# SURVEY OF TREE PLANTING ACTIVITIES IN PNPM GREEN SUBPROJECTS

***Final Report***

by

Nata Samastha Foundation (NaHa)

submitted to


NOVEMBER 2013

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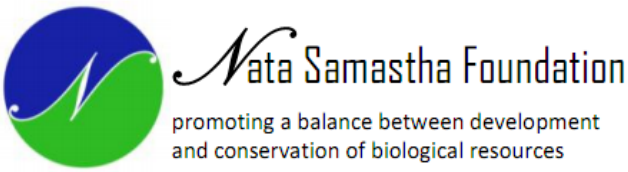

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**Nata Samastha Foundation** (NaHa)

is a science-based Foundation, consists of an association of professional conservationists, who work together with various Government institutions, universities, NGOs, communities, and others in promoting a balance between development and conservation of biological resources and their habitat. The score of our work encompass four major areas: (1) research on various topics of conservation of biological resources; (2) policy formulation and policy analysis to promote a balance of conservation and development; (3) consultation and facilitation of various conservation issues, and (4) environmental education and extension.

# LIST OF ABBREVIATION

| | |
|---|---|
| BLM | *Bantuan Langsung Masyarakat*, block grant funding |
| CSO | Civil Society Organization |
| FGD | Focus Group Discussion |
| FK | *Fasilitator Kecamatan,* Sub-District Facilitators |
| FK-L | *Fasilitator Kecamatan –Lingkungan,* Sub-District Facilitators - Environment |
| GERHAN | *Gerakan Rehabilitasi Lahan* |
| HOK | *Hari Orang Kerja*, payment on daily basis |
| IDR | Indonesian Rupiah |
| IGA | Income Generating Activities |
| MAD | *Musyawarah Antar Desa*, Inter-Village Meeting |
| MD | *Musyawarah Desa*, Village Meeting |
| MIS | Management Information System |
| NRM | Natural Resource Management |
| OWT | Operation Wallace Trust |
| PEMDA | *Pemerintah Daerah*, Local Government |
| Perdes | *Peraturan Desa*, Village Regulation |
| PJOK | *Penanggung Jawab Operasional Kegiatan* |
| PNPM | *Program Nasional Pemberdayaan Masyarakat;* National Program for Community Empowerment) |
| RE | Renewable Energy |
| RTM | *Rumah Tangga Miskin*, Poor household |
| TPK | *Tim Pengelola Kegiatan* |
| TPU | *Tim Penulis Usulan* |
| UPK | *Unit Pengelola Kegiatan* |
| USD | United States Dollar |
| WB | World Bank |

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The report would not have been possible without the support and assistance and help of many people. We wish to thank various people for their contribution to this project. Firstly, we are particularly grateful for the assistance given by Akbar Ario Digdo, Wilson Novarino, Field Coordinators (Edyson Maneasa, Hendra Gunawan, Rudianto Surbakti, Agus 'Boyce' Winarno) and all Enumerators (Palmarum M. Marsalamate, Michael Rantung, Reydi Marco Manahampi, Luh Gede Ani Ambararatih, La Ode Gafaruddin Oba, Tafsirul Anam, Ryan Fahmi, Sandrak Herman Manurung, Teguh Ade Kaisa, Pekki Jhonsen, Husnul Fikri, and Bimo Pramono). Without their assistance, our data and information would not have been completed.

Our visits to the fields were accompanied by our colleagues from *Direktoral Jenderal Pemberdayaan Masyarakat dan Desa – Kementerian Dalam negeri* (Ditjen PMD – Kemedagri/Directorate General Community Empowerment - Ministry of Home Affairs) – Jakarta. They were kindly liaise us with the local Government, and we would like to thank these persons: Ana Gurning, Dani Usadi, and Warintoko.

We greatly appreciate the help provided by all people working with the local Government office of sites we visited, including Bapak Bupati, Camat, Kepala Desa, and all of their supporting staffs. We would like to offer our special thanks to our friends and colleagues who previously involved in the PNPM Green in the past and have shared their invaluable experience with us in our sampled sites: *Unit Pengelola Kegiatan* (UPK), *Penanggun Jawab Operasional Kegiatan* (PJOK), *Fasilitator Kecamatan* (FK), *Fasilitator Kecamatan-Lingkungan* (FK-L), *Fasilitator Teknik* (FT), *Tim Penulis Usulan* (TPU), and Civil Society Organization (CSO).

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We also thank to Reviewers (Natasha Hayward, Prof. Dr. Damayanti Buchori, Vivianti Rambe) who have been thoroughly reading our draft and providing very useful comments and additional information. Their comments and information surely makes us more confident in presenting the results of the tree planting activities.

Our biggest thanks and appreciation were directed to all of our respondents who have shared their invaluable experiences, thought and ideas. We also thank them for their hospitality and their permission to visit and observed their plantation. Finally, we thank our friends and colleagues who directly and indirectly contributed to the production of this report but their names are missed not mention here.

# EXECUTIVE SUMMARY

Government of Indonesia has launched a program to empower rural and urban communities to proactively participate in development called PNPM (*Program Nasional Pemberdayaan Masyarakat;* the National Program for Community Empowerment). PNPM Green (2008-2013) was one of the PNPM-Rural core program, designed to further integrate environmental issues into the local community-driven development planning process. Among many activities in PNPM Green, there was a Tree Planting Activities. PNPM Green has been active in 4 provinces in Sulawesi (North Sulawesi, South Sulawesi, South East Sulawesi, and West Sulawesi) and in 4 provinces in Sumatra Island (Nangroe Aceh Darussalam, Bengkulu, North Sumatra, and West Sumatra).

The study was aimed at monitoring (a) the success rate of tree planting, (b) the maintenance of community investments in tree planting project beyond the immediate Block Grant cycle, (c) the maintenance of benefit sharing mechanisms for investments in tree planting, (d) the environmental social capital generated through the investment. Four provinces were purposely selected for this study, namely North Sulawesi, South East Sulawesi, North Sumatra, and West Sumatra.

The project sites as sampling units were 127 BLMs (*Bantuan Langsung Masyarakat*; Block Grant Funding) out of all 1,171 BLMs related to planting sites (13.73%). Criteria used for selecting the sites were (1) the availability of contact persons who still resided in the field, (2) accessibility to the planting site from the capital city of the selected province, (3) volume of activities (large and medium size volumes were more likely to be selected), (4) variety of activities and species planted (all or most activities and species planted would be included in the samples), (5) landscape representation (varied from mangroves, sandy beach, lowland, and highland), (6) planting year (2008 to 2012), and (7) gender balance.

Data were collected in June and July 2013. In each province, a Field Coordinator and 3 local Enumerators assisted the data collection to optimize timing, avoid language constraints, and to break socio-cultural barrier. Prior to the data collection, half-day training on methods by the Consultant Team for the Field Coordinator and Enumerators was performed, in order to gain the same perception to avoid bias and misunderstanding. Additional one-day on-site practice was conducted together by all members of survey team.

The data basically consisted of 2 types: (1) qualitative information regarding community investment, benefit sharing, social capital, and other related information, and (2) quantitative data on the planting success and size (height and diameter) of planted trees. The qualitative data were gathered through series of FGD with representative stakeholders in each sub-districts and village. A set of questionnaires for the tree planting (quantitative data) and other quantitative data were developed as guidance. Data analyses basically were simple statistics and graphs.

About 40% of the projects fall under agroforestry project, specifically in South East Sulawesi where agroforestry accounted for more that 75%. In North Sulawesi, project related to watershed management (including seashores) were more dominant. Meanwhile, project in North Sumatra were mainly related to the plantation of commercial timber. In West Sumatra, projects were mostly related to agroforestry and watershed management.

Total funding awarded for the projects in the sampled village (n=127) was IDR 7,970,576,430 (USD 877,140). On the average, a grantee (village) received IDR 63,263,581 (USD 6,962) for implementing tree planting activities on their area. The cost for one tree varies highly, from about IDR 11,100 for North Sulawesi to IDR 96,500 for North Sumatra, averaging IDR 28,600 from all 4 sampled provinces.

The total number of tree species planted in all sampled provinces was 49 species, with North Sulawesi as the highest number (25 species). The total number of trees planted in all sampled was 280,431 trees (average of 70,107 trees in each province and 2,208 trees for each BLM).

Of the successfully planted trees, 77.69% of the plants were in healthy condition. The North Sulawesi province has the highest percentage (96.77%) of healthy trees, followed by South East Sulawesi (90.00%), North Sumatra (81.25%), and West Sumatra as the lowest province (48.65%).

Causes of tree mortality were care and maintenance, climate (drought), animal nuisance, pest and disease, fire, land abrasion and erosion, and human factor. Currently some of the planted trees have already started to produce some yield: coffee var. *Ateng* and oranges (in North Sumatra), as well as nutmeg, *rambutan* and mango (in North Sulawesi).

About two-third BLMs (63.20%) had planted trees on privately owned land, and about a third (30.40%) was planted on the communal land. Although planting in communal land was preferred, it seems that it was difficult to fulfill in all provinces. Tree planting on privately owned land created some positive and negative impact, and the most concerned negative impact basically was that the richer member of the community got more opportunity to take advantage of the tree planting activities.

Local people have much traditional knowledge related to the plantation, especially to the site nearby. Basically they already mastered the knowledge of selection, species selection, land preparation, planting, and tree maintenance. The socio-economic background of the local people apparently affect the skill and experience on tree planting.

In term of labor, most of the labor for the land clearing, land preparation, and tree planting were budgeted in the proposal. However, various actors in the community might have invested in labor (i.e. overtime work) in many other stages of the project. In-kind contribution (non-cash) contributed to the tree planting activities were the use of equipments, organic fertilizers, mulch, and shades. Maintenance of the planted trees were done by community (together), individuals, or paid worker. Investment on control was seemed not so important. On the average, only about 22% of the BLMs had some sort of control mechanism. As for the phase-out plan, the average of number of BLMs having the phase out plan was only 20.02%.

The BLM recipients in Sulawesi (both in North and South East Sulawesi) had a high degree of satisfaction on the consultation and facilitation process. On the average, only 9.9% for both province admitted that they did not feel satisfy, while in Sumatra, on the average 43.61% of the BLM recipients did not satisfy with the consultation and facilitation they have received during the implementation of the project.

Judging from the information gathered during this study, it was obvious that the higher the community investment will result in the higher success of the tree planting activities. Many factors might work together and contributed to the success, including care and maintenance, skill and input, leaders and agents of change, geographic location, socio-cultural background, and climate (mostly rainfall).

On the benefit haring mechanism, only a relatively small percentage (32.28%) of villages as BLM recipients have produced the mechanism of benefit sharing, either formally stated in the Village Regulations (*Peraturan Desa*) or being processed to be formalized. The beneficiary target of the tree planting activities was slightly miss-targeted because the community member who benefit most from the activities were wealthier people, while the project was mainly aimed at the RTM (*Rumah Tangga Miskin,* poor household).

Social capital generated from tree planting was considered to be good in interaction (i.e. participation and networks). Women also played important roles (96.69%) in tree planting. In West Sumatra, in addition to participated in the planting implementation, women also had an important role in planning process (45.95%), specifically during Village Meetings and Inter-Village Meetings. This is most likely related to the matriarchal socio-culture of the West Sumatra.

Norms (i.e. transparency, trust, cooperation, coordination, perception, independence, regulation, and institution) were also well developed in all provinces. One of the significant emergent norms resulting from the tree activities was the creation of formal Village Regulation (*Peraturan Desa, Perdes*) in many BLM village recipients. In Sulawesi most villages (more than 50%) already had Village Regulations related to the benefit sharing in the near future, including in

mangrove forest. Environmental awareness was also high and strengthened in all sampled provinces. Many local champions were emerging as results of the tree planting activities.

At this stage, the result of the planting is obvious. However, impact of these planting activities in economics, ecology and socio-culture can only be predicted. Commercial fruit and timber would be producing in medium and long-term. In ecological aspects, trees are expected to provide various ecological services in the medium and long-term. In cultural aspect, in the future, the planted trees could be a pride and legacy of the community.

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# I. INTRODUCTION

## A. BACKGROUND

Government of Indonesia's PNPM (*Program Nasional Pemberdayaan Masyarakat;* the National Program for Community Empowerment) is a nationwide program for community empowerment aimed at accelerating poverty reduction. The goal of this program is to empower rural and urban communities to proactively participate in development.

One of the five core programs within the PNPM is the PNPM-Rural. The objective of the PNPM-Rural is for villagers in rural locations to benefit from improved socio-economic and local governance conditions. Within the PNPM-Rural core program, there are 6 funding window/pilot program, one of them is PNPM Green Subproject (hereafter referred to 'PNPM Green'), which is designed to further integrate environmental issues into the local community-driven development planning process. The PNPM Green runs for five-year, started in 2008 and ended in 2012.

The development objective of the PNPM Green is "to make the utilization of natural resources by rural communities sustainable". This is achieved through (i) mainstreaming natural resource management issues in the community-driven development planning process; (ii) increasing environmental awareness and related management capacity of communities and government stakeholders; and (iii) the disbursement of block grants to fund environmentally supportive 'green' projects at the sub-district and district level. Activities within the PNPM Green consisted of four components: Natural Resource Management (NRM), Income Generating Activities (IGA), Renewable Energy (RE), and Technical Assistance for Increasing Awareness. Approximately 75% of the activities of subprojects fall within the NRM group (Harum 2012).

PNPM Green has been active in selected target locations in Sulawesi and Sumatra Island (4 provinces for each island). On Sulawesi Island, PNPM Green has been active since 2008 as a pilot program, and in 2010 the pilot program was expanded into 4 provinces in Sumatra Island.

In Sulawesi, the target 4 provinces were North Sulawesi, South Sulawesi, South East Sulawesi, and West Sulawesi, covering 33 sub-districts (*regency; kecamatan*) in 11 districts (*kabupaten)*. In Sumatra, the selected sites for the PNPM Green were 45 sub-districts within 15 districts in the province of Nangroe Aceh Darussalam, Bengkulu, North Sumatra, and West Sumatra.

Approximately 75% of all the PNPM Green selected for Block Grant Funding (BLM, *Bantuan Langsung Masyarakat*) within the NRM group was related to tree planting, including for reforestation, agro-forestry, community forests, timber/fruit tree planting, mangrove restoration, and erosion control. Recent evaluations and surveys (Quality of PNPM Green Sub-projects, WB 2011) have documented that in many cases community beneficiates are more interested in the short-term benefits of tree planting activities (i.e. block grants financing wages for those who plant seedlings) than the sustained maintenance of these activities, which is integral to supporting medium/long-term impact.

In addition, features to track the location and species of trees planted has been include in the PNPM Green Monitoring Information System (MIS). Unfortunately, limited effort has been in place to measure communities' maintenance of the planted trees.

In order to obtain the lessons learned, as well as to assess the environmental impact of the PNPM Green (Phase 1), this study (Tree Planting Survey) was undertaken. The study is important to inform any follow up on PNPM Green activity that will likely include climate change mitigation and adaptation/resilience activities, for which tree planting is important.

## B. OBJECTIVES

As shown in Fig. 1-1, this study was aimed at monitoring:

a. The success rate of tree planting;
   The success rate of tree planting will be assessed to measure the current condition of planted trees. Data on the situation and condition of the sites will be collected to identify problems and challenges during planting.

b. The maintenance of community investments;
   Maintenance of community investments beyond the project's block grant cycle is very important since it provides insight into the sustainability of the project. Community's investments are assessed based on how much community' has provided funding, labor and other in-kind materials for the plantation. The hypothesis used is that the bigger the investment, the higher success rate of tree planting.

c. The maintenance of benefit sharing mechanisms for investments in tree planting;
   Although the planting was started four years ago at the longest and currently might not show apparent benefit, the plan for the sharing mechanism is also an important part of the success of the project. The benefit could be both tangible and intangible.

d. The environmental social capital generated through the investment;
   Tree planting investment might bring a positive change in environmental awareness and collective actions by communities. Although the social capital is a slow process, qualitative assessment was conducted.

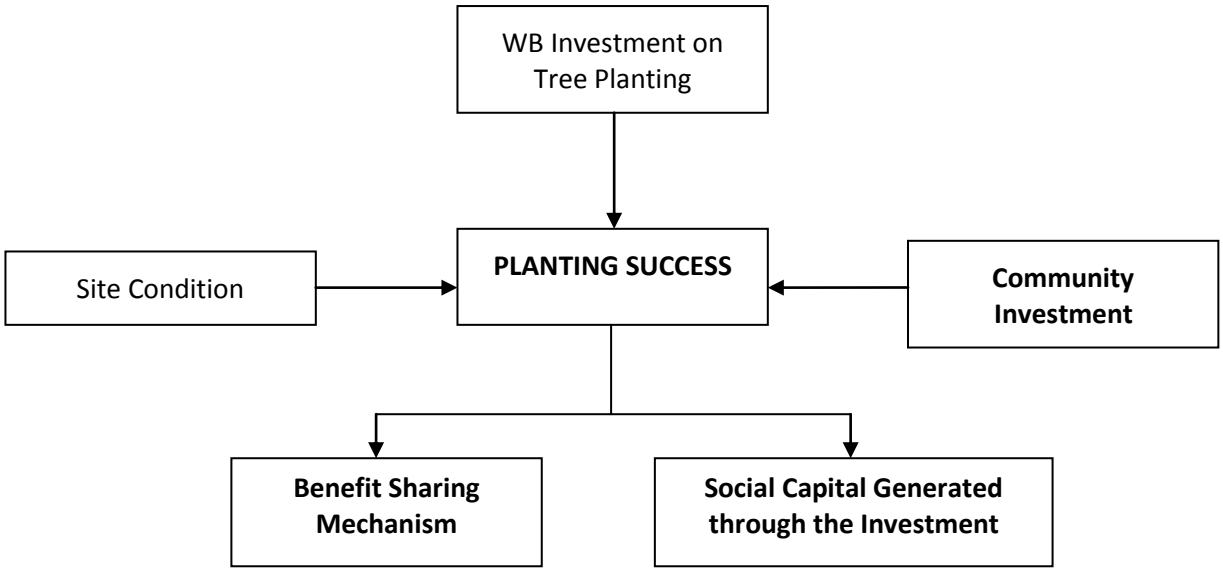


Figure 1-1. The relationship of each objective with another within this study.

# II. APPROACH AND METHODOLOGY

## A. DESK STUDY

A Desk Study was conducted in the early phase of the study by assessing reports, available documents, and other documented results (e.g., general publication, scientific papers, web sites, etc.). Database of the PNPM Green (www.pnpm-green.com) in all provinces was accessed in order to choose BLM related to tree planting. Of the 8 provinces where tree planting activities were conducted, 4 provinces (i.e. North Sulawesi, South East Sulawesi, North Sumatra, and West Sumatra) were purposely selected following an intensive consultation with the World Bank team, local PNPM Green Advisor and Field Coordinator. Within the 4 selected provinces, BLMs were chosen through screening by using criteria described in the next part.

## B. SELECTION OF SAMPLING SITES

The project sites as sampling units were BLM (*Bantuan Langsung Masyarakat*; Block Grant Funding). The sampled BLMs projects (n=127; Annex 1) under the PNPM Green in 4 provinces (out of 8 provinces), namely North Sulawesi, South East Sulawesi, North Sumatra, and West Sumatra (Fig. 2-1) were visited and reviewed (see Table 2-1 for number of samples for each province). These BLMs are selected for deep review out of 1,171 planting sites. The samples chosen represent the various tree planting types (protection, agro-forestry, fruit production, wood production, etc)[1]. Provinces and sampling unit below provinces (i.e., district/*kabupaten*, sub-district/*kecamatan*, village/*desa*) were selected purposively, based on scheme shown in Fig. 2-2.

The selection of sampled units through purposive sampling in different administrative level (multi-stage) could draw some unavoidable biases. However, this approach was considerably appropriate considering that the nature of the BLMs as sampling sites (varies highly in planting size, species planted, planting year, habitat, amount of funding, socio-cultural background), coupled with limitation in time and personnel. By using this approach, data from the sampled BLMs could be extracted and calculated. However, the limitation of this approach was that the sampling percentage could not be exactly pre-defined and, therefore, the extrapolation to the whole population cannot be done due to the large biases resulting from the sampling scheme.

[1] BLM recipients on tree planting activities for other non-sampled provinces: South Sulawesi 175, West Sulawesi 0, Nangroe Aceh Darussalam 145, Bengkulu 184. Total for these non-sampled 4 provinces: 540. Total number of BLM recipients on tree planting activities in for all 8 provinces during 2008-2012: 1,675 BLMs.

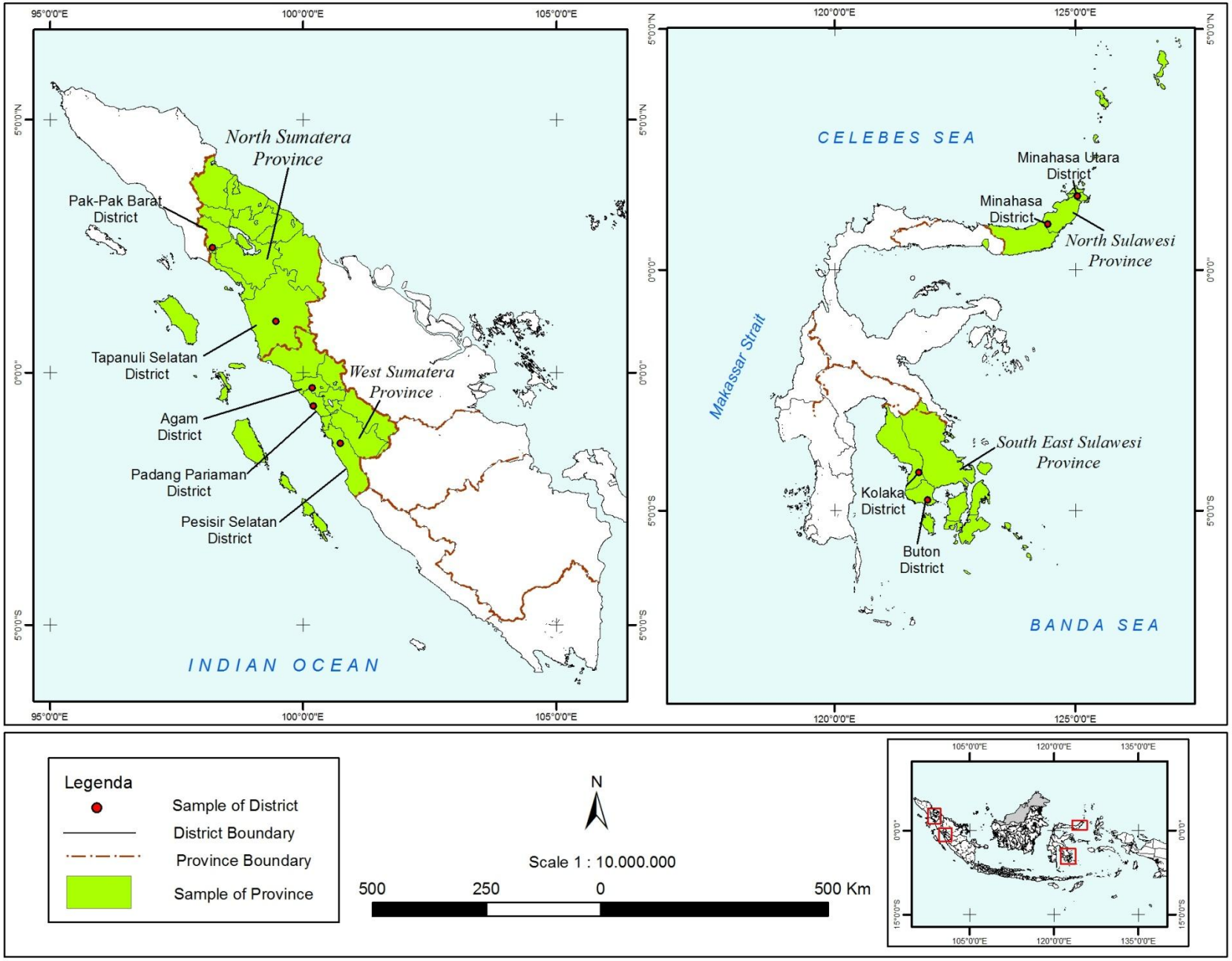


Figure 2-1. Sampled provinces for the PNPM's tree planting activities: North Sulawesi, South East Sulawesi, North Sumatra, and West Sumatra.

