



TECHNICAL REPORT

PROJECT ITTO PD 646/12 REV.3 (F)

Initiating the Conservation of Cempaka Tree Species (*Elmerrillia* spp.)
Through Plantation Development with the Local Community Participation
in North Sulawesi

Ministry of Environment and Forestry Republic of Indonesia
Manado Environment and Forestry Research and Development Institute (MFRDI)
Research Development and Innovation Agency



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MANADO, November 2020

Manado Environment and Forestry Research and Development Institute
Research Development and Innovation Agency
Ministry of Environment and Forestry, Republic of Indonesia
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Manado, NORTH SULAWESI, INDONESIA

Front cover : Cempaka germination research and technologies

Back cover : Cempaka plantation in Tomohon City, North Sulawesi

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- October 2019 – September 2020 : Project implementation



ITTO PROJECT TECHNICAL REPORT

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Cempaka mixed with agricultural plants on Minahasa land (Photo: Moody C. Karundeng)

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Project Coordinator
ITTO PD 646/12 Rev.3 (F)



Survey on cempaka growing stock in Minahasa (Photo: PMU)

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LIST OF ACRONYMS

MFRI	: Manado Forestry Research Institute
MEFRDI	: Manado Environment and Forestry Research and Development Institute
ITTO	: International Tropical Timber Organization
FORDA	: Forestry Research Development Agency
AAC	: Annual Allowable Cut
SOP	: Standard Operating Procedure
ISMP	: Integrated Strategic Management Plan
EFORDIA	: Environment and Forestry Research Development Innovation Agency
R&D	: Research and Development
PSC	: Project Steering Committee
YPO	: Yearly Plan Operation
PMU	: Project Management Unit
FMU	: Forest Management Unit
FGD	: Forum Group Discussion
MoEF	: Ministry of Environment and Forestry
SHF	: Stakeholders Forum
SLVK	: Sistem Verifikasi Legalitas Kayu (Timber Legality Assurance System)
ISMP – CRCD	: ISMP for Cempaka Resource Conservation and Development
IDR	: Indonesian Rupiah
NSPFA	: North Sulawesi Provincial Forestry Agency



Cempaka stand in Tomohon (Photo: PMU)



Figure 1. Minahasa wooden house (photo: PMU)

1. INTRODUCTION

1.1 Context and Design of ITTO Project PD 646/12 Rev.3 (F)

- ITTO Project PD 646/12 Rev.3 (F) entitled “Initiating the conservation of cempaka tree species (*Elmerrillia* spp.) through plantation development with the local community participation in North Sulawesi” has been implemented by Manado Forestry Research Institute (MFRI), Forestry Research and Development Agency (FORDA), the Ministry of Forestry of Indonesia. Note that the MFRI has been recently renamed as Manado Environment and Forestry Research and Development Institute or MEFRDI for short.
- The project was the sole initiative of the MFRI to address sustainability problem on cempaka resource in Sulawesi in general, North Sulawesi Province in particular. It was noted by MFRI then that supply of cempaka wood from natural and planted forests could not meet the continuously growing demand for the wood in recent decades. The supply volume was practically stagnant due to limited harvest of natural forests brought about by at least two reasons: the ever growing distance of harvestable forests that resulted in increasing cost of logs production, and the very slow progress of cempaka plantation

development. On the other hand, demand for cempaka wood was continuously growing sparked mainly by the increasing demand for Minahasa wooden house that use cempaka wood as its prime input.

- Concerned with sustainability of cempaka resource, above mentioned project was designed to address the key problem facing cempaka resource management, i.e. very slow progress in cempaka species plantation development. Consistent with the key problem to address the specific objective was defined as “To develop the conservation and plantations of cempaka with the involvement of local communities in North Sulawesi”. Its development objective was to contribute to the conservation of cempaka species in North Sulawesi”.
- The specific objective was planned to be achieved through delivery of three outputs, namely:
 - i. Capacity of local communities in cempaka plantation development enhanced.
 - ii. Participation of local communities in cempaka plantation development increased; and
 - iii. Government policy on the conservation and utilization of cempaka species reviewed and strengthened.

The outputs were planned to be delivered through implementation of the following activities, respectively:

Output 1

- 1.1** To identify sources of quality cempaka seed at six sites
- 1.2** To conduct experiments on appropriate techniques for cempaka seed collection, storage, and germination
- 1.3** To establish three small-scale nurseries at village level to be managed by local communities
- 1.4** To review available information on cempaka’s silviculture techniques
- 1.5** To establish 18 Ha of plantation demonstration for purpose of long-term research and training of local communities as well as other local stakeholder

Output 2

- 2.1** To conduct intensive dialogues on long-term benefits of cempaka plantation with 20 villages in 3 Districts
- 2.2** To train local communities on cempaka nursery development techniques at the small-scale nurseries
- 2.3** To train local communities on cempaka planting techniques at the plantation demonstration plots

- 2.4** To collaboratively identify and introduce appropriate incentives for local communities to plant cempaka trees
- 2.5** To collaboratively develop an extension program on cempaka resource Conservation

Output 3

- 3.1** To conduct survey on growing stock and distribution of cempaka species
- 3.2** To conduct a study an economics of cempaka wood utilization
- 3.3** To determine sustainable level of AAC for cempaka tree species
- 3.4** To develop SOP and procure equipment and facilities for monitoring of forest operations and timber legality
- 3.5** To pilot test application of SOP, equipment, and facilities in one forest District
- 3.6** To establish and operate a stakeholder forum at provincial level
- 3.7** To organize one provincial workshop on cempaka conservation and utilization.



Figure 2. Cempaka seedlings (photo: MEFRDI)

1.2 Strategies for and Approaches to Implementing the Project

The underlying notions of the strategies and approaches pursued in the implementation of the project were:

- Local communities were viewed as the primary player of cempaka resource management in general, cempaka plantation development in particular, that their active participation was inescapable.
- Participatory approach, i.e. consultation, communication, cooperation, and collaboration, was fundamental for a successful implementation of the project.
- Dissemination of relevant information on different aspects of cempaka resource management to all stakeholders was prerequisite to promoting investment in cempaka resource development.
- Training of stakeholders in general, local communities in particular, on different elements of cempaka management operations, from in-situ to ex-situ conservation, from harvesting to logs utilization is an essential precondition for sustainable cempaka resource management.
- Establishment of a stakeholder forum at the provincial level facilitates exchange of information, experience, and insights between stakeholders that its operation should be supported by the government.
- To assist the governments at different levels in decision making as regards cempaka resource sustainable management, MEFRDI needs to develop a legitimate Integrated Strategic Management Plan (ISMP) for cempaka resource decision makers to consult with in policy making.
- Considering the natural geographical distribution of cempaka resource, MEFRDI is expected to become the centre of excellence for cempaka resource development that the institute should place highest priority to R&D on cempaka resource.
- Official designation of lands for cempaka plantation should be clearly reflected in regional spatial plans of province and District governments.

Due to the extremely slow progress in implementation of project activities during the first two years, the operational strategy was somewhat modified by the 4th PSC meeting held in Manado on 11 September 2019 in view of completing implementation of all activities under YPO 3 that lasted in September 2020 without additional funding; the modifications made are listed below :

- i. Activity 1.5 was to be self-executed by MEFRDI; originally in cooperation with a competent local contractor yet to be identified.
- ii. Activity 2.3 would be self-executed by MEFRDI outside the demplots; originally in cooperation with a local contractor at the demplot sites.
- iii. Activity 2.5 would be executed in collaboration with North Sulawesi Provincial Forestry Agency (NSPFA), originally with the assistance of a consultant.

- iv. Activities 3.1 and 3.3 would be self-executed by MEFRDI with the assistance of Bogor Research, Development and Innovation Agency; originally in cooperation with University of Sam Ratulangi.
- v. To execute Activity 3.2 the PSC appointed Dr. Subarudi of Bogor Research Development and Innovation Agency, originally with the assistance of a local consultant.
- vi. Activities 3.4 and 3.5 would be self-executed, originally with the assistance of a national expert.
- vii. Activity 3.6 would be executed in collaboration with NSPFA, originally with a national expert.
- viii. Activity 3.7 would be self-executed by MEFRDI, originally with the assistance of a local contractor.

Above modifications of strategy indicated that heavier load work and larger responsibility were given to the Executing Agency and Implementing Agency. In addition to modifying strategy, the old project coordinator was also replaced with a new one to ensure an accelerated pace of project operations.

1.3 Progress in Implementation of the Project under the Modified Strategy

Under the original project implementation strategy and approach, project operation was moving extremely slow. Under the first YPO, covered the period from February 2016 to January 2017, only two activities were fully completed. Then the project was idle due to weak communication between the Project Coordinator (PC) and ITTO and the lack of initiative in part of the PC; the idle operation lasted for twenty months. By end of the first YPO, 15 activities remained in a non-commence status.

The second YPO (YPO 2) covering the period from October 2018 to September 2019, planned to execute 11 activities but only 2 activities were fully realized. Therefore, by end of YPO 2 in September 2019, 13 activities were to be implemented under YPO 3 that covered the period from October 2019 to September 2020. The extremely slow progress in implementation of the project was the very reason for the PSC to modify the operational strategy and approach at its 4th meeting.

Under the new strategy and approach adopted as decided by the PSC, the project operations were progressing in full speed coupled with an intensive communication between the PMU and ITTO. The remaining 13 activities were fully implemented and reported by end of September 2020, thanks to the hard work of the PMU under its new leader, Ms. Diah Irawati Dwi Arini.

1.4 Organization of the Report

The second part of the report presents the methodologies employed in implementing individual activities pertaining to each of the outputs. In the third part of the report, the project interventions for enhancing capacity of local communities and for increasing their participation in cempaka plantation development as well as for strengthening government policy on cempaka resource

conservation and utilization are presented along with their results. The fourth part of the document discusses achievement of the project in light of the indicators defined, sustainability and lessons learned from implementation of the project. The fifth part, of the report presents the conclusions drawn and recommendations made for follow-up actions, while the last outlines the practical implications of project's outputs and findings.



Figure 3. Cempaka ground survey in Kakas, Minahasa (Photo: PMU)



Figure 4. Seed sources survey in Taranan, South Minahasa (Photo: PMU)

2. METHODOLOGIES

The methodologies employed in implementing individual activities under the respective outputs are presented in the following sections.

2.1 Activities Under Output 1

2.1.1 Activity 1.1: To identify sources of quality cempaka seed at six sites

- The activity was implemented in two provinces, North Sulawesi and South Sulawesi, known as the ecological, natural distribution areas of cempaka species.
- The steps involved in the identification were:
 - » To compile information on cempaka species that had been previously collected by researchers and MEFARDI covering cempaka taxonomy, distribution, phenotypes, silviculture characteristics, etc.
 - » The information compiled was then field verified with the assistance of local communities and mapped.

