties. Trainer: Adam Redman. Proposed date: October 2015.
2. Gluing: the following topics will be included in the training program: wood preparation, adhesive preparation, gluing conditions and specific characteristics of adhesives produced by Henkel International (the company agreed to provide the training). Training was originally planned for January 2015 but has been postponed by Henkel for August or September 2015.
4. Furniture design No 2 – Completed.
5. Furniture design No 3 – Early 2016.
6. Sawing & Wood recovery in sawmilling: training to be conducted by objective 2 members in August 2015.
7. Wood recovery in manufacturing; a two day training explaining the concepts behind wood recovery and the results from the wood recovery activity in addition to a practical demonstration. Training will be provided by Objective 3 members in June 2015.
8. Veneering: training to be organized once the equipment at NUoL is operational.
9. Finishing: program and date to be determined by Objective 3 members.
10. Product costing: program and date to be determined by VALTIP2 team.
11. Marketing: program and date to be determined by VALTIP2 team.
4.3: Enhancing educational and research capabilities

A team led by Assoc. Prof. Latsamy Boupha developed a strategy for the enhancement of teaching and research capabilities. The major components of the strategy include:

- Human Resource Development: Strengthening human resources capacity by supporting short, medium and long-term trainings of trainers in both national and regional centers; Supporting study tours and exchanging teaching and learning programs between national and regional universities.

- Wood Technology Laboratory Development: Improvement of the existing wood technology laboratory; Development of wood processing and furniture producing laboratory workshops; Development of wood product finishing and painting laboratories.

- Wood Industry Research Development studies: Wood properties, Wood processing and furniture producing; Wood preservation; Wood processing recovery; Wood furniture recovery; Wood identification.

- Wood Industry Teaching Material and Manual Development: Monitoring for the existing wood industry curriculum for improvement; Cooperating with the Pakpasak Technical College on the development for Diploma, Bachelor and Master curriculums based on wood industry and technology for teaching and learning.

- Network Building: Cooperate with both private and national government organizations based on wood factories processing sector by exchanging lesson learned, seminars, lectures, information and marketing; Build connection with regional university and wood industry factories by exchange lesson learned experiences and study tours for teaching learning.
3 Impacts

3.1 Scientific impacts

A study on mapping and stratification of plantation teak areas using high resolution remote sensing imagery in a geographical information system is well advanced. Rapid field survey and remote sensing interpretation techniques have been utilised to enable detailed mapping over 2 million hectares. The study provides valuable data on area and stratification for inventory of standing volume and yield forecasting.

A comprehensive study was completed which assessed the legal barriers to smallholder plantation owners and the associated timber value chain by describing, deconstructing and mapping the institutional and regulatory environment for the value chain for smallholder timber plantations and wood processing. Recommendations with respect to improving the efficiency and effectiveness of the regulatory process and for removing barriers to participation were made. The research found that there is a need to better understand the relationships between policy and incentives across a range of issues such as poverty reduction, land allocation and reducing deforestation and the resulting livelihood strategies of smallholder plantation growers that may influence their decisions about whether to register their plantations and when to harvest timber. The study examined the nature and evolution of international and trans-national timber legality policies and their impacts on both the legal framework in Lao PDR and the consequences for smallholder plantation owners and the timber value chain. In particular the implications of regimes for timber legality assurance were examined. For smallholder plantation growers, legal barriers to registering plantations have been identified as a factor which limits their participation in, and the benefits they could derive from, the plantation timber value chain.

The science impacts of the transaction costs project arise primarily in the social sciences, by assisting in understanding the prevalence, motivations and behaviours that underpin certain kinds of informal costs that appear to be widely associated with the plantation value chain in Lao PDR. Although this question is not central to the terms of reference or the project, we have nevertheless made a number of important observations that will assist further research, particularly where the interest is in the factors that give rise to and perpetuate corrupt practices. Although the issue is has been the subject previous policy dialogue, the project will nevertheless contribute to the body of research by providing a more recent perspective on the question and perspective that is particular to the plantation forestry sector. The paper includes policy suggestions for consideration by the GoL in respect of this issue, amongst over thirty other policy suggestions for ameliorating the adverse impacts of undue transaction costs on value chain participants.

Through their participation in the action research process, partners from the NuOL and Souphanouvong Universities have developed research skills that will be useful in their future work. The outcomes of the action research have been incorporated into the community forestry curriculum at NUoL. Further, it is expected that the linking of family socio-economic data (Teak Agroforestry Project) and data on the participation in group activities (VALTIP2), to be finalised this year, will boost understanding by researchers and field practitioners of the motivating factors that enable teak farmers to participate in group activities.

A value-chain, risk based, methodology for reviewing, comparing and analysing voluntary certification and involuntary regulatory compliance systems was undertaken to determine what verifiable systems are feasible for private, smallholder plantations in Lao PDR. The approach involved defining ‘feasibility’ as providing a net benefit when assessed against three broad criteria (Appropriateness; Practicality; and Cost Effectiveness) and 17
associated elements which incorporate international and domestic market and regulatory influences. It was concluded that, in general, (1) current systems apply a similar risk profile to both private, smallholder plantation growers and large, industrial growers, with little differentiation in the level of risk associated with production; (2) the cost of verification requires at least 5,000 ha as a minimal area to reduce costs to a reasonable levels; and (3) verification or compliance requirements are too complex and costly when adopted by smaller plantation owners, especially within less developed economies where existing management and regulatory structures are evolving. It was concluded that less complex and more practical processes should be trialed with an emphasis on legality and 3rd party verification that incorporate a minimal test of 'net benefit'. Seven options were identified as potentially feasible and could be undertaken to test the appropriateness, practicality, and cost effectiveness of established systems.