Table 2-1. Number sampled BLMs in selected provinces.

| | N Sulawesi | SE Sulawesi | N Sumatra | W Sumatra | Total |
|---|---|---|---|---|---|
| Number of all BLMs on tree planting | 537 | 271 | 136 | 227 | 1,171 |
| Number of sampled BLMs | 31 | 30 | 30 | 36 | 127 |
| Percentage of sampling (%) | 5.8 | 11.1 | 22.1 | 15.9 | - |
| Average of sampling (%) | 13.73 | | | | - |

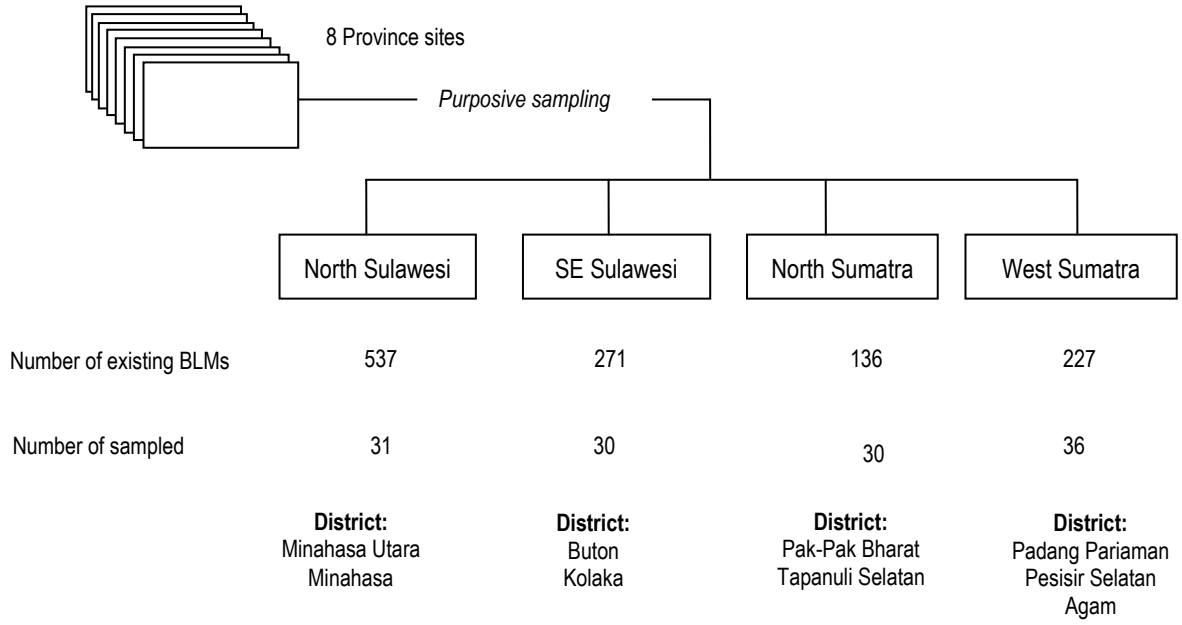


Figure 2-2. Scheme of location of project sites (BLMs) visited.

Following some intensive discussions with the PNPM Green Advisors[2], the locations to be reviewed were slightly adjusted compared to the original proposal. Criteria used for selecting the sites were (1) the availability of contact persons who still resided in the field (as all projects were finished), (2) accessibility to the planting site from the capital city of the selected province, (3) volume of activities (large and medium size volumes were more likely to be selected), (4) variety of activities and species planted (all or most activities and species planted would be included in the samples), (5) landscape representation (varied from mangroves, sandy beach, lowland, and highland), (6) planting year (2008 to 2012), and (7) gender issue (location with higher percentage of women involved in the activities were likely to be selected).

Data on all BLMs are available in the WB database and have been use as the first screening for selecting sites contained tree planting activities in various years. Furthermore, in order to properly select the representative sites, consultations and discussion with Field Consultant (hired separately by the WB) and staffs from Directorate General of PMD (*Pembangunan Masyarakat Desa*) in the national level in Jakarta, as well as in each selected province, district (*kabupaten*), their

[2] To assist the Survey of Tree Planting Acivities, PSF hired a PNPM Green Advisor and a Field Consultant under separate contract. PNPM Green Advisor and the Field Consultant went to the field with the Consultant, but both did not involve in the report production.

representative in sub-districts (*kecamatan*) were conducted. The names of project sites selected for this study - based on the above criteria - are shown in Table 2-2.

Table 2-2. Sites (district, sub-district, and village) selected for this study.

| Province | District (*Kabupaten*) | Sub-District (*Kecamatan*) | Village (*Desa*) |
|---|---|---|---|
| North Sulawesi | Minahasa Utara | Wori | Bulo, Ponto, Tiwoho |
| | | Likupang Barat | Bahoi, Kinabahutan, Termaal |
| | Minahasa | Tombulu | Kamangta, Kembes I, Koka, Suluan |
| South East Sulawesi | Buton | Pasar Wajo | Awainulu, Kacinaa, Kombeli, Waangu-angu |
| | | Sampolawa | Bangun, Jaya Bhakti |
| | | Mawasangka | Mawasangka, Tanailandu, Terapung |
| | Kolaka | Ladongi | Atula, Gunung Jaya |
| | | Dangia | Dangia, Lembah Subur |
| North Sumatra | Pakphak Barat | Kerajaan | Kuta Meriah, Kuta Saga, Parduhapen |
| | | Salak | Binanga Boang, Bung Manalu, Salak I |
| | Tapanuli Selatan | Batang Toru | Garoga, Huta Godang, Hutabaru Siagian |
| West Sumatra | Pesisir Selatan | Sutera | Ampiang Parak, Bukit Pantai Cermin, Lansana, Padang Tae, Rawang Gunung Malelo, Taratak, Ujung Air |
| | Agam | Palembayan | Kampung Tabu, Koto Alam, Marambuang, Palembangan Tengah, Piladang, Sungai Puar |
| | Padang Pariaman | VII Koto | Ambacang Gadang, Ambung Kapal, Ampalu, Apar, Bungin, Kampuang Dama, Kampung Badang, Koto Tabong, Larenan Panjang, Limau Hantu, Lohong, Padang Ampalu, Pincuran Sunsang, Sakarih, Silangkuang, Sungai Ibur I, Sungai Ibur II, Toboh |
| | | Enam Lingkung | Balah Aie, Baliah-Baliah, Kapuah, Padang Toboh, Pasar Pakandangan |

## C. DATA COLLECTION

Data were collected in sampled BLM in 4 provinces (North Sulawesi, North East Sulawesi, North Sumatra, West Sumatra) in June and July 2013 (date of field visit is presented in Annex 2). In each province, a Field Coordinator (hired in each respective province) and 3 local Enumerators (recruited from local Universities or local NGOs) assisted the data collection to optimize timing, avoid language constraints, and to break socio-cultural barrier. The Field Coordinator organized and supervised the work of the 3 Enumerators.

Summary of the steps in data collection is presented in Fig. 2-3. After the sites were carefully selected, all sites were visited for data collection. Prior to the data collection, half-day training on methods by the Consultant Team for the Field Coordinator and Enumerators was performed, in order to gain the same perception to avoid bias and misunderstanding. The half-day training basically covered explanation about general methods, questionnaires and discussion points for FGDs (Focus Group Discussions). The trainings were conducted in Manado (North Sulawesi),

Kolaka (South East Sulawesi, Medan (North Sumatra), and Padang (West Sumatra) prior to the actual data collection.

Additional one-day on-site practice was conducted together by all members of survey team (i.e. Project Team/Consultant, PNPM Green Advisor, Field Coordinator, and Enumerators). All members of the survey team worked together to collect data (qualitative and quantitative data). One or two villages in each selected province (in one or two sub-districts, depend on the distance of the villages from the capital city and from each other) were purposively selected. In this way, the data collection on day 1 (i.e., FGDs, tree measurements) was also served as the practice day for the Enumerators, to ensure that the Enumerators would be able to do the data collection by themselves in the next 10 days.

The data basically consisted of 2 types: (1) qualitative information regarding community investment, benefit sharing, social capital, and other related information, and (2) quantitative data on the planting success and size (height and diameter) of planted trees. The additional data collection (training day) also include all data need to be collected for this study. The qualitative data were gathered through series of FGD with representative stakeholders in each sub-districts and village.

In the FGD of sub-district level, the resource persons invited were the local government (head of the sub-district), and others who were involved in the planning and decision making of the tree planting activities. The Field Coordinator in cooperation with the Head of Sub-Districts would ensure that all representatives of the resource persons attended the FGDs. The venues of the FGD in sub-districts level were in the office of the sub-districts (*Kantor Kecamatan)* and usually took about half day.

FGDs in sub-districts were administered by the Field Coordinator. Information collected were on the benefit sharing agreements and mechanisms established in each village (*Peraturan Desa*/village regulations) to establish the equity of the investment, as well as the likelihood of on-going participation of communities in benefiting from and caring for the trees. Further, qualitative data regarding the level of awareness/perception of communities/sub-national stakeholders were also collected. List of points of discussion in FGDs are presented in Annex 3.

FGDs in village were organized by Enumerators and usually took place on the head of village's office (*Kepala Desa)*, lasted about 3 to 4 hours. In the FGD in village level, the Enumerators discussed various information with persons directly involved in tree planting. In addition, the Enumerators also collected data on tree planting and quantitative data. Data on tree planting were name of tree species, origin of the plant (own nursery/bought from who/where), when was planted, number of trees planted, planting distance, number of plants still alive today, and general health status. Further, considering the extremely high variation of the BLM (species planted, number of tree planted, habitat, planting scheme), number of samples for measurement was set at minimum 30.

The quantitative data were collected by Enumerators were including (a) estimating the percentage tree stand condition, and (b) taking measurement (height and diameter) of sampled surviving trees. For the tree stand condition, the Enumerator estimated the percentage of trees in healthy condition in a planting site. 'Healthy stand' were characterized by appropriate height (depend on species and age), appropriate diameter, healthy leaves (e.g. not infested by disease or eaten by cattle), and appropriate leaf color. The tree stand was considered healthy if more than 80% of the stand is in good condition. Otherwise, it will be categorized as 'less healthy'

Other information need to be collected in village level by Enumerators were: data on planting site included location, size of area (ha), legal status of the site, how was the site selected for tree planting, whether the tree planting included in the village plan, decision making process related to the planting activities, sharing of benefits among participants, and expected benefits from tree planting activities. Questionnaires for the tree planting and other quantitative data were depicted in Annex 4 and Annex 5.

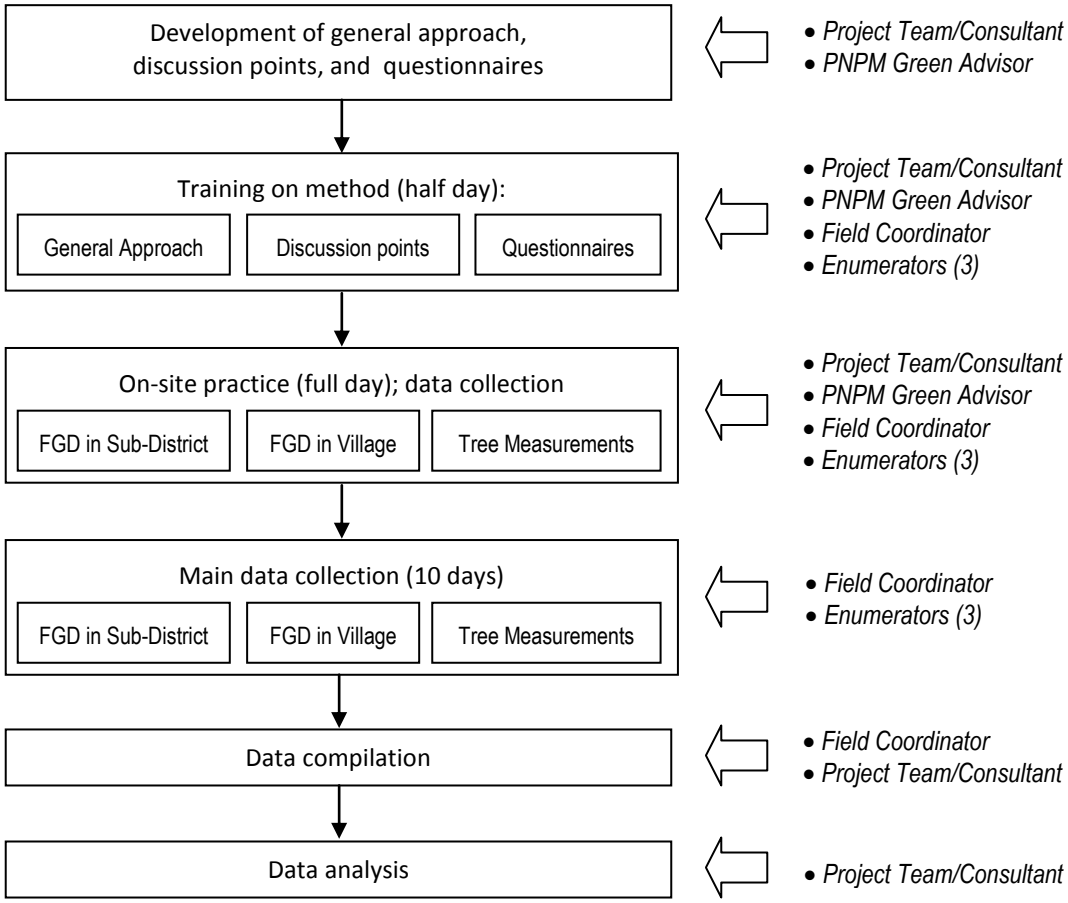


Figure 2-3. Steps in data collection in sampled BLMs for each sampled province.

During the data collection process, there might be some possibility of biases. Some sources of biases have been identified since the beginning of the study. Attempts to reduce the biases were conducted in order to obtain a more reliable and accurate data and information (See Table 2-3).

Table 2-3. Possible biases in the data collection and attempts to reduce the biases.

| Possible Biases | Attempts to Reduce Biases |
|---|---|
| Enumerators (12 persons in 4 provinces) and Field Coordinator (4 persons) mis-understood the methods used | Training on methods and on-site practice were conducted in each province |
| Lack or absence of resource persons in sub-district level | Field Coordinator set appointments prior to the visit to ensure the availability of the resource persons |
| A (or some) important representative(s) of the resource persons was/were missing | Field Coordinator works in cooperation with the Head of the Sub-District and Head of Village to ensure that all representatives were included in the resource persons |
| Language barrier | Enumerators were able to speak local language |
| People who involved directly in the planting activities (BLM recipients and all PNPM Green) staffs all did not express their true opinion | Enumerators were selected from the same region or had been working in the same region, and thus they have the same ownership |
| Field Coordinators might influence the results of the tree planting, as some of them were involved in the tree planting activities before | Field Coordinators were not involved in the tree measurements and FGDs in village level; they were only involved in the FGDs in sub-district level |
| Bias in collecting the quantitative data by Enumerators | Enumerators selected had a background in forestry, biology or agriculture, and thus they are already familiar with methods used |
| Mistyped in data entry | Data compilation and data entry by the Supporting Staff will be double checked by the Team Leader |

## D. Data Analysis

All raw data were compiled by Field Coordinator and sent to the Project Team/Consultant for further analysis. Data analyses basically were simple statistics (average) and graphs. All data were presented either in tables or in graphs. No further statistical test was performed due to the very large variation of the data.

# III. PLANTING SUCCESS

## A. NUMBER OF TREE PLANTING BLMS WITHIN THE PNPM GREEN PROGRAM

As mentioned in the previous session, within the Green PNPM Program, there were 4 main categories, namely NRM (Natural Resources Management), IGA (Income Generating Activities), and RE (Renewable Energy), and Technical Assistance for Increasing Awareness. Tree planting activities were under the NRM, among other activities related to the management of natural resources.

The World Bank database (www.green-pnpm.com) listed 2,695 PNPM Green projects (BLMs), of which 1,675 BLMs were tree planting activities in all provinces (i.e. 2 provinces in Sulawesi for the year 2008 to 2012, and 4 provinces in Sumatra for the year 2010 to 2012; Table 3-1).

The province that received the highest BLMs was North Sulawesi (32.0%), followed by South East Sulawesi (16.2%) and West Sumatra (13.6%). One province in Sulawesi, namely West Sulawesi Province, has a small number of PNPM Green BLMs, but none of them was categorized as Tree Planting Activities. Of the 1,675 BLMs in Sulawesi and Sumatra, 1,171 BLMs (69.9%) were located in 4 sampled provinces.

Table 3-1. Number of tree planting activities within the PNPM Green Projects in Sulawesi and Sumatra.

| **Province** | **Number of PNPM Green** | **Number of BLM in Tree Planting** | **Percentage of BLM Tree Planting** |
|---|---|---|---|
| *Sulawesi* | | | |
| North Sulawesi* | 746 | 537 | 32.0 |
| West Sulawesi | 18 | 0 | 0.0 |
| South East Sulawesi* | 398 | 271 | 16.2 |
| South Sulawesi | 421 | 175 | 10.4 |
| *Total for Sulawesi* | *1,583* | *983* | *58.6* |
| *Sumatra* | | | |
| Nangroe Aceh Darussalam | 204 | 145 | 8.7 |
| North Sumatra* | 157 | 136 | 8.1 |
| West Sumatra* | 440 | 227 | 13.6 |
| Bengkulu | 311 | 184 | 11.0 |
| *Total for Sumatra* | *1,112* | *692* | *41.4* |
| **Total** | 2,695 | 1,675 | 100 |

*selected as sampled province for this study

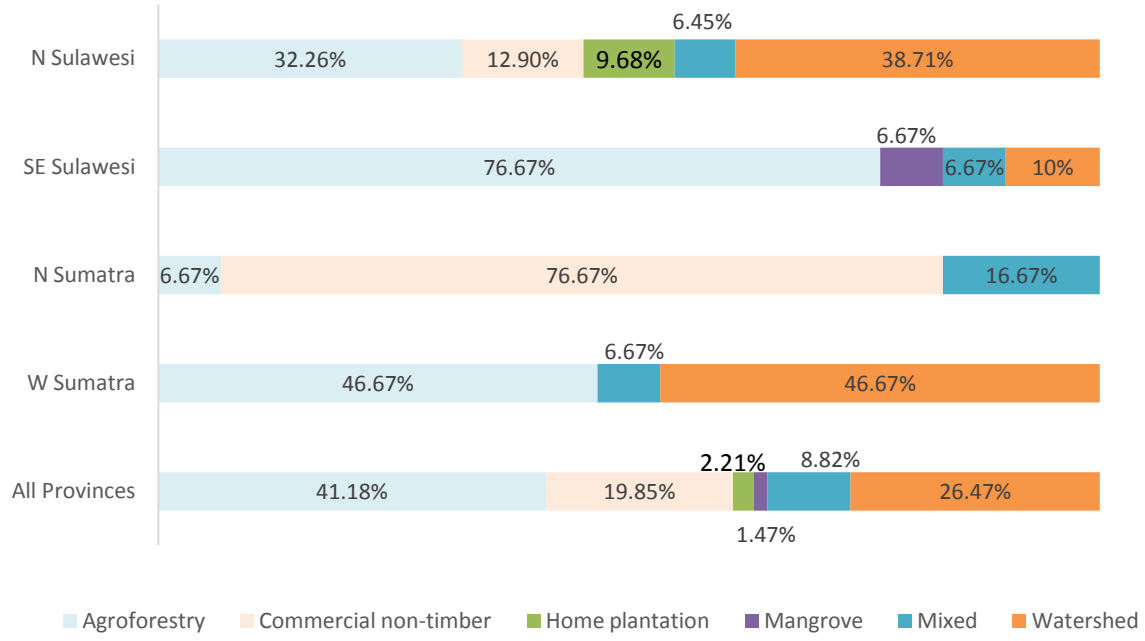


Figure 3-1. Category of tree planting projects in sampled BLMs.

Further categorization of the BLM tree planting showed that about 40% of the projects fall under agroforestry project, specifically in South East Sulawesi where agroforestry accounted for more that 75% (Figure 3-1). In North Sulawesi, project related to watershed management (including seashores) were more dominant. Meanwhile, project in North Sumatra were mainly related to the plantation of commercial timber. In West Sumatra, projects were mostly related to agroforestry and watershed management.

## B. Financial Investments for Tree Planting

Total funding awarded for the projects (tree planting activities) in the sampled village (n=127) was IDR 7,970,576,430 or USD 877,140.58 (USD1 = IDR 9,087 in 2011). On the average, a grantee (village) received IDR 63,263,581 (USD 6,962) for implementing tree planting activities on their area, although in North Sulawesi the amount was a bit less, averaging IDR 37,808,365 (Table 3-2).

Table 3-2. Amount of block grant (BLMs) awarded to grantees (village) for tree planting activities.

| | N. Sulawesi | S.E.Sulawesi | N. Sumatra | W. Sumatra |
|---|---|---|---|---|
| Number of sampled BLMs (villages) | 31 | 39 | 30 | 36 |
| Total amount of BLMs for each province (IDR) | 1,172,059,330 | 2,204,546,400 | 2,360,560,800 | 2,233,409,900 |
| Total amount of BLMs in 4 sampled provinces (IDR) | 7,970,576,430 | | | |
| Average BLM for each village (IDR) | 37,808,365 | 73,484,880 | 81,398,648 | 60,362,429 |
| Average for each BLM in 4 sampled provinces (IDR) | 63,263,581 | | | |

## C. SPECIES PLANTED IN SAMPLED PROVINCES

The total number of tree species planted by the local communities in all sampled BLMs in the selected 4 provinces was 49 species (Table 3-2), with North Sulawesi as the highest number of species planted. Most of the tree was income generating species (fruits, resin, timber, spices) and a few was categorized as trees with a special ecological function (mangroves or sand/land stabilisator/shade trees). The list, however, does not represent the total number of trees planted[3].