- » The mapped natural stands were then assessed as regards suitability source of quality seed using “ocular” technique; eleven criteria were employed in the assessment process, namely : tree diameter, total height, clear bole (branch tree) height, bole shape, existence of defects, bole healthiness, existence of buttress, crown form, crown condition, leaves performance and tree overall condition.

2.1.2 Activity 1.2: To conduct experiments on appropriate techniques for cempaka seed collection, storage and germination

- The aim of conducting this experiment was to produce technical manuals on seed collection, storage, and germination to support cempaka planting program. The activity was carried out at the six seed sources identified and at MEFRDI laboratory. The methodologies employed in implementing the activity are described below:

On seed collection

- At each site of identified seed stands, 20 mother trees were randomly selected at a minimum distance of 50 meters from one another.
- Fruits were collected by climbing the mother trees.
- Collected fruits were sorted based on level of maturity; a fully ripe fruit is red in colour while a nearing ripe ones is reddish green.
- The ripe fruits were extracted through solar drying process till the fruits broken.
- The seed obtained from the broken fruits were then soaked in water to ease cleaning of seed epidermis.
- Good quality seed are brown in colour.



Figure 5. Flower, fruits, and fruits collection of Cempaka (Photo: J. Kinho)



Figure 6. Dry extraction of Cempaka fruits (Photo: J. Kinho)

On seed storage

- Three parameters were considered: treatment in storage room, duration of storage and container types used in seed storing.
- The treatments applied in the storage room were 3 different levels of temperature: 27 – 30°C; 17 – 20°C, and 10 – 14°C.
- Duration of storage considered was: 1 week, 2 weeks, 3 weeks, and 4 weeks.
- Container types used were aluminium foil, aluminium foil plus damp scouring ash, aluminium foil plus damp cotton and plastic as control.



Figure 7. Seed storage in sealed plastic bag (Photo: J. Kinho)

On germination technologies

- The objective of this experiment was to observe germination rate of seed experiencing different treatments during storage as described above and originating from 6 different seed sources and two seed maturity level, i.e. fully ripe and nearly ripe as indicated by different colours: black and brown.
- Each treatment was replicated three times and 500 seeds were used for each treatment and replication.
- The seed samples were then planted on nurseries and their germination rate recorded every day for 35 days.



Figure 8. Cempaka germination technologies (Photo: J. Kinho)

2.1.3 Activity 1.3: To establish three small-scale nurseries at village level to be managed by local communities

- The objectives of the activity were : i) to serve as the sites for testing growth of the seed experiencing different treatments and originating from different sources, ii) to select the best seedlings to plant on demo plots, and iii) to serve as the site for training of local communities on the production of quality planting materials.
- The expected outcomes were:
 - » Three nurseries at a size of around 250 m² each established in Minahasa, South Minahasa, and North Minahasa, respectively.
 - » In each nursery, 6,720 seed from 120 cempaka families were grown.
 - » Technical manual for the production of quality cempaka seedlings developed.
- To establish the nurseries, CV. Culture Mandiri had been selected as the contractor based on experience and competence in doing similar jobs. The activity was implemented from February to September 2019.

- The steps followed in the establishment of the nurseries were:
 - » To identify three sites suitable for nurseries in three Districts using the criteria commonly applied in nursery development programs.
 - » To establish 3 small-scale nurseries with a size of around 250 m² each and capacity to grow 6,720 seeds.
 - » To label each nursery bed for purpose of monitoring seed growth.
 - » To nurture planted seed and young seedlings.

2.1.4 Activity 1.4: To review available information on cempaka's silviculture techniques

- The activity was conducted in June – September 2016 with the assistance of an experienced expert on silviculture, Mr. Riskan Effendy; he was a retiree of Bogor Research Development and Innovation Agency.
- The methodology applied was desk work or literature study, followed by a field visit for purpose of validating different findings of the study.

2.1.5 Activity 1.5: To establish 18 Ha of plantation demonstration for purpose of long-term research and training of local communities as well as other local stakeholder

The objective of implementing the activity was to establish 18 Ha of cempaka plantation at 3 different sites in 3 districts for purpose of demonstration and training. Note that size of demplots was initially set at 36 Ha; the adjustment was made due to the slow progress in implementation and remaining financial resource of the project. The steps followed in the establishment of cempaka demplots included:

- Conduct of field surveys in 3 Districts to identify suitable sites for planting cempaka seedlings through species-site matching technique.
- Verification of legal status of the lands used involving landowners, local government authority and local customary leaders.
- Signing of MOUs for use of lands for cempaka wood plantation demplots; the MOUs between MEFREDI and landowners in North Minahasa and Minahasa Districts last for 30 years while the MOU in South Minahasa lasts only for 5 years.
- Land preparation which consisted of land clearing, compartmentation, instalment of hole markers, holes digging and planting of seedlings.
- The planting system adopted was agro-forestry at 3 different spaces :3 by 3; 4 by 3 and 5 by 3 meters. Planting was carried out in November – December 2019 during the rainy season.



Figure 9. Field survey to identify suitable land for planting (Photo: PMU)



Figure 10. Cempaka planting by local community (Photo: PMU)

2.2 Activities Under Output 2

2.2.1 Activity 2.1: To conduct intensive dialogue on long-term benefits of cempaka plantation with 20 villages in 3 Districts

Expected outcomes of this activity were: i) long-term benefits of conservation and development of cempaka resource fully understood by local communities, and ii) interest of local communities in growing cempaka increased. The activity was implemented in Minahasa, North Minahasa and South Minahasa Districts from October to December 2019 involving 21 villages or one village above the original target.

The methodology employed in implementing the activity is highlighted below:

- i. Preparatory stage
 - Development of conceptual framework for the dialogue by expert to ensure that dialogue would be effective in delivering the expected outcomes.
 - Development of modules to guide conduct of dialogue sessions.
- ii. Socialization stage
 - At this stage, the main stakeholders were approached by executors to ensure that they were well informed of the activity and its objectives.
 - The main stakeholders approached were NSPFA, concerned Forest Management Units (FMUs) and village administrators.
 - The 21 villages involved in the dialogue were selected based on available data on potential for cempaka plantation development in terms of biophysical and socio-economic and accessibility of a village. Selection of the villages was accomplished collaboratively by local governments, forestry agency, competent consultant and FMUs.
- iii. Village level dialogue stage
 - Exposition of different benefits of cempaka resource accruable to local communities in the long-run.
 - The dialogue was based on Minahasa people's saying "Maju bersama mencapai tujuan" or "Advancing together to prosper".
- iv. Evaluation stage
 - Level of understanding was detected using questionnaire sheet deliberately developed by competent expert, before and after in dialogue session.
 - The information collected, facilitated classification of participants comprehension level of the topic exposed and discussed.

2.2.2 Activity 2.2: To train local communities on cempaka nursery development techniques at the small-scale nurseries

The expected outcomes of this activity were:

- 45 community leaders or members of farmers groups trained on techniques for developing small-scale nurseries, and
- Technical manual for nursery development produced and distributed.

The methodology employed in implementing the activity consisted of the following elements:

i. Planning or preparation stage

Appointment of a competent professional to serve as a trainer, development of training materials and needed questionnaire, selection of participants, identification of venue and coordination with local authorities.

ii. Actuating stage

Presentation of materials by trainer, discussion, group assignment, practical application and field visit.

iii. Evaluation stage

- Assessment of training outcomes using the questionnaire sheet circulated before and after the training
- Reporting of training program implementation.

2.2.3 Activity 2.3: To train local communities on cempaka planting techniques at the plantation demonstration plots

The expected outcomes of the activity were:

- In total, 45 community leaders or members of farmers groups in 3 Districts acquired technical skills for cempaka planting
- Technical manual on cempaka plantation development produced and distributed.

The methodology employed in implementing the activity consisted 3 steps:

i. Step 1: Planning/preparatory works

- Development of questionnaire for assessment of training results, identification of training sites, selection of participants, development of training modules, and appointment of trainers.
- The criteria used in the selection of trainees included: she/he was community leader or member of a farmer group, gender sensitive, had experience in tree planting, landowner and cempaka lover.

- ii. Step 2: Actuating the training
 - Presentation of materials, discussion, group assignment, practical application, visit to community-owned cempaka plantation.
- iii. Step 3: Assessment of training results
 - Analysis of comprehension level of the trainers made through the questionnaire.
 - Reporting of the training process.
 - Development of a technical manual on cempaka plantation development.

2.2.4 Activity 2.4: To collaboratively identify and introduce appropriate incentives for local communities to plant cempaka trees

- The expected outcomes of the activity were:
 - i. Different format of incentives needed by local communities for growing cempaka identified through village level workshop involving 21 villages in 3 districts.
 - ii. Feasible forms of incentive to apply collaboratively identified by the project, government authorities, and local community leaders.
 - iii. Strategy for applying the feasible incentives developed.
- The methodology adopted in implementing the activity consisted of the following steps:
 - i. Preparatory works
 - Development of attractive materials for presentation and discussion in the 21 villages with local stakeholders.
 - ii. Socialization
 - Communication with main stakeholders: NSPFA, concerned FMUs, village administrators and community leaders about the activity and its objectives.
 - iii. Village level dialogues
 - » Organization of village level dialogues in the form of FGDs involving 21 villages in 3 Districts
 - » Identification of different form of incentives for local communities
 - iv. Districts level FGD's
 - » Selection of feasible forms of incentives involving the main local stakeholders.
 - » Preliminary formulation of strategy for applying the feasible incentives.
 - v. Province level FGD
 - » Selection and confirmation of feasible forms of incentives to introduce
 - » Confirmation of the strategy for exercising the incentives selected.

2.2.5 Activity 2.5: To collaboratively develop an extension program on cempaka resource Conservation

The expected outcomes of the activity as defined by the terms of references were:

- i. A sound extension program on cempaka conservation developed and implemented since year 3, and
- ii. Document of extension program produced and distributed to relevant stakeholders in year 3.

The methodology adopted in implementing the activity consisted of the elements below:

- i. Preliminary interview

During this stage, 100 respondents representing farmer groups, forestry extension officers, NGOs' extension professional on rural development, village administrators, processors as well as traders of cempaka wood were interviewed regarding their views on current program on the conservation and utilization of cempaka resources, problem facing cempaka resource management, what have been done and what ought to be done to enhance programs and capacity in implementing extension programs.

