The United Republic of Tanzania

Preparatory Survey on BOP Business for Sustainable Procurement of FSC certificated Wood

Final Report

November 2019

Japan International Cooperation Agency

Yamaha Corporation

OS
JR
19-167

＜本報告書の利用についての注意・免責事項＞

・本報告書の内容は、JICA が受託企業に作成を委託し、作成時点で入手した情報に基づくものであり、その後の社会情勢の変化、法律改正等によって本報告書の内容が変わる場合があります。また、掲載した情報・コメントは受託企業の判断によるものが含まれ、一般的な情報・解釈がこのとおりであることを保証するものではありません。本報告書を通じて提供される情報に基づいて何らかの行為をされる場合には、必ずご自身の責任で行ってください。

・利用者が本報告書を利用したことから生じる損害に関し、JICA 及び提案法人は、いかなる責任も負いかねます。

<Notes and Disclaimers>

・This report is produced by the trust corporation based on the contract with JICA. The contents of this report are based on the information at the time of preparing the report which may differ from current information due to the changes in the situation, changes in laws, etc. In addition, the information and comments posted include subjective judgment of the trust corporation. Please be noted that any actions taken by the users based on the contents of this report shall be done at user's own risk.

・Neither JICA nor the proposed corporation shall be responsible for any loss or damages incurred by use of such information provided in this report.

Table of Contents

1 General Information

1.1 Overview of the survey

In this survey, we mainly aimed the establishment of a BOP business model for implementing the wood procurement, which could contribute to the sustainable development in local communities. African blackwood which has been an indispensable material for wood-wind instruments was selected as the target species, a business model was finally described in order to solve the present problems surrounded to this species, such as the serious resource reduction in recent local natural forest. This model was based on a forest certification, FSC (Forest Stewardship Council)-certification, in which the third party can evaluate the sustainability of forest including the timber traceability. Furthermore, the efficient material utilization by which high material yield can be provided, was also studied as short-middle term business.

The several surveys were conducted during 3-years survey period in local communies, i.e. located at the southern part of Tanzania, Kilwa District, Lindi, Tanzania, in cooperation with a local Tanzanian NGO as the counterpart. The potential of forest management to control growth condition was successfully indicated through the field survey, the growth of this species living under the various environment was suggested to be controllable using a general forest management system. In addition, the possibility of selective propagation aiming to cultivate high-quality timber was preliminary indicated through the planting activity focusing on the species conservation combined with local development. Total 3,500 seedlings have completely planted in natural forest since 2017, which were cultivated and transplanted by village members themselves, then we also observed that some social effects such as the improvement of consciousness. Moreover, increasing of farming area and the construction of new facilities, were simultaneously acting in the local community. Meanwhile, the supply-chain of material timber was prepared with a local partner company, in order to amplify the sustainability of local development as well as musical instruments manufacture. The construction of this supply-chain was a necessary part for achieving the sustainability, the possible financial support system to local activities as well as was also discussed at the same time. Total 2.4 m^3 of African blackwood heartwood, which is equal to the volume of 2000 clarinets, has been already exported since 2019.

The business model described in this survey was suggested to become more effective for community forestry, however some present issues should be solved for actual implementing the model. Especially, the issues related to foundation of model, i.e. the value-chain from timber trade to forest conservation, should be resolved promptly. The top priority

is to continue the timber trade with the required quality according to wood-wind instruments manufacture, even though the possible quality of timbers has not been evaluated yet during the survey period. Consequently, it was suggested that the further study and trial should be needed for achieving this model, to build up the model should be aimed for next 5 years.

1.2 Background of the survey

Fig. 1 African blackwood tree

African blackwood (hereafter called as ABW, *Dalbergia melanoxylon*) (Fig. 1), commonly known as Mpingo in Swahili (trade name, grenadilla), is generally used in the manufacture of wood-wind instruments such as clarinets, oboes, piccolo and bagpipes. This timber has been exported to European countries for this purpose since the early 19th century, and furthermore been regarded as an appropriate material for the instruments not only because of its exterior appearance but also due to the precious advantages of the material. Since ABW is the only species that can meet the requirements for musical instrument production, the conservation of this timber resource is vitally important for a sustainable music industry.