As a result of the development and testing of round and square log grading systems combined with in-mill trials, the VALTIP2 team has developed a good understanding of the log grading requirements for the Lao PDR plantation teak and eucalyptus industry. Negotiations are underway with the relevant Government departments to standardise these grading systems.

Initial kiln drying trials performed at various mills provide valuable data on drying characteristics of plantation material in Laos PDR. The results will allow the development of best practice drying procedures for the Laos processing industry and individual solutions to improve drying time and/or quality at various sites. Recommended drying improvements (inserting air baffles) in a kiln at the Burapha company, has reportedly resulted in a reduction of the drying time by 50%; doubling the productivity of this kiln.

Initial sawn recovery studies conducted at six sawmills provides valuable base-line data on sawn recoveries, for square and round logs, using different equipment, for Laos companies. A specialised 'jig' was designed and produced by DAF and NUoL team, to improve the accuracy of the first flitch cut, with the intention of improving overall sawing accuracy and sawn recovery. Significant economic impacts are expected due to the improved wood recovery.

Laboratory testing of glue-bond strength and the performance of various adhesives for high value appearance wood products using plantation species provides a significant scientific contribution to wood technology research. To date, limited data is available on this subject, in particular in relation to teak (*Tectona grandis*) and river red gum (*Eucalyptus camaldulensis*). Four types of non-structural adhesives were tested: cross-linking polyvinyl acetate emulsion; polyvinyl acetate emulsion; polyurethane; and epoxy. The glued joints were submitted to four different exposure conditions before being tested in accordance with international standard ASTM D5751 Standard specification for adhesives used for laminate joints in non-structural lumber products. Both species performed reasonably well. Factors such as wood properties, timber preparation and adhesive application were also considered. The comparative analysis showed that a high slope of grain in a sawn board affects the shear strength mechanical property of glued joints. Such observation suggests that secondary processing industries aiming to produce high-quality wood products should be careful when selecting or dressing sawn boards prior to gluing. Optimisation through improved efficiencies of the primary wood processing sector could help limiting the impact of this factor by preventing the production of boards with high slope of grain. The number of knife marks when planing prior to gluing was also found to have a significant effect on the glued joint shear strength. When rough or poorly dressed surfaces are joined, uneven pressure along the bondline results in the adhesive to flow from the areas of very high pressure to those of little to no pressure resulting in very thick bondlines.

The analysis of wood recovery in furniture manufacturing conducted at the Industry Cluster companies provides a noteworthy contribution to science. The literature review revealed that only a limited number of studies on wood recovery in the manufacturing process have been undertaken. The methodology developed within this project, when
published, will undoubtedly create a significant interest within the international research community. The aim of the study was to improve manufacturing process by determining which practices, strategies, and training programs could be applied to improve productivity and increase the value recovery in the manufacturing process. The recovery rate (%) was determined by collecting data on input and output (volume or weight) on each machining operation from the original dry sawn timber to the final wood component. Additional information was collected from a visual assessment (equipment, staff decision-making) and by asking questions to factory staff. At the end of the study, data was analysed and individual recovery rate determined. An action plan containing recommendations will be provided to each company. The main recommendations will include: planning the product design process to reduce the waste factor by using appropriate cutting patterns, purchasing the right grade to avoid sorting, selecting, and eventually accumulating pick over sawn boards; executing an inventory management by storing and segregating adequately the lumber and off-cuts to minimise inventory; introducing a quality control program with a practical measurement system; implementing a good communication with the workforce in a company to improve wood recovery through proper education and training for a successful implementation; introducing a regular maintenance and sharpening schedule to increase productivity and wood recovery.

### 3.2 Capacity impacts

The acquisition of the FINNMAP digital aerial photography and training in the use of GIS and GPS referenced photographs is enhancing the capacity of LPTP and the Provincial Forestry for rapid mapping and assessment of plantations and forests. Other forest management related project are expressing interest in the map products of the project, providing good opportunities for future collaboration.

A plantation log grading system was previously non-existent in Laos. The utilisation and teaching of the log grading system are now part of the NUoL curriculum. The grading system will provide improvements in efficient utilisation of Lao PDR plantation resources through optimum matching of logs to products.

Vietnamese solar drying and energy conservation expert (Professor CAC) presented at the wood drying workshop held at NUoL for 15 Laos PDR cluster company managers and workers in May 2015. New solar drying solutions relevant to the Laos industry and budget were present for drying solid wood and veneer. Two Laos sawmilling companies have since contacted the CAXE company to provide solar kiln quotations.

The installation and commissioning of a veneer peeling plant at the NUoL will allow the University to undertake veneer processing research for Laos PDR companies interested in investing in this technology. Veneer processing can be added to the university curriculum involving hands on practice and training. The University can use the plant to train company workers in this field. The plant can be used to characterise the quality and potential of different plantation wood species, locations and silviculture, for veneer production and veneer based product utilisation.