The selection of the trees planted in a specific location basically was decided by the local communities themselves through series of meetings, facilitated by the Facilitators (FK-L *Fasilitator Kecamatan – Lingkungan*/Sub-District Facilitator – Environment). Some important consideration in selecting the tree species were (a) habitat suitability, including soil types, topography, and rainfall, (b) planting knowledge and experience, and (c) economic and/or ecological benefit of the species. As for the criteria and mechanism for proposing a project, it was clearly listed in the *Petunjuk Teknis Operasional* (Technical Operational Guidance) document, published by the Directorate General Community Empowerment - Ministry of Home Affairs.

Comparing across province, it seemed that (i) mahogany, durian and mango were the most popular tree species planted in all 4 sampled provinces; (ii) each province developed a local specific species, for example Nantu *Palaquium obtusifolium* in North Sulawesi, Bitti *Vitex cofassus* in South East Sulawesi, and gambir *Uncaria gambir* in North Sumatra (see Box 3-1); (iii) all province showed a high variation of species being planted, although fruit trees seemed to be dominant.

Mangrove species were planted in suitable locations. The western coast of Sumatra mostly consisted of rocky or sandy beaches, and naturally has a few mangrove forests. No mangrove species was planted in North Sumatra Province in all BLMs. In contrast, mangrove species were planted in a good number in North Sulawesi.

The PNPM Green project has already set 17 negative list for PNPM Green practices, four of which were related to planting activities (see Box 3-2), namely planting of oil palm, tobacco, and exotic and invasive species. The list of the species planted in all BLMs studied did not contained species in the negative list. Tree selection in all BLMs were considered appropriate (i.e., not included in the negative list), although a few species had a low survival rate, for example durian monthong in West Sumatra, a variety of durian originated from Thailand (Box 3-3).

Table 3-2. Tree species planted in all sampled BLMs.

| Tree Grouping | Local Name | Latin Name | Province | | | |
|---|---|---|---|---|---|---|
| | | | N Sulawesi | SE Sulawesi | N Sumatra | W Sumatra |
| COMMERCIAL | | | | | | |
| ○ Timber tree | Bayur | *Pterospermum indicus* | | | | √ |
| | Bitti | *VItex cofassus* | | √ | | |
| | Cempaka | *Michelia champaka* | √ | | | |
| | Gmelina, 'white teak' | *Gmelina arborea* | | √ | | |
| | Jabon | *Anthocephalus cadamba* | | √ | | |
| | Jati, teak | *Tectona grandis* | | √ | | |
| | Mahoni, mahogany | *Swietenia macrophylla* | √ | √ | √ | √ |
| | Nantu | *Palaquium obtusifolium* | √ | | | |
| | Pinus, pine | *Pinus merkusii* | | | √ | |

[3] The total number of trees planted was 280,431 (see next Sub-Chapter).

| | | | | | | |
|---|---|---|---|---|---|---|
| | Sengon, jeunjing | *Paraserianthes falcataria* | √ | √ | √ | |
| | Surian | *Toona sureni* | | | | √ |
| ○ Non-timber tree | | | | | | |
| • Fruit tree | Alpukat, avocado | *Persea americana* | | | √ | |
| | Duku, langsat | *Lansium domesticus* | √ | | √ | |
| | Durian | *Durio zibethinus* | √ | √ | √ | √ |
| | Jengkol | *Pithecellobium jiringa* | | | √ | |
| | Jeruk, orange | *Citrus aurantifolia* | √ | | √ | √ |
| | Kelapa, coconut | *Cocos nucifera* | √ | | | |
| | Lemon | *Citrus limon* | √ | | | |
| | Mangga, manggo | *Mangifera indica* | √ | √ | √ | √ |
| | Manggis, mangosteen | *Garcinia dulcis* | | | √ | √ |
| | Matoa | *Pometia pinnata* | √ | | | |
| | Petai | *Parkia speciosa* | | | √ | √ |
| | Rambutan | *Nephelium lappaceum* | √ | √ | √ | |
| | Sirsak, soursop | *Anona muricata* | √ | | | |
| | Sukun, bread tree | *Artocarpus communis* | √ | √ | | |
| • Spice tree | Cengkeh, clove | *Eugenia aromatica* | √ | √ | | |
| | Kemiri, candle nut | *Aleurites moluccana* | | √ | | |
| | Pala, nutmeg | *Myristica fragrans* | √ | √ | | √ |
| • Resinuous tree | Gaharu, agarwood | *Aquilaria malaccensis* | | | | √ |
| | Gambir | *Uncaria gambir* | | | √ | |
| | Karet, rubber | *Hevea brasiliensis* | | | √ | √ |
| • Others | Aren, Enau | *Arenga pinnata* | √ | | √ | |
| | Bambu, bamboo | *Bambusa* sp. | √ | | | |
| | Cacao | *Theobroma cacao* | √ | | √ | √ |
| | Coffee | *Coffea* sp. | | √ | √ | |
| | Jambu mete, cashew | *Anacardium occidentale* | | √ | | |
| | Melinjo | *Gnetum gnemon* | | | | √ |
| | Pinang, areca nut | *Areca catechu* | | | √ | |
| NON-COMMERCIAL (ECOLOGICAL FUNCTION) | | | | | | |
| • Sand/land stabilisator | Bintangur, nyamplung | *Calophyllum inophyllum* | √ | | | |
| | Cemara laut | *Casuarina equisetifolia* | | | √ | √ |
| | Ketapang | *Terminalia catappa* | √ | | | |
| • Shade trees | Angsana | *Pterocarpus indicus* | √ | | | |
| | Asam, tamarind | *Tamarindus indica* | | √ | | |
| | Beringin, fig tree | *Ficus* sp. | √ | | | |
| | Johar | *Cassia siamea* | | √ | | |
| | Lamtoro | *Leucaena leucocephala* | | | √ | |
| | Trembesi, rain tree | *Samanea saman* | | √ | | |
| • Mangroves | Bakau, mangrove | *Rhizophora mucronata* | √ | √ | | √ |
| | Nyiri, cannonball | *Xylocarpus granatum* | √ | | | |
| Number of species planted in each province | | | 25 | 20 | 20 | 15 |
| Number of species planted in all sampled provinces | | | 49 | | | |

**Box 3-1. Species selection: Gambir, an export commodity from North Sumatra.**

Gambir *Uncaria gambir* (Family Rubiaceae, also known as gambier) is a name of a plant, and also referring to the resinous astringent extract produced by the plant. It is native to Indonesia (Sumatra, Kalimantan), as well as Malaysia and Singapore.

The plant is actually a woody shrub, with lots of branches to stimulate growth of its leaves. It is from the leaves that the resin of gambir was produced. To make the gambir extract resin, basically the leaves are harvested, and boiled to separate the resin from other substances. Then, the extract was molded to form a light, small and brownish cylindrical gambir resin.

Gambir has been used for a companion for 'menyirih' (eating sirih and *pinang*/betel nut), a long-life tradition in some parts of Indonesia. It is also popular for tanning and dyeing substance in pharmacy, leather and textile industies, and has been sought after by other countries such as India. In fact, about 68% of the gambir traded in India was imported from Indonesia.

North Sumatra has been known to be the major producer for gambir in Indonesia. Several years ago, the North Sumatra government (Pak-Pak Bharat District) has launched a program called "Sejuta Gambir" (A million of Gambir). Thus, the planting of Gambir of the PNPM Green was in line with and supported the local government's program.

*Gambir, planted Pak-Pak Bharat District, North Sumatra*

**Box 3-2. Negative List related to tree planting activities within the PNPM Green Program.**

| | |
|---|---|
| #1 | Located in the conservation areas or protected forest and do not have any written permission from the forest authorities |
| #6 | Contains substances harmful to the environment, including pesticides and herbicides |
| #10 | Linked to tobacco and other psychotropic substances |
| #15 | Provision of seedling and planting of oil palm |
| #16 | Introduction of alien (exotic) species and invasive species, as well as plants that disturb ecological and hydrological function |

Source: DIrektorat Jenderal Pemberdayaan Masyarakat dan Desa (2011).

**Box 3-3. Planting failure: Inappropriate species selection.**

Durian monthong (Mon Thong; Golden Pillow) is probably the most popular variety of durian, originated from Thailand. Its thick, full-bodied creamy and mild sweet tasting flesh with relatively moderate smell emitted and smaller seeds makes the durian monthong the most commercially sought after by the durian lovers.

*A survived durian monthong in West Sumatra*

Once imported from Thailand, now the seedlings are available commercially in many areas in Indonesia. Driven by the high commercial value of the durian, the local communities in Sutera Sub-District, West Sumatra Province, have planted durian monthong for the BLM projects. Unfortunately in the Sub-District the rate of success was considerably low, less than 20%. The survived trees were small and stunted. The exact data on tree mortality in Sutera Sub-District, however, was not available.

Unlike the local durian, the durian monthong apparently needs intensive maintenance, including regular fertilizing, watering, weeding, and mulching. The inability of the local people to provide maintenance resulting in a planting failure. This is because most of the durian monthong were planted far from their houses and thus the durian plants were only received a very little maintenance.

## D. Number of Tree Planted in the Sampled BLMs

The total number of trees planted in all sampled BLMs (n=127) was 280,431 trees, with average of 70,107 trees in each province and 2,208 trees for each BLM (Table 3-3). North Sulawesi Province had the highest average number of the trees planted in each BLM compared to other province, while North Sumatra has the lowest number.

In assessing the number of species planted, there were other units of tree planted used by the local community, namely area unit (ha) and length (km). There was no further information regarding the species planted in each ha, and thus the number of trees could not be estimated. As for the unit in km, it was used particularly in sites where planting were conducted in rows, for example along village roads. Similar with the situation in the “ha” unit, the number of trees in “km” unit were also could not be estimated.

As the funding awarded for each BLM was recorded (see Table 3-2), the cost for producing one individual tree can be calculated by dividing the fund with the number of trees planted. The cost for one tree varies highly, from about IDR 11,100 for North Sulawesi to IDR 96,500 for North Sumatra, averaging IDR 28,600 from all 4 sampled provinces. Factors that might contribute to the high cost are the mortality rate, local transportation, and price for the seedlings (i.e., commercial fruit trees normally more expensive than timber trees).

Table 3-3. The total number of trees planted in sampled BLMs.

| Province | N | Number of Trees (Individuals) | Average of Trees per BLMs (Individuals) | Other Units[4] | Cost per Tree* (IDR) |
|---|---|---|---|---|---|
| North Sulawesi | 31 | 104,984 | 3,386.6 | 4 ha | 11,164 |
| N. E. Sulawesi | 30 | 75,871 | 2,529.0 | | 29,057 |
| North Sumatra | 30 | 25,293 | 843.1 | | 96,547 |
| West Sumatra | 36 | 74,283 | 2,062.4 | 8.5 ha; 26.8 km | 29,268 |
| **Average** | 31.7 | 70,107.7 | 2,208.1 | | 28,687 |
| **Total** | 127 | 280,431 | | 12.5 ha; 26.8 km | |

Note: data were taken from the report of each BLM recipients
* refer to Table 3-2 for the amount of grants per BLM

Data from the field (n=127 BLMs) revealed that most of the seedlings (95.47%) were germinated in polybags (Fig. 3-2) and only a small percentage was originated from other means, including propagules/seeds (e.g., mangroves), stumps (e.g. *angsana*), wildlings (e.g. nantu), and seeds (e.g. coconut, nyiri/cannonball). In South East Sulawesi, all seedlings were germinated in polybags. Seedlings in polybags were obtained by buying from local nurseries. The price of the seedlings – varies from IDR 4,000 up to 30,000 - depended on species, height of seedling, and transportation to the planting sites. As mentioned previously, fruit trees basically were more expensive than other types of trees.

There was a high variation in planting distances (2x2 m up to 8x8 m) depend mostly on the species planted and the surrounding environment. These differences reflect the types/species of plants that were planted, and micro and macroclimatic condition of the surrounding environment. Mangrove species was more densely planted, sometimes arranged in big clumps to withstand the strong current and tides. Fast growing timber species, in contrast, were planted more sparsely.

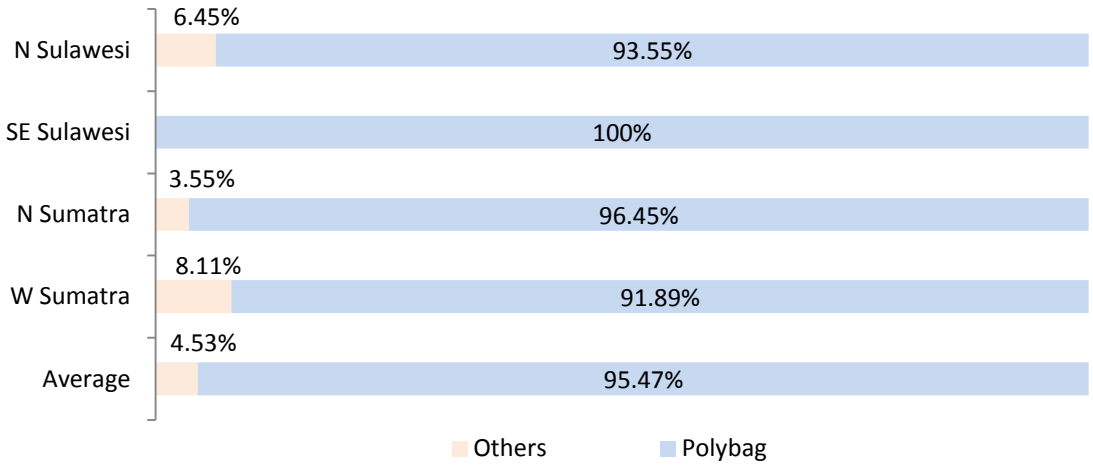


Figure 3-2. Methods of germinating seedlings for planting.

[4] These units were in addition to the commonly used 'individual tree' unit. For tree planting along roadsides, some times unit 'km' was used, without any further information on the number of planted trees per km. Other BLMs also used 'ha', also without any information on the number of planted trees per ha.

## E. CONDITION OF PLANTED TREES

As previously explained in the Chapter II, condition of the planted trees (existing) was quantified through the condition of tree stands (a collection of trees). In each of the sampled BLMs visited by the Consultant and/or Enumerator, a tree stand was considered 'healthy' if more than 80% of the trees were in good condition, as shown by the condition and size of leaves, tree diameter, and tree height. If the tree stand was considered 'less healthy' (i.e. tree with good condition is less than 80%), the cause(s) of the unhealthiness was recorded through visual observation and/or interviews.

Of the 127 sampled BLMs in the four selected province, 77.69% of the plants were in healthy condition. Plantation in Sulawesi (average 93.38% for North Sulawesi and South East Sulawesi combined) were healthier than that of Sumatra (average 64.95% for North Sumatra and West Sumatra combined) (Fig. 3-3). The North Sulawesi province has the highest percentage of healthier trees compared to the other three provinces.

Less healthy trees showed a bad growth, surrounded by weeds, or stunted. Data from the field showed that about half of the trees in West Sumatra were less healthy, mainly due to bad growth and stunted (Table 3-4). As for the mortality rate during planting, data were unavailable because the BLM recipients did not monitor the number of percentage of the tree mortality when planting was conducted 2-4 years ago.

Tree care and maintenance by the community surely affected the condition of the planted trees. Local practice and wisdom, for example how local community overcame the problem of drought (Box 3-4), was also influence the planting success. Further, many local communities admitted that there were many obstacles in first year of the project (2010) due to confusion on the implementation of the BLM projects. In addition to this technical constraint, there were several causes of the tree mortality in all sampled provinces (Table 3-5, Table 3-6), including due to animal nuisance (Box 3-5) and pathogen (Box 3-6).

Table 3-4. Condition of less healthy tree stands in sampled provinces (in %).

| Condition | N Sulawesi | SE Sulawesi | N Sumatra | W Sumatra | All Provinces |
|---|---|---|---|---|---|
| Healthy* | 96.77 | 90 | 81.25 | 48.65 | 77.69 |
| Less healthy | 3.23 | 10.00 | 18.75 | 51.35 | 22.31 |
| - due to pest, disease, animal nuisance | *3.23* | *0* | *6.25* | *21.62* | *8.46* |
| - dominated by weeds | *0* | *3.33* | *3.13* | *2.70* | *2.31* |
| - stunted | *0* | *6.67* | *0* | *18.92* | *6.92* |
| - varies | *0* | *0* | *9.38* | *8.11* | *4.62* |
| Total | 100 | 100 | 100 | 100 | 100 |

*good stand condition of more than 80% was categorized as healthy

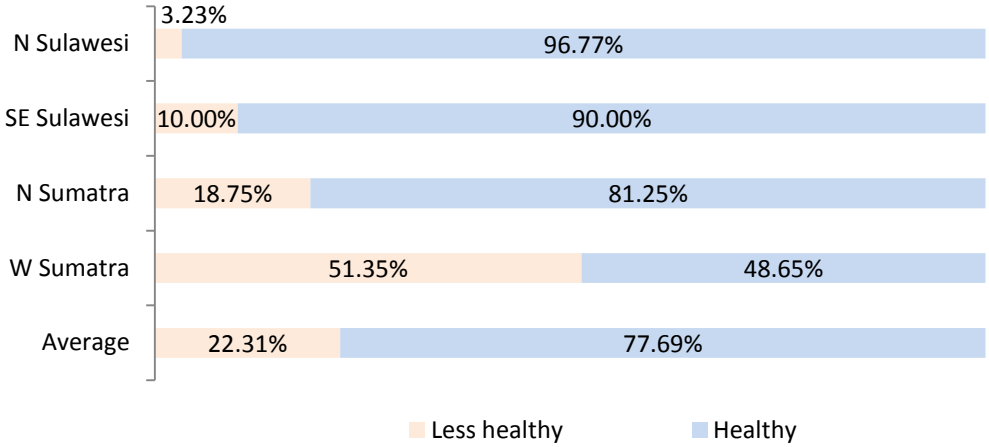


Figure 3-3. Percentage of condition of planted trees in four sampled provinces (all planting years and species combined).

**Box 3-4. Local wisdom supporting the success of tree maintenance: Tree watering.**

Several planting locations tend to be dry, e.g. Hendea Village of Sampolawa District, Buton Sub-District. To ensure survivability of the plants supplied, they need a regular maintenance. Regular watering was given to plants located far from water source. The community normally created water tents to collect rainwater. The water tents were typically placed by the community housing for their daily needs or watering their fields. In addition, the community uses drip/infusion method to irrigate their plants using holed-through *maja Aegle marmelos* fruits or mineral water plastic bottle. The village also enforces social monitoring/sanction. Any family head which fails to properly maintain their plants will be excluded from the forthcoming aid's programme.

*A water tent situated by the house, functioning to collect rainwater.*

Table 3-5. Causes of tree mortality in the sampled provinces.

| Category | Causes of Mortality | Major/ Minor* | Remarks |
|---|---|---|---|
| Care and maintenance | Lack of shading | Minor | For light intolerant species such as nutmeg |
| | Unable to compete with weed due to lack of maintenance | Major | Mostly in remote BLMs |
| | Competition with other plants | Major | For in-between planting |
| | Lack adaptation of seedling | Minor | Planted directly upon arrival of seedling. After transported from distance areas, the seedling should be placed under shade condition allowing the root recover from destruction |
| Climate | Inappropriate timing of planting | Major | Sometimes unavoidable due to the need of prompt funding disbursement |
| | Unexpected high tidal wave | Minor | Along seashores |
| | Flooded | Minor | In low areas and along riverbanks |
| Animal nuisance | Directly consumed or by indirect causes | Major | Direct consumed (by cows, goats, Long-tailed macaques *Macaca fascicularis,* Pig-tailed maqaques *Macaca nemestrina,* rats), or through destructive soil ploughed by wild boar *Sus srofa* |
| Pest and disease | Eaten by pests or infested by disease | Major | Mostly in monoculture plantation of cacao and orange - termites, ants, brown rot caused by *Ralstonia solanacearum* bacteria, white root rot disease caused by *Rigidoporus microporus*, and various diseases causes by mites (Acari: Tetranychidae) |
| Fire | Direct flame | Minor | In fire-prone areas, especially during long drought seasons |
| Land abrasion and erosion | Washed away by water | Minor | Along seashores or riverbanks |
| Human factor | Varies | Minor | Incorrect species selection, incorrect decision in silvicultural practices, seedlings were too young, seedlings were unhealthy following transportation from nursery |

*based on frequency of occurrence

Table 3-6. Dominant problems in tree planting in the sampled provinces.

| Province | Dominant Causes |
|---|---|
| North Sulawesi | Most BLMs (61.29%) did not experience any problem; a few (38.71%) had problems with drought and pests |
| South East Sulawesi | 65.52% of the plantation had a drought problem, some were washed away by high tides (mostly mangroves) |
| North Sumatra | Diseases, lack of maintenance (competition with weed) |
| West Sumatra | Lack of maintenance, flooded, consumed by cattle |

**Box 3-5. Planting failure: Animal nuisance.**

In West Sumatra, many cattle (mostly cows, a few goats) are free roaming in the village to ease the grazing and feeding activities. When the grass was lacking or unavailable, the cattle accidentally consumed the newly planted trees nearby. In the Sutera Sub-District (West Sumatra), the BLM recipients tried to propose to the PNPM Green Authority to get more funding for fencing. However, the request was turned down because funding for such activities in tree planting activities was not allowed.

Another animal that cause some problems during planting in West and North Sumatra was the soil destruction by wild boar *Sus scrofa*. Following the planting, wild boars often visited the newly planted seedling/sapling at night. They most often did not consume the young trees. Instead, they dug the surrounding soft soil, looking for grubs, worms, and other soil insects. The boars pulled out the trees by chance, causing a high mortality of the trees.

For nuisance caused by cattle, the newly plant consumption should have been predicted earlier, and thus precautionary measures can be budgeted in the initial proposal. As for the disturbance from the wild boar, it might be quite difficult to prevent.

In contrast to the situation in West Sumatra, the cattle nuisance in Sulawesi was negligible. Most cattle in Sulawesi were restrained and kept in enclosure, and in some places there was a Village Regulation (*Peraturan Desa)* that prohibits cattle to be freely roamed around the village.