- ii. Conduct of FGD on development of a sound extension program

The FGD was attended by previously mentioned stakeholders and also by the Production Unit of planting materials of the NSPFA, forest rangers and law enforcement unit of MoEF. The objective of this FGD was similar to that of the preliminary interview but with wider scope.

- iii. In-depth interview

This interview involved the key stakeholders, namely Head of NSPFA and Head of Education and Training Centre of MoEF in Makassar, South Sulawesi. The main objective was to formulate needed facilities on enhancing forestry extension program and operational capacity of the institution involved in forestry extension affairs.

- iv. Observation and literature study

The observation was conducted as a tool to verify the information gathered under elements i) to iii) above. The literature study was carried out as a means for assessing current extension program with respect to adequacy and achievement.

It is to be noted at this juncture that the first outcome of this activity as defined by the TOR was unattainable in terms of "implemented since years 3" as the activity was only implemented in year 3 while some preparatory works are needed to properly implement the sound extension program produced.

2.3 Activities Under Output 3

2.3.1 Activity 3.1: To conduct survey on growing stock and distribution of cempaka species

- The objectives of this activity were: i) to collect data on growing stock of cempaka natural and planted stands as regards volume and distribution, and ii) to map geographic distribution of cempaka stands in North Sulawesi province.
- The survey on growing stock involved three geographic areas as the sample, namely: Minahasa District, Tomohon City, and South Minahasa District; the survey took place in April – July 2020 covering natural and planted cempaka stands occupying lands of different slopes at 35 – 1,300 meters of altitude.
- The methodology employed in conducting the survey was combination of ground survey and spatial modelling using Sentinel 2B satellite imageries and Digital Elevation Model (DEM) data and consisted of the following elements:
 - i. Generation of required spatial data
 - » Coordinate data on cempaka stands or trees generated under previous works of MEFRDI and activity 1.2 of ITTO Project PD 646/12 Rev.3 (F) showing longitude and altitude positions.



Figure 11. Cempaka stands ground survey in Langowan, Minahasa District (Photo: PMU)

- » Sentinel 2B satellite imagery (8 tiles) with cloud cover less than 10%, acquisition period of December 2019 – March 2020.
 - » Digital Elevation Model (DEM) at 134 layers.
 - » Land slope spatial data produced from DEM data.
 - » SAVI (Soil Adjusted Vegetation Index) spatial data constructed using Blinn *et al* (2019) formula.
- ii. Overlay of waypoints data and variables; as many 280 waypoints were obtained from previous research works and overlaid with spatial maps of SAVI, elevation and slope.
 - iii. Development of spatial model using PCA (Principal Component Analysis) procedures.
 - iv. Construction of a spatial model using Biner Logistic Regression procedures.
 - v. Model validity test.
 - vi. Construction of volume estimating model using different forms of statistical equations.

2.3.2 Activity 3.2: To conduct study economics of cempaka wood utilization (for Woloan house production)

- The primary objective of implementing this activity was to collect reliable information on Minahasa wooden house industry to be used as the basis for making decision on the promotion of the industry both by the governments and investors
- The study was conducted in Minahasa, South Minahasa and Southeast Minahasa Districts, and city of Tomohon from July to September 2020.
- The methodology employed consisted of the following components:
 - i. Collection of primary data
Primary data were obtained through field surveys and covered the data on extent of cempaka plantation, harvest time, volume of production and harvesting cost, selling price of logs, channel of logs marketing, profit by growers, etc.
 - ii. Collection of secondary data
Secondary data on management status of cempaka plantations in the sample areas, unit and capacity of Minahasa wooden house industries, targeted markets, etc, collected through literature search.
 - iii. Identification of respondents
Selection of respondents through purposive sampling technique, consisting of cempaka individual farmers, farmer groups leaders and members involved in cempaka growing and Minahasa wooden house producers.



Figure 12. Survey on Minahasa wooden house industry (Photo: PMU)

2.3.3 Activity 3.3: To determine sustainable level of AAC

- The objectives of implementing this activity were: i) to calculate sustainable level of AAC (Annual Allowable Cut) for cempaka stands, and ii) to measure level of cempaka wood consumption of households.
- Employed methodology consisted of several elements:
 - » Survey on weight of wood products involving 13 furniture industries and timber traders in 3 Districts.
 - » Data inputs: collected field data were input in the form of table and stored in database



Figure 13. Survey on Cempaka wood consumption (Photo: PMU)

- » Interview of respondents: 99 households in Minahasa, North Minahasa, Minahasa and South Minahasa Districts were used as the respondents.
- » Data analysis using TEINIT application (Abdulah *et al*, 2020a and Abdulah *et al.*, 2020b) and Kayo *et al* (2018) procedures and techniques.

2.3.4 Activity 3.4: To develop SOP and procure equipment and facilities for monitoring of forest operations and timber legality

- The objectives this activity were: i) to develop SOP for monitoring of forest operation and timber legality, and ii) to procure the equipment and facilities needed to conduct monitoring of forest operations and timber legality. The activity was implemented in North Sulawesi and South Sulawesi provinces from November 2019 to January 2020.
- The methodology employed consisted of:
 - » Interviews of key informants on monitoring of wood accounting process as the Central and North Sulawesi provinces levels.
 - » FGD (Forum Group Discussion), to discuss on draft SOP involving practitioners of BPHP Palu, NSPFA, FMU Region V, representatives of farmers groups, village administrators, Minahasa wooden house producers, cempaka timber traders.



Figure 14. FGD for developing SOP for forest monitoring (Photo: PMU)

- » Observation, for purpose of verifying the data obtained through the interviews and FGD.
- » Literature search, to assess performance of current monitoring of forest operations and compliance to SLVK.

2.3.5 Activity 3.5: To pilot test application of SOP, equipment, and facilities in one forest District

- The main objectives of this activity were: i) to pilot application of SOP, equipment and facilities procured under activity 3.4, and ii) to refine the SOP based on inputs received from the professionals and forestry authorities involved in the piloting exercise.
- The activity was implemented at FMU Region 5 in February – March 2020.
- The methodology employed is highlighted below:
 - i. Coordinating step

It was necessary to coordinate with Districts forestry stakeholders, notably with the FMU Region 5 to ease field operations.
 - ii. Sampling of respondents

The respondents employed were selected using purposive sampling techniques for two populations: processor consuming cempaka wood and cempaka growers on owned lands.
 - iii. Field testing of SOP at cempaka harvesting sites, log yards, sawmills and wood industries (furniture and Minahasa wooden house).

iv. Evaluation step

To assess strength and weakness of the SOP developed and tested for purpose of refining the SOP.

2.3.6 Activity 3.6: To establish and operate a stakeholder forum at provincial level

- The objectives of this activity were: i) to compile information on stakeholders; ii) to assess need for establishing a stakeholders forum through consultation with influential stakeholders; iii) to formally establish a Stakeholders Forum (SHF), and iv) to pilot operation of the forum.



Figure 15. Survey on stakeholders for establishing SHF (Photo: PMU)

- The steps followed in implementing the activity were:
 - i. Preparation stage
Identification of stakeholders of cempaka resources, identification of problem facing cempaka plantation development and utilization, collection of information on cempaka through questionnaire or interviews and data analysis.
 - ii. Forum establishment stage
During this stage, a number of informal meeting were held with the main objective to get acquaintance among the initiators and sponsors; also 3 FGDs were organized to discuss formal formation of SHF covering its mission and tasks, memberships, organizational structures, funding sources, etc.
 - iii. Operational stage
One trial meeting was held on 21 August 2020 to discuss on among others, development of SHP operational plan, means of communication, technical report on implementation of Activity 3.6, etc
 - iv. Reporting stage
To report on SHF activities and assist in refining technical report on Activity 3.6.

2.3.7 Activity 3.7: To organize one provincial workshop on cempaka conservation and utilization

- The primary objective of the activity was to review draft ISMP-CRCD (Integrated Strategic Management Plan for Cempaka Resource Conservation Development) involving stakeholders; the draft would be finalized using inputs from the workshop.
- The workshop was held on 25 August 2020 at Four Points Hotel in Manado, attended by small group of participants and broadcasted using ZOOM meeting application.
- The steps followed in organizing the workshop were:
 - » Establishment of workshop organizer
 - » Drafting of ISMP-CRCD with assistance of a national consultant
 - » Distribution of draft to reviewers and invitees
 - » Inviting competent reviewers on the draft
 - » Conduct of the workshop
 - » Compilation of inputs received from the workshop
 - » Finalizing document on ISMP-CRCD
 - » Submission of technical report in the implementation of the workshop.



Figure 16. Cempaka natural forest in Langowan, Minahasa District (Photo: PMU)



Figure 17. Ground survey in Mahawu Mountain, Tomohon City (Photo: PMU)

3. PROJECT INTERVENTIONS AND RESULTS

3.1 Enhancing Capacity of Local Communities in Cempaka Plantation Development

To enhance capacity in cempaka plantation development, five activities had been fully implemented in order to deliver the planned first output of the project which was “enhanced capacity of local communities in cempaka plantation development”. The activities that had been implemented and their respective results are presented in the sections that follow.

3.1.1 To identify sources of quality cempaka seed (Activity 1.1)

Results of this activity are six sources of quality seed in two provinces; they are:

i. **Toulumuten seed stands**

- Located at 1°16'22" N and 124°56'55" E, at 655 meters of altitude with 30 to 60 % of land slopes, in Kiniar village of Minahasa District, North Sulawesi Province.