Fig. 2 Current distribution of African blackwood

(Cunningham AB, 2016)

ABW is now widely distributed through sub-Saharan African countries such as Tanzania, Mozambique, Kenya, Nigeria and even Senegal (Fig. 2). It commonly occurs in deciduous woodland, coastal bushland and wooded grassland. The individuals are frequently found in Miombo woodlands, in population densities of 9–90 trees/ha, often

growing in clusters (Gregory et al. 1999; Opulukwa et al. 2002; Mariki and Wills 2014; Nakai et al. 2019). However, the intensive harvestable volume has been stocked in only Eastern African region such as Tanzania and Mozambique. The general growth characteristics of ABW trees have been reported as: average height, 5-7 m; multi-stemmed with a bole circumference normally < 120 cm; and irregularly shaped crown (Sacande 2007, Lovett 1988). Small trees tend to cause serious problems in the operation of sawmills due to lateral twists, deep fluting, and knots including cracks (Lovett 1987), such defects may also affect the general performance of musical instruments. As a result, sawmills can generate only a small amount of timber of the necessary quality, with an actual timber yield of 9% (Gregory et al. 1999). Meanwhile, intensive harvesting has raised a social concern about the sustainability of ABW resources. This inefficient utilization has made ABW one of the most highly priced timbers in the world, with a market rate of US$14,000–20,000 per m^3 (Cunningham et al. 2015, Jenkins et al. 2002), and has threatened the species' future existence (Hamisy and Hantula 2002). Nowadays, this species has been designated as "Near Threatened" on IUCN red list since 1998 (World Conservation Monitoring Centre, 1998), and the international trade of all existing *Dalbergia* species including ABW has been restricted by CITES since 2017 (UNEP-WCMC, 2017).

Currently, the local Non-Government Organization (NGO), Mpingo Conservation & Development Initiative (hereafter called as MCDI), is working for sustainable forest conservation based on a Forest Stewardship Council (hereafter called as FSC)-certified forest in the southern part of Tanzania, Kilwa District, Lindi, in where ABW is mainly harvested. Lindi region is the fourth largest state in Tanzania with a land area of 6.7 million ha, ca. 50% of the land is covered by forest area (Miya et al, 2012), i.e. the Miombo woodlands mixed with coastal forest. Kilwa District is located in the northern part of Lindi region, some crop productions such as sesame has especially become the main industry of local people, with the expansive farming area. Recently, MCDI focuses on a Participatory Forest Management system (PFM), which can give local communities' control and ownership of their own forest resources including timber products. PFM can contribute to controlling illegal logging with improvement of local community forestry, the general profit created by timber harvesting directly lead to the public benefit of the village (Fig. 3).

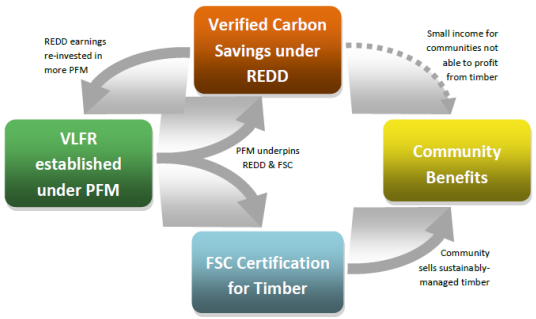

Fig. 3 Overview of MCDI activities (MCDI, 2015)

Yamaha Corporation has purchased ABW timbers from Eastern African countries such as Tanzania and Mozambique, since over 20 years ago, however the resource reduction caused by overharvesting depended on inefficient material use, has become recognized a serious concern about this species. That is because there is no substitution to this suitable material for wood-wind instruments. In addition, the forest management has not been applied for cultivating high-quality trees, even though the limited quality can be satisfied the present requirement for musical instruments. Therefore, the establishment of sustainable timber supply-chain can be thought to be a basis for sustainable forest, the continuous profit created through the chain might encourage harmonized development of local communities and music culture.