The two week ACIAR funded training course held at the DAF Salisbury Research facility, Brisbane from 16 to 27 February 2015 has provided 5 key Objective 2 staff training in veneer processing, veneer grading and property measurement, mechanical property testing of wood based products, adhesives and plywood production, log grading, small log processing, dried product grading, wood anatomy and ID, biological degrade in timber, wood drying, project management, report writing, data analysis and formatting and lean manufacturing concepts. Material used during the training has been translated to Laos language and is used in the NUoL curriculum.

Training on furniture manufacturing for 4 researchers from NUoL was held on 7 – 15 March 2015, in Melbourne, at the University of Melbourne and Furnishing Industry
Training Centre, Holmesglen Institute of TAFE. The training enhanced the knowledge of the researchers on the furniture manufacturing process, in particular practical knowledge of machinery used in various stages of furniture production, timber material flow, machinery and tools maintenance, setting up the machines, OH&S and other important issues concerning the furniture production.

NUoL team members who contributed to the gluing trials activity not only developed scientific research skills but also acquired the knowledge on wood adhesion and adhesion testing. The researchers have already conducted gluing experiments in parallel to the ACIAR project with Oji company.

Researchers at NUoL are being trained on how to undertake research studies in wood processing and manufacturing, how to conduct industry assessments and to assist the industry in implementation of the recommended changes. The training includes both theoretical sessions and in-mill/in factory practical training (e.g., in-mill training on how to conduct log mensuration and sawmilling recovery studies, log and sawn boards grading training, wood drying procedures, proper gluing procedures and how to reduce wood waste through measuring current recovery rate at various machining operations). The skills gained by NUoL researchers have been already passed on to students and industry members.

Mr Phongxiong Wanneng, a lecturer at NUoL and an active member of VALTIP2 team, was awarded a prestigious John Allwright Scholarship to undertake PhD study at the University of Melbourne.

### 3.3 Community impacts

#### 3.3.1 Economic impacts

More plantation registration options that reflect the diversity of the smallholder plantation resource may encourage farmers to register their plantations. More efficient plantation registration processes may also reduce the cost burden on smallholders of registering their plantations. This may also increase the supply of legal plantation grown wood in the timber supply chain. However, plantation registration may formalise land use rights and open/promulgate a ‘plantation market’ though which plantations are sold by farmers to absentee landlords acquiring land for a range of purposes. This group of owners (absentee landlords) is not a focus of this project and it would be important to understand their intention with respect to the future management of the plantation resource to fully understand this impact.

A specialised ‘jig’ for sawing small logs, designed and built at NUoL, has a potential to provide significant economic benefits to Lao sawmills. The jig is used to stabilise small logs during the first cut of the log. The jig holds the log firmly in place without wobbling, particularly out of shape logs with high ovality, taper or bend. This then creates a nice straight cut on the first pass. Because the log is rolled onto the freshly cut face it should sit flat thus making subsequent cuts also more straight. This translates into boards cut with less overall variation in thickness, allowing the potential for more boards to be sawn from a single log and improving overall recovery. Initial trials in a sawmill in Luang Prabang resulted in a 41% improvement in thickness variation, 11% increase in green sawn recovery and an 8% increase in saleable board recovery, when using the jig. If implemented by other sawmills the improvements in wood recovery could be substantial.

Significant economic benefits for sawmills are expected due to improvements in wood drying techniques. For example, a simple recommendation to insert air baffles in a kiln at the Burapha company, has reportedly resulted in a reduction of the drying time by 50%; doubling the productivity of this kiln.

The recovery study in furniture companies revealed that the implementation of a regular quality control program would allow improving productivity and increase competitiveness.
of furniture manufacturing companies. If the recommendations are implemented, improved product quality and compliance with market quality requirements will not only facilitate access to higher value markets and global markets but also improve competitiveness of wood processing industries by promoting adoption of industry best standards already used in major neighbouring markets.

A study conducted on the various uses of wood waste and off-cuts for the Lao wood processing and manufacturing industry concluded with recommendations on which practices and value-added manufacturing technologies would increase the value recovery of small dimensions, inferior quality plantation wood and facilitate early improvements from dry feed stock to marketable products. The strategies listed in the document can be applied to improve productivity and quality in wood processing and manufacturing to improve competitiveness in global markets.

### 3.3.2 Social impacts

It is envisaged that there will be significant social and community benefits arising from the project activities. In particular, studies of transaction costs and legality across the supply chain will offer increased transparency and market information to growers. In due course, this will influence harvesting and sales intentions and negotiations about price.

Clarification and streamlining of the process for land use rights and plantation registration may enhance security of tenure for smallholder farmers and encourage more farmers to establish plantations. A more efficient and transparent regime for transaction costs may distribute the impact of these costs amongst value chain participants in line with their capacity to pay.

The development of growers’ groups will improve collaboration of farmers growing teak and will enhanced community cohesion.

During the assessments of sawmills and furniture companies the research teams noted a lack of workplace health and safety culture. Recommendations for increasing awareness of risk in the workplace are being incorporated within all reports and training modules to foster a safety culture.

### 3.3.3 Environmental impacts

Clarification and streamlining of the process for land use rights and plantation registration may enhance security of tenure for smallholder farmers and encourage more farmers to establish plantations. While this could reduce the demand for timber from natural forests there is also a risk that natural forest may be converted to agriculture if plantations are established on fallow swidden land.