- Extent of the site was around 2 ha and contained 37 cempaka trees, whose age was approximately 21 years with diameter ranged between 20 and 40 Cm, total height 16 - 26 meters and clear bole of 8 – 19 meters.
- The local people met indicated the annual fruiting seasons in May and September.

ii. **Yayasan Masarang seed stands**

- Geographically located at 1°29'75" N and 124°78'24" E at 640 meters of altitude on lands sloping around 15% in Pinaras village of Tomohon city, North Sulawesi Province.
- Extent of the site was about one hectare, contained 26 cempaka trees aging approximately 20 years with 20 – 30 centimetres of diameter, 10 – 28 meters of total height and 11 – 20 meters of clear bole.
- According to the local people met, fruiting seasons took place in May and November every year.

iii. **Raruman seed stands**

- Geographically located at 1°22'41" N and 124°72'14" E in Rumoong Atas village of South Minahasa District, North Sulawesi Province, of 575 meters of altitude on lands sloping 40% or less.
- Extent of the stands was around 1 hectares that contained 29 cempaka trees aging around 20 years with 18 – 73 centimetres of diameter, total height of trees of 14 – 33 meters and clear bole of 6 – 20 meters.
- Annual fruiting seasons in May and November were indicated by the local people met with.

iv. **Lesung seed stands**

- The stands are located geographically at 1°00'38" N and 124°04'04" E at Tonsawang village of Southeast Minahasa District, North Sulawesi Province at 550 meters of altitude on lands sloping less than 60%.
- The stands grew on one hectare of land and occupied by 25 cempaka trees with 20 – 80 centimetres of diameter, tree height of 12 – 35 meters and clear bole height of 10 – 20 meters.
- Fruiting seasons occurred yearly in May and November.

v. **Tondok seed stands**

- The stands were located geographically at 2°56'49" S and 119°55'60' E at Sangkaropi village of Tana Toraja District of South Sulawesi Province, at 946 meters of altitude on lands sloping 30 – 60%.
- The stands grew on 5 hectares of land and contained 27 cempaka trees with 29 – 96 centimetres diameter, tree height of 20 – 38 meters and clear bole height of 10-21 M.
- Fruiting seasons occurred in May and November, every year.

vi. Lempe seed stands

- The stands are geographically located at 2°57'09" S and 119°51'38" E at Lolai village at Tana Toraja district in South Sulawesi Province, at 890 meters of altitude on lands sloping at 30 to 60%.
- The stands grew on 8 hectares of land and contained 27 cempaka trees with varying age having diameter of 37 to 53 centimeters, tree height of 20-35 meters and clear bole height of 8-13 meters.
- Fruiting seasons occurred twice a year in May and November.

Conclusions on results of Activity 1.1

- Six seed stands of cempaka were identified, four in North Sulawesi Province and two in South Sulawesi Province.
- No specific information provided on the species occupying each site; all that mentioned was cempaka species.
- The seed stands in South Sulawesi Province were situated at a higher altitude, 890 – 946 meters above sea level, then the stands in North Sulawesi Province, 550 – 655 meters above sea level.
- Fruiting seasons at all locations reportedly occurred regularly twice a year around May and November.



Figure 18. Survey on seed sources in North Sulawesi (Photo: A.E. Thomas)



- Location seed sources:
1. Tolomuten seed stands
 2. Yayasan Masarang seed stands
 3. Raruman seed stands
 4. Lesung seed stands
 5. Tondok seed stands
 6. Lempe seed stands

3.1.2 To conduct experiments on appropriate techniques for cempaka seed collection, storage and germination (Activity 1.2)

- The objectives of Activity 1.2 were: i) to identify appropriate techniques for seed collection, storage and germination, and ii) to develop technical manuals for seed collection, storage and germination.
- Results of the experiments conducted under Activity 1.2 are highlighted below:

Seed collection

- » Flowering and fruiting seasons of cempaka wasian observed at six seed sources located in North and South Sulawesi provinces, occurred twice a year: from February to April and August to January, harvesting of fruits is best undertaken in March – April and September – October.
- » One cempaka wasian mother tree may host different forms of flower, such as buds, blossoms, etc. and different forms of fruit such as first, ripe and overripened fruits, simultaneously at one point in time.
- » Harvesting of fruits must take weather condition into account; harvesting during heavy rainy season may increase water content causing the fruits prone to pest and fungal attack while harvesting during windy days may cause young fruits to fall down. The best time to harvest fruits is during clear days.

Seed storage

- » The best germination rate of seed was obtained from the seed experiencing the following treatments during storage period : i) seeds are kept inside sealed plastic bags, ii) the bags are stored at room temperature, and iii) storage time is about three weeks.
- » Brown or black coloured seed does not affect germination rate significantly.



Figure 19. Cempaka seeds germination (Photo: J. Kinho)

Seed germination

- » Seed germination rate was found affected by room storage temperature, types of container used to keep the seed and duration of storage as elaborated above.
- » A technical manual for seed collection, storage and germination of cempaka wasian has been developed and is now available with MEFRDI.

Conclusions on results of Activity 1.2

- » Cempaka wasian at the six seed sources in North and South Sulawesi experienced flowering and fruiting seasons regularly in February-April and August – January every year; recommended seed harvest time is in March – April and September – October.
- » To obtain highest rate of seed germination, recommended seed storage treatments are: i) to keep seed in sealed plastic bags, to store seed at room temperature for only around three weeks.

3.1.3 To establish three small-scale nurseries at village level to be managed by local communities (Activity 1.3)

The objectives of implementing this activity were : i) to establish small scale nurseries to serve as the sites for growing cempaka seed of different origins and treatments, ii) to select the best seedlings for demplots development, and iii) to serve as a training centre for seedling production. The results realized at completion of the activity were:



Figure 20. Cempaka small-scale nursery in Talawaan Atas Village, North Minahasa (Photo: PMU)



Figure 21. Cempaka small-scale nursery in Tombulu Village, Minahasa (Photo: PMU)



Figure 22. Developing small-scale nursery with local community participation (Photo: PMU)

- Three small-scale nurseries had been established at 3 sites, each with a size of 0.1 hectares and production capacity of 8,300 seedlings, located at Kembes Village of Minahasa District, Rumoong Atas Village of South Minahasa District and Talawaan Atas Village of North Minahasa District, respectively.

- A technical manual for cempaka nursery development has been developed, covering seed collection and preparation, seed sorting and testing, seed packaging, seed sowing, weaning or moving young seedlings from sowing beds to polybags and nurturing of young seedlings.

The technical manual developed is now available with MEFRDI for distribution upon request.

3.1.4 To review available information on cempaka silviculture techniques (Activity 1.4)

Results of the review are highlighted below:

- The cempaka species widely known in North Sulawesi is that one having scientific name as *Elmerrillia ovalis* (miq) Dandy; this name has been recently revised to *Magnolia tsiampacca* (L) Figlar & Noot.
- Cempaka species can grow on sites from low altitude up to 1,000 meters above sea level, from flat to heavily sloping lands, with annual rainfall of 1,400-2,600 mm, can reach 45 meters in height and up to 200 cm in diameter.
- Local communities have been planting cempaka at different spacing: 3 x 3 meters or 2 x 2 meters in monoculture and 5 x 5 meters in agro-forestry system; the latter system produced better quality of plantations due to more intensive nurturing.
- Available data indicated an average height growth of 1.19 meters and diameter growth of 3.45 centimetres per annum that at 11 years of age trees may reach 13 meters of height and 38 centimetres of diameter



Figure 23. Review on results of Activity 1.4 in Manado, North Sulawesi (Photo: PMU)

3.1.5 To establish 18 Ha of plantation demonstration for purpose of long-term research and training of local communities as well as other stakeholders (Activity 1.5)

The results produced at completion of implementing of the activity are highlighted below:

- The surveys on suitability and availability of lands for cempaka demplots conducted in three Districts identified 3 parcels of land to use were: 8.5 Ha at Tombuluan Village of Minahasa District; 3.5 Ha at Rumoong Atas Dua of South Minahasa District; and 6.0 Ha at Talawaan Atas Village of North Minahasa District.
- Long-term use of the lands for demplots has been secured through the MOUs signed by MEFRDI and the landowners.
- Preparation of the lands at each site for planting of seedlings, involved works on land clearing, land blocking, installing markers for planting holes, holes digging, and planting of sorted seedlings produced at the small nurseries.
- Seedlings had been planted under agro-forestry systems using different spacing and crop species.
- Maintenance of the plantations in the first year, to be financed by ITTO, covered weeding, hoeing around seedlings, fertilizing, replacing died plants and monitoring works.
- At age 4 – 5 months, it was found that combination of cempaka and corn plants yielded highest survival rate with the measure of height and diameter averaging 54.93 centimetres and 4.4 millimeters, respectively



Figure 24. MOUs signed between MEFRDI and landowner in Tareran South Minahasa (Photo: PMU)



Figure 25. Cempaka seedlings on agroforestry system (Photo: PMU)



Figure 26. Monitoring and maintenance of cempaka plant (Photo: PMU)

- At age 4 – 5 months, spacing of 3 x 3 meters resulted in the highest survival rate at 92.25% with average height of 57 centimetres.
- The demplot design that had been developed by a competent expert could not be used in the establishment of demplots as seedlings produced in the nurseries for the demplots were not properly documented with respect to seed origin which was truly a big blunder by the project management.

3.1.6 Discussion on results of the activities under Output 1

The indicators of Output 1 as defined in the Logical Framework Matrix of the project document were:

- i. Six sources of seed identified and mapped in year 1.
- ii. Experiments on techniques for seed collection, storage and germination completed in year 1.
- iii. Six small-scale nurseries established in 3 Districts by year 2.
- iv. Silviculture techniques for cempaka reviewed in year 1.
- v. 30 Ha of plantation demonstration plots established in 3 Districts in years 1 and 2.
- vi. Technical manuals for seed collection, storage and germination as well as for planting available for use by local communities.

Please note that some adjustments to the original indicators, listed above, had been proposed by the Implementing Agency and approved by ITTO on 15 March 2019 per its letter Ref No. F.19-0017. The 3rd and 5th indicators had been adjusted to become “3 small-scale nurseries and 18 Ha of cempaka demo plots”, respectively.

Note that Output 1 was defined as “capacity of local communities in cempaka plantation development enhanced”. Matching the results of implemented individual activities under Output 1 with defined indicators of the output revealed that: all six defined indicators have been met regardless of timing of realization. In light of the results of the activities and defined indicators, it is reasonable to conclude that Output 1 of the project has been delivered as planned. Indeed, this conclusion requires examining by asking this question “has delivery of Output 1 actually enhanced capacity of local communities in cempaka plantation development?”.

Plantation development requires inputs, the essential ones are lands, quality seedlings and skilfull farmers. As regards lands there remains a question about availability of suitable lands as well as their distribution as existing spatial plans at the province and District levels may have not accommodated the program on cempaka plantation development, despite the claim made by the governments on the iconic status of cempaka products.

On quality seedlings, the project interventions were confined only to identifying cempaka seed sources, developing technical manual for seed collection, storage and germination, and establishing small-scale nurseries. How farmers will produce quality seedlings under the present circumstances? It is true that seed sources have been identified, a technical manual on seed collection, storage, and germination has been produced. The questions are: have farmers received and comprehended the manual?, are farmers able to apply the manual in practice?, do farmers have needed resources to apply the manual? With respect to skilfull farmers, no interventions have been made by the project so far as regards capacity building, i.e. no training of farmers has yet been actually conducted on process of plantation development. The stated objective of Activity 1.3 and 1.5 are to serve as training site on nursery development (implicitly on production of seedlings) and

cempaka planting techniques, respectively. These objectives, however, have not been realized, thus the activities did not provide training of farmers on needed skills, but only sites for training.