1.3 Objectives

The main purpose of this survey was to achieve the wood procurement business based on sustainable forest conservation, we focused on the possibility of FSC-certified ABW timber which could be directly supplied from local community forests. Especially, not only the long-term benefit depended on natural tree growth but also the short-middle term benefit created by timber procurement were simultaneously considered. We also focused on the current community forestry system which has been conducted by MCDI, the sustainable forest conservation was discussed to incorporate both technical and financial elements into the present forestry system. Our aiming points in this study were described as below;

A) To conserve ABW resource for the next generation, planting and forest management

B) To utilize the present resources effectively, improvement of material use

C) To make consciousness of local forestry, incentive in local community

2 Methodology

2.1 Overall Survey Plan

In this survey, we approached achieving sustainable forest with the objectives of timber procurement, utilization, and ABW propagation as described in Fig. 3. Cultivating high-quality trees was discussed through the demonstration of planting in local community forest. Firstly, the supply route of FSC-certified timbers from a local forest was secured in order to achieve a short-term effect on local communities. Both quality and material yield, secondary,

were studied together with developing novel techniques for using the wasted timbers in local sawmill. Thirdly, the pilot planting activity was demonstrated in local village. This activity was also focused on creating temporal employment in village, thus it was expected to result in improvement of local incentive for community forestry as well as tree propagation.

Fig. 4 Approaches for achieving sustainable forest

2.2 Survey area and tree

2.2.1 Survey area

The survey was conducted in southern part of Tanzania, Kilwa District, Lindi, Tanzania as described in Fig. 5. The 70% of this area is covered by forest area, which is one of the widest forests in Tanzania. More than 180,000 ha of this area has been under FSC-certified forest supported by MCDI. In 2019, 14 FSC-certified community forests have existed 43 among local communities which has been attached to MCDI project, ca. 430,000 ha in total.

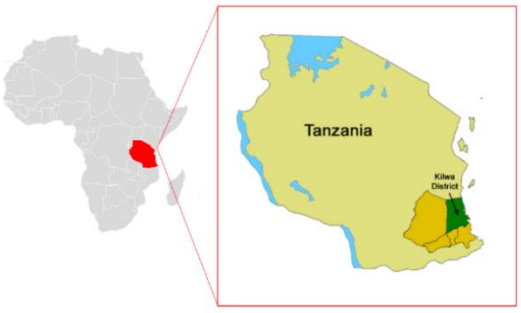

Fig. 5 Location of Kilwa District in Tanzania

For this study, three FSC certified community forests (Kikole, Nainokwe and Nanjirinji) were selected as the forest samples, the community forest of Nanjirinji village was particularly the widest forest of FSC communities in MCDI, i.e. estimated over 60,000 ha. Furthermore, the partner sawmill company, Sound and Fair Ltd., was located in a part of Nanjirinji village, the pilot planting activity was also conducted in there at the same time as considering timber procurement.

2.2.2 Survey tree

Tree species: African blackwood, Fabaceae trees

Scientific name: *Dalbergia melanoxylon*

Local name: Mpingo (Swahili)

Trade name: Grenadilla

2.3 Survey Period

3 years, from December 2016 to November 2019.

The main survey activities including field investigation were all completed until September 30, 2019.

2.4 Structure and Role

The project's overall structure was indicated in Table 1. Yamaha Corporation (hereafter called as Yamaha) oversaw the project overall, moreover Yamaha conducted all survey in collaboration with Japan International Forestry Promotion and Cooperation Center (hereafter called as JIFPRO) and a local NGO, Mpingo Conservation & Development Initiative (hereafter called as MCDI). In addition, Sound and Fair Ltd. (hereafter called as S&F) was coordinated with Yamaha in carrying out the pilot timber trade of FSC-certified timbers from the local forest (Nanjiriji-A village).

Table 1 Overall structure of the BOP business survey

Name of Organization	Abbreviation	Role	Details
Yamaha Corporation	Yamaha	Main practitioner	Planning a business model and surveys, Timber procurement
Japan International Forestry Promotion and Cooperation Center	JIFPRO	External experts	Supporting forest and social economic study,
Mpingo Conservation & Development Initiative	MCDI	Counter part	Supporting field activities, managing local forest and experimental area
Sound & Fair Ltd.	S&F	Partner company	Harvesting, sawing, exporting to Japan

3 Results and Discussion

3.1 Business model

The business model created in this survey was described in Fig. 6, and we could find the possible operationalization of this model. In this model, Yamaha could secure the supply route of FSC-certified ABW timbers from S&F, in order to utilize them for wood-wind instruments. Since MCDI has already established PFM in affiliated communities, the commercial profit provided by timber harvesting could directly become the public benefit of local communities. Yamaha's production process became successfully functional for contribution to sustainable forest as a continuous timber demander. Meanwhile, the necessity of long-term financial supporting system was found to achieve sustainable forest, even though the possibility of additional works to achieve long-term tree conservation such as planting, were technically suggested. Such funding should be provided through timber purchasing by the demanders such as Yamaha, we have an idea under consideration to purchase value-added timber based upon the suitable forest management. However, a satisfied value-chain was not implemented in this study, as described with dotted line in Fig. 6.