The adoption of sustainable forest management practices provides measurable environmental benefits. The identification and promotion of cost effective and simple to use approaches to legality and sustainability processes supports improvements in sustainable land management practices and policies. Identifying options for trial that reduce the complexity and costs (direct and indirect) associated with demonstrate compliance with laws and verified sustainable practices will promote opportunities for the expansion of forest management practices that deliver benefits to the grower and broaden market opportunities.

The correct use of grading rules minimises waste through better segregation and allocation of resources to the most suitable product. For example, higher value wood is used for high value products and lower quality wood is used in low value components or products.

Improved sawn recovery and recovery in the furniture manufacturing process minimises waste of sawn logs and potentially reduces the demand on raw material.
The project is introducing more efficient wood processing and manufacturing methods, decreasing wood drying degrade, utilisation of small dimension timbers and wood off-cuts for various components and products. These value-added methods will result in more efficient use of timber which will provide both environmental and economic benefits.

3.4 Communication and dissemination activities

Project related publications during the reporting period

Project reports:


Conference papers and posters:


Power point presentations:

Objectives 1–4 progress reports presented at the Mid-Term Review held in Luang Prabang, 16 September 2014.


Ozarska, B. (2014). Improving value-adding in downstream processing of plantation timbers in South-East Asia and Pacific region. Lecture for the postgraduate subject
“Timber, Sustainable and Renewable Material”, The University of Melbourne, October 2014.

**Communication and dissemination:**

**Whole of project team meetings**

- The project Mid-Term Review was held in Luang Prabang on 16 September 2014. The event provided an opportunity for project members and stakeholders to gather and discuss about the challenges and opportunities for the project and review its progress.
- Objectives 1-4 co-ordination meetings and field trips were held in conjunction with the Mid-Term Review from 9th to 17th September 2014 in Vientiane and Luang Prabang. These meetings allowed discussing the project and cross-objective issues.

![Figure 10: Project Mid-Term Review, 16 September 2014, Luang Prabang.](image)

**Coordination meetings:**

**Objective 1:**

- K. Boer: mapping project coordination visit including for data acquisition, mapping method development, ground truthing, staff training and GIS set up. (26th May-11th June 2015).
- Objective 1-4 Mid Term Review (11th September – 19th September)
- Ken Boer: Meeting with National Geographic Department. Participants: Ken Boer, Bounchanh Lattanavongkot, Mr Vannasone NGD regarding data availability (2nd February)
- Ken Boer: Meeting with F-PREP Project. Participants: Ken Boer, Nori Kitamura (JICA), Eiji Egashira (JICA) regarding sharing and comparing mapping products.
- Ken Boer: Meeting with WWF Carbon sink and biodiversity project. Participants: Ken Boer, Denis Smirnov (WWF) to share project information.
- Hilary Smith: Meeting with FLEGT-VPA team. Participants: Hilary Smith, Heiko Woerner, Marc Gross (Program Director Support to Lao EU- FLEGT process), Manilay Thipphalansy (National FLEGT Advisor), Adam Redman regarding the FLEGT VPA process and sharing of information. H. Smith was asked to participate in a smallholder thematic working group (2nd February 2015).
- Hilary Smith: Meeting with FAO. Participants: Hilary Smith and Akiko Inoguchi, Forestry Officer (REDD+), Adam Redman regarding FAO project on Legal
Compendium for Forestry in Laos and sharing of the legality work undertaken by the ACIAR project (2nd February 2015).

- Hilary Smith: Meeting with Lao Director of Wildlife Conservation Society Scott Stanley. Main issue discussed was incentive for smallholder plantation establishment around Nam et- Phou Louey National Protected Area.

- Objective 1 team meeting 3rd February Lang Prabang
- The following coordination meetings in connection with Activity 1.3A:

  In connection with Action Research Round 3 – May – June 2014
  - Meeting with representatives of Hatnyao rubber cooperative on 13 May to provide a 500,000 EUR loan – this not taken up.
  - Visit to Luang Prabang on 25 – 26 May. Discuss progress with the LPTP team and hold a meeting with potential members of farmer group enterprises – identified members interested in forming enterprises.
  - Training to develop business plans for four farmer group enterprises from 17-19 June (Xienglom, Kok Ngiu, Lak 10, Ensavanh) – this led to the creation of four approved enterprises that have invested money in processing equipment.
  - Start co-operation process with Mark Dieter’s project – data collection complete March 15 and needs to be analysed.

  In connection with Action Research Round 4 – Feb 2015
  - Meeting with other members of the Objective 1 team on 3 Feb to follow up recommendations and actions from the previous round of action research and the mid-term review.
  - Visit to Hatnyao rubber cooperative to understand the impact of the downturn in rubber prices on the activities of the group – group is continuing by expanding its services to other areas (e.g. training in rubber tapping).
  - Visits to two planned farmer groups in Luang Prabang (Pakseng and Phonexay districts) to understand and recommend changes to LPTPs existing strategies when starting off farmer groups – resulted in some streamlining of LPTP processes but potential for this to be taken further.
  - Visits to the four original LPTP farmer groups where FGEs were introduced to summarise their experiences (Xienglom, Kok Ngiu, Lak 10, Ensavanh) – these continue to be sustainable.

UoM and DAF management meetings and teleconference meetings.