Another yet problem with the conclusion on “Output 1 have been delivered” is on implementation of Activity 1.5. The objectives of this activity were to establish 18 Ha of demo plots to serve as cempaka long-term research laboratory and as training site for local communities and other stakeholders. Indeed, the demplots established can serve as research laboratory for cempaka. Two questions remain : i) has MEFRDI scientifically finalized a long-term R&D program on cempaka ? and ii) what are the R&D works that can be scientifically and properly performed on the demplots knowing that origin of the seeds and seedlings used in establishing the demplots was not clear, due to unorganized labelling of seeds sown in the nurseries ? On above discussions, concluding that Output 1 has been delivered through implementation of five planned activities has to be understood cautiously. It is conceptually correct in light of the indicators defined. In practice, however, quality of the output delivered is arguable, or it might be the case that the output was less precisely defined by the proponent.

3.1.7 Lessons learned

Among the important lessons learned from the implementation of the activities under Output 1 are:

- Identification of seed sources is a resource consuming task that the stands have to be monitored continuously and their protection secured.
- To be useful, the technical manual on seed collection, storage and germination produced under Activity 1.2 has to be distributed to local stakeholders, notably local communities, and its application demonstrated through training sessions at strategic venues.
- The information collected and compiled under Activity 1.4 has been produced in English; obviously, it is not useful for potential users, especially local communities, due to language problem that its production in Bahasa Indonesia is strongly advisable. Use of language on ITTO project reporting should be based on ability of potential users to comprehend the report.
- Establishment of village nurseries intended for demonstration and training site by contractor without involving local people may not be a useful vehicle for technology transfer. In addition, training on nursery development should not cover only technical skills but also managerial aspect of a nursery.
- In developing field laboratory for R&D on growth and yield of cempaka or any other species, seed accounting process shall be performed accurately to ensure that genetic origin of seeds and seedlings used is adequately documented. In addition, a master plan for cempaka R&D on growth and yield should have been developed before designing the demplots to make sure that the elements of the master plan are accommodated in demplot design.



Figure 27. Monitoring of demo plot by PMA, Head of MEFRDI and Head of NSPFA (Photo: PMU)

3.2 Increasing Participation of Local Communities in Cempaka Plantation Development

Apparently, the project proponent had assumed during the project development process, that the full implementation of five relevant activities identified through the problem analysis should increase participation of local communities in cempaka plantation development. The activities that has been identified and fully implemented as well as their respective results are presented in the following section:

3.2.1 To conduct intensive dialogues on long-term benefits of cempaka plantation with 20 villages in 3 Districts (Activity 2.1)

- The expected outcomes of the activity were: deep understanding of local communities on benefits of planting cempaka and increased interest of local communities in cempaka growing.
- The dialogue involved 21 villages in total which were located in 3 Districts, namely:
 - » Minahasa with 7 villages and 105 participants.
 - » South Minahasa with 7 villages and 109 participants.
 - » North Minahasa with 7 villages and 105 participants.
- Six dialogues sessions were organized in October – November 2019 with 319 participants in total, 106 were females (33%).
- Results of the dialogues are summarized below:
 - i. Long-term economic benefits of development and conservation of cempaka wasian were fully understood by the participants, level of comprehension of the dialogue materials presented ranged between 3.25 at Wori and 3.65 at Tareran dialogue sessions, respectively, out of 4.0 scale possible.

- ii. The participants also perceived that demand for cempaka wasian wood would continue to rise, which would increase wood price and interest in growing cempaka, which would consume larger volume of seed, which implied occurrence of economic spill over effects.
- iii. Long-term ecological benefits of development and conservation of cempaka wasian were less understood by the participants; level of comprehension was scored between 2.55 and 2.85, out of 4.0 score possible, indicating the fact that economic value was more attractive to the participants than ecological value of cempaka wasian.



Figure 28. Discussion session on long-term benefits of cempaka plantation (Photo: PMU)

- iv. Interest in growing cempaka wasian trees was found stronger after the dialogues than before the dialogues due mainly to the perceived growing demand for cempaka wasian wood and its promising economic impacts. The increase in interest ranged from 67% at Wori session to only 4.4% at Tareran dialogue session.
- v. The participants that were not interested in growing wasian tree had cited different reasons for their position; most common ones were:
 - Did not acquire needed skill for growing cempaka tress
 - Legality of harvested timber was uncertain
 - Cempaka seed needed for planting were hard to obtain
 - Owned-land had been planted with other plants
 - Weak capacity to participate.
- vi. Most of the participants, in the order of 80 to 90%, expressed interest in growing cempaka wasian trees after completion of the dialogues. There still room to increase the level of interest if above listed reasons for not growing cempaka tress could be overcome.

3.2.2 To train local communities on cempaka nursery development techniques at the small scale nurseries (Activity 2.2)

- The expected outcomes of the activity were: i) 45 community leaders or members of farmer groups in 3 districts trained on techniques for developing small-scale nurseries, and ii) technical manual for nursery development produced and distributed.
- Results of the activity are summarized below:
 - In total, there were 52 training participants, comprising 35% females and 65% males, aging between 23 to 78 years, originating from 3 Districts, namely Minahasa, South Minahasa and North Minahasa.
 - In the beginning of each training session, participants were also provided with knowledge on different species of cempaka, techniques for seed collection, storage and germination and on planting.



Figure 29. Training on small-scale nursery development (Photo: PMU)



Figure 30. Field visit in CV. Culture Mandiri's nursery in Manado and BPDAS Tondano's permanent nursery (Photo: PMU)

- iii. The participants were also equipped with skills for nursery development budgeting and analysis of economic benefits of investment in nursery development.
- iv. The participants were also exposed to other such nurseries as Culture Mandiri's and BPDAS Tondano's for sharing of experience and ideas.
- v. Results of questionnaire sheet filled out by the participants before and after the training indicated that:
 - » Participants from South Minahasa Districts scored 71.2 compared to 59.2 and 54.1 for participants from Minahasa and North Minahasa Districts, respectively, as regards skills for growing cempaka and developing nursery, before the training.
 - » After the training, the score rose to 81.5; 78.1; and 69.8 for participants from South Minahasa, North Minahasa, and Minahasa Districts, respectively.

- vi. Most of the participants, especially those from South Minahasa Districts, have had strong experienced in growing cempaka and in dealing with planting material. In fact, tree planting program has started since the 1980s in this District and established around 100 Ha of tree plantation in Tareran sub-Districts alone, mostly using cempaka wasian species.
- In conclusion, the training session had taught 52 participants some knowledge and skills on small-scale nursery development included techniques for seeding, construction of a simple small nursery, nurturing of sown seed and seedlings, nursery costing analysis and success stories of cempaka growers. A technical manual has been produced by the project for distribution to farmer groups free of charge. Since farmer groups are the prime developer of cempaka plantation, enhancing capacity of this grass root institution is worth considering by provincial and District governments.

3.2.3 To train local communities on cempaka planting techniques (Activity 2.3)

- The expected outcomes of the activity were: 45 communities leaders or members of the farmer groups acquired technical skills for planting of cempaka and technical manual on cempaka planting produced.
- The realized results of the activity are outlined below:
 - i. The first training session was held at Tombulu village in Minahasa District with 30 participants from Minahasa and North Minahasa Districts, comprising 83% men and 17% women aging between 23 and 64 years.
 - ii. The second training session was organized at Rumoong Atas II Village in South Minahasa District with 15 participants from this District only, comprising 80% men and 20% women aging from 42 to 78 years.



Figure 31. Training on Cempaka planting techniques for community leaders (Photo: PMU)

- iii. The first agenda item of both training sessions was to circulate a pre-test questionnaire for the participants to fill out to assess level of knowledge and skills before the training.
- iv. The main agenda items of each session were: a) a presentation of the training module which had been developed by professionals that covered different topics including general information on cempaka tree species, preparatory works prior to planting, planting procedures and techniques, maintenance of planted seedlings, economic analysis of cempaka growing ventures, etc, b) discussions on the presentation and experience of the participants in planting cempaka, c) field application of the concepts, procedures and techniques taught in the classroom, and d) visits to existing plantations.
- v. At completion of each training session, post-test questionnaire sheet was again circulated and filled out by the participants. Assessment of the pre-test and post-test questionnaire sheets indicated that:
 - » Both training sessions were able to increase level of knowledge and skills of the participants as much as 22%, 20% and 13% for participants from North Minahasa, Minahasa and South Minahasa, respectively.
 - » The gain in knowledge and skills by the participants from South Minahasa Districts was much smaller than that by the participants from the other two Districts due to the fact that the participants from South Minahasa had already acquired higher level of knowledge and skills prior to attending the training session. Adding more to crowded space is always more different than to roomy space.
- vi. A technical manual on cempaka planting techniques has been produced and distributed to the participants and other stakeholders.



Figure 32. Field practice on cempaka planting techniques training (Photo: PMU)

3.2.4 To collaboratively identify and introduce appropriate incentives for local communities to plant cempaka trees (Activity 2.4)

- The expected outcomes of this activity were:
 - i. Different forms of incentives identified through dialogues with 21 villages
 - ii. Feasible forms of incentives collaboratively identified by the project, government authorities at different levels and community leaders.
 - iii. A strategy for applying the feasible incentives developed.
- Main results of the activity are outlined below:
 - i. Major impediments to cempaka plantation development facing local communities identified were: weak technical capacity of farmers, lack of capital investment due to the relatively long gestation period, uncertain timely availability of seed in terms of quantity and quality, questionable legality of harvested cempaka wood and weak operational management of farmers' institution.
 - ii. Prominent constraints identified concerned with unavailability of needed seed in time and questionable legality of harvested cempaka wood. These two factors alone have been most discouraging for local communities to get involved in cempaka planting
 - iii. Among the feasible incentives to apply were:
 - a. Construction of nurseries at strategic points taking distribution of potential growers into account
 - b. Continued coaching by professionals on different tasks of planting.
 - c. Persisting production and distribution of outreaching materials in indifferent forms, relevant to cempaka plantation development for purposes of continued refreshing and reminding of local communities of cempaka conservation and development.
 - d. Wide dissemination of information on policies governing cempaka resources management, confirming the right of growers to harvest trees and sell the wood they had planted.



Figure 33. Provincial level FGD on incentives for growing cempaka (Photo: PMU)

- e. Organization of scheduled training sessions widely announced before dates of the training to allow farmers prepared for attending, free of charge.
- f. Provision of information and coaching on financial aspect of growing cempaka including development of cempaka business plan, free of charge.