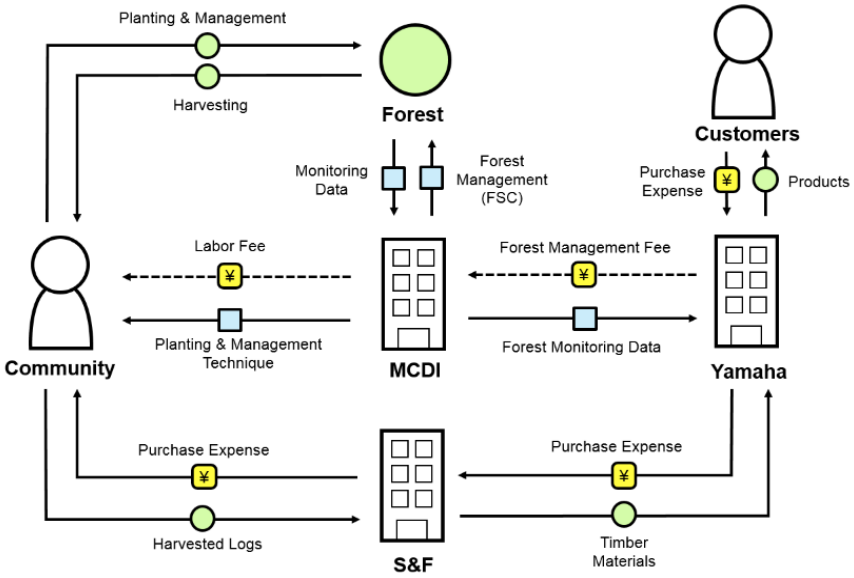

Fig. 6 Business model for FSC-certified timber procurement

3.2 ABW growth characteristics in natural forest

In the forest survey, both the environmental conditions and physical properties of living ABW trees were investigated to figure out the appropriate conditions for growth and quality requirements as musical instruments. We investigated environmental factors (stand structure

and soil properties) in the miombo woodlands of southern Tanzania, where ABW was once widely distributed, to clarify the factors affecting growing conditions of ABW. Three community forests participated in MCDI project, were selected as the comparative survey sites. In addition, the stem qualities of standing trees were evaluated by visual inspection rating and a non-destructive measurement of stress-wave velocity, for understanding the relationship between environmental factors and growth form.

Consequently, we found that ABW can survive under various environmental conditions with intensive population (Table 2). However, the trees living under inferior conditions in wooded grassland tended to have smaller DBH, lower height, and worse appearance. By contrast, the trees in open woodland such as Nanjirinji, showed better qualities in tree form and appearance (Fig. 7). Especially, the trees tended to have the superior growth form in Nanjirinji site where the soils with better properties were mostly observed. This suggested that soil condition could influence ABW growth, and the difference of ABW growth form might be related to the light-demanding, and the influence of the struggle against other plant species. There was no significant difference in stress-wave velocities of living ABW trees from all sites, even though we observed significant environmental effects on tree appearance. We therefore concluded that there was no significant effect of external factors on the real physical properties of trees as timber materials. Forest management should focus on producing high-yield trees with bigger DBH and higher branch height to achieve sustainability of ABW resources as an industrial material.

Table 2 ABW tree density and basal area at each survey site

Forest	Density of trees (no./ha)	Total Basal area (m^2/ha)
Kikole	39.9	14.8
Nainokwe	48.6	9.4
Nanjirinji	25.0	12.5

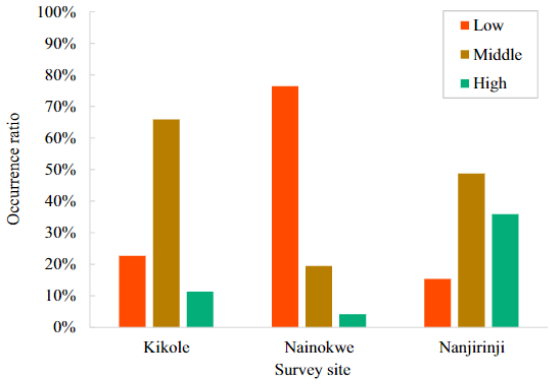

Fig. 7 Occurrence ratio of individuals evaluated at each site

(Nakai et al., 2019)