*Cattle sometimes consumed the newly planted trees in North East Sulawesi (left) and in West Sumatra (right).*

**Box 3-6. Planting failure: Major pests and diseases in North and South East Sulawesi.**

**Durian tree stem borer (*Batocera* sp.)**

This pest is a stem/branch-boring beetle lervae which makes the attacked plant parts whiter and dry due to permanent interruption of water and nutrients supply to that part. Visible indication of its attack is boring hole in the stem/branch surrounded by wood dusts.

Prevention from this pest is by performing good maintenance of the field sanitation and disposing the attacked tree parts. Pest control is performed by closing the hole with pesticided cotton. This pest attack may lead to plant's death, which in turn quantitatively affects the planting success and reduce farmer's income.

**Cocoa stem borer *(Conopomorpha cramerella)***

Cocoa stem borer attacks cocoa fruits, leaving impairs to the seed growth and unevenly distributed fruit maturation. Figure on the left was cocoa fruits in Ladongi attacked by stem borer. Visible external symptom is yellow and green colours on fruits and bore holes.

The recommended prevention is by fully packing fruits 5-8 cm in size. Humidity control by reducing the number of wild buds can also lower the attack intensity. While this stem borer attack does not cause death, it significantly reduces plant productivity. Therefore, if assessment is merely based on the number of surviving trees, the disease would be of no harm. But if the farmers' income is an indicator of tree planting success level, the disease will be proven causing a great deal of adverse impact.

**Black-pod disease (by *Phytophthora palmivora*)**

Cocoa fruits attacked by the black-pod disease are blackish brown in colour. This disease quickly attacks the entire cultivation area. The infection occurs through sporangium carried away by rainwater. The attack will be very intense in areas with high level of rainfall and humidity. While the disease attack does not cause death to plant, it greatly reduces the plant productivity. From plant survivability, it does not affect the planting success. But in the future it will adversely affect farmers' income, due to decreasing yield quantity.

## F. GROWTH OF TREES

The growth of trees in the sampled BLMs was good in most locations, although there were BLMs that only had a fair growth especially in West Sumatra. Table 3-7 presents the average of the height and diameter of the sampled trees in four selected provinces. Fast growing species such as the rain tree *Samanea saman* in North Sulawesi has reached more than 20 m height, and able to provide its ecological function as shade tree along the village road, four years after planted. Another fast growing species, *Gmelina arborea*¸ was also reached more than 10 m height.

As for the fruit trees, some of the planted trees have already started to produce some yield. The local variety of coffee, called *Ateng* (Aceh Tengah), for example, was a fast growing variety and can produce coffee in about 2 years. The average height of this species in North Sumatra was less than 2 m, but in some BLMs the *Ateng* coffee has already been harvested, although the yield was still low because of the young age of the coffee trees. Another species that will produce fruit within a year was oranges, planted by community in North Sumatra. In North Sulawesi, the 4-year old nutmeg has produced, so did *rambutan* and mango (Box 3-7).

Table 3-7. Average height and diameter of sampled trees (all provinces combined).

| Tree Grouping | Local Name | n | Average Height (m) | Average Diameter (cm) |
|---|---|---|---|---|
| Fruit trees | | | | |
| | Alpukat, avocado | 36 | 3.42 | 2.00 |
| | Duku | 76 | 2.96 | 2.05 |
| | Durian (local) | 158 | 1.94 | 1.62 |
| | Durian var. monthong | 41 | 4.86 | 3.25 |
| | Jengkol | 15 | 0.61 | 0.35 |
| | Jeruk, orange | 60 | 2.59 | 1.69 |
| | Manggis, mangosteen | 16 | 0.69 | 0.77 |
| | Mangga, mango | 46 | 8.18 | 4.70 |
| | Manggo var. 'harum manis' | 10 | 2.86 | 0.52 |
| | Manggo var. 'golek' | 10 | 7.47 | 3.20 |
| | Petai | 20 | 2.13 | 2.83 |
| | Rambutan | 76 | 4.94 | 3.00 |
| Timber tree | | | | |
| | Bayur | 140 | 1.88 | 2.75 |
| | Cempaka | 128 | 4.48 | 3.40 |
| | Jati putih, *Gmelina* | 70 | 10.70 | 4.25 |
| | Jati, teak | 20 | 16.51 | 4.62 |
| | Mahoni, mahogany | 278 | 4.26 | 3.47 |
| | Medang | 10 | 1.48 | 2.26 |
| | Nantu | 42 | 1.37 | 1.11 |
| | Sengon, albizzia | 65 | 2.94 | 3.70 |
| | Surian | 46 | 2.53 | 2.43 |
| Spices tree | | | | |
| | Cengkeh, clove | 40 | 3.16 | 2.26 |
| | Pala, nutmeg | 319 | 2.19 | 1.41 |
| Resinuous tree | | | | |
| | Karet, rubber | 386 | 2.54 | 2.71 |
| | Gambir | 87 | 1.36 | 1.06 |

| | | | | |
|---|---|---|---|---|
| Others | | | | |
| | Aren | 60 | 3.23 | 2.22 |
| | Cacao | 175 | 2.16 | 1.92 |
| | Coffee var. Ateng | 89 | 1.93 | 1.01 |
| | Pinang | 15 | 3.36 | 1.25 |
| Sand/land stabilisator/shade trees | | | | |
| | Angsana, linggua | 30 | 5.91 | 3.96 |
| | Cemara laut | 90 | 2.67 | 5.17 |
| | Lamtoro | 15 | 0.61 | 0.85 |
| | Trembesi, rain tree | 10 | 23.45 | 5.00 |
| Mangroves | | | | |
| | Bakau | 20 | 0.99 | 1.40 |
| | Xylocarpus, cannonball | 4 | n.a. | 1.27 |

**Box 3-7. Quick-yielding productive plants.**

Introduction of cash crop and fruit crops into new location brings high risk because fruit plants require specific conditions to produce flower and fruits. In some provinces, PNPM Green Project introduced cash crops (cloves, coffee variety ateng, and nutmeg), and fruit crops (rambutan and mango). Seedlings of cloves, nutmeg and coffee are propagated by seeds, while those of rambutan and mango are propagated by grafting. Plants propagated through grafting method produce fruits faster than those propagated through seeds. From field observation, plants with 2-3 years of age have started to produce fruits, for instance coffee variety Ateng, nutmeg, rambutan, and mango. This shows that selection of plant species is suitable with the agro-climate condition of the areas.

Coffee variety Ateng has short stem but can produce high quality of fruits very soon; therefore it is popular to be cultivated in the Province of North Sumatra. The fruits can be harvested at the age of 1½-2 years after being planted and its productive period is 10 years. Once the plants are productive, harvest can be done bi-weekly (twice a month). The price of fresh coffee beans ranges between IDR 15.000-25,000 per kg. One hectare can produce 400 kg of fresh beans, or equal to IDR 3-4 million per month.

Nutmeg is introduced in the Village of Minut, Menado, North Sulawesi Province. Prior to PNPM Green program, nutmeg was not an attractive commodity; coconut was more popular then. However, when the nutmeg started to produce fruits, people's preference changed. Before long the species has been planted in many places, and usually it is planted underneath coconut plantation. The attraction came from its competitive price and continuous harvest period. The price of 1 kg nutmeg is around IDR 125,000, plus the selling of its flesh and mace.

Mango and rambutan were introduced in Bohoi Village – North Sulawesi. Both fruit trees have been producing. Cash crops and fuit crops in the future will have a good potential to increase household income and at the same time enhance community's nutrition.

*Trees planted under PNPM projects that have been produced: coffee var. Ateng in North Sumatra (top), nutmeg in North Sulawesi (center), and mango in North Sulawesi (bottom).*

# IV. COMMUNITY INVESTMENT

Community investment in this report basically aims to assess how much community has invested their land, labor and other in-kind contribution, tree maintenance and control, formulation of phase-out plan, and in consultation and facilitation process. The initial hypothesis was: the bigger the investment, the higher success rate of tree planting.

## A. TYPES AND AMOUNT OF COMMUNITY INVESTMENT

### 1. Land

Of the 172 BLMs that were studied, about two-third BLMs (63.20%) had planted trees on privately owned land, and about a third (30.40%) was planted on the communal land (Fig. 4-1). The trend of planting in private land was similar in all provinces. Planting in communal land was preferred, but it seems that it was difficult to fulfill. Box 4-1 provides an illustration of the tree planting activities on the communal land in South East Sulawesi.

Although tree planting activities within the PNPM Green was not prohibit planting in a private land, the program actually much preferred planting in a communal land. The local people as the main stakeholder and beneficiary actually fully understood about this preference of the PNPM Green. However, they did not have any other options, because: (a) there was no communal land available in the village; almost all land were privately owned, except perhaps narrow strip along the roadsides, or commonly owned coastal areas, (b) communal land has been planted through other plantation funding, for example GERHAN (Gerakan Rehabilitasai Lahan of Ministry of Forestry), (c) there were some offers by local people who happened to have sufficient area of 'empty' land.

Tree planting on privately owned land, however, created some positive and negative impact, as listed in Table 4-1. The most concerned negative impact basically was that the richer member of the community got more opportunity to take advantage of the tree planting activities. People who did not have land obviously lost their opportunity to have new productive trees.

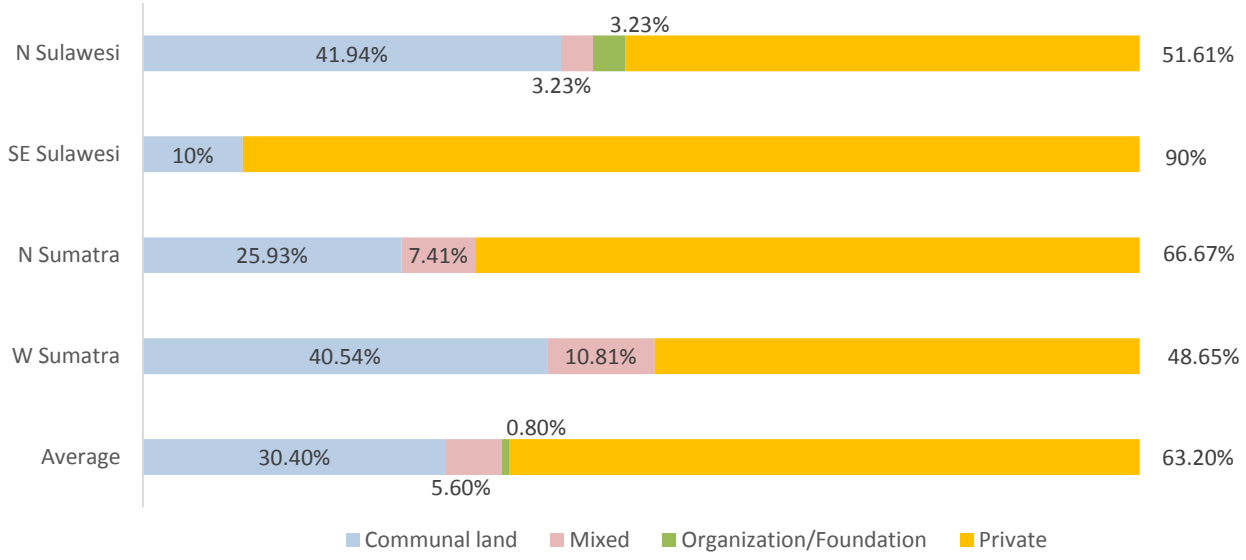


Figure 4-1. Type of land ownership where tree planting activities were conducted.

Table 4-1. Positive and negative impact of tree plantation on private land.

| | Positive Impact | Negative Impact |
|---|---|---|
| Project in general | • A certain number of the trees were able to be planted and the project was able to be executed. Otherwise, the project might not be executed at all. | • The situation was still allowed although it was not preferred by the project.<br>• Some BLMs had a relatively small percentage of planting success because the land owner did not taking care of the tree planted on their vast land. |
| Household target | | • Plantation was not located on land owned by the poor household (*RTM, rumah tangga miskin*) because only relatively rich families had a sufficient areas for tree planting. People who did not own private land were still able to work in the land preparation. The benefit of the tree planting activities to the poor household, however, was only temporary. |
| Economic | • Provide an economic incentive in the future for the land owners.<br>• The entire village could receive some benefit if the benefit sharing mechanism was in place. | • Could create more gaps on household revenue in the long run. |
| Socio-cultural | | • The project favored to the richer and thus could create a jealousy for the people who did not have land for planting. |

**Box 4-1. Community investment on land: Planting on customary forests.**

Most of tree planting was carried out on privately owned land. However, Gunung Jaya Village of Ladongi District, Kolaka Regency, South East Sulawesi was different. Planting in the village was carried out in Santi Karya Customary Forest. The forest, initiated by Balinese transmigrants, was formalized in 1980, aiming at sustaining the spring located therein. A Balinese-Hindu temple was built in the forest for religious ceremonies occasionally.

Gunung Jaya Village community was highly motivated to maintain their green areas. The village passed a Village Regulation compelling its community members caught cutting down trees to compensate every single one of them with 100 others. The community's motivation indirectly helps the Government's forest conservation programme, as Ladongi District is a buffer zone to Rawa Aopa National Park. The planting in this customary forest is aimed to enrich the existing forest plant species

*A Balinese-Hindu temple in Santi Karya Customary Forest, used for various Hindu rituals held by community of Balinese transmigrants descent.*

*Signboard imposing obligation to protect Santi Karya Customary Forest, posted by front of the forest area. Thank to the forest existence, river within this area flows year-round.*

*A variety of tree and other vegetation species growing in the forest. Harvesting bamboo under permission is allowed for religious ritual purposes.*

**2. Skill and Experience**

The local people shared their skill and experiences to the Tree Planting Activities, as most of them indeed are farmers. In all sampled province, farming has been practiced by the local community since a long time ago. When the planting activities of the PNPM Green were offered to them, intuitively use the skill and experience to conduct the project.

Local people have much traditional knowledge related to the plantation, especially to the site nearby. Basically they already mastered the knowledge of selection, species selection, land preparation, planting, and tree maintenance. To increase the rate of success of the tree planting, the local people of North Sulawesi, for example, have practiced several useful techniques (Box 4-2).

In the production of the seedling, however, only a certain people could produce them, as they required special skill, location, and source of seedling/seed/wildlings. Thus, the local people most likely bought the seedlings from farmers or companies that produce the seedlings, instead of producing the seedlings by themselves.

The socio-economic background of the local people apparently affected the skill and experience on tree planting. Culturally, West Sumatra people are a bit different than the other sampled provinces. People of West Sumatra (called '*Minangkabau*') have very strong instinct and skill on entrepreneurship. Their time dedicated to the tree planting could be less than needed, especially for remote planting sites.

**Box 4-2. Skill and experience of North Sulawesi people: Appropriate technology.**

Success of tree/fruit planting in particular area greatly depends on many factors such as community's ability in applying appropriate technology, which is a technology utilising local resources to more easily, simply solve problem at low cost. PNPM Green Programme in North Sulawesi is deemed successful. One of the factors behind it is agrarian culture by highly innovative community using appropriate technology. Some examples of the appropriate technology are as follow.




a b c d

**Coconut fibre utilization**

Rising domesticated chicken outside farm fence is common among North Sulawesi rural communities. But it becomes problem when chickens feed from microorganisms in organic fertiliser poured around trees, scattering off the materials and dulling the fertilisation. To prevent against this undesired effect, the local community places coconut fibre (see Figure a) around the fertilised tree trunk to maintain humidity and soil temperature and to cover the fertiliser from rain, allowing the rooting to well grow.

**Cover crop**

Newly moved plant seedlings on site are vulnerable to high level of evapotranspiration. They may wither or suffer from stagnant growth, leading to death. North Sulawesi community uses *Codiaeum* (an ornamental plant species locally known as *suli*) as cover crop. This plant species easily grows from stem cutting. Both the main plant seedling and *suli* will grow together temporarily, and once the main plant is matured, the cover crop will be cleared (Figure b).

**Palm midrib as canopy**

In addition to *suli*, the community also uses palm midrib and leaves as canopy. The midribs cover the plant seedlings from direct sunlight. Both palm midrib and leaves are easily found in the local community's plantation (Figure c).

**Technics for curbing land erosion**

Under intense rainfall and rolling land slopes, intensity of erosion over agricultural land in North Sulawesi tends to be high. Farmers cope with this condition by placing banana trunks in parallel with the land contour to hold against erosion. This is done simultaneously with plant weeding (Figure d).

## 3. Labor and Other In-Kind Contribution

In term of labor, most of the labor for the land clearing, land preparation, and tree planting were budgeted in the proposal, meaning that the local people were paid to those works. The standard amount of payment for one day varies from IDR 40,000 to 50,000, depend on the locations and the difficulties of the job. Thus, the community investment in land clearing, land preparation, and tree planting was considerably very little, except in some places where the local people were paid less as a contribution to the project/activities. Various actors in the community might have invested in labor in many other stages of the project, as summarized in Table 4-2.

Table 4-2. Examples of community investment in labor for tree planting activities.

| Players/Actors | Investment in Labor |
|---|---|
| Land owners (of the planted trees) | • Tree maintenance and replanting |
| Non-land owners | • Land preparation, tree maintenance and replanting |
| PJOK (*Penanggun Jawab Operasional Kegiatan*/ Operational PIC) | • Overtime work during project planning and implementation |
| TPU (*Tim Penulis Usulan)* | • Overtime work during project planning and proposal writing |
| TPK *(Tim Pengelola Kegiatan)* | • Overtime work during project planning and implementation |

In addition to the contribution listed previously, the local people also provides other in-kind contribution (non-cash) such as the use of equipments (hand plough/*cangkul*, hand fork, watering can), organic fertilizers, mulch, and shades. In some area, the cost for the replacement planting was also paid by the community or by individual, if the cost of replacement planting was not budgeted in the proposal.

### 4. Tree Maintenance and Control

After planting period, the newly planted trees need to be maintained and cared for, especially during dry season, when the tree needs watering and maybe shading. In addition, trees might also need some weeding, fertilizing, and mulching. Some BLMs include the maintenance in the proposal, and thus were budgeted, while some other were partially had the funding, and few others did not include the maintenance in the proposal.

Maintenance of the planted trees were done by community (together), individuals, or paid worker. In Sulawesi (both in North and South East), tree maintenance were mostly done by individuals, while in North Sumatra the maintenance was done by community. In West Sumatra, the tree maintenance was done by combination of individual, community, and paid worker (budgeted in the proposal).

There were few projects that admitted that there was no tree maintenance following the planting period. In West Sumatra, the percentage of the BLMs that did not receive any maintenance was 24.32% (Fig. 4-2). The reason for the absence of the maintenance was mostly the low access of the planting area.

Following the planting period, control of the tree condition and maintenance also need to be done. It seems that the community felt that the investment on control was not so important. On the average, only about 22% of the BLMs had some sort of control mechanism (Fig. 4-3).

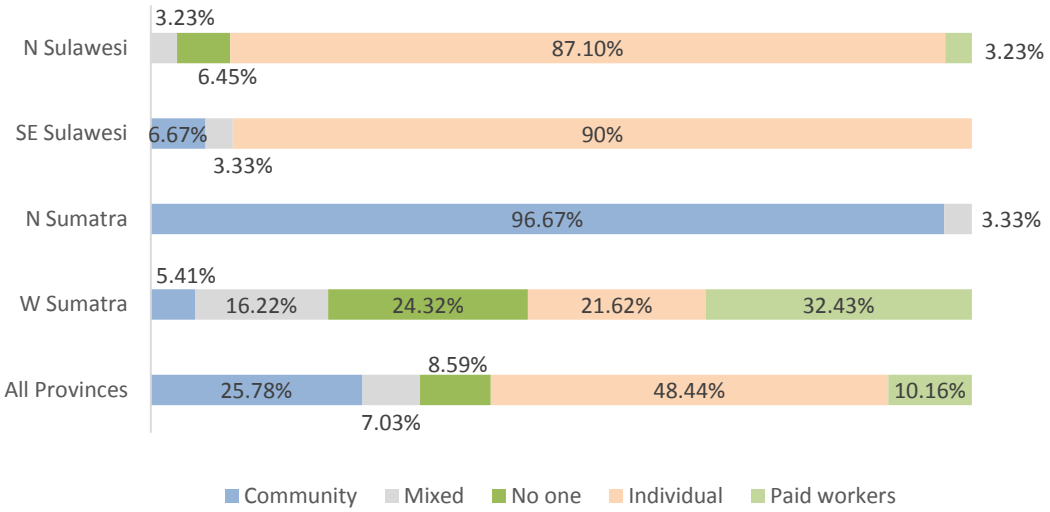


Figure 4-2. Percentage of tree maintenance by various actors of BLM recipients.

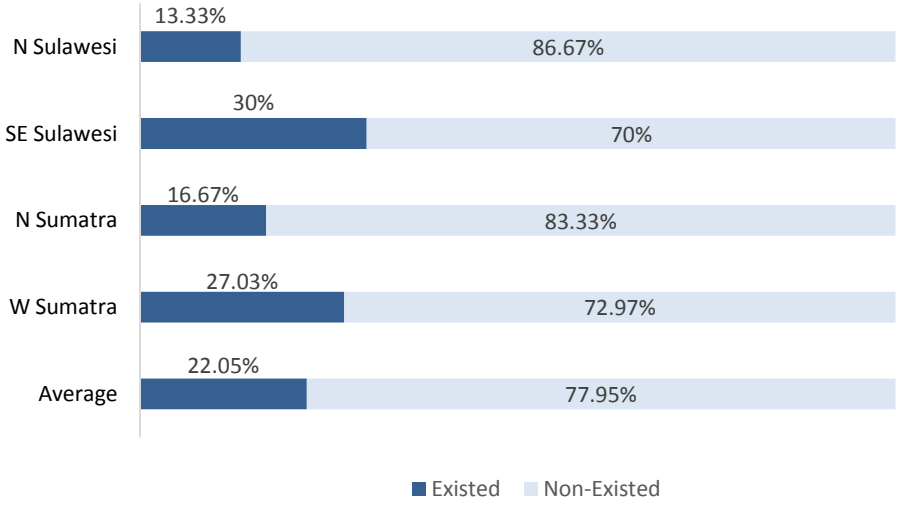


Figure 4-3. The existence of control mechanism following planting period.

## 5. Phase-Out Plan

The tree planting activities run for 4 to 5 years. The duration between the planting and the maturity of the planted tree was much longer, up to 40 years or maybe more for a certain timber producing species. The phase-out is applied at the end of the project (5 years); therefore, it is necessary to see the level of success for those tree planting trees that were planted in the earlier stage of the project (i.e. 2008 and 2009).

The phase-out plan basically outlined the steps need to be taken after the project was finished. The average of number of BLMs having the phase out plan was 20.02% (Fig. 4-4). Some examples of phase out plan were the integration of the tree planting into the next year's budget plan, developing a task force for tree planting monitoring, and formulating *Peraturan Desa* (Village Regulation).