3.2.5 To collaboratively develop on extension program on cempaka resource conservation and development (Activity 2.5)

- The expected outcomes of this activity were:
 - i. A sound extension program on cempaka conservation developed
 - ii. Document of the extension program produced and distributed in Year 3.
- Results of the activity are highlighted below:
 - i. Data on available manpower to serve forestry extension service collected; currently, there were 234 extension officers in duty consisted of 72% university graduates and 28% of lower education. In addition, there were also 113 volunteered forestry extension personnel.
 - ii. Main function and tasks of the provincial forestry extension service were reviewed with the following results:
 - » To develop a forestry extension program in close consultation with other government services
 - » To develop program on capacity building for forestry extension officers and staff
 - » To develop SOP for implementing forestry extension program
 - » To monitor and evaluate implementation of the forestry extension program



Figure 34. Participants of FGD on development of extension program on cempaka resource conservation (Photo: PMU)

- iii. Constrains to implementing forestry extension program identified were:
 - » Insufficient number of extension officers
 - » Documented extension materials not available
 - » Limited operational resources including funds
 - » Weak capacity of local community in cempaka plantation development for lack of technical, institutional and financial resources
 - » Lack of capacity to perform timber legality assurance system (SLVK)
 - » Lack of information on government policies on cempaka utilization
 - » Illegal charges on transporting of wood products
- iv. A document on cempaka extension program called “Buku Penyuluhan Pengembangan Cempaka di Sulawesi Utara” has been produced and distributed to all extension officers and staff.
- v. In addition to above mentioned handbook, a document on “Strategy for the Extension of Cempaka Development Program in North Sulawesi” has also been developed and distributed.

3.2.6 Discussion on results of the activities under Output 2 and defined indicators of achievement

- Defined indicators of Output 2 in the project document were:
 - i. Dialogue with 20 villages on cempaka conservation conducted
 - ii. 60 community leaders from 3 districts trained in both cempaka nursery and plantation development techniques in Year 1 and 2.
 - iii. Incentives for local communities to plant cempaka collaboratively identified in Year 1
 - iv. An extension program on cempaka collaboratively developed and implemented since Year 3
 - v. At least 10 villages involved in cempaka related planting activities
- Note that Output 2 was defined as “Participation of local communities in cempaka plantation development increased”. The question is “have the project interventions through implementation of Activities 2.1 through 2.5 actually increased participation of local communities in cempaka planting thus expanded the area planted?”. To properly answers this question there is a need to carefully examine both defined indicators of Output 2 and results of the activities under the output.
- Under Activity 2.1, dialogue with 21 villages, one village over the target, was completed; under Activity 2.2, 45 community leaders or members of farmer groups had been trained on techniques for nursery development; under Activity 2.3, 45 communities leaders or members of farmers groups had been trained on techniques for cempaka planting; under Activity 2.4, incentives for local communities to plant cempaka had been identified

collaboratively with the involvement of primary stakeholders. Under Activity 2.5, an extension program on cempaka had been developed yet not been implemented. It is to be noted that Activity 2.5 was completed only in Year 3; as implementation of the extension program requires substantial preparatory works, it was not realistic to expect implementation of the program in Year 3. Therefore, indicator iv) the output should be defined as “An extension program on cempaka collaboratively developed”. Indeed, the program was developed involving the NSPFA and other stakeholders.

- Indicator v) of Output 2, apparently was meant to reflect increased participation of local communities. The consultation made with the district governments and NSPFA confirmed that at least 10 villages have engaged in cempaka planting exercise for decades now, even long before the presence of ITTO Project PD 646/12 Rev. 3 (F).
- Above matching of defined indicators of Output 2 with the results of executed activities under the output clearly indicated that all defined indicators have been satisfied. It is therefore justifiable to conclude that Output 2 has been fully delivered. In other words, participation of local communities in cempaka plantation development has been increased. This conclusion deserves a closer examination in order to confirm or otherwise argue on the conclusion drawn.
- The questionnaire sheet filled out by the participants before and after the dialogue session indicated that most participants had significantly increased comprehension on long-term benefits of cempaka planting. One can argue that improved comprehension does not necessarily increase participation. It is more realistic to conclude that after the dialogues under Activity 2.1, potential for participation has been increased; the participation itself, in fact, has not increased yet.
- Results of Activities 2.2 and 2.3 revealed that participation in the training has improved their technical skills on cempaka nursery and plantation development. Improved skills, however, does not mean increased participation but may increase confidence and interest to participate. Consequently, it is more realistic to conclude that the training program has increased the potential to participate noting that the participation itself has not been increased.
- Under Activity 2.4, feasible incentives for local communities have been identified for purpose of accelerating the pace of cempaka planting. Indeed, the incentives identified will surely increase interest in cempaka planting. However, the incentives identified have not been exercised; it takes some time to do so. Consequently, the incentives identified did not directly take effect and increase participation; for sure, the incentives will increase the interest in cempaka planting thus also participation in due time.
- The sound extension program developed and distributed under Activity 2.5 will require time lapse to take effect. Therefore, it is more logical to perceive that extension program could increase interest in cempaka planting thus participation after some time, after the extension program has been fully implemented.

Conclusion: above discussion pointed out to the fact that full implementation of activities under Output 2 have reinforced interest of local communities in cempaka plantation development, but level of participation has not been increased directly but the enabling conditions for increased participation have been prepared by the project. In practice, increased participation will be materialized only after some time; consequently, increased participation has indeed not occurred yet.



Figure 35. Publication book:

- A. Material of extension program
- B. Cempaka planting technique
- C. Collection, storage and germination techniques of cempaka wasian
- D. Small-scale nursery development Techniques
- E. Extension strategy

3.2.7 Lesson learned

Among the important lessons learned from the implementation of the activities under Output 2 are:

- i. Immediate impact of a training program on a dialogue session is best assessed using questionnaire sheet distributed to participants right before the commencement and after completion of the training or dialogue.
- ii. There is a need to distinguish between conceptual and practical achievement of a project intervention when defining indicators of achievement; there might be a time lapse in occurrence of the two kinds of achievement,



Figure 36. Distribution of cempaka extension material to extension officer (Photo: PMU)

- iii. Identified feasible incentives for local communities by the government to develop cempaka plantation, would take some time to be applicable as such an initiative should undergo an institutional process that very often, is time consuming,
- iv. Increased participation should be perceived with care as reinforced or strengthened interest is not necessarily the same as increased participation but only serve as an enabling condition for participation, and
- v. The sound extension program developed under the project will be useful to trigger participation if its operational resources are made available, notably as regards professional extension officers, and secured operating funds.

3.3 Strengthening Government Policy on the Conservation and Development of Cempaka Resource

To strengthen government policy on cempaka resources conservation and development, seven project activities had been fully implemented in order to deliver the third output of the project. The activities that had been implemented and their respective are presented in the sections that follow:

3.3.1 To conduct survey on growing stock and distribution of cempaka species (Activity 3.1)

Results of this activity are summarized below:

- The predictive model, deliberately developed for the project, indicated that the extent of lands occupied by cempaka trees in North Sulawesi province, excluding the northern Districts which composed of small islands, was about 175,000 hectares which spread over twelve Districts and cities.
- Largest area where cempaka stands found was South Bolaang Mongondow District at around 44,471 hectares while smallest area was located in Kotamobagu City at around 1,936 hectares only.
- The predictive model estimated a total volume of cempaka trees at around 1.2 million m³; the largest volume was found in Bolaang Mongondow District at around 295,000 m³ while the smallest was in Kotamobagu city around 12,478 m³.
- In terms of volume of cempaka trees the largest volume at 12 m³/hectares was found in South Minahasa District whilst the smallest was due to Manado City.

Conclusion:

- Mapping of cempaka distribution in North Sulawesi Province was completed using Sentinel 2B satellite image.
- The Logistic regression model was sound but less accurate in explaining actual field data
- Cempaka trees were sporadically distributed that prediction of volume was possible only by individual trees not by stands.

3.3.2 To conduct study economics of cempaka wood utilization (Activity 3.2)

- The objectives of the study were to: i) present history of the traditional house industry in North Sulawesi, ii) examine performance the traditional house industry, iii) analyse economic aspect of traditional house industry, and iv) analyse potential impacts of expanded traditional house industry.
- The study was conducted in July – September 2020 involving three Districts (Minahasa, South Minahasa and Southeast Minahasa) and Tomohon City.
- Results of the activity are summarized below:
 - » The history on development of traditional house in North Sulawesi consisted of four distinct eras, namely: colonialism era (1920 – 1945), independence and civil war era (1945 – 1962), new political regime era (1962 – 2000) and globalization era (2000 – present). Each era its distinct features particularly with respect to home design, processing technology and marketing strategy.



- » Minahasa wooden house production process normally consisted of several steps, namely development of home design, identification of construction parts, specification of parts manufacturing, parts assembling test, final check and construction at house at buyer's place.
- » Total production cost of a 70 m² Minahasa wooden house in year 2020 was IDR 111 million or around USD 8,000; selling price was around IDR 2.2 million (app USD 143) per meter square in North Sulawesi market depending on assembling site.
- » In recent years, use of cempaka wood in Minahasa wooden house construction was only 10 – 25% of total wood consumption due to scarcity of cempaka wood indicating an urgent need to promote cempaka plantation development, to widely disseminate information on cempaka wood availability and promote competitiveness of Minahasa wooden house industry through increased processing efficiency, improved quality and advance innovation in view of minimizing cost of production.

Conclusion:

- Implementation of the activity was successful in achieving its defined objectives despite the fact that methodology employed was not built on the fundamental theory of micro-economics.
- No information on level of processing efficiency and quality of products generated by the study; in addition, no discussion was made as regards profit maximizing behaviour of the traditional house industry.

3.3.3 To determine sustainable level of AAC (Activity 3.3)

- The expected outcomes of this activity were: i) figure on level of AAC for cempaka species produced using scientifically sound process, and ii) the AAC figure will be used to the basic for issuing regulation on cempaka timber harvesting.
- The activity had been fully implemented in July – August 2020, its results are summarized below:



Figure 38. Shipping of Minahasa wooden house part to other country (Photo: PMU)

- » Per capita consumption of cempaka wood was 0.17 m³ in 2020; largest use was for house construction, followed by interior appliances such as cupboard and dining sets.
- » Younger people consumed larger volume of cempaka wood especially for doors, windows and drawers, house construction used less of cempaka wood.
- » Largest total consumption of wood occurred in Manado City (12,000 – 12,575 m³/year), followed by Minahasa District (6,000 – 8,000 m³/year) and other Districts at less than 6,000 m³/year.
- » Assuming a per capita consumption at 0,17 m³/year and North Sulawesi's population size of 2.5 million, total consumption of wood could reach 435,000 m³ in 2019.
- » The predictive model developed under activity 3.1 estimated a total growing stock of cempaka at around 1.2 million m³; assuming a maturity age of 20 years, sustainable level of AAC would be around 60,000 m³.
- » If annual consumption is assumed 435,000 m³ in total, there is an obvious deficit of 375,000 m³/year, indicating the need to significantly increase supply through a massive planting platform.