- DAF Objective 2 activity planning meetings, discussion on activities: 30/7/2014, 22/08/2014, 14/10/2014, 26/10/2014, 9/12/2014, 29/12/2014, 05/02/2015.
- NUoL and DAF Objective 2 activity planning meetings, discussion on activities: 11/10/2014, 09/11/2014, 08/01/2015, 31/01/2015, 11/03/2015, 31/03/2015.
- Dr. Henri Baillers visit NUoL from 09 -10/12/2014 to discuss and manage Objective 2 activities.
- DAF and NUoL staff visit Burapha company head office on 10/12/2014 to discuss potential veneer peeling implementation at Burapha factory.
- DAF and UoM staff visit GIZ Vientiane office on 12/01/2015 to discuss legality, FLEGT and marketing topics related to the project.
Dr Barbara Ozarska meetings in Vientiane to review progress and discuss future work on Objectives 2-4 on 19-21/05/2014; 11-13/09/2014 and 12-15/02/2015.

UoM and DAF meetings in Brisbane to discuss Objectives 2 & 3 progress: February 2015 and teleconference meetings.

UoM weekly staff meetings and correspondence by emails and skype with VALTIP2 researchers in Laos.

Dr Latsamy Boupha and Dr Kaisone Phensopha met with Mr Khounoudom from the Department of Industry and Handicraft - Ministry of Industry and Commerce, and Mr Manohak, DG of Wood Industry Department, in March 2015 to discuss the transfer of leadership for the marketing development strategy activity.

Workshops and seminars:

- Market Research Workshop was held on 20 May, 2014, in Vientiane. The workshop allowed discussing the findings of the market research study conducted by VALTIP2 team and give ownership of the activity to the MoIC. The MoIC agreed with the work conducted by VALTIP2 team and recognized the importance of increasing wood products value. It was agreed that the project team will assist MoIC in the process of developing market strategy for the timber industry by providing information and data when required.

- Adam Redman attended a one day workshop in Vientiane on 12 December 2014 organised by GIZ and Laos PDR Ministry of Industry and Commerce. The workshop outlined the early stages of FLEGT implementation in Laos PDR and MOIC draft of Agreement 415; a wood product dimension standard.

- A half-day workshop on log grading was held on 10 February 2015 provided by Adam Redman. The workshop presented the first draft of a small plantation log grading system for Laos PDR. The workshop was attended by 12 government department representatives, 13 NUoL staff and 1 German aid (GIZ) representative. The government departments included: Division of Forestry (DoF-harvesting and standards sectors), Dept. Of Industry and Handicraft, Dept. Of Forest Inspection, Dept. of Measurement and Standards, Dept. of Import and Export, Dept. of Forest Economy and Wood Technology, Dept. of Forest Management and Forest Resource, Dept. of Watershed and Land Use, Dept. of Ecotourism.

- A two-day workshop on wood drying fundamentals, technology, processes, quality assurance and best practice was held on 7-8 May 2015 provided by Adam Redman. There were 42 attendees including: 12 company personnel (from the project cluster), 4 Luang Prabang Teak Program (LPTP) personnel, 11 NUoL staff members, and 15 NUoL students.

Field days

Regular visits to plantation sites, tree growers, timber companies and other relevant companies and organisations have been undertaken by research teams according to the project needs.

Visits to the Industry Cluster companies were undertaken by team members of Objectives 2 and 3 to implement recommended improvements in their wood processing and manufacturing processes.

Examples of field trips and visits to factories:

26th – 30th January 2015 Objective 1.1 (Mapping) Audit and ground truthing of mapping work Ban Hatgna and Ban Somsanouk. Assessment of trail area of scattered teak plantings.
26th – 30th January 2015 Objective 1.2a (legality) participate in, and observe, plantation registration process with LPTP in Pak Ou District. Consideration/discussion of alternative plantation registration processes.

17-18/10.2014. Drying research trials were conducted at TNK factory, Luang Prabang.

24/10/2014. The site for the new Somsakid Company factory, currently being constructed was inspected.

21/11/2014. Drying research trials were conducted at Khampaisana factory, Vientiane.

19/12/2014, 09/01/2015, 22/01/2015. Drying research trials were conducted at Burapha factory, Vientiane.

16/01/2015. Log grading study was conducted at Burapha factory, Vientiane.

9/04/2014. Sawing and log grading study conducted at Sone Sawmill, Luang Prabang.

20/04/2014. Drying research trial was conducted at Phouthone Sawmill, Vientiane.

21/04/2014. Sawing study was conducted at Phouthone Sawmill, Vientiane.

June 2014 – March 2015: Visits by VALTIP2 team to furniture companies to conduct wood recovery studies, Vientiane. Companies visited: Phouthone, TNK, PKK, Khampai Sana, Lao Furniture Company, Kongsa, Changaavang, Viengniyom and Chanpheng.
4 Training activities

Objective 1 training

- Training in enterprise development and business planning for representatives of 4 Farmer group Enterprises, Luang Prabang, 17-19th June 2014 (19 participants, including 3 women)
- Study tour for 4 Farmer Group Enterprises to wood processors in Vientiane, January 2015, involving a total of 19 participants (15 farmers and 4 staff, 0 women) on the processing study tour to Vientiane which took place between 3-6 January.