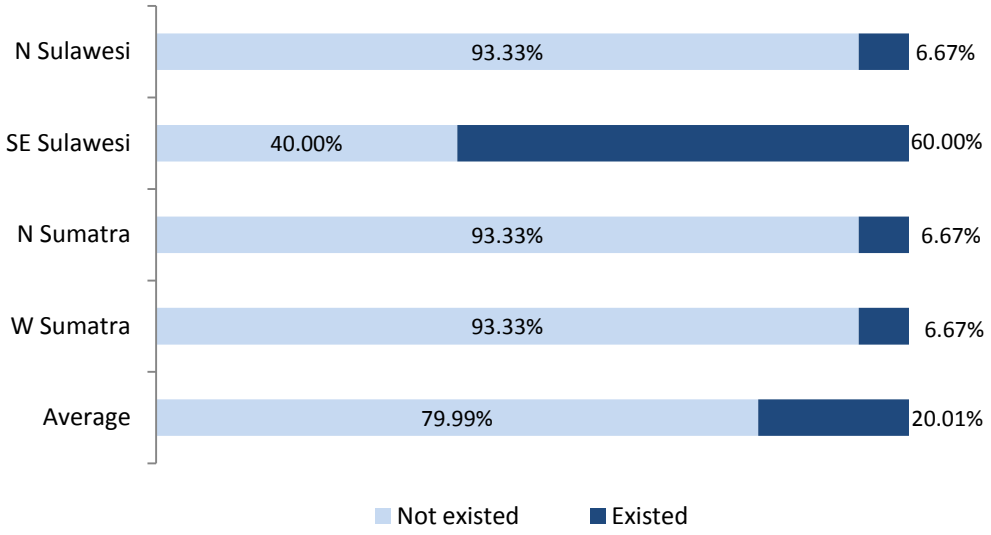


Figure 4-4. Percentage of BLMs that already have formulated phase-out plans.

## 6. Degree of Satisfaction of the Consultation and Facilitation Process

Similar to other PNPM projects elsewhere, the tree planting activities also provided many consultation and facilitation process. There were several facilitators assigned to assist the grantees, including *Fasilitator Kecamatan* (FK; Sub-District Facilitators), *Fasilitator Kecamatan-Lingkungan* (FK-L; Sub-District Facilitators –Environment), and *Fasilitator Teknik* (FT; Technical Facilitators).

Interestingly, the BLM recipients in Sulawesi (both in North and South East Sulawesi) had a high degree of satisfaction. On the average, only 9.9% for both province admitted that they did not feel satisfy with the consultation and facilitation process. In Sumatra, on the average 43.61% of the BLM recipients did not satisfy with the consultation and facilitation they have received during the implementation of the project (Fig. 4-5).

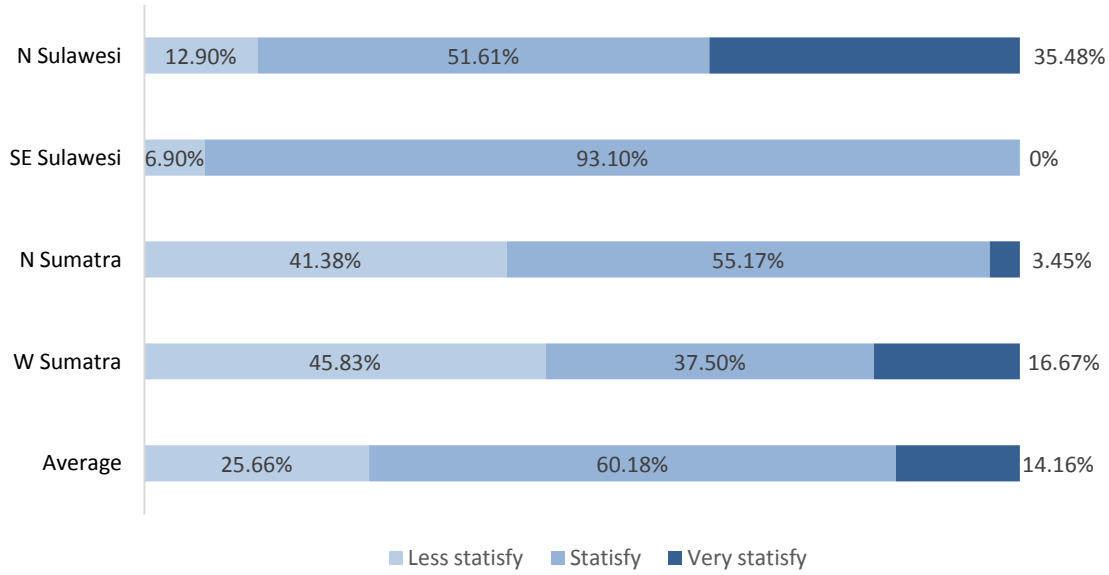


Figure 4-5. Percentage of satisfaction of the BLM recipients on consultation and facilitation process.

B. COMMUNITY INVESTMENT AND THE PLANTING SUCCESS

Judging from the information gathered during this study, it was obvious that the community investment have influenced the tree planting success, although the quantitative data to support it was unavailable. The planting success was a results of many factors combined, mainly the high effort invested by the local community. Higher community investment will result in the higher success of the tree planting activities. Many factors might work together and contributed to the success and Table 4-3 summarizes identified factors that contribute to the success of tree planting activities.

Comparing amongst the four sampled provinces, tree planting in North Sulawesi was the most successful project, judging from the percentage of surviving tree and the growth of trees. In addition, the tree planting activities in the North Sulawesi province was also effective, (i.e. cost per tree was the lowest) compare to other three provinces.

Table 4-3. Factors contributing to the success of the tree planting activities.

| Factors | | Remarks |
|---|---|---|
| Main factors | | |
| | Care and maintenance | Intensive maintenance and care from the community, especially from individuals as grantees, including the amount of time invested for the care and maintenance following the termination of the project/activities. |
| | Skill and input | The tree planting received high input for skill and experience from the local community. Many actions and local wisdom were practiced to take care of the plants. |
| | Leaders and agents of change | Local leaders and agents of change played active roles and provided new initiatives of the planting program. |
| Supporting factors | | |
| | Geographic location | Planting sites were relatively close in distance to community's home, and thus easy to control and to maintain daily |
| | Socio-culture | Agriculture has been the main activities of the majority of the community, coupled with strong sense of belonging of the community and the buy-in of the project by the community. |
| | Climate (i.e. rainfall) | Timing of planting was crucial. Planting preferably conducted during the early rainy season (i.e. September in most part of Indonesia). Otherwise, more investment in labor and resources (water) would be needed to ensure a high survival rate of the newly planted trees. |

# V. BENEFIT SHARING MECHANISM

Benefit sharing mechanism is defined on how the benefit of the green project can be delivered/distributed to the project recipient. Therefore, it is important to identify varies benefits of the project (in term of economical, social-cultural and ecological benefit), actors and rules (formal/informal) to ensure the benefit sharing mechanism is accepted among the recipient of the project. The definition was adopted from policy note by Pescett (2011).

## A. MECHANISM PLANNED BY BLM RECIPIENTS

Currently the trees that have been planted through the PNPM Green's Tree Planting Activities are almost 5 years of age in Sulawesi, and 3 years in Sumatra. Some of the commercial species might have started to produce fruit or others. Considering that (a) the seedlings and many other works related to the planting were actually grants from the Central Government, and (b) most of the granted seedlings were planted on private land owned by a certain community members, it is normal that benefit sharing mechanism could or should be in place. As for the trees with ecological function, it is understandable that there will be no economic benefit sharing, but the ecological and socio-culture would be shared by all members of the communities.

Data gathered from the field showed that a relatively small percentage (32.28%) of villages as BLM recipients have produced rule for the mechanism of benefit sharing, either formally stated in the Village Regulations (*Peraturan Desa*) or being processed to be formalized. Most villages (67.72%) did not have rule for the benefit sharing mechanism for various reasons as depicted in Table 5-1.

Table 5-1. Reasons of no formal rule for benefit sharing mechanism.

| Reasons | Remarks |
|---|---|
| • There was a misperception from the communities that there was no economic benefit from the tree planting activities | • For non commercial or ecological function species |
| • The planting success was still questionable in the long term | • Mostly for slow growing timber species such as mahogany and teak |
| • No need to have a formal regulation | • In many local communities, non-formal regulations sometimes are better and stronger than formal regulations |
| • The local people belief that when the trees have already producing, the land owner will voluntarily give their share to the Village Administration | • Mostly happened in villages where social bonding is very strong |
| • Distrust of the benefit sharing mechanism | • Local people got suspicious when benefit sharing mechanism was discussed; they were worried that one day the Government may seize their land |

The decision whether a certain BLM recipients need to have a rule for benefit sharing mechanism or not was entirely up to the discussion among the community member, as this matter was not directed in the Operational Manual Guidelines. Comparing across the 4 sampled provinces, it was clear that the local people in North Sulawesi had been thought about the benefit sharing scheme, compare to other provinces. Some examples on the existing rule for benefit sharing scheme is presented in Table 5-2.

Table 5-2. Examples of rule for benefit sharing mechanism related to the tree planting activities.

| Province | Village | Benefit Sharing Rule |
|---|---|---|
| North Sulawesi | Bulo | 2% for village administration, 98% for beneficiary |
| | Tiwoho | 2% for village administration, 98% for beneficiary (*BUMD*); nutmeg |
| | Ponto | 2-5% for village administration, 95-98% for beneficiary |
| | Koka | 2.5-5% for village administration, 95-97.5% for beneficiary |
| | Suluan | 5% for village administration, 95% for beneficiary |
| | Kembes I | 5-10% for village administration, 90-95% for beneficiary |
| | Kamangta | 20% for village administration, 80% for beneficiary |
| | Maponto | 10% for village administration, 90% for beneficiary; timber products |
| South East Sulawesi | Atula | 40% for local government, 60% for beneficiary |
| | Dangia | 100% for beneficiary |
| North Sumatra | - | none |
| West Sumatra | - | There are some informal scheme, but unspecified |

## B. Beneficiary Target

The basic expectation for the tree planting was that the trees planted by the BLM recipients were located in the communal land, therefore, belonged to all community. Benefit gained from the tree planting – either commercially or ecologically - supposedly can be enjoyed by all member of the community. However, apparently finding the empty communal land - except land along the public road - was quite difficult. At the end, most trees were planted in the personally owned land, and creating some challenges in the benefit sharing mechanism in the future, as listed in Table 5-3.

Furthermore, among the community, the first beneficiary target was the poor people in the village, the second target was the community institution, and the third target was the governance (Direktorat Jenderal Pemberdayaan Masyarakat dan Desa 2011). As already mentioned in the previous Chapters, this study revealed that the tree planting activities was slightly miss-targeted because the community members who benefit most from the activities were wealthier people.

An innovative way to overcome this challenge is needed, if a similar activity will be commenced in the future. An agreement amongst the land owner (wealthier people), workers (poorer people) and the village administration can be formulated to ensure that the benefit can be shared proportionally.

Table 5-3. Some challenges of the benefit sharing mechanism if the tree planting were on privately owned land.

| Challenges | Remarks |
|---|---|
| Mechanism to select the available land | • The village administrators need to decide whose land will be planted. In many cases this is not an easy task because many – if not all - community members want their land to be planted, considering that the trees were 'free', granted by Government.<br>• In some BLMs, they were expected that the year after there would be more grants available, so more people could have a chance to plant the free trees.<br>• There were some cases where the trees were simply given away to any member of the community who wants them, hoping that the trees still be planted in the community's backyard or home garden. In this situation, it was difficult to estimate the rate of success of the planted trees. |
| Tree maintenance | • When the trees were planted on the personal land, most probably the owner of the land had to take care of the trees during the earlier years of the planting, including provide shading, watering, weeding, and other tree care activities.<br>• If planted trees were aimed for ecological purposes, in many cases the trees got lack or minimum maintenance, resulting in low survival rates. If planted trees were economic-generated species (e.g. coffee, orange, rubber), the trees usually received more intensive maintenance and care. |
| Replacement planting | • Similar to the tree maintenance, the land owner will gladly replaced the non-survived seedlings from their own funding, if the trees were categorized as economic-generated trees. Otherwise, for the ecological trees, replacement were seldom or none. |
| Sociological impact | • Local people who have a piece of land surely are considered wealthy. It seemed ironic that it was the wealthy people who had a higher chance to receive the free trees, while the poor people had a smaller chance to have the free tree and they might only involved in the planting process (although they were paid for the labor). This situation had created some envious situation in some sampled BLMs. |
| Ensuring the benefit sharing mechanism | • Although the benefit sharing mechanism has already in place for some villages, there were some doubts that the benefit sharing mechanism can actually be implemented when the time of production comes. This was mostly a concern for the economic-generated timber species, which of course take a longer time to harvest. To produce a high quality of Teak, for instance, takes 45 years (but less if a fast growing clones were planted). Mahogany on the average can be harvested after 15 years. There is no guarantee that the benefit sharing mechanism will still valid in the long run. |

# VI. SOCIAL CAPITAL AND IMPACT GENERATED FROM TREE PLANTING

Social capital is the norms and networks that enable people to act collectively (Woolcock & Narayan 2000). In this study, social capital is seen as having two main dimensions: (i) interaction (relating to the social relations among individuals or within groups (families, organizations, communities etc.), and (ii) norms (relating to the established rules of behavior or standards of conduct and the shared understandings or values held by a group of people).

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## A. SOCIAL CAPITAL GENERATED FROM TREE PLANTING ACTIVITIES

- **Social Interaction**

As mentioned in the previous paragraph, the social interaction refers to the interaction among individuals involving in the tree planting activities, or within groups. Although the social interaction in the individuals and group has been existed in the past, it might be strengthened due to the tree planting activities. Table 6-1 presents the various social interactions resulting from the tree planting activities. The types of interaction that might exist are participation and networks.

Table 6-1. Types of social interactions resulting from the tree planting activities.

| Type of Interaction | Remarks |
|---|---|
| Participation | • Participations in project activities can be seen through meetings involvement, in-kind contribution and maintenance.<br>• Almost all of adult members of the communities participated in the activities. The frequent participation, however, varies depend on the position of the member of the communities.<br>• In most cases, land owners participated in providing the planting areas, while non-land owners participated in as labors in the land preparation and planting.<br>• All members in the village administrative involved in the activities in planning, organizing, actuating, and controlling the activities, including in the decision making process.<br>• Women participation of the activities was quite apparent. Many BLMs had female TPKs and they have been successfully performed their task. |
| Networks | • Networks have been established among members of the community, and strengthening the existing social relations.<br>• New networks with neighboring village have been established during planning of the tree planting activities through Inter-Village Meeting (*MAD*, *Musyawarah Antar Desa*), trainings, and other formal meeting.<br>• New networks also have been established through collaborations during executing tree planting activities, including with other parties having similar works (e.g., agriculture extension specialists). |

As for the role of women, it was obvious that women had greatly participated in the tree planting activities in all provinces (Fig. 6-1), especially in the planting implementation (e. g. planting of seedlings, weeding, watering). It was also interesting to highlight here that in West Sumatra, in addition to participated in the planting implementation, women also had an important role in planning process, specifically during Village Meetings (MD, *Musyawarah Desa*) and Inter-Village Meetings (MAD, Musyawarah Antar Desa). This is most likely related to the matriarchal socio-culture of the West Sumatra. In fact, about 85% of the populations in the West Sumatra Province are ethnic groups called *Minangkabau*, notable in the annals of anthropology as the world's largest matriarchal society, where children take their names from their mother's side and, on marriage, the husband moves into the wife's family.

In many villages, one of the key the success of the planting activities was the participation and the role the local leaders. Those leaders have been acting as the prime movers of the entire society, leading to the success of the tree planting activities in the village they resided. As illustrations, Box 6-1 explains examples of the role of local leaders in the tree planting activities in Sulawesi.

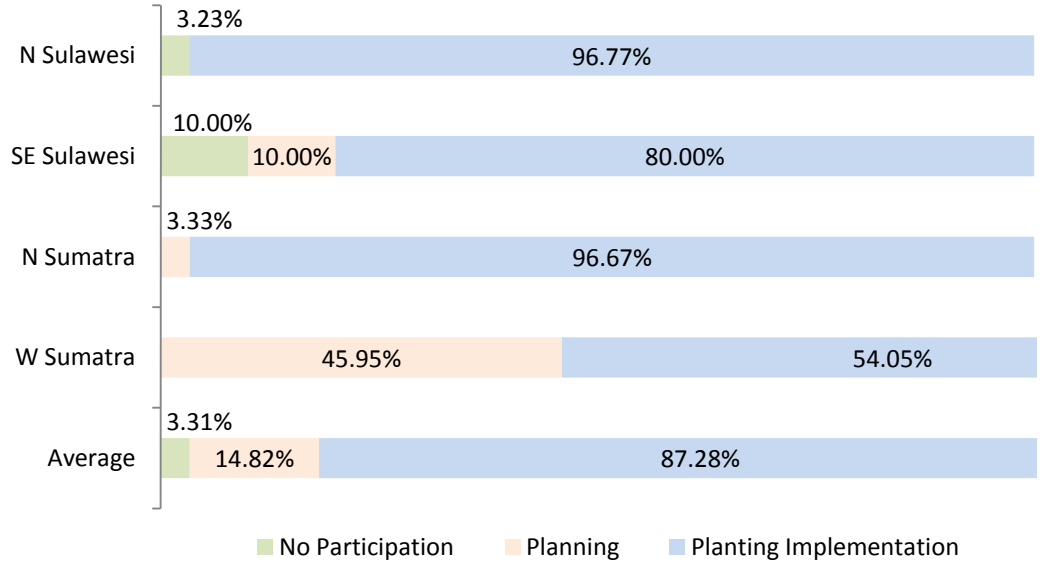



Figure 6-1. The role of women in tree planting activities.

**Box 6-1. The role of leader and agent of change.**

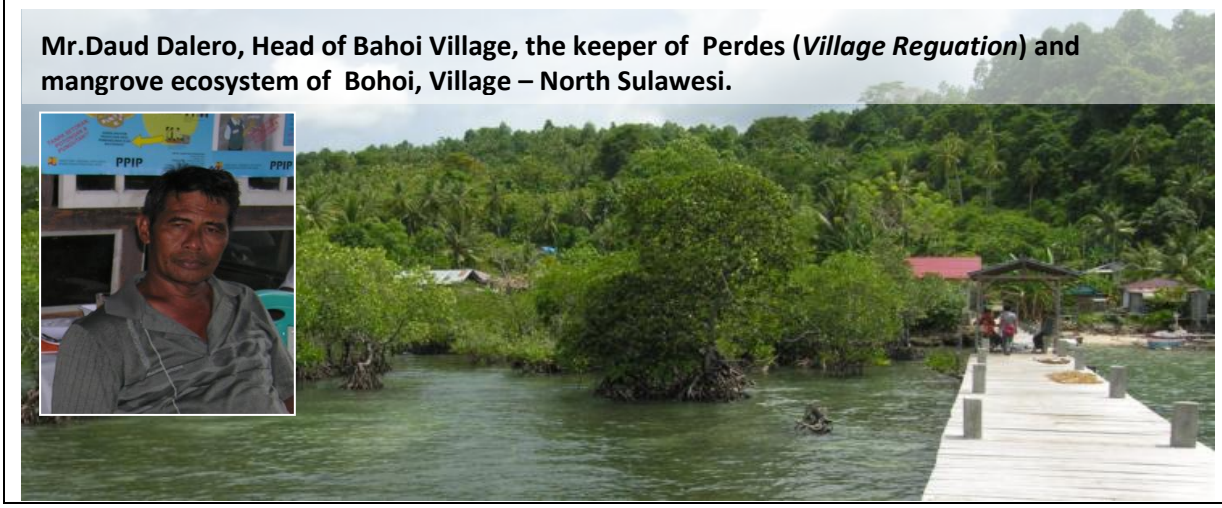
In the rural society, it is common to have informal leader beside formal leader within the formal organization hierarchy within the village. The formal leader has influence to the community due to his formal position. Meanwhile, informal leader is respected due to his character, dedication and personality. Both of them have important role on community education (Tohani, 2012) and diffusion of technology innovation in the village (Sidik, 2007). Further, Sidik (2007) explained that diffusion of technology to change the community behavior by agent of change need cooperation of formal and informal leader.

Ladongi sub-district is multiethnic community, consisted Javanese, Balinese, Bugis and Tolaki. They came and stayed there as participants of *transmigrasi* program. PNPM Tree planting program at Ladongi was considered as a success story. The achievement was due to the significant contribution of informal leader and agent of change, Mr Dewa. He is outstanding farmer (*Petani Teladan),* informal leader of Balinese community and agricultural extension officer of Gunung Jaya village, Sub-district of Ladongi

The success of PNPM Green at Desa Bahoi-Sulawesi Utara, was also due to the role of leader. He is Pak Daud Dalero, head of Desa Bahoi. Desa Bahoi has formulated some *Peraturan Desa* (*Perdes*), namely prohibition to waste garbage on inappropriate places, prohibition to cut mangrove and prohibition to release cattle. These three *Perdes* contributed to the achievement of green PNPM and therefore Bahoi village have a good mangrove ecosystem, which is popular among tourist.


**Mr.Dewa, informal leade and agent of change at Ladongi Sub-district, South East.**

**Mr.Daud Dalero, Head of Bahoi Village, the keeper of Perdes (*Village Reguation*) and mangrove ecosystem of Bohoi, Village – North Sulawesi.**



- **Norms**

Norms in this report refers to the establishment of rules of behavior or standards of conduct and the shared understandings or values held by a group of local people involving in the tree plating activities. Norms can be further categorized as transparency, trust, cooperation, coordination, perception, independence, regulation, and institution, satisfaction, and environmental awareness (Table 6-2). In general, the grant recipients were satisfy with the consultation processes provided by Facilitators (Fig. 6-2).

One of the significant emergent norms resulting from the tree activities was the creation of formal Village Regulation (*Peraturan Desa, Perdes*) in many BLM village recipients (Table 6-3). Field data shows that in Sulawesi most villages (more than 50%) already had Village Regulations related to the benefit sharing in the near future, including in mangrove forest (see Box 6-2 as an illustration). In contrast, in Sumatra the regulation was lacking or even not existed in North Sumatra Province (Fig. 6-3).