Conclusion:

The activity generated important information on sustainable level of AAC based on existing growing stock of cempaka and per capita consumption of cempaka wood which confirmed on the urgent need to expand cempaka plantation area at an accelerated pace.

3.3.4 To develop SOP and procure equipment and facilities for monitoring of forest operations and timber legality (Activity 3.4)

The results produced at completion of the activity are highlighted below:

- The SOP for monitoring of timber in the market, distinguished wood by origin, i.e. state and community or private lands.
- For timber originating from non-state lands, the requirements for transporting harvested timber include:
 - » Land ownership legal document
 - » Map of the land
 - » Transporting document
 - » Planting permit by forestry authority
 - » Age and dimension of harvested trees
- The SOP also provided a list of needed equipment and facilities for monitoring of traded timber which include:
 - » Motorcycle for monitoring operation
 - » Navigating tools: GPS, map, and compass
 - » Communication tools: handy-talky, mobile phone
 - » Camera
 - » Security posts
 - » Computer/laptop for reporting
- Most of the timber transported and traded in local markets were not equipped with require legal papers.



Figure 39. Checking of legal documents of cempaka wood at industry site (Photo: PMU)

3.3.5 To pilot test application of SOP, equipment, and facilities in one forest District (Activity 3.5)

Result of the activity or its completion are outlined below:

- During the piloting of SOP, defined requirements for wood transport and trading were inspected on the post
- The inspection exercise was carried out at three points, namely: selected sites of harvest, log yards and wood industries.
- The piloting exercise indicated that the SOP worked well on the ground with some constrains including inventory document on tree stands owned by communities or individuals and legal land ownership which were not available.
- The customary law at Minahasa people distinguished four types of land ownership:
 - i. *Pasini*: land ownership by individuals
The land was inherited by parents, regardless of how the parents had obtained the land
 - ii. *Kalakeran*: collective ownership that takes three different forms
 - a. District *Kalakeran*, a parcel of land is owned and utilized collectively by the district's natives
 - b. Village *Kalakeran*, a parcel of land is collectively owned by villagers and utilized by appointed villagers on behalf of the village
 - c. Families/clan *Kalakeran*, a parcel of land is owned by more than one families under one clan and utilized in turn by each family for an agreed upon time duration by the families
- Above land ownership types were not identified by the ministerial decree number 48 of 2017.



Figure 40. Officiating establishment of SHF (Photo: PMU)

3.3.6 To establish and operate a stakeholder forum at provincial level (Activity 3.6)

Results of implementing the activity are summarized below:

- The need to establish a Stakeholder Forum (SHF) was assessed through consultation with 37 respondents representing owners of cempaka plantation (9), cempaka wood processor (23), seed and seedling suppliers (6) and others (9).
- On “scarcity of cempaka species”, the respondents’ answers were scarce (59.5%), not scarce (24.7%), not answering (10.8%).
- On “need to establish a SHF”, the answers of the respondents were: need to establish (94.6%), no need to establish (2.7%) and not answering (2.7%); therefore, it was concluded that a provincial cempaka stakeholder forum was strongly needed.
- The SHF was officially established on 7 August 2020 through the executive decision of North Sulawesi Provincial Forestry Agency No. 522/22/SK/DKD/2020.
- Defined main functions of cempaka SHF are to facilitate, coordinate, and synchronize efforts of stakeholders on sustainable management of cempaka resources.
- A mid-term operational plan for the forum covering the period of 2020 – 2023 has been formulated; the work programmes identified:
- The “trial meeting” held on 21 August 2020 indicated that forum looks prospective to perform its functions noting that its operation requires resources expectedly to be met by MEFRDI and NSPFA.

Conclusion:

- Under the activity, a provincial cempaka stakeholder forum has been officially established based on affirming results of consultation, and operationally piloted through conduct of a trial meeting.
- A mid-term operational plan for the forum has been developed and enabling conditions to continuously operate forum identified.

3.3.7 To organize one provincial workshop on cempaka conservation and utilization (Activity 3.7)

Results of the workshop are summarized below:

- The workshop was conducted on 25 August 2020 at Four Points Hotel in Manado, attended by 115 participants in total, mostly under virtual fashion.
- The ISMP-CRCD presented to workshop was scrutinized by appointed reviewers and would be refined by incorporation the following inputs received from the workshop:
 - i. There is a need to conduct a financial analysis on cempaka plantation development to produce reliable information on financial aspect for purposes of raising interest in cempaka planting; such an analysis should consider application of agro forestry system and mixed species.

- ii. Planting of cempaka should prioritize on marginal lands as the species can also survive on sites of poor soil fertility.
- iii. Information on site requirement particularly as regards climate condition as presented in draft ISMP needs updating to avoid confusion of users.
- iv. There is a need to map the extent and distribution of suitable and available lands for cempaka plantation development preferably showing legal stands of the lands
- v. Establishment of cempaka plantation demo plots is strongly advisable at some localities for purpose of learning and replication by local communities
- vi. Application of agro-forestry system is win-win solution for farmers in land use decision making
- vii. Natural cempaka stands and cempaka wood processing must be included in the ISMP document, consisted with the commonly perceived coverage of a forest strategic management plan
- viii. The ISMP needs to present confirmed scientific, local and trade names of the species of cempaka under consideration, and updated information on different aspects of cempaka resources management
- ix. The governments are required to develop and publish policies relevant to promoting cempaka growing by referring to the final ISMP document

3.3.8 Discussion on results of the activities under Output 3 and delivery status of the output

- Defined indicators of Output 3 or approved adjusted indicators are listed below:
 - i. Survey on cempaka growing stock in North Sulawesi completed in Year 2
 - ii. Sustainable AAC of cempaka identified in Year 2
 - iii. A study on economics of cempaka wood utilization conducted in Year 3
 - iv. SOP for monitoring of forest operations and timber legality developed and needed equipment and facilities procured in Year 3
 - v. A stakeholder forum (SHF) established in Year 2 and operational since Year 3.
 - vi. One provincial workshop on cempaka conservation and development organized in Year 2
- Note that Output 3 was defined as “Government policy on the conservation and utilization of cempaka species reviewed and strengthened”. This output would be delivered through implementation of seven planned project activities. There is a need to match results of the activities under Output 3 that had been implemented with defined indicators of the output as listed above.
- Under activity 3.1, a survey on cempaka growing stock was carried out and its findings reported. Hence, the first indicator of Output 3 has been met. Under Activity 3.3, sustainable level of cempaka AAC (Annual Allowable Cut) was estimated using the

growing stock data produced under Activity 3.1. In this case, the second indicator of Output 3 has been satisfied. Under Activity 3.2, a study on cempaka wood utilization was accomplished successfully and its findings reported; consequently, the third indicator of Output 3 has been met. Under Activity 3.4 and 3.5, SOP for monitoring of forest operations and timber legality had been produced and piloted in one forest District while needed equipment and facilities to apply the SOP had been produced. Therefore, the fourth indicator of Output 3 has obviously been satisfied. Under Activity 3.6, a provincial cempaka stakeholder forum had been officially established and its operation run-tested; consequently, the fifth indicator of Output 3 has been fulfilled. Under Activity 3.7, one provincial workshop on cempaka conservation and development was organized thus the last indicator of Output 3 has been met.

- Above matching of results of implemented activities with defined indicators of Output 3, regardless the years of occurrence of the results, in should be safe to conclude that Output 3 has been fully delivered. This conclusion is justifiable on ground of the conceptual framework pursued by the project planner, i.e. Output 3 will be delivered if all planned activities are fully implemented.
- Note that deliverable Output 3 is reviewed and strengthened government policy on cempaka resources conservation and development. One can argue on how implementation of Activities 3.1 through 3.7 have reviewed and strengthened the government policy? It might be the case that government policy on the forest management in general, cempaka resource management in particular, had been reviewed for purpose of developing appropriate methodologies to employ in the implantation of individual activities or for comprehension the issue at hand such reviews, however, clearly did not make government policy strengthened.
- Close examination of the results of individual activities revealed that:
 - i. None of the activities has directly make government policy in cempaka conservation and development strengthened
 - ii. Findings and recommendation of individual activities would strengthen government policy only if appropriate follow-up actions are taken
 - iii. Implementation of individual activities have generated reliable information needed to formulate new, strengthened policies on cempaka resource management. In other words, implementation the activities under Output 3 has initiated the process on strengthening government policy on cempaka. How long and at what pace the process will be moving forward depending on follow-up actions to utilizing findings and recommendations of the activities.
- In conclusion, Output 3 as defined as a deliverable of the project, has been conceptually achieved and delivered. In practice, government policy has not been strengthened. However, the process towards strengthening government policy in cempaka management has commenced through generation of reliable information on current situation and existing problems on cempaka resources management.

3.3.9 Lessons learned

Among the important lesson learned from the implementation of the activities under Output 3 are:

- i. To conduct a growing stock survey required substantial inputs and special efforts that must be prepared in extra care and thoughtful manner.
- ii. Selection of partners in implementing particular tasks is best based on expertise and competence on the subject to ensure quality products
- iii. Project planners need to be aware of the difference between conceptual and practical achievement of a project to ensure appropriateness of defined indicators
- iv. Establishment of the stakeholders forum was accomplished in an effective manner as high level decision makers and influential representative stakeholders were supportive of forming the SHF and involved in its establishment process.
- v. Organizing a workshop or discussion under a semi-virtual fashion like the one implemented under the project is worth considering for replication as such a fashion was cost effective without compromising participation of reviewers, experts and interested observers.



Figure 41. Planting ceremony by SHF before one trial meeting (Photo: PMU)



Figure 42. The land allocated for cempaka demplots in Tombulu Village (Photo : PMU)

4. DISCUSSION

4.1 Overall Achievement of the Project

- The specific objective of the project was defined as “to develop the conservation and plantation of cempaka with the involvement of local communities in North Sulawesi”. Defined indicators of achieving the objective were:
 - i. Quality seed available to support planting approximately 100 hectares of cempaka per annum
 - ii. 18 hectares of demo cempaka plantation established
 - iii. Three small-scale nurseries in three Districts productive since Year 3
 - iv. Cempaka SHF operational
- The six seed sources of cempaka identified under Activity 1.1 have the potential production of seeds up to one million per annum which is much more than the amount of seeds needed to plant cempaka on 100 Ha of land. Even if seedling mortality, low germination rate and defective seeds are considered, the seed sources identified should be able to fulfill needed seeds for planting 100 Ha of cempaka per annum. Conceptually, the first indicator of the specific has been satisfied.