Objective 1 partner organisations the Luang Prabang Teak Program (LPTP) and The Forests Trust (TFT), which are funded partly by ACIAR project FST/2010/012 also delivered the following training and coordination activities (Table 1):

Table 1: Training and coordination activities delivered by LPTP and TFT

<table>
<thead>
<tr>
<th>Activity date</th>
<th>Village</th>
<th>Description</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Nov-14</td>
<td>Ban Sop Jaeck</td>
<td>Handout teak farmer plantation certificates</td>
<td>27</td>
</tr>
<tr>
<td>17-Nov-14</td>
<td>Kokwan</td>
<td>Handout teak farmer plantation certificate</td>
<td>19</td>
</tr>
<tr>
<td>19-21/11/2014</td>
<td>Ban Nambor</td>
<td>Assessment for plantations certificate and preparation of Forest Management Plan</td>
<td>4</td>
</tr>
<tr>
<td>19-21/11/2014</td>
<td>Kokwan</td>
<td>Assessment for plantation certificate and preparation of Forest Management Plan</td>
<td>4</td>
</tr>
<tr>
<td>26-Nov-14</td>
<td>Ban Natan</td>
<td>Thinning and pruning training.</td>
<td>15</td>
</tr>
<tr>
<td>26-Nov-14</td>
<td>Ban Dansavang</td>
<td>Thinning and pruning training.</td>
<td>12</td>
</tr>
<tr>
<td>4-Dec-14</td>
<td>Ban Heuymart</td>
<td>Handout teak farmer plantation certificate</td>
<td>24</td>
</tr>
<tr>
<td>8-Dec-14</td>
<td>Ban Xieng Lom</td>
<td>Meeting with Indian trader to discuss future wood sale</td>
<td>4</td>
</tr>
<tr>
<td>22-Dec-14</td>
<td></td>
<td>Meeting with trader – plantation survey and discuss future wood sale possible PEFC certification</td>
<td>6</td>
</tr>
<tr>
<td>6-9/1/2015</td>
<td></td>
<td>LPTP-TFG study tour: Vientiane wood processing factories</td>
<td>16</td>
</tr>
<tr>
<td>20/1/2015</td>
<td>Kokwan</td>
<td>Hand teak farmer plantation certificate and clarified purpose and the benefit of LPTP</td>
<td>25</td>
</tr>
<tr>
<td>21/1/2015</td>
<td>Ban Nambor</td>
<td>Hand teak farmer plantation certificate and clarified purpose and the benefit of LPTP</td>
<td>23</td>
</tr>
<tr>
<td>26/1/2015</td>
<td>Ban Hart ya</td>
<td>Meeting with villagers/teak farmers regarding LPTP activities</td>
<td>32</td>
</tr>
<tr>
<td>28/1/2015</td>
<td>Ban Somsanouk</td>
<td>Meeting with villagers/teak farmers regarding LPTP activities</td>
<td>39</td>
</tr>
<tr>
<td>19/2/2/15</td>
<td>Ban Natan</td>
<td>Harvesting and wood sale training</td>
<td>24</td>
</tr>
<tr>
<td>20/2/2015</td>
<td>Ban Napho</td>
<td>Harvesting and wood sale training</td>
<td>15</td>
</tr>
<tr>
<td>26/2/2015</td>
<td>Ban Thinsom</td>
<td>Harvesting and wood sale training</td>
<td>16</td>
</tr>
</tbody>
</table>
Objective 2:

- A two week ACIAR funded training course was held at the DAF Salisbury Research Facility, Brisbane from 16 to 27 February 2015. Five NUoL staff attended the training along with 3 VAFS (Vietnam) researchers involved in ACIAR project FST/2008/039. The NUoL attendees were: Mr. Phongxiong Wanneng, Mr. Phonepaserd Phanpadith, Mr. Pongky Phommachan, Mr. Khonethong Soukphasay and Mr Lothim Seatern. Training included the following topics: veneer processing, veneer grading and property measurement, mechanical property testing of wood based products, adhesives and plywood production, log grading, small log processing, dried product grading, wood anatomy and ID, biological degrade in timber, wood drying, project management, report writing, data analysis and formatting and lean manufacturing concepts.

- A two-day training workshop on wood drying fundamentals, technology, processes, quality assurance and best practice was held on 7-8 May 2015 provided by Adam Redman. There were 42 attendees including: 12 company personnel (from the project cluster), 4 Luang Prabang Teak Program (LPTP) personnel, 11 NUoL staff members, and 15 NUoL students. Professor CAC from CAXE Engineering, HCM Vietnam was invited to the workshop as a special guest to present on innovations in solar drying.

- A half day lecture on fundamentals of wood drying was presented by Adam Redman to year-5 NUoL students on 10 November 2014.

- A half-day training course on log grading was provided by Adam Redman for NUoL students at Burapha company on 5 February 2015.

- NUoL Objective 2 staff were provided with and trained in the use of kiln assessment tools including an anemometer, humidity sensors, thermocouples and dataloggers. This equipment has been used for data gathering for kiln drying study activities.