Table 6-2. Types of social norms resulting from the tree planting activities.

| Type of Norms | Remarks |
|---|---|
| Transparency | • The PNPM Green was design in such a way to prioritize the transparency. In fact, transparency and accountability was one of the 11 basic principles of the project, as written in the document of Technical Operational Guidance.<br>• Information from the field revealed that all activities, funding and anything related to the administration were operated in transparent manner. |
| Trust | • Clearly there were lots of high trusts in administering the tree planting activities. The local people basically trust each other. Part of the reason of the trust was due to the transparency of the activities.<br>• The local communities trust the people in managing their fund. They also trust the facilitators and village administrators. |
| Cooperation | • The tree planting activities naturally needs cooperation in every stage of the activity.<br>• Culturally, all members of the local people have a strong bond, even before the tree planting activities was began. This condition triggered the stronger cooperation among the local communities. In North Sumatra, the social bonding and cooperation was even stronger because many of them belong to the same family clan (*marga Batak*).<br>• Cooperation also was strengthened through the help of the religious leader (*tokoh agama*) of Moslem religion (West Sumatra, South East Sulawesi) or Catholic (North Sulawesi) or Christian and Moslem (North Sumatra). |
| Coordination | • The coordination and chain of command within the tree planting activities was obvious and already planned far before the execution of the activities. The local people and village administrators only need to follow the existing procedures.<br>• Coordination was clearly set in the village level up to the national level. |
| Perception | • Perception in the role and function of trees has been increased and strengthened.<br>• Perception that certain tree species can generate economic income in a relatively short time has been increased. However, the impact of the shift of tree planted needs further assessment. As an illustration, in North Sulawesi, coconut (as the producer of copra) was massively replaced by nutmeg because of the price discrepancy. The price of nutmeg per kg (IDR 125,000) was much higher than copra (IDR 4,000). |

| | |
|---|---|
| | • Perception on the PNPM Green program was good, although some of the community felt that the procedure of the tree planting was tedious and troublesome. |
| Independence | • Although the tree planting activities is a national program, the BLM recipients were given independence in deciding a specific planting site, and selecting an appropriate or preferred species to be planted. As a result, local-specific trees still can be found in every sampled province, although there were some species that seemed preferred in all provinces.<br>• The community also was given an independence to decide various aspects post-planting activities, including deciding the benefit sharing. |
| Regulation | • In some BLM recipients, formal (written) and non-formal regulations were created in relation to the tree planting activities.<br>• Some other village as the BLM recipients are in the process on creating a new regulation related to the benefit sharing mechanism in the future. |
| Institution | • The tree planting activities has strengthened the existing institution in the village level and above.<br>• In some village, the tree planting activities are linked to the existing development program. |
| Satisfaction | • Satisfaction of the consultation process was high in most areas. |
| Environmental Awareness | • Environmental awareness was increased and the local champions were emerging in many locations.<br>• Regulations related to the environmental conservation were formulated. |

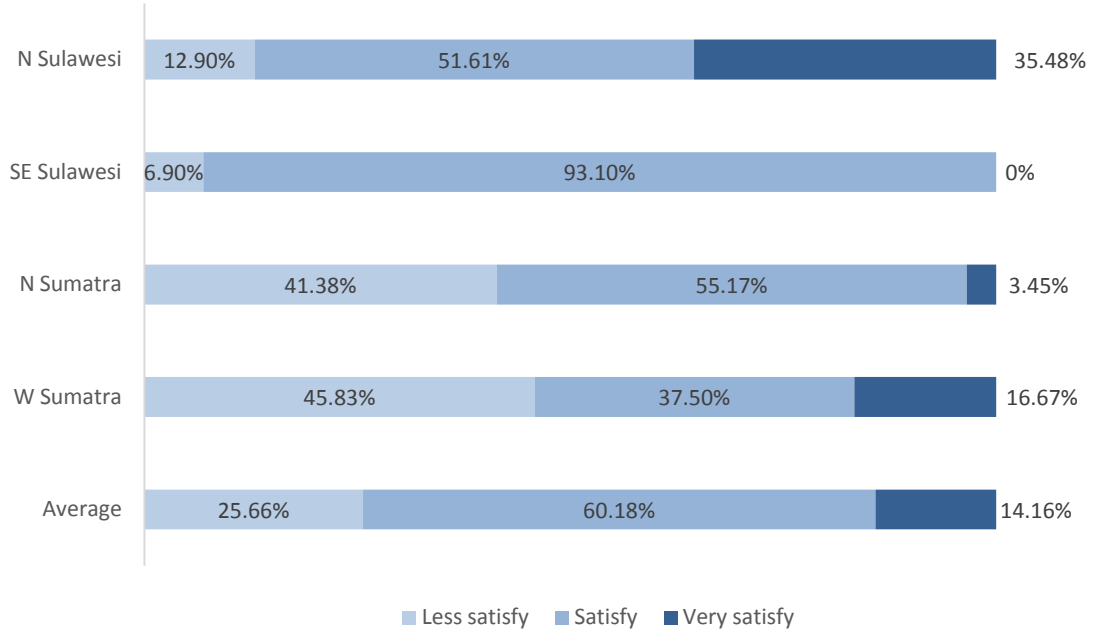



Figure 6-2. Percentage of satisfaction of the consultation process

Table 6-3. Examples of formal Village Regulation (*Peraturan Desa)* as results of tree planting activities in four sampled provinces.

| Village Regulation | Village | Province |
|---|---|---|
| *Benefit sharing for planted trees* | | |
| **See Chapter 5 on Benefit Sharing Mechanism** | | |
| *Prohibition* | | |
| Prohibit to harvest mangrove planted by PNPM Green Project; if a member of the community cannot avoid to harvest a mangrove tree, he/she has to replace it with 5 trees for each tree harvested | Termaal | North Sulawesi |
| Prohibit to harvest mangrove planted by PNPM Green Project; fine IDR 500,000 for the one who violate this Regulation | Kinabuhutan | North Sulawesi |
| Prohibit to harvest mangrove planted by PNPM Green Project | Bahoi | North Sulawesi |
| Prohibit to harvest mangrove planted by PNPM Green Project | Awainulu | South East Sulawesi |
| Cattle was prohibited to enter sites of BLM tree planting | Mawasangka | South East Sulawesi |

**Box 6-2. Village Regulation on mangrove planting.**

In North Sulawesi, mangrove planting can be found - among others - in West Likupang District, mostly at its coastal area. In this area, mangroves has grown naturally, although in some other parts of the area they have suffered from damages, weakening their function as coastal barrier against abrasion, as well as many other ecological functions. Mangroves were planted at Kinabuhutan and Termaal Villages.

Mangroves in both locations were planted in a formerly cleared/damaged mangrove area. The planting was conducted by the local community who were paid (payment on daily basis/HOK) and upon non-Government basis. Success level of the planting was usually lower than that of fruit trees as in the initial phase many seedlings were uprooted by strong wave and currents. To prevent from damages due to human activities, both villages passed Village Regulations. In Kinabuhutan, any person who clears a mangrove tree will be sentenced by a penalty of IDR 500,000.

Termaal's Village Regulation prohibits its community members to clear mangroves. Mangrove utilisation is only allowed for newly established household needing to use mangrove to build as their houses, provided that one tree must be substituted with five. However, illegal mangrove harvesting still occurs perpetrated by people from neighbouring village community. The two villages' community suggested regular patrolling, which has not been implemented because the team personnel need to be salaried.

Mangroves can also be found in Bahoi Village of West Likupang. The village regulation does not open any opportunity for community to cut down mangroves. Those cutting down mangrove trees or causing damage to coral reefs, will be fined as per the village regulation, given warnings, and obliged to make statement not to repeat committing the same action. Bahoi Village has developed community-based coastal eco-tourism. According to Bahoi Village Head, the community already recognises benefits of mangroves due to preserved natural condition, fish abundance and well-growing coral reefs, hence additional income due to visit of both domestic and foreign tourists.

*Mangroves planted in 2008 in Termaal Village, North Sulawesi*

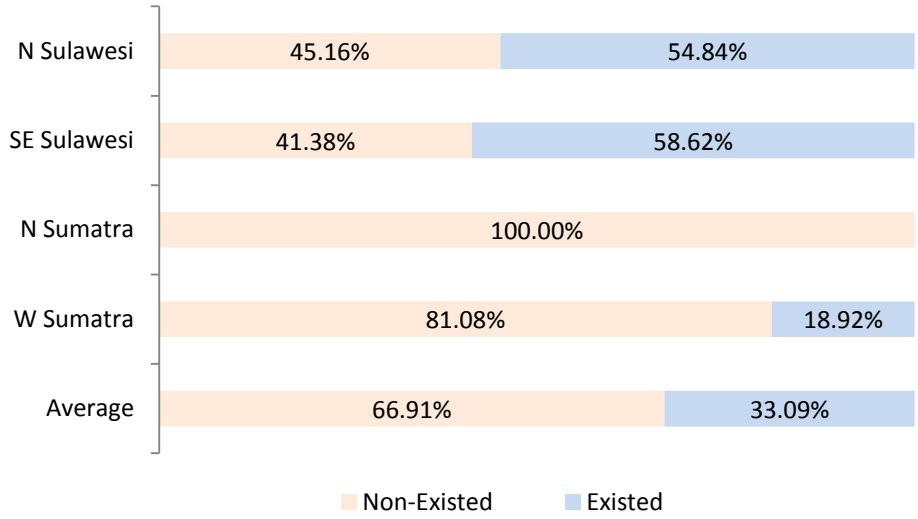



Figure 6-3. The existence of Village Regulations related to benefit sharing of tree planting activities.

## B. Predicted Impact of the Tree Planting Activities

At this stage, only a few years after the tree planting activities (i.e., 4 years for North and South East Sulawesi, 2 years for North and West Sumatra), the result of the planting is obvious. In almost all sampled BLMs, trees have been growing as expected. However, impact of these planting activities can only be predicted, considering that the real impact can be assessed several years after the activities were commenced.

Table 6-4 presents the predicted impact of the panting activities. The predicted impact was categorizes into 3 aspects, namely economics, ecology, and socio-culture. As for the time span, periods of impact are arbitrarily assigned into short-term (5 years and less), medium term (5 to 20 years), and long term (more than 20 years).

Table 6-4. Predicted impact from the tree planting activities.

| Aspect | Predicted Impact |
|---|---|
| Economics | |
| Short term<br>(5 year or less) | • Some commercial species can be expected to produce fruit/timber, including coffee, orange (both in North Sumatra), Gmelina *Gmelina arborea* (in South East Sulawesi), clove (North and North East Sulawesi), gambir *Uncaria gambir* (North Sumatra), and thus will provide economic income for the local community. |
| Medium term<br>(5-20 year) | • Most commercial species can be expected to produce fruit/timber, and thus will provide economic income for the local community. Example of fruit/spice/resinous trees that can be estimated to yield within this period are *jengkol,* manggo*, rambutan, petai,* soursop*,* avocado*, durian,* nutmeg, clove, rubber, agarwood*.* |
| Long term<br>(20 year or more) | • Trees producing high value of timber can be harvested and provide economic income for the local community. Some examples of species producing high valued timber are teak, mahogany, *cempaka, nantu, bitti, bayur.* |

| | |
|---|---|
| ECOLOGY | |
| Short term<br>(5 year or less) | • Fast growing tree species (e.g., *Samanea saman, Leucaena leucocephala, Pterocarpus indicus)* may started to provide ecological services (shading, controlling local climate) to the environment.<br>• Young mangrove stands of *Rhizophora mucronata* will be able to stabilize sea shore against abrasion and wind. |
| Medium term<br>(5-20 year) | • The provision of ecological services (shading, controlling local climate) to the environment by fast growing tree species will greatly increase. The trees can provide other important environmental services such as prevention of erosion, holding soil water, and renewing bio-geochemical substances.<br>• Mangrove stands will grow higher and provide more function in stabilizing sea shore. The mangrove forest may start to create a good habitat as nursery ground for various commercial fish species. |
| Long term<br>(20 year or more) | • The trees will grow bigger at this period and will be able to provide their highest capacity to maintain ecological function, including preventing erosion, maintaining soil water, renewing bio-geochemical substances, and securing water cycle (depend on the size of the forest created).<br>• The mangrove plantation will become a mature mangrove forest, capable of protecting the sea shore against destructive strong wind and sea abrasion. The mangrove forest can also serve as a buffer for a tsunami prone areas (e.g., in Nangroe Aceh Darussalam, Bengkulu, West Sumatra Province). The mangrove forests also serve as good nursery grounds and sanctuaries for various marine organism (including commercial fishes). Combined with the coral reef nearby, the site can be developed further as a tourist attraction.<br>• Carbon that has been sequestrated by the trees will contribute to the stabilization of the atmospheric mixture content and mitigate the climate change. |
| SOCIO-CULTURE | |
| Short term<br>(5 year or less) | • The local people may experience a pride feeling due to the success of the plating activities. In addition, skill and experience of administering a project might be gained or increased. |
| Medium term<br>(5-20 year) | • Most of the tree will be expected to produce fruit/resin/timber or some ecological function by this period. The trees or forests can be physically visible and most likely create a sense of pride and satisfaction to the local people and village administrator. The forest can also contribute to the high environmental quality of the village and can be competed for the prestigious Kalpataru Award from the central Government. |
| Long term<br>(20 year or more) | • The tree stands or forest created through the tree planting activities can serves as a legacy for the next generation of the local community. |

# VII. ROOM FOR IMPROVEMENT ON PROJECT MECHANISM

During the field visit, some facts related to the project mechanism were also discovered. Table 7-1 provides summary on the findings and suggestions to improve the project mechanism in the future.

Table 7-1. Findings related to the project mechanism and some suggestions to improve them.

| Findings | | Suggestion for Improvement |
|---|---|---|
| **Funding** | | |
| Fund disbursement | Inappropriate timing of disbursement (i.e. coincide with dry season) | PMD should discuss the mechanism with local government to find better solution |
| Funding allocation | Too rigid, no room for flexibility, i.e. in the case of animal nuisance , request for fencing was denied because it is not listed in the initial proposal | PMD should discuss the mechanism with local government to find better solution |
| Budget installment | There is a requirement to spend budget within certain dates while on the other hand there is a delay in installment which create improper reporting | PMD should discuss the mechanism with local government to find better solution |
| **Organization and Governance** | | |
| Selection of beneficiary | Violation of beneficiary selection, which include village official who is not eligible for beneficiary (by using family member's name) | Control mechanism should be in place |
| **Human Resources** | | |
| Facilitator recruitment mechanism | Low acceptance of facilitator from local region, which lead to lower performance of facilitator due to lack of communication (i.e. unable to speak local language) and differences of religion/culture | Open recruitment for the position, including advertising to local community |
| **Coordination with other Institution** | | |
| Coordination | Agriculture extension program existing from other institutions (Ministry of Agriculture) is not included as part of the PNPM program even though the program is in line with tree planting as such, hindered the phase-out process | PMD and other technical ministries should discuss the mechanism with local government for more involvement of other sectors |
| Networking | Lack of networking among institutions, PNPM is considered as program from Ministry of Home Affairs only although it include planting which should be part of Ministry of Agriculture and Ministry of Forestry | PMD and other technical ministries should discuss the mechanism with local government for more involvement of other sectors |

| | | |
|---|---|---|
| **Phase-Out** | | |
| Exit-strategy | Lack of exit-strategy, in case of North Sumatra including no proper information regarding the end of program. Facilitators were upset because they feel that they were not informed prior to project termination | PMD should discuss the mechanism with local government to find better solution |
| Dependency to project | High dependency of project. Program will not continue without funding from project. | PMD should discuss the mechanism with local government to find better solution |
| **Benefit Sharing** | | |
| Timber trade | Possibility to obtain money from timber trade might be low due to paperwork requirements from other institution (Forestry Office) which for some seen as complicated | PMD should discuss the mechanism with other sector (Forestry office) to find better solution. PMD could also published letter of acknowledgement that timber is produced from PNPM project |
| Village Regulations | In some cases, local community reject Village Regulation (*Peraturan Desa*) of benefit sharing due to possibility that planted land will be claimed by the Government | PMD should conduct intensive community awareness on legal aspect of land |

# VIII. LESSONS LEARNED

**Strategic Planning**

- The successful projects or activities in tree planting developed based on local needs, taking into consideration of the availabiility of the land to be planted. If the local community essentially does not need such project, implementation of such project would be most likely less successful. In other words, if the local community does not need a tree planting project, better not conduct the project.

- Local environmental characteristics, including soil type, rainfall and its pattern over a year period, topography, and altitude, are important factors in selecting tree to be planted. Non-native or alien species (or cultivars) should not be used for tree planting activities. Finding of this study has proven that the non-native or alien species had a very low survival rate, and in some sites even completely failed.

- Native species have better adaptation to the local condition. Should a non-native species has to be planted in a certain area, it should be selected more carefully.

- Pest attack and animal nuisance need to be predicted since the beginning. Precautionary actions to lessen the attack and nuisance can be taken beforehand, or if possible, can be included in the budget.

**Institutional Management**

- Project implementation would be excellent in places where the existing institution (e.g., Badan Permusyawaratan Desa/Dewan Kelurahan, Lembaga Pemberdayaan Masyarakat Desa, Lembaga Ketahanan Masyarakat Desa) is strong. This is basically because the persons who administered the project have been accustomed to the implementation of other project.

**Human Resources**

- Field facilitators play important roles in the success of the tree planting activities. Lack of technical knowledge in planting methods and attitude of facilitators often lead to disagreement and failure of the project.

- Identification of local champions or leaders that act as agent of change would lead to the success of program. This study showed that facilitators from local community and well known as leaders worked better for the success of the program.

**Socio-Culture**

- Socio-culture characteristics and uniqueness of each project/program site need are important to understand before starting a tree planting project, especially related to the local people's perception toward the project/program and the role of community members in contributing to the implementation of the project.

- Local culture is a significant factor to the success of the program. Programs conducted in non-intensive agriculture community should get more support from strong facilitators. Design of program could be varied according to local culture and local-specific.

- Traditional knowledge and local wisdom big assets for project related to tree planting. There are many traditional knowledge hidden in almost all community in Indonesia and the knowledge need to be revived and used.

**Policy**

- Project in line with Government policy (local, national) would be much easier to get support from various stakeholders. This is also important for the long-term sustainability of the project, as the project could be picked up by the long/medium term of delelopment plan of the province/district/sub-district.

**Impact on Environment**

- Tree planting activities produced a long-term impact on environment, and probably the results cannot be seen immediately. It is necessary to have a long-term evaluation to assess the impact of the project/activities. The impact on environment can be focusing on the trees which provide ecological function, although other tree categories also have impacted the environment.

**Sustainability**

- Sustainability of such program will be achieved if all stakeholders fully participated. Therefore, it should be designed to prevent community dependency on project. The post-project maintenance is crucial and it needs to be discussed amongst the community on how they should proceed with this.

- Community awareness will be the key to improve knowledge on the long term benefit that they can get, and increase motivation to keep the planting program after end of project. For the economic generated tree species, the benefit is obvious and awareness on this tree category was less necessary. A more intensive awareness on the function of the ecologically function tree species is still needed to ensure that the community will maintain the trees.

- For a short-term project, it is important to have a phase-out plan to ensure sustainability of the benefit generated from the project. The phase-out plan needs to be formulated by all stakeholders.

# IX. SUMMARY AND CONCLUSION

**Site Condition**

1. About 40% of the projects fall under agroforestry project, specifically in South East Sulawesi where agroforestry accounted for more that 75%. In North Sulawesi, project related to watershed management (including seashores) were more dominant. Meanwhile, project in North Sumatra were mainly related to the plantation of commercial timber. In West Sumatra, projects were mostly related to agroforestry and watershed management.

**WB Investment**

2. Total funding awarded for the projects in the sampled village (n=127) was IDR 7,970,576,430 (USD 877,140). On the average, a BLM grantee (village) received IDR 63,263,581 (USD 6,962) for implementing tree planting activities on their area.

3. The cost for one tree varies highly, from about IDR 11,100 for North Sulawesi to IDR 96,500 for North Sumatra, averaging IDR 28,600 from all 4 sampled provinces.

**Planting Success**

4. The total number of tree species planted in all sampled provinces was 49 species, with North Sulawesi as the highest number (25 species). The total number of trees planted in all sampled was 280,431 trees (average of 70,107 trees in each province and 2,208 trees for each BLM).

5. The North Sulawesi province has the highest percentage (96.77%) of healthy trees, followed by South East Sulawesi (90.00%), North Sumatra (81.25%), and West Sumatra as the lowest province (48.65%).

6. Causes of tree mortality were care and maintenance, climate (drought), animal nuisance, pest and disease, fire, land abrasion and erosion, and human factor.

7. Currently some of the planted trees have already started to produce some yield: coffee var. *Ateng* and oranges (in North Sumatra), as well as nutmeg, *rambutan* and mango (in North Sulawesi).

**Community Investment**

8. About two-third BLMs (63.20%) had planted trees on privately owned land, and about a third (30.40%) was planted on the communal land. Although planting in communal land was preferred, it seems that it was difficult to fulfill in all provinces. Tree planting on privately owned land created some positive and negative impact, and the most concerned negative impact basically was that the richer member of the community got more opportunity to take advantage of the tree planting activities.

9. Local people have much traditional knowledge related to the plantation, especially to the site nearby. Basically they already mastered the knowledge of land selection, species

selection, land preparation, planting, and tree maintenance. The socio-economic background of the local people apparently affect the skill and experience on tree planting.

10. Most of the labor for the land clearing, land preparation, and tree planting were budgeted in the proposal. However, various actors in the community might have invested in labor (i.e. overtime work) in many other stages of the project. In-kind contribution (non-cash) contributed to the tree planting activities were the use of equipments, organic fertilizers, mulch, and shades.

11. Maintenance of the planted trees were done by community (together), individuals, or paid worker.

12. Investment on control was seemed not so important. On the average, only about 22% of the BLMs had some sort of control mechanism.

13. The average of number of BLMs having the phase out plan was only 20.02%.

14. The BLM recipients in Sulawesi (both in North and South East Sulawesi) had a high degree of satisfaction on the consultation and facilitation process. On the average, only 9.9% for both province admitted that they did not feel satisfy, while in Sumatra, on the average 43.61% of the BLM recipients did not satisfy with the consultation and facilitation they have received during the implementation of the project.

15. The higher the community investment will result in the higher success of the tree planting activities. Many factors might work together and contributed to the success, including care and maintenance, skill and input, the role of leaders and agents of change, geographic location, socio-cultural background, and climate (mostly rainfall).

**Benefit Sharing Mechanism**

16. Only a relatively small percentage (32.28%) of villages as BLM recipients have produced the mechanism of benefit sharing, either formally stated in the Village Regulations (*Peraturan Desa*) or being processed to be formalized.

17. The beneficiary target of the tree planting activities was slightly miss-targeted because the community member who benefit most from the activities were wealthier people, while the project was mainly aimed at the RTM (*Rumah Rangga Miskin*, poor household).

**Social Capital Generated through the Investment**

18. Social capital generated from tree planting was considered to be good in interaction (i.e. participation and networks).

19. Women also played important roles (96.69%) in tree planting. In West Sumatra, in addition to participated in the planting implementation, women also had an important role in planning process (45.95%), specifically during Village Meetings and Inter-Village Meetings. This is most likely related to the matriarchal socio-culture of the West Sumatra.

20. Norms (i.e. transparency, trust, cooperation, coordination, perception, independence, regulation, and institution) were also well developed in all provinces. One of the

significant emergent norms resulting from the tree activities was the creation of formal Village Regulation (*Peraturan Desa, Perdes*) in many BLM village recipients. In Sulawesi most villages (more than 50%) already had Village Regulations related to the benefit sharing in the near future, including in mangrove forest.