- Under Activity 1.5, 18 Ha of demo cempaka plantation has been established in three Districts. Despite the reservations made regarding quality of the demo plantations as discussed in section 3.1.6, the second indicator of the specific objective has been basically met.
- Under Activity 1.3, three small-scale nurseries have been established in three Districts. Regardless of the weakness in the establishment process, the third indicator of the specific objective has been essentially fulfilled.
- Under Activity 3.6, a provincial SHF has been officially established and its operation initiated by conducting a trial SHF meeting. Therefore, the fourth indicator of specific objective has been served.

Above matching of defined indicators of the specific objective with the results of implemented activities clearly indicated that all indicators of achievement have been met. It is therefore reasonable to conclude that the specific objective has been achieved. This conclusion is verifiable by testing the hypothesis used in designing the project as shown below:

- The hypothesis made in designing process was “full implementation of all identified activities under a particular output should deliver that output; delivery of all defined outputs should achieve the specific objective”. Previous discussions have revealed that three defined outputs have been delivered through the full implementation of seventeen identified activities. As all three outputs have been delivered, the specific objective should have been achieved. In other words, the hypothesis is accepted, and acceptance of hypothesis confirms the previously made conclusion, i.e. the specific objective has been achieved.
- The remaining question is “have the project interventions actually promoted conservation and developed cempaka plantation?”. One can convincingly argue that conservation of cempaka resource has not been promoted while cempaka plantation have not been expanded. However, the enabling conditions to do so have been made available by the project:
 - » Under Output 1, conditions for elevating capacity of local communities to develop cempaka plantation had been put in place
 - » Under Output 2, the requisites for increasing interest and participation of local communities in cempaka plantation development had been satisfied
 - » Under Output 3, reliable information on different aspects of cempaka resource conservation and development has been compiled and is ready to use in policy making
- At this juncture, it should be justifiable to conclude that defined specific objective will materialize after some time under the conditions that: i) findings of the project are utilized, and ii) the government are committed to sustain benefits of the project.

4.2 Sustainability of the Project

Sustainability and benefits of a project to primary beneficiaries are closely correlated while project is benefits, both observed and potential ones, are the incentive for the beneficiaries to sustain the project, and hence, its benefits.

Who are the primary beneficiaries of the project? As presented in the project document, they were the governments at different levels, poor local communities and cempaka processing industries. How these groups of stakeholders have and would benefited from the project is highlighted below:

The governments

- Have received invaluable reliable updated information on different aspects of cempaka resource management which was generated using substantial resource, covering: seed sources and seeding technologies, prepared enabling conditions for accelerating the pace of cempaka planting, documents on extension program and Integrated Strategic Management Plan for Cempaka Resource, revenues from cempaka resource utilization, etc.
- The government would continue receiving benefits from expanded cempaka plantations including increased revenues better-off local communities with less social tensions and conflicts, etc.

Local communities

Have enjoyed different benefits from the project including training on needed skills for cempaka planting free of charge, small income through involvement in project implementation, etc. In the long run, local communities would be better-off due to increased income from expanded cempaka plantation.

Cempaka wood industries

Have enjoyed different benefits from the project including information on problems facing sustainability of cempaka wood, on developing processing technologies and on market potential for processed cempaka products. In addition, the industries have also enjoyed pride of being able to employ local people through in limited number and some financial profit. Through expanded cempaka plantations, processing industries and expected to increase processing capacity, employ more people and make larger profits.

Above discussion indicated that the beneficiaries of the project have the very reasons to sustain project's benefits. Prerequisites to sustaining the project are" i) consistent use of the project's outputs, results and findings; ii) continuation of critical activities initiated under the project such as maintenance of the demo plots, training on use of produced technical manuals, operation of the SHF, etc: iii) responsible institution for implementing tasks i) and ii) above, and iv) secured finding resource.

It is reasonable to suggest that only the government who has capacity to lead above mentioned tasks for sustaining the project and its benefits. With a strong political will to conserve and develop cempaka resource, its influence as well as controlled resource, there is no doubt for a secured sustainability of the project. The North Sulawesi Provincial Forestry Agency could be the right institution to lead the sustaining endeavour.

4.3 Cempaka Plantation Development versus Local Livelihood

Among the primary aims of ITTO Project PD 646/12 Rev.3 (F) was to increase capacity and participation of local communities in cempaka plantation development. While this aim has not been realized in practice, the process towards its realization had been initiated by putting in place the enabling conditions and requisites for cempaka plantation development. To effectively realize the aim, there is a need for interventions by the government through formulation and implementation of needed policies using the information that had been generated by the project in different formats including technical reports, technical manuals and ISMP document.

Assuming that promotion of cempaka planting could be realized in the mid-term production of cempaka wood, in terms of quantity and quality, could be expected to significantly increase in the long-term, which drive incoming of cempaka growers to rise as must, if not all, of them are owners of plantations, not part-time laborers.

An important requisite to realizing the rising income and hence local livelihood improvement is the presence of market of the cempaka wood produced which is the processing industries. Therefore, existence of cempaka wood processing industries is fundamental for improving local livelihood. If so, it is strongly advisable for the government to provide with assistance for the industries in improving performance and increasing processing capacity. More specifically, capacity expansion should proceed in tandem with renewal processing technologies as well as improvement of processing efficiency and produced quality. By so doing, cempaka growers may expect to have a competitive and healthy wood industry, able to consume large volume of cempaka wood and buy at an attractive price level

4.4 The Lessons Learned

The lessons learned from the project implementation processes were highlighted in section 3.1.7; 3.2.6 and 3.3.9 of this document. Most important ones are listed below for readers' convenience:

- i. Identification of cempaka seed stands is a resource consuming task that the stands must be fully protected and sustained.
- ii. To be useful, any technical manuals produced must be distributed and user taught on how to make use of the manuals.
- iii. Any technical reports should be documented using language understood by users to avoid wasting of resources.

- iv. Extreme care should be practiced in the labelling of seed of different origins or provenances to avoid confusion in doing follow-up actions.
- v. Using questionnaire sheet to assess result of training or dialogue was found most effective if the sheet were distributed right at the beginning and completion of the session.
- vi. Project planners should be aware because of the occurrence of conceptual and practical achievement of a project when defining indicators of achievements.
- vii. The feasible incentives for local communities to grow cempaka would undergo a long institutional process that their effect would take some time to materialize.
- viii. The sound extension program developed under the project would not be useful as intended to unless needed resources to operationalize it are made available.
- ix. To conduct an adequate survey on forest growing stock required substantial inputs that its planning should be done with extreme care.
- x. To ensure quality results of an activity, selection of partner(s) or expert(s) to implement should be solely based on competence and expertise.
- xi. Establishment of a stakeholder forum was accomplished effectively due to the support and involvement of high-rank decision makers and influential stakeholders.
- xii. Organizing a workshop or seminar under a semi-virtual fashion proved effective in achieving planned objectives and accommodated wide participation thus worth considering for initiating.



Figure 43. Cempaka planting with local community (Photo : D.I.D. Arini)



Figure 44. Cempaka plantation in Tomohon City (Photo :R. Suryaningsih)

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

- i. All 17 planned project activities had been fully implemented to produce three defined outputs which, in turn, have achieved the specific objective of the project, at least in conceptual sense:
- ii. Important products or findings relatively to Output 1 were: seed stands identified at 6 sites, a technical manual for seed collection, storage and germination produced, three small-scale nurseries established, cempaka silvicultural information produced in English and 18 hectares of cempaka demonstration plantation established, leading to prepared enabling conditions for enhanced capacity of local communities in cempaka plantation development.
- iii. Important results or product relating to Output 2 included: improved understanding on long-term benefits of growing cempaka by local communities; 52 local people trained on nursery development techniques and a technical manual produced; 45 community leaders trained on cempaka planting techniques and a technical manual produced; appropriate incentives for local communities to grow cempaka species collaboratively identified; and

a sound cempaka extension program developed and distributed, all leading to fortified interest in and, after some time, increased participation of local communities in cempaka plantations development;

- iv. Under Output 3, important findings and products included: data on cempaka growing stock collected, a study on economics of cempaka wood utilization published, a sustainable AAC of cempaka wood calculated, SOP for monitoring of forest operations developed and pilot tested, a provincial cempaka SHF established and run-tested, and a legitimate ISMP for cempaka resource conservation and development produced; all of which are necessary inputs to cempaka policy making.
- v. Overall, the project had generated individuals reliable information and different products that have practical significance for cempaka resource conservation and development.

5.2 Recommendations

- i. Delivery of planned outputs and achievement of the specific objective of the project should be interpreted with care by distinguishing between conceptual or direct effect and practical achievement or postponed effect.
- ii. To be useful, it is best to translate the document on cempaka silvicultural information into the language of prospective users, i.e. Bahasa Indonesia.
- iii. To ensure that local communities can use the technical manuals produced under Output 1 and 2, there is an urgent need to conduct demonstration training on the application of the manuals.
- iv. The cempaka extension program produced under Output 2 will be useful only if it is disseminated and practiced for which operational resources must be made available.
- v. To sustain the project and its intended benefits is most effectively achieved by using the outputs, findings and results of the project.
- vi. In formulating policies to govern conduct of cempaka resource management, the ISMP must be consulted care as it is the only reference document that has been reviewed by stakeholders.
- vii. The provincial cempaka SHF is a powerful means for coordination and communication among all stakeholders that its continued operations should be ensured through allocation of sufficient operational resources.



Figure 45. Training on nursery establishment for local community (Photo :PMU)

6. IMPLICATIONS FOR PRACTICE

- i. Any findings products of the project require immediate follow-up actions if they are ever be useful without losing the momentum. This is particularly true with the technical manuals on seed collection, storage and germination, on cempaka nursery and plantation development and formulation of policy brief on introduction of incentives for local communities collaboratively identified by stakeholders under Output 2.
- ii. The seed stands are scarce resources having essential role in cempaka plantation development that their protection and security must be given highest priority by concerned authorities.
- iii. The SOP for monitoring of forest operations and timber legality needs to be widely applied to other forest Districts of home to cempaka species.
- iv. The level of sustainable AAC of cempaka species needs to be formalized and announced for application through a Governor's executive decision.
- v. The provincial cempaka SHF should be serving as a partner of the provincial government in decision making and formulation of policies on cempaka resource management.



Figure 46. Cempaka demplot in North Minahasa

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**TECHNICAL REPORT
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