- NUoL and DAF staff were trained on the use of the veneer processing equipment installed at NUoL on 25-29 May 2015.
Objective 3

Training on furniture manufacturing for four researchers from NUoL was held on 7 – 15 March 2015, in Melbourne, at the University of Melbourne and Furnishing Industry Training Centre, Holmeaglen Institute of TAFE. The researchers were: Louxiong SIAKOR, Vansy PHENTHACHAIM, Phoulouang CHOUNLAMOUNTY and Si XIONG. The training, funded by ACIAR project, included the following topics: furniture manufacturing process, in particular practical knowledge of machinery used in various stages of furniture production, timber material flow, machinery and tools maintenance, setting up the machines, OH&S and other important issues concerning the furniture production. The trainees also had opportunity to visit a few furniture companies in Melbourne which allowed them to observe the Australian methods of furniture manufacturing, furniture
design style and quality control procedures used in the production. Project partner, Salwood Asia Pacific Pty Ltd, hosted two of the trainees (Vansy PHENTHACHAIM, Phoulouang CHOUNLAMOUNTY) for a further one week visit to Canberra the NSW South Coast and Sydney to inspect natural eucalypt forests and high-market wood furniture outlets. Project partner, Salwood Asia Pacific Pty Ltd, hosted two of the trainees (Vansy PHENTHACHAIM, Phoulouang CHOUNLAMOUNTY) for a further one week visit to Canberra the NSW South Coast and Sydney to inspect natural eucalypt forests and high-market wood furniture outlets.

Figure 13: NUoL researcher, Mr Khamtan Phonetip, PhD student at the University of Melbourne, the recipient of John Allwright PhD scholarship, explains his PhD experiments to his Lao colleagues.

Figure 14: VALTIP2 researchers at training course at Furnishing Industry Training Centre, Melbourne (Left) learning about machinery, (right) with the training certificates.

Two furniture design training courses were arranged for the Industry Cluster members, VALTIP2 researchers, NuOL students and Pakpasak students. Training No 1 was held on 5-6 May 2014 and Training NO 2 on 4-5 December 2014. The participants enjoyed the training as they had an opportunity to learn about the design process and work in groups to design their own products.

Louxiang Siakor attended Finishing Training at the Lao Furniture Training Centre, May, 2014, in Vientiane, organized by Lao Furniture Association and Thai Do_No Gen Gen Co., Ltd.
Louxiong Siakor and Sithatha Boupha attended training on Biomass Energy and Technology in Kunming Science and Technology University, China, on 14-30 July, 2014. Training on wood recovery study and gluing testing was provided to VALTIP2 researchers by Dr Benoit Belleville in May 2014, September 2014 and January 2015.

Figure 15: Participants of the furniture design training courses (left): opening ceremony at Training No 1, (right): training Photo group at Training No 2.
5 Intellectual property

To date no novel technologies or products have yet been developed.
6 Variations to future activities

Variations to several milestones are requested:

- Activity 1.1, milestone 3, currently set down for 30 March 2015 (previously revised from 30 September 14), requested extension to 30 September 2015 for completion of all teak plantation resource mapping for Luang Prabang Province. This is due to delay in the availability of data for the northern third of the Province which is still being processed and is not yet available to the Lao National Geographic Department and also the slower than anticipated rate of mapping progress. As a result milestone 4 will also be delayed and an extension is requested to 31/12/2015.

- Activity 1.2A, milestone 3, currently set down for 31 December 2014 (previously revised from 30 September 2014), requested extension to 30 June 2015 to allow coordination with survey outputs from ACIAR project FST/2012/041; and

- Activity 1.3A, milestone 4, currently set down for 30 September 2015, requested extension to 31 March 2016 (coinciding with the due date for related Activity 1.2B, milestone 8) to allow time for a further round of Action Research with growers on the subject of transaction cost mitigation.

- Activity 2.4, milestone 1, currently set down for 30 June 2014, requested extension to 30 July 2015. A detailed assessment of drying operations, kiln conditions, and dried quality of companies willing to participate has been completed. A report for each company (translated into Laos language) is in progress.

- Activity 2.4, milestone 2, currently set down for 30 November 2014, requested extension to 30 September 2015. Recommended improvements to drying operations will be provided in the initial report. Follow up studies will be conducted at companies willing to improve and improvements reported.

- Activity 2.5, milestone 1, currently set down for 30 June 2015, requested extension to 30 September 2015. The development of a set of sawn product grading rules applicable to the Laos industry is well advanced but not yet finalised.

- The purchase, installation and performance of preliminary trials of a veneer peeling lathe and ancillary equipment is a new activity added to Objective 2. As a consequence some of the time allocated to other activities in objective 2.6 will be used for this purpose.

- Activity 3.3, milestone 6 and 7, currently set down for 30 December 2015, requested extension to 30 March 2015 and 30 May respectively. Milestone 6: extension required in order to include all activities’ results in the Manual. Milestone 7: as the final Manual will combine manuals on wood processing (Objective 2) and wood manufacturing (Objective 3) more time will be required to complete the final publication.

- With the development of a marketing strategy activity now being led by the MoIC it is difficult to determine whether or not the next milestone (4.1.5. Analysis of Lao market situation and product research) can be completed by July 2015 as expected, since we don’t have much control on the progress of this work.

- Activity 4.2, milestone 3, currently set down for 30 April 2015, requested extension to 30 December 2015. Three training modules have been completed to date and a few more will be developed till the end of the year 2015.
7 Variations to personnel

There have been no variations to Objective 1 personnel during the report period.

Objective 2 and 3 received four new staff members: Phonepaserd Phanpadith, Pongky Phommachan, Phouloung Chounlamouny and Vansy Phengthajaim.