21. Environmental awareness was also high and strengthened in all sampled provinces. Many local champions were emerging as results of the tree planting activities.

22. At this stage, the result of the planting is obvious. However, impact of these planting activities in economics, ecology and socio-culture can only be predicted. Commercial fruit and timber would be producing in medium and long-term. In ecological aspects, trees are expected to provide various ecological services in the medium and long-term. In cultural aspect, in the future, the planted trees could be a pride and legacy of the community.

Results of tree planting success, community investment, benefit sharing, social culture, and predicted impact in tree planting activities is extracted in Table 9-1.

Table 9-1. Summary of tree planting success, community investment, benefit sharing, social culture, and predicted impact in tree planting activities.

| Variables | | All Sampled Provinces | North Sulawesi | South East Sulawesi | North Sumatra | West Sumatra |
|---|---|---|---|---|---|---|
| **Site condition** | | | | | | |
| 1 | Starting year | **2008, 2010** | 2008 | 2008 | 2010 | 2010 |
| 2 | Number of BLM tree planting in 4 provinces | **1,171** | 537 | 271 | 136 | 227 |
| 3 | Number of samples | **127** | 31 | 30 | 30 | 36 |
| 4 | Sampling percentage | **13.73** | 5.8 | 11.1 | 22.1 | 15.9 |
| 5 | Dominant category of planting | **Agroforestry, watershed protection** | Watershed protection | Agroforestry | Commecial non-timber plantation | Watershed protection |
| 6 | Average amount of block grant (IDR) in each BM (IDR) | **63,263,581** | 37,808,365 | 73,484,880 | 81,398,648 | 60,362,429 |
| **Planting success** | | | | | | |
| 7 | Number of species planted | **49** | 25 | 20 | 20 | 15 |
| 8 | Dominant trees in sampled BLMs | **-** | Nutmeg, durian, cempaka | Mahogany, Gmelina, Albizia | Rubber, mahogany, coffee, orange | Bayur, cacao, Casuarina, mahogany |
| 9 | Average number of tree planted in each BLM | **2,208** | 3,386.6 | 2,529.0 | 843.1 | 2,062.4 |
| 10 | Percentage of plants in good condition | **77.69** | 96.77 | 90.00 | 81.25 | 48.65 |
| 11 | Causes of tree mortality | **Drought, pests, disease, lack of maintenance, consumed by cattle** | Drought, pests | Drought, high tides | Disease, lack of maintenance | Disease, lack of maintenance, consumed by cattle |
| 12 | Growth of trees in general | **Fair to very good** | Very good | Very good | Good | Fair |
| 13 | Species already produce some yield | **Mango, nutmeg, rambutan, coffee, orange** | Mango, rambutan, nutmeg | None | None | Coffee, orange |
| 14 | Cost of one tree (IDR) | **28,687** | 11,164 | 29,057 | 96,547 | 29,268 |
| **Community investment** | | | | | | |
| 15 | Percentage of planting on private land | **63.20** | 51.61 | 90.00 | 66.67 | 48.65 |
| 16 | Percentage of planting on communal land | **30.40** | 41.94 | 10.00 | 25.93 | 40.54 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 17 | Skill and experience | **Improved** | Improved | Improved | Improved | Improved |
| 18 | Labor | **Extensive** | Extensive | Extensive | Extensive | Extensive |
| 19 | In kind contribution | **Moderate to high** | High | High | Moderate | Moderate |
| 20 | Percentage BLM having phase-out strategy | **20.01** | 6.67 | 60.00 | 6.67 | 6.67 |
| 21 | Control mechanism | **High** | High | High | High | High |
| 22 | Percentage of maintenance by private/individuals | **48.44** | 87.10 | 90.00 | 0 | 21.62 |
| 23 | Percentage of maintenance by community | **25.78** | 0 | 6.67 | 96.67 | 5.41 |
| 24 | Degree of satisfaction of the consultation process | **High** | High | High | Medium | Medium |
| 25 | Percent satisfaction of the consultation process | **74.34** | 87.10 | 93.10 | 58.62 | 54.17 |
| **Benefit sharing mechanism** | | | | | | |
| 26 | Percentage BLMs having village regulation on benefit sharing mechanism | **33.09** | 54.84 | 58.62 | 0 | 18.92 |
| 27 | Beneficiary target | **Miss-targeted** | Miss-targeted | Miss-targeted | Miss-targeted | Miss-targeted |
| **Social capital** | | | | | | |
| 28 | Participation | **High** | High | High | High | High |
| 29 | Network | **High** | High | High | High | High |
| 30 | Role of women | **High (96.69%)** | High (96.77%) | High (90.00) | High 100%) | High (100%) |
| 31 | Percent of women participation in planning | **14.82** | 0 | 10.00 | 3.33 | 45.95 |
| 32 | Transparency | **Comply to PTO*** | Comply to PTO | Comply to PTO | Comply to PTO | Comply to PTO |
| 33 | Trust | **High** | High | High | High | |
| 34 | Cooperation | **Moderate to high** | High | High | High | Moderate |
| 35 | Coordination | **Excellent** | Excellent | Excellent | Excellent | Excellent |
| 36 | Perception | **Excellent** | Excellent | Excellent | Excellent | |
| 37 | Independence | **Excellent** | Excellent | Excellent | Excellent | |
| 38 | Percentage of the existence of Village Regulation | **66.91** | 54.84 | 58.62 | 0 | 18.92 |
| 39 | Institution | **Strengthened, complement to existing function** | Strengthened, complement to existing function | Strengthened, complement to existing function | Strengthened, complement to existing function | Strengthened, complement to existing function |
| 40 | Environmental awareness | **High and strengthened** | High and strengthened | High and strengthened | High and strengthened | High and strengthened |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Predicted impact (short, medium, long term)** | | | | | | |
| 41 | Economics: Short term | **Low to high** | High | High | Moderate | Low to moderate |
| 42 | Economics: Medium and long term | **Low to high** | High | High | Moderate | Low to moderate |
| 43 | Ecology: Short term | **Unseen** | Unseen | Unseen | Unseen | Unseen |
| 44 | Ecology: Medium and long term | **High** | High | High | Moderate | Moderate |
| 45 | Socio-culture: Short term | **High** | High | High | High | High |
| 46 | Socio-culture: Medium and long term | **Moderate to high** | High | High | Moderate | Moderate |

*PTO: *Petunjuk Teknis Operasional*, Technical Operational Guidance

# X. RECOMMENDATIONS

**Project Planning and Organization**

1. Tree site selection of the tree planting activities should be more selective and ensure the availability of the planting location. If the land is unavailable, better not have a tree planting plan. Otherwise, the community only took the opportunity to get the funding without really care about the result of the planting.

2. The target beneficiary of the BLMs for tree planting actually was poor households (*Rumah Tangga Miskin, RTM*). However, the study revealed that the tree planting activity was slightly miss-targeted as most trees were planted on privately owned land, owned by a relatively wealthy people. Poor people have chance only as short term (temporary) workforces. A more careful selection of the grantee coupled with an innovative approach is needed in the future to ensure that the tree planting activities benefit the poors who do not own land.

3. The project cycles and timing of funding availability is crucial for the tree planting activities, as the onset of the planting must coincide to the early rainy season (September or October the latest) to achieve a high survival rate of the tree planted.

4. Accountability, transparency and openness in many steps of the planning needs to be maintained and increased when necessary, to gain more trust to the project administrators and sense of belonging of all community members.

5. Decision making through a participatory processes haven been running well. However, the decision needs to reflect what all/most community needs. This is particularly important in places where patron-client relationship is dominant or where formal/informal community leaders exercise the authoritarian leadership style.

6. During planning session, the people who involved in the planning and proposal writing need to be more anticipative. For example, many newly planted trees were consumed by cattle which actually have been free roaming at the same area before the planting was started.

7. Strategic planning also needs to consider the integration and harmonization of the newly planned project with other existing projects, as all projects implemented by the community might use similar resources, especially human resources. The village community as the recipient of the BLMs in many cases had been implementing other projects, which might or might not be related to the tree planting project (or other World Bank projects).

8. If there is a possibility that the seedlings to be planted could be eaten by cattle, an anticipative should be in placed, for example by providing cattle enclosures beforehand, prohibit free-roamed cattle through Peratura Desa (Village Regulation), or adding budget for fencing.

**Project Implementation**

9. The rate of survival could be increase through intensify maintenance post planting period, select the suitable timing for plating (i.e. coincide with the onset of rainy season), apply a specific requirement of the seedling (e.g. shading, addition of mulch).

10. Despite the success of the project, the existing tree planting activities was lack of new innovation and new approach. Future project might consider to include bio-technological innovation and new approach for tree planting, for example by adding mycorrhiza for the low nutrient soil, applying a drip watering system during drought season.

**Monitoring and Evaluation**

11. BLM recipients (Village Administrators) need to have a long-term scheme of monitoring of the success/failure of the project, as the plantation will lasts in a long time, much longer than the project which lasts only a few year. The monitoring system needs to have clear and measurable indicators of success.

12. The World Bank (donor) also needs to conduct an ex-post evaluation (preferably by a third party) after a certain period has passed since the completion of a target project (i.e. 5-10 years after). The evaluation emphasize on the effectiveness and sustainability of the project, and aims at deriving lessons and recommendations for the improvement of similar World Bank projects.

**Lessons Learned**

13. There are many good and important lessons learned derived from the tree planting project. These lessons learned needs to be collected and extracted from the community, analyzed, and documented for further references. Further, case studies – either success or failure – also need to be documented so they can be used as examples for others.

**Impact**

14. Benefit sharing of the tree plantation need to be formulated or strengthen, in order to maximize benefit to a wider community, and eliminating economic gaps derived from the yield of the planting as well as possible enviousness amongst the community member.

15. Ecological impact of the tree planting should be monitored and measured, especially for locations where plantation was foreseen as one of important solutions for preventing catastrophic events such as tsunami, sea water rises, and absence of water discharge.

**Sustainability**

16. The sustainability refers to the continuation of a project's goals, principles, and efforts to achieve desired outcomes. Many BLM recipients (grantees) still think that when the project is over, the work related to the project is also finished. BLM recipients need to fully understand that they should continue to maintain the planted tree, so they can enjoy the benefit of the economic and ecological benefit derived from the planting. To ensure that they understand this philosophy, dialogues can be conducted in a special occasion or coincided with evaluation process.

# REFERENCES


Direktorat Jenderal Pemberdayaan Masyarakat dan Desa. 2011. Petunjuk teknis operasional (PTO) – Program Nasional Pemberdayaan Masyarakat Lingkungan Mandiri Pedesaan (PNPM-LMP). Direktorat Jenderal Pemberdayaan Masyarakat dan Desa – Kementerian Dalam Negeri Republik Indonesia. Jakarta.

Green PNPM Task Team. 2011. Green PNPM 2010 Annual Status Report: Environmental Pilot-project within the Government of Indonesia's National Program for Community Empowerment in Rural Areas (PNPM-Rural). World Bank Indonesia, Social Development Sector. Jakarta.

Harum, F. 2012. Training courses on natural resources management for application in rural areas. DANIDA-PNPM Mandiri. Jakarta.

Pedersen, P. & T. Bargsteen. Undated. Natural Priorities: The complexities of promoting natural resource management in Indonesia -Aœcommunity driven Green PNPM Programme. Aalborg Universitet. Downloaded on 1 September form http://www.u-landsnyt.dk/sites/default/files/specialeportal/n113934/n113934f3249-natural_priorities_2011_official_1.pdf.

Pescett, L. 2011. Benefit sharing in REDD+: Exploring the implications for poor and vulnerable people. World Bank and REDD-net. Downloaded on 10 September 2013 from redd-net.org/files/BenefitSharingReport.pdf.

Siddik, M.A. 2011. Difusi inovasi teknologi pengelolaan sampah pada masyarakat. Jurnal Teknologi Lingkungan 8(3):253-260.

Tohani, E. 2012. Kapasitas kultural pemimpin informal dalam mewujudkan masyarakat harmonis. Jurnal Pembangunan Pendidikan: Fondasi dan Aplikasi 1 (1): 17-28.

Wildlife Conservation Society, Indonesia Program. Undated. Rural development and climate change mitigation. Wildlife Conservation Society, Indonesia Program. Downloaded on 15 August 2013 from http://desakuhijau.org/wp-content/uploads/2012/12/Presentation2-GHG-and-Green-PNPM.pptx.pdf.

Woolcock, M. & D. Narayan. 2000. Social capital: Implications for development theory, research, and policy. Final version submitted to the World Bank Research Observer. Downloaded on 10 August 2013 from http://deepanarayan.com/pdf/papers/woolcock.pdf.

World Bank. 2011. Green PNPM evaluation of sub-project implementation quality. The World Bank. Jakarta.

# ANNEXES

**Annex 1. Samples of BLM projects for this study.**

| No. | Provinsi | District | Sub-District | Village | Year | Project Title |
|---|---|---|---|---|---|---|
| 1 | N Sulawesi | Minahasa Utara | Wori | Bulo | 2008 | Penghijauan sumber mata air rambutan |
| 2 | N Sulawesi | Minahasa Utara | Wori | Bulo | 2011 | Penanaman pohon pala |
| 3 | N Sulawesi | Minahasa Utara | Wori | Bulo | 2012 | Penanaman pohon pala dan durian |
| 4 | N Sulawesi | Minahasa Utara | Wori | Ponto | 2008 | Penghijauan sumber mata air rambutan |
| 5 | N Sulawesi | Minahasa Utara | Wori | Bulo | 2009 | Perlindungan sumber air bersih |
| 6 | N Sulawesi | Minahasa Utara | Wori | Ponto | 2010 | Penanaman pohon kayu |
| 7 | N Sulawesi | Minahasa Utara | Wori | Ponto | 2009 | Pemanfaatan pekarangan rumah |
| 8 | N Sulawesi | Minahasa Utara | Wori | Ponto | 2011 | Penanaman pohon pala |
| 9 | N Sulawesi | Minahasa Utara | Wori | Ponto | 2012 | Penanaman pohon durian |
| 10 | N Sulawesi | Minahasa Utara | Wori | Tiwono | 2008 | Penanaman pohon pala |
| 11 | N Sulawesi | Minahasa Utara | Wori | Tiwono | 2010 | Penanaman pala di sekitar mata air |
| 12 | N Sulawesi | Minahasa Utara | Wori | Tiwono | 2011 | Penanaman pala dan durian (Rehabilitasi hutan) |
| 13 | N Sulawesi | Minahasa Utara | Likupang Barat | Bahoy | 2009 | Penanaman mangga dan rambutan |
| 14 | N Sulawesi | Minahasa Utara | Likupang Barat | Kinabahutan | 2008 | Penanaman mangga |
| 15 | N Sulawesi | Minahasa Utara | Likupang Barat | Kinabahutan | 2009 | Penanaman hutan bakau |
| 16 | N Sulawesi | Minahasa Utara | Likupang Barat | Termaal | 2008 | penanaman pala di sekitar mata air |
| 17 | N Sulawesi | Minahasa Utara | Likupang Barat | Termaal | 2008 | Rehabilitasi hutan bakau |
| 18 | N Sulawesi | Minahasa Utara | Likupang Barat | Termaal | 2010 | Penanaman rambutan |
| 19 | N Sulawesi | Minahasa Utara | Likupang Barat | Termaal | 2012 | Penanaman pala dan nantu |
| 20 | N Sulawesi | Minahasa | Tombulu | Kamangta | 2009 | Penanaman mahoni, cempaka, durian |
| 21 | N Sulawesi | Minahasa | Tombulu | Kamangta | 2011 | Penanaman mahoni, cempaka, duku |
| 22 | N Sulawesi | Minahasa | Tombulu | Kamangta | 2012 | Penanaman pala |
| 23 | N Sulawesi | Minahasa | Tombulu | Kembes 1 | 2009 | Rehabilitasi DAS |
| 24 | N Sulawesi | Minahasa | Tombulu | Kembes 1 | 2011 | Penanaman cempaka dan duku |
| 25 | N Sulawesi | Minahasa | Tombulu | Kembes 1 | 2012 | Penanaman cengkih |
| 26 | N Sulawesi | Minahasa | Tombulu | Koka | 2009 | Rehabilitas DAS dan penanaman cempaka |
| 27 | N Sulawesi | Minahasa | Tombulu | Koka | 2011 | Penanaman cempaka |
| 28 | N Sulawesi | Minahasa | Tombulu | Koka | 2012 | Penanaman pala |

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| 29 | N Sulawesi | Minahasa | Tombulu | Suluan | 2009 | Penanaman aren |
| 30 | N Sulawesi | Minahasa | Tombulu | Suluan | 2011 | Penanaman aren |
| 31 | N Sulawesi | Minahasa | Tombulu | Suluan | 2009 | Penanaman aren |
| 32 | SE Sulawesi | Kolaka | Ladongi | Atula | 2010 | Penghijauan lahan disekitar sumber mata air (tanaman jati putih) |
| 33 | SE Sulawesi | Kolaka | Ladongi | Atula | 2011 | Penghijauan lingkungan dengan tanaman jati putih |
| 34 | SE Sulawesi | Kolaka | Ladongi | Atula | 2010 | Penghijauan lahan disekitar sumber mata air (tanaman jati putih) |
| 35 | SE Sulawesi | Kolaka | Ladongi | Atula | 2009 | Penanaman tanaman di lahan kritis (jati putih) |
| 36 | SE Sulawesi | Kolaka | Dangia | Dangia | 2011 | Penghijauan lingkungan dengan tanaman jati putih |
| 37 | SE Sulawesi | Kolaka | Dangia | Lembah Subur | 2009 | Penanaman durian |
| 38 | SE Sulawesi | Kolaka | Ladongi | Gunung Jaya | 2008 | Penghijauan tanaman jati lokal dan mahoni |
| 39 | SE Sulawesi | Kolaka | Ladongi | Gunung Jaya | 2010 | Penghijauan hutan rakyat |
| 40 | SE Sulawesi | Kolaka | Ladongi | Gunung Jaya | 2011 | Penghijauan lahan masyarakat dengan penanaman jati putih |
| 41 | SE Sulawesi | Buton | Sampolawa | Bangun | 2009 | Penanaman sengon |
| 42 | SE Sulawesi | Buton | Sampolawa | Bangun | 2009 | Penanaman mangga golek |
| 43 | SE Sulawesi | Buton | Sampolawa | Bangun | 2010 | Penanaman mahoni |
| 44 | SE Sulawesi | Buton | Sampolawa | Jaya Bakti | 2009 | Penanaman sengon |
| 45 | SE Sulawesi | Buton | Sampolawa | Jaya Bakti | 2010 | Penanaman mahoni |
| 46 | SE Sulawesi | Buton | Sampolawa | Jaya Bakti | 2011 | Penanaman mangga arum manis |
| 47 | SE Sulawesi | Buton | Pasarwajo | Wanguangu | 2008 | Penanaman cengkeh |
| 48 | SE Sulawesi | Buton | Pasarwajo | Wanguangu | 2009 | Penanaman mahoni |
| 49 | SE Sulawesi | Buton | Pasarwajo | Wanguangu | 2010 | Penanaman rambutan |
| 50 | SE Sulawesi | Buton | Pasarwajo | Wanguangu | 2011 | Penanaman mahoni |
| 51 | SE Sulawesi | Buton | Pasarwajo | Wanguangu | 2012 | Penanaman pala |
| 52 | SE Sulawesi | Buton | Pasarwajo | Kombeli | 2010 | Penanaman pohon mahoni |
| 53 | SE Sulawesi | Buton | Pasarwajo | Kombeli | 2011 | Penghijauan dengan pohon mahoni |
| 54 | SE Sulawesi | Buton | Pasarwajo | Kombeli | 2012 | Penghijauan lahan masyarakat dengan pohon sengon |
| 55 | SE Sulawesi | Buton | Pasarwajo | Kancinaa | 2008 | Penanaman pala |
| 56 | SE Sulawesi | Buton | Pasarwajo | Kancinaa | 2009 | Penanaman pohon mahoni |
| 57 | SE Sulawesi | Buton | Pasarwajo | Awainulu | 2008 | Penanaman pohon mahoni |
| 58 | SE Sulawesi | Buton | Pasarwajo | Awainulu | 2011 | Rehabilitasi hutan bakau |
| 59 | SE Sulawesi | Buton | Mawasangka | Mawasangka | 2008 | Penanaman mangrove |

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|---|---|---|---|---|---|---|
| 60 | SE Sulawesi | Buton | Mawasangka | Tanailandu | 2011 | Penanaman jati lokal pada lahan masyarakat |
| 61 | SE Sulawesi | Buton | Mawasangka | Terapung | 2009 | Penghijauan desa dengan tanaman prambesi |
| 62 | N Sumatra | Tapsel | Batang Toru | Hapesang Baru | 2011 | Penghijauan desa : mahoni dan pinang |
| 63 | N Sumatra | Tapsel | Batang Toru | Batu Hula | 2011 | Pembibitan karet dan coklat |
| 64 | N Sumatra | Tapsel | Batang Toru | Hapesang Baru | 2010 | Penghijauan desa : mahoni |
| 65 | N Sumatra | Tapsel | Batang Toru | Padang Laucat | 2011 | Pembibitan karet, coklat & tanaman hutan |
| 66 | N Sumatra | Tapsel | Batang Toru | Huta Baru Siagian | 2011 | Pembibitan karet, coklat dan tanaman hutan lainnya |
| 67 | N Sumatra | Tapsel | Batang Toru | Garoga | 2012 | Pembibitan karet dan tanaman hutan lainnya |
| 68 | N Sumatra | Tapsel | Batang Toru | Padang Laucat | 2012 | Pembibitan karet, alpukat dan rambutan |
| 69 | N Sumatra | Tapsel | Batang Toru | Sumuran | 2010 | Pembibitan tanaman buah/hutan |
| 70 | N Sumatra | Tapsel | Batang Toru | Hapesang Baru | 2012 | Pembibitan karet, alpukat dan rambutan |
| 71 | N Sumatra | Pak-Pak Bharat | STTU Jehe | Tanjung Mulia | 2010 | Hutan tanaman rakyat ; mahoni dan Karet |
| 72 | N Sumatra | Pak-Pak Bharat | STTU Jehe | Peroliken | 2011 | Kebun bibit desa |
| 73 | N Sumatra | Pak-Pak Bharat | STTU Jehe | Maholida | 2011 | Kebun bibit desa |
| 74 | N Sumatra | Pak-Pak Bharat | STTU Jehe | Kaban Tengah | 2011 | Pelatihan budidaya okulasi karet unggul |
| 75 | N Sumatra | Pak-Pak Bharat | STTU Jehe | Bandar Baru | 2011 | Kebun bibit desa |
| 76 | N Sumatra | Pak-Pak Bharat | STTU Jehe | Janjung Mulia | 2011 | Kebun bibit desa |
| 77 | N Sumatra | Pak-Pak Bharat | Salak | Kuta Tinggi | 2012 | Pemanfaatan lahan pola agroforestry gambir dan jengkol |
| 78 | N Sumatra | Pak-Pak Bharat | Salak | Kuta Tinggi | 2010 | Pemanfaatan kopi ateng dan durian |
| 79 | N Sumatra | Pak-Pak Bharat | Salak | Boang Manaki | 2010 | Penanaman jeruk dan durian |
| 80 | N Sumatra | Pak-Pak Bharat | Salak | Salak 1 | 2010 | Penanaman jeruk dan durian |
| 81 | N Sumatra | Pak-Pak Bharat | Salak | PB. Boang | 2011 | Budidaya gambir, petai, jengkol, dan alpukat |
| 82 | N Sumatra | Pak-Pak Bharat | Salak | Boang Manalu | 2011 | Budidaya kopi ateng dan Lomtoro |
| 83 | N Sumatra | Pak-Pak Bharat | Salak | Salak 2 | 2011 | Budidaya kopi ateng dan Lomtoro |
| 84 | N Sumatra | Pak-Pak Bharat | Salak | Salak 1 | 2012 | Penanaman kopi ateng dan lamtoro |
| 85 | N Sumatra | Pak-Pak Bharat | Kerjaan | Kuta Saga | 2010 | Penanaman karet dan pelatihan karet okulasi |
| 86 | N Sumatra | Pak-Pak Bharat | Kerajaan | Perduhapon | 2012 | Kebun bibit desa : karet, durian, sengon |
| 87 | N Sumatra | Pak-Pak Bharat | Kerajaan | Kuta Meriah | 2010 | Penanaman dan pelatihan karet okulasi |
| 88 | N Sumatra | Pak-Pak Bharat | Kerajaan | Suka Ramai | 2011 | Budidaya cacao |
| 89 | N Sumatra | Pak-Pak Bharat | Kerajaan | Perpulungen | 2011 | Budidaya tanaman gambir |
| 90 | N Sumatra | Pak-Pak Bharat | Kerajaan | Pardamuan | 2011 | Budidaya gambir |