Mr Douangta Bouaphavong commenced his Masters study at Kasetsart University, Thailand. Mr Phongxioung Wanneng has replaced him as in-country leader of Objective 2. However, Mr Wanneng will relocate to Melbourne, Australia, in July 2015, to undertake PhD study at the University of Melbourne. A suitable replacement for Mr Wanneng has not yet been found by NUoL at the time of writing.

Khamtam Phonetip has relocated to Melbourne, Australia, in July 2014, to undertake PhD study at the University of Melbourne. Louxiong Siakor replaced him as in-country leader of Objective 3.

Research Scientist Adam Redman, DAF, moved his base to NUoL in Vientiane in September 2014 for a nine-month period. This provided significant benefits to the project as it enabled regular visits to wood processing companies for trials and implementation of recommendations and accelerated capacity building in NUoL as well as with the industry partners. Adam will return to DAF, Brisbane, on 8 June 2015.
8 Problems and opportunities

Problems

− For Objective 1.2A the institutional complexity of the legal value chain, which involves many different government agencies (MAF, MOIC, MONRE, MOF) and at a range of levels (National, Provincial, District), has made identification of and engagement with departmental representatives challenging. This is also a challenge for ‘trialling’ any new options for plantation registration. Other processes (such as FLEGT-VPA) have brought together these agencies and it would be beneficial to focus on engagement through these existing channels.

− The project team has recognised that implementing recommendations and changes in processing and manufacturing methods is a difficult process because, in the majority of cases, capital investments are required in order to put the recommendations into practice (e.g. drying). However, the companies have very limited financial resources for purchasing the recommended equipment, tools and quality control instruments. Unfortunately, this problem cannot be solved by the project team as these issues are outside the project scope and budget.

In summary the following problems have been identified:

• Difficult to implement recommendations due to lack of capital cost (e.g. drying).

• Slow pace to make changes in the production processes (e.g. factory lay-out, cleaning the waste) due to lack of understanding of potential benefits.

• Companies expectations that the project would find markets for their products. The project aim is to improve the products quality and make the industry more efficient but not to find the markets.

− Although significant improvements still need to be made in order to make the Lao furniture industry competitive on international markets, the companies are eager to learn and participate in the project activities, in particular in training courses.

− The departure of Mr Phongxiong Wanneng in July 2015 will create a large void since he is the main link between Australian and Lao team members. A candidate to replace Phongxiong should be identified to insure good communication system for the rest of the project.

Opportunities

− For Objective 1.1, opportunities have been identified for data sharing and comparison with the JICA F-PREP project.

− For Objective 1.2 A opportunities have been identified for participating in and sharing legal research with the FLEGT-VPA process particularly with respect to differentiating smallholder plantation grown wood from timber harvested from natural forests or industrial plantations. As the FELGT-VPA process may drive future regulatory reform this is a good opportunity to progress some of the recommendations from the ACIAR project.

− The installation of a lathe and commencement of veneering provides an excellent opportunity for capacity building in this increasingly important domain of research and processing.

− Increasing the number of researchers at NUoL to be trained in primary and secondary wood processing was identified as an urgent matter in the previous Annual Report. Subsequently, four new researchers have been appointed to FoF who are fully engaged in ACIAR project. This provides an opportunity to the project, NUoL and Lao
companies as the researchers will be able to acquire new skills and experiences in wood processing and manufacturing technologies, and will pass on their knowledge to FoF students and industry members.

The project has already made significant achievements and it is expected that it will provide substantial economic, environmental and social impacts for smallholders and the timber industry in Laos. There have already been scientific and capacity building impacts which will benefit academic, research and training communities. Many opportunities have been identified for enhancing various elements of the value chains for plantation wood in Laos and it is critical to keep the momentum achieved to date going after this current project is completed. Any interruption of the momentum achieved could jeopardise the realisation of future opportunities and benefits.
## 9 Budget

No significant variations from the approved budget occurred during the reporting period. The summary of the expenditure for the project is presented below.

Financial Statement of Income and Expenditure till 30 April 2015

<table>
<thead>
<tr>
<th>Project Title: Enhancing key elements of the value chains for plantation-grown wood in Lao PDR</th>
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</thead>
<tbody>
<tr>
<td>Grantor: AUST CENTRE FOR INTL AGRICULTURAL RESEARCH</td>
</tr>
<tr>
<td>Chief Investigator: A/PROF BARBARA OZARSKA</td>
</tr>
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<td>UOM Reference: 094464</td>
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<table>
<thead>
<tr>
<th>Receipts:</th>
<th>Grants received from ACIAR</th>
<th>TOTAL</th>
<th>$1,872,613.00</th>
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<tbody>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACIAR Grants</td>
<td>354,874.00</td>
<td>522,221.00</td>
<td>706,584.00</td>
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<table>
<thead>
<tr>
<th>Less Expenditures:</th>
<th>Year 1 – 4 (as per Apr-15)</th>
<th>Outstanding payments: Payments 8 (July-15) &amp; Payment 9 (Jan-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Melbourne</td>
<td>447,817.00</td>
<td>139,973.00</td>
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<td>ANU</td>
<td>417,528.00</td>
<td>95,237.00</td>
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<td>DAF</td>
<td>349,148.00</td>
<td>109,919.00</td>
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<td>Overseas partners</td>
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<td>160,039.00</td>
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<tr>
<td>Totals</td>
<td>1,872,613.00</td>
<td>505,168.00</td>
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</tbody>
</table>

Total project balance: $505,168.00