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|---|---|---|---|---|---|---|
| 91 | W Sumatra | Padang Pariaman | VII Koto | Silangkuang | 2010 | Penghijauan DAS |
| 92 | W Sumatra | Padang pariaman | VII Koto | Sikarih | 2010 | Penghijauan DAS |
| 93 | W Sumatra | Padang Pariaman | VII Koto | Koto Tabong | 2011 | Penghijauan tebing halan gunung batu |
| 94 | W Sumatra | Padang Pariaman | VII Koto | Sungai Ibur II | 2011 | Penghijauan bukit kandis |
| 95 | W Sumatra | Padang Pariaman | VII Koto | Ampalu | 2010 | Penghijauan DAS |
| 96 | W Sumatra | Padang Pariaman | VII Koto | Ambacang Gadang | 2010 | Penghijauan DAS |
| 97 | W Sumatra | Padang Pariaman | VII Koto | Bungin | 2010 | Penghijauan DAS |
| 98 | W Sumatra | Padang Pariaman | VII Koto | Sungai Ibur I | 2010 | Penghijauan lereng bukit dengan tanaman produktif di kayu balam |
| 99 | W Sumatra | Padang Pariaman | VII Koto | Ambung Kapal | 2010 | Penanaman pohon di tebing pencegah terjadinya longsor |
| 100 | W Sumatra | Padang Pariaman | Enam Lingkung | Balah Aie | 2010 | Penghijauan DAS |
| 101 | W Sumatra | Padang Pariaman | Enam Lingkung | Padang Toboh | 2010 | Penghijauan di lereng bukit |
| 102 | W Sumatra | Padang Pariaman | Enam Lingkung | Baliah-Baliah | 2010 | Penghijauan DAS |
| 103 | W Sumatra | Padang Pariaman | Enam Lingkung | Pasar Pakandangan | 2011 | Konservasi sumberdaya alam dan lingkungan (penanaman dasar aliran sungai) |
| 104 | W Sumatra | Padang Pariaman | Enam Lingkung | Kapuah | 2010 | Penghijauan DAS |
| 105 | W Sumatra | Pesisir Selatan | Sutera | Rawang Gunung Malelo | 2010 | Penghijauan lereng Gunung Malelo |
| 106 | W Sumatra | Pesisir Selatan | Sutera | Padang Tae | 2010 | Penghijauan pantai dengan cemara laut |
| 107 | W Sumatra | Pesisir Selatan | Sutera | Bukit Pantai Cermin | 2011 | Penanaman pohon pala, durian, mahoni, petai, dan bayur |
| 108 | W Sumatra | Pesisir Selatan | Sutera | Lansana | 2011 | Konservasi awal ekosistem pantai dengan cemara laut |
| 109 | W Sumatra | Pesisir Selatan | Sutera | Ujung Air | 2010 | Penghijauan pantai dengan cemara laut |
| 110 | W Sumatra | Pesisir Selatan | Sutera | Ampiang Parak | 2010 | Penghijauan pantai dengan cemara laut |
| 111 | W Sumatra | Pesisir Selatan | Sutera | Taratak | 2011 | Penanaman durian, karet, dan pala |
| 112 | W Sumatra | Padang Pariaman | VII Koto | Toboh | 2012 | Penghijauan DAS dan jalan pedesaan |
| 113 | W Sumatra | Padang Pariaman | VII Koto | Pincuran Sunsang | 2010 | Penghijauan DAS |
| 114 | W Sumatra | Padang Pariaman | VII Koto | Limau Hantu | 2010 | Penghijauan DAS |
| 115 | W Sumatra | Padang Pariaman | VII Koto | Laren Nan Panjang | 2010 | Penghijauan DAS |
| 116 | W Sumatra | Padang Pariaman | VII Koto | Kampung Badang | 2010 | Penghijauan DAS |
| 117 | W Sumatra | Padang Pariaman | VII Koto | Lohong | 2010 | Penghijauan DAS |
| 118 | W Sumatra | Padang Pariaman | VII Koto | Kampuang Dama | 2010 | Penghijauan DAS |
| 119 | W Sumatra | Padang Pariaman | VII Koto | Padang Ampalu | 2010 | Penghijauan DAS |
| 120 | W Sumatra | Padang Pariaman | VII Koto | Apar | 2010 | Penghijauan DAS |
| 121 | W Sumatra | Agam | Palembayan | Koto Alam | 2011 | Penanaman coklat |

| | | | | | | |
|---|---|---|---|---|---|---|
| 122 | W Sumatra | Agam | Palembayan | Koto Alam | 2011 | Penanaman durian, mahoni, sengon, mangga dan sirsak |
| 123 | W Sumatra | Agam | Palembayan | Palembangan Tengah | 2011 | Penanaman karet, dan coklat |
| 124 | W Sumatra | Agam | Palembayan | Marambuang | 2012 | Penghijauan di lereng bukit |
| 125 | W Sumatra | Agam | Palembayan | Piladang | 2011 | Penghijauan dan pembibitan cokelat |
| 126 | W Sumatra | Agam | Palembayan | Kampung Tabu | 2012 | Penghijauan di sekitar lereng bukit |
| 127 | W Sumatra | Agam | Palembayan | Sungai Puar | 2012 | Penghijauan lereng bukit |

**Annex 2. Dates of the field visit, listed based on chronological timing.**

| Province | Surveyor | Date | Remarks |
|---|---|---|---|
| West Sumatra | Team Project (Consultant) | 9 – 13 June 2013 | |
| | Field Coordinator | 9 – 23 June 2013 | |
| | Enumerators | 9 – 23 June 2013 | |
| South East Sulawesi | Team Project (Consultant) | 16 – 20 June 2013 | |
| | Field Coordinator | 16 – 30 June 2013 | |
| | Enumerators | 16 – 30 June 2013 | |
| North Sulawesi | Team Project (Consultant) | 30 June - 4 July 2013 | Simultaneous with North Sumatra visit |
| | Field Coordinator | 30 June - 14 July 2013 | |
| | Enumerators | 30 June - 14 July 2013 | |
| North Sumatra | Team Project (Consultant) | 30 June - 4 July 2013 | Simultaneous with North Sulawesi visit |
| | Field Coordinator | 30 June - 14 July 2013 | |
| | Enumerators | 30 June - 14 July 2013 | |

**Annex 3. Discussion points of Focus Group Discussion in sub-districts and villages.**

1. Clarification of information from village vs WB

2. Project preparation
   a. Who initiated
   b. How project participant candidates were selected
   c. Who determined the species planted, the location, and participants
   d. Who wrote the proposal, including planning the budget
   e. Were there any help/assistance from other parties, including CSO
   f. Number or proportion of women in preparation process
   g. Was there any internal conflict during preparation period
   h. The role of UPK and other institution (CSO)
   i. The process they went through (after the proposal completed) until the fund was disbursed
   j. Suggestion to project preparation

3. Fund disbursement
   a. Fund disbursement process
   b. Number of term for fund disbursement and requirements before the fund is disbursed in the following term
   c. Was there any delay in the disbursement
   d. If fund were delayed, what were the implications to the project?
   e. Suggestion to fund disbursement

4. Implementation in the field
   a. Technical: seedlings origin
   b. Type of seedlings (inside polybag, widling, stump, cutling, etc.)
   c. Planting pattern, space
   d. Treatment to newly planted seedlings
   e. Distribution of plant maintenance works
   f. Factors that favors and hinders the planting
   g. Donation from community, including land, seedlings, man power, equipment lending, etc.
   h. Institution: who is responsible for field planting
   i. Assistance process mechanism
   j. Proportion or number of women in planting implementation in the field
   k. Control and evaluation process mechanism
   l. Constraints, problems, and ways to solve the problems
   m. Field assistance/CSO/maintenance team function
   n. Suggestion to field implementation

5. Project completion
   a. What are the things that happen when the project is near completion
   b. Is there any written report
   c. How is the financial reporting and who make the financial report?
   d. How is project closing mechanism?
   e. How is government's evaluation mechanism?
   f. Suggestion to project completion process

6. Community perception
    a. Community perception to the project in general
    b. Does the community feel the benefit of the project?
    c. Did the project chosen meet their needs?
    d. Have the community feels the benefit from the trees planted

7. Post project
    a. Who was (were) assigned to maintain the trees after the project completed
    b. Who receive the benefit from this activity (main and additional recipients)

8. Benefit sharing
    a. What are the potential benefits can be obtained from the planting (timber, fruit, resin)
    b. What is the impact of planting to community's economy that can already be felt
    c. Is there any plan to share the benefit from planting (assumption: for commercial trees, e.g. that can be logged after x years)
    d. Is there any regulation(s) made relate to benefit sharing

9. Impact to the community and environment
    a. Did community awareness increase by planting activity
    b. Did the planting activity promoted/created other environment-related activity(ies)
    c. Did the planting activity promoted/created network with other party(ies), particularly related to networking
    d. Have the environmental impact of planting be felt yet (e.g. erosion controlled, abrasion reduced, bird diversity and abundance increased, etc.)

**Annex 4. Questionnaire of tree planting for Enumerators.**

BLM Year: Activity name:

Village: Sub-District/District:

Enumerator name: Date:

Respondent name:

Position in BLM:

GENERAL INFORMATION

1. Area width or number of tree planted (or length of planting area):
   _____ m2 _____ha _____m _____km _____ trees
   Data is not available because_____
   _____
2. Managing organization at village level: _____
3. Land status:
   ☐ village forest/land ☐ government-owned ☐ *waqaf* (given by individual) land
   ☐ customary land ☐ mixture, please explain_____
   ☐ others, please explain_____
4. Land type (answer can be more than one):
   ☐ terrestrial, highlands ☐ terrestrial, lowlands ☐ near shore, coastal area
   ☐ mangrove ☐ riverside
   ☐ others, please explain _____
5. Land history (choose the most appropriate):
   ☐ ex reed (alang-alang/imperata) area ☐ ex planting ☐ degraded area
   ☐ ex land fire ☐ mire (rawang) forest ☐ unknown
   ☐ others, please explain_____
6. Planting category according to objective (choose the most appropriate)
   ☐ agroforestry ☐ spring protection ☐ watershed rehabilitation
   ☐ replanting ☐ community forestry (HKm, hutan kemasyarakatan)
   ☐ others, please explain_____

PLANTING PREPARATION STAGE

7. Land preparation method
   ☐ no preparation ☐ prepare holes ☐ hoeing/ploughing the whole area
   ☐ slash and burn ☐ others, please explain_____
8. Planting hole
   ☐ not prepared/directly planted ☐ prepared prior to planting
   ☐ prepared and given compost
   ☐ others, please explain _____

9. Type of seedlings planted in the field (could be more than one)
   ☐ inside polybags ☐ widling ☐ seed ☐ stump ☐ propagule (mangrove)
   ☐ others, please explain _____

10. Way to obtain seedlings that will be planted
    ☐ from own nursery ☐ from other party's nursery ☐ bought
    ☐ widling ☐ donation from_____

PLANTING STAGE

11. Spacing
    ☐there is no specific spacing, random ☐ 3 x 3 ☐ 2 x 2
    ☐ others, please explain_____

12. Planting scheme
    ☐ 'mountain belt', following the contour ☐ strip ☐ clustered
    ☐ no clear scheme ☐ others, please explain_____

13. Composition of tree species planted
    ☐ only 1 species, which is_____
    ☐ 1 dominant species, which is _____ combined with several species, which are_____
    ☐ mixture of several species: _____
    _____

PLAN MAINTENANCE

14. Erosion control method
    ☐ non, not necessary ☐ ridge terrace ☐ bench terrace ☐ wood/stone dam
    ☐ others, please explain_____

15. Plant maintenance activity
    ☐ none ☐ fertilizing ☐ pests/diseases spraying ☐ weeding
    ☐ watering ☐ provide shelter
    ☐ weeding and tilling the soil ☐ others, please explain_____

16. General disturbance and constraints that cause low growth percentage:
    ☐ no disturbance ☐ al disturbance can be handled
    ☐ disease, which is _____ ☐ pest, which is_____
    ☐ drought ☐ too much water/stagnated
    ☐ lack of watering ☐ plant species selection was not appropriate
    ☐ lack of shelter ☐ lack of weeding, too many weeds
    ☐ seedlings planted were too small/young
    ☐ there were technical error during planting
    ☐ disturbance from people (trampled, yanked out, crushed)
    ☐ natural disturbance (wind, big wave, high tide and low tide)
    ☐ other disturbance, which is_____ _____

STANDS/PLANTATIONS CONDITION

17. Percentage of area covered by tree from planting activity:
    ☐ 80 -100% ☐ 60 – 79% ☐ 40-59% ☐ 20 – 39% ☐ <20%
    ☐ Difficult to estimate because it is mixed with other planting activity (ies)
    ☐ Difficult to estimate because the area is too big
    ☐ Difficult to estimate because the area is scattered in many locations
    ☐ Others, please explain_____

18. Trees' health condition in general (answer can be more than one):
    ☐ Mostly healthy ☐ Mostly stunted ☐ Could not compete with weeds
    ☐ Only few are healthy
    ☐ Others, please explain _____

COMMUNITY INVESTMENT AND BENEFIT SHARING

19. Who prepared the land for planting?
    ☐ there was no land preparation ☐ villagers (individual)
    ☐ community cooperating with each other ☐ villagers who were paid/given wages
    ☐ cooperation with certain organization (NGOs or others), please mention_____
    ☐ cooperation with government (e.g. Agency), please mention _____
    ☐ others, please mention_____

20. How much time needed to prepare the land? (take note of data so that it can be converted to HOK)
    ☐ _____ HOK
    ☐ could not be estimated, because_____

21. Who planted the trees?
    ☐ villagers (individual)
    ☐ community cooperating with each other ☐ villagers who were paid/given wages
    ☐ cooperation with certain organization (NGOs or others), please mention_____
    ☐ cooperation with government (e.g. Agency), please mention _____
    ☐ others, please mention_____

22. How much time needed to plant the trees? (all trees, take note of data so that it can be converted to HOK)
    ☐ _____ HOK
    ☐ could not be estimated, because_____

23. Who maintain the trees?
    ☐ no one maintain the trees ☐ villagers (individual)
    ☐ community cooperating with each other ☐ villagers who were paid/given wages
    ☐ cooperation with certain organization (NGOs or others), please mention_____
    ☐ cooperation with government (e.g. Agency), please mention _____
    ☐ others, please mention_____

24. How much time needed to maintain the trees? (all trees, take note of data so that it can be converted to HOK)
    ☐ _____ HOK
    ☐ could not be estimated, because_____

25. Type of work in tree maintenance:
    - ☐ trees could not be maintained, because_____
    - ☐ trees do not need maintenance, because_____
    - ☐ fertilized, with_____ _____, frequency_____
    - ☐ watered, frequency_____
    - ☐ sheltered, explain_____

26. Monitoring (internal, by the villagers)
    - ☐ there is no monitoring ☐ once a week
    - ☐ once a month ☐ others_____

27. Is there any co-funding?
    - ☐ no ☐ yes, from the community, IDR _____
    - ☐ yes, from other party _____, IDR _____
    - ☐ in-kind contribution, please mention_____

28. Is there any *phasing-out plan*?
    - ☐ no ☐ yes, please explain_____

29. Is there any consultation process and help from other party?
    - ☐ community could implement it without help from other party
    - ☐ community had help from facilitator/CSO
    - ☐ community actively reach out for help from other party
    - ☐ others, _____

30. If there were consultation process, are the community satisfied?
    - ☐ very satisfied ☐ satisfied ☐ quite satisfied ☐ disatisfied ☐ very disatisfied
    - Reason: _____

31. Role of women in this project
    - ☐ women are not involved
    - ☐ women are involved in _____

32. Are there any rules and regulations related to benefit sharing
    - ☐ there is no benefit sharing scheme
    - ☐ there is opportunity to obtain benefit, but there is no rule/regulation yet
    - ☐ there is opportunity to obtain benefit and there is already rule/regulation, please explain
      _____

**Annex 5. Sheet of tree measurement by Enumerators.**

**TREE MEASUREMENT DATA**

(CHOOSE 10 TREES AS REPRESENTATIVE SAMPLES, MINIMUM 30 TREES)

BLM Year: Activity Name:
Village: Sub District/District:
Enumerator Name: Date:
Sample percentage estimation: _____%

| No | Local Name | Height (m) | Circumference* (cm) |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

- Or diameter, ±15 cm above ground

NOTE:

**Annex 6. Average diameter and height of sampled trees in each province.**

A. Province: North Sulawesi

| Tree Grouping | Local Name | n | Average Height (m) | Average Diameter (cm) |
|---|---|---|---|---|
| Fruit trees | | | | |
| | Rambutan | 66 | 3.97 | 2.51 |
| | Mangga | 46 | 8.18 | 4.70 |
| | Durian | 108 | 1.69 | 0.81 |
| | Duku | 61 | 2.89 | 2.26 |
| Timber tree | | | | |
| | Mahoni, mahogany | 18 | 3.90 | 2.78 |
| | Cempaka | 128 | 4.48 | 3.40 |
| | Nantu | 42 | 1.37 | 1.11 |
| Spices tree | | | | |
| | Pala, nutmeg | 289 | 3.11 | 1.47 |
| | Cengkeh, clove | 30 | 1.36 | 1.42 |
| Others | | | | |
| | Aren | 60 | 3.23 | 2.22 |
| Trees with ecological function | | | | |
| | Bakau | 56 | N.a. | 1.47 |
| | Xylocarpus | 4 | N.a. | 1.27 |

B. Province: South East Sulawesi

| Tree Grouping | Local Name | n | Average Height (m) | Average Diameter (cm) |
|---|---|---|---|---|
| Fruit trees | | | | |
| | Durian montong | 10 | 8.71 | 5.00 |
| | Mangga arum manis | 10 | 2.86 | 0.52 |
| | Mangga golek | 10 | 7.47 | 3.20 |
| | Rambutan | 10 | 5.91 | 3.50 |
| Timber tree | | | | |
| | Gmelina | 70 | 10.70 | 4.25 |
| | Jati (lokal) | 20 | 16.51 | 4.62 |
| | Mahoni, mahogany | 80 | 6.88 | 3.47 |
| | Sengon | 40 | 5.13 | 6.29 |
| Spices tree | | | | |
| | Cengkeh, clove | 10 | 4.96 | 3.10 |
| | Pala, nutmeg | 20 | 2.11 | 1.16 |
| Trees with ecological function | | | | |
| | Trembesi, rain tree | 10 | 23.45 | 5.00 |
| | Bakau | 20 | 1.98 | 1.32 |

C. Province: North Sumatra

| Tree Grouping | Local Name | n | Average Height (m) | Average Diameter (cm) |
|---|---|---|---|---|
| Fruit trees | | | | |
| | Alpukat | 36 | 2.00 | 3.42 |
| | Duku | 15 | 3.04 | 1.84 |
| | Durian lokal | 45 | 2.77 | 1.82 |
| | Jengkol | 15 | 0.61 | 0.35 |
| | Jeruk | 60 | 2.59 | 1.69 |
| | Mangosteen | 12 | 0.72 | 0.24 |
| Timber tree | | | | |
| | Mahoni, mahogany | 95 | 3.33 | 3.76 |
| | Surian | 25 | 1.60 | 2.45 |
| Resinuous tree | | | | |
| | Gambir | 87 | 1.36 | 1.06 |
| | Karet, rubber | 326 | 2.58 | 2.93 |
| | | | | |
| Other tree | | | | |
| | Cacao | 65 | 2.60 | 1.45 |
| | Coffe (Ateng) | 89 | 1.93 | 1.01 |
| | Lamtoro | 15 | 0.61 | 0.85 |
| | Pinang | 15 | 3.36 | 1.25 |

D. Province: West Sumatra

| Tree Grouping | Local Name | n | Average Height (cm) | Average Diameter (cm) |
|---|---|---|---|---|
| Fruit trees | | | | |
| | Mangosteen | 4 | 0.67 | 1.30 |
| | Durian var. monthong | 31 | 1.01 | 1.51 |
| | Durian lokal | 5 | 1.35 | 2.22 |
| | Petai | 20 | 2.13 | 2.83 |
| Timber tree | | | | |
| | Bayur | 140 | 1.88 | 2.75 |
| | Surian | 21 | 3.46 | 2.40 |
| | Mahoni, mahogany | 85 | 2.92 | 3.88 |
| | Sengon | 25 | 0.75 | 1.11 |
| | Medang | 10 | 1.48 | 2.26 |
| Resinuous tree | | | | |
| | Karet, rubber | 60 | 2.49 | 2.49 |
| Spices tree | | | | |
| | Pala, nutmeg | 10 | 1.36 | 1.62 |
| | Caco | 110 | 1.72 | 2.39 |
| Trees with ecological function | | | | |
| | Cemara laut | 90 | 2.67 | 5.17 |