3.3 Social effects during project period

In the social economic survey, we investigated the social changing in a local community, which was caused by the trial activities of this survey such as timber harvesting and planting activity. The survey was mainly conducted at Nanjirinji village in where ABW had been

intensively harvested as FSC-certified timber, furthermore the changing of consciousness for local forestry was discussed as an example of improving local incentive. We conducted the interviews for 2 times, 2017 (base-line) and 2019 (end-line), using questionnaires to focus on the livelihood of each household. The household were randomly selected from 2 types of village members, VNRC (Village National Resource Committee, an organization for community forestry which is affiliated in the village council) and non-VNRC (defined as normal villagers).

Consequently, not only the changings relevant to social economy but also the positive changing of consciousness in the community was observed in this study. Although the results suggested that all observed effects were not necessarily to be produced in the project's activities, it was suggested that some changings indicated the improvement of livelihood during a period of 2 years. For example, we confirmed that the construction of 1 additional guest house for external use, the renewal of village office and the establishment of logistic system dedicated to agricultural products such as sesame. By such changings in village, most people could understand that local forestry could directly contribute to their livelihood in addition to the existence of the forest management system. Meanwhile, Agricultural products have additionally participated to public benefit of the village, especially sesame cultivation could become the large part of general income in each household (Fig. 8). The average farming area was significantly increased compared to the base-line survey in 2017 (End-line: 5.5 ha in average, Base-line: 4.0 ha in average). These findings suggested that the village economy was becoming better with population increasing, whereas the further improvement of agricultural activity implied for implementing sustainable forestry in terms of the harmonized land use with forestry.

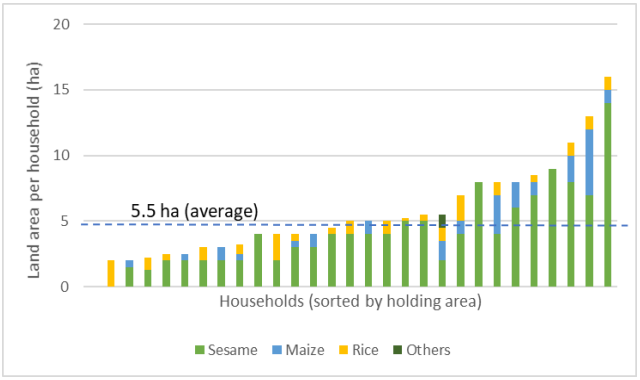

Fig. 8 Agricultural area of each surveyed household at the end-line survey in 2019.

3.4 Pilot planting

The pilot planting of ABW was suggested to become a part of local community forestry with improving the incentive of local people to forestry. In this activity, the possibility of ABW planting was studied in terms of local operationalization as well as technical perception, therefore we aimed for cultivating the high-quality tree required for musical instruments. The seedlings cultivated in Nanjirinji village by local people was transplanted to the natural forest using an enrichment planting method, total 3,500 seedlings were finally planted in 2.5 ha of community forest for 2 years according to the planned schedule as described in Table 3. The nursery site in where the people could cultivate the seedlings of ABW was constructed in the central part of Nanjirinji village (Fig. 8), with the actual capacity for around 6,000 seedlings as the annual yield. In this site, the people attached to VNRC could manage the seedling production by themselves, Yamaha and MCDI technically supported them to cultivate seedlings with high efficiency. The growth of seedlings after planting has been periodically monitored, over 80% survivals were successfully observed in a year.

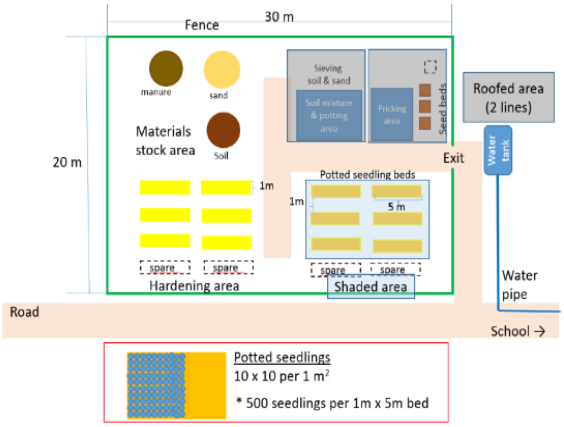

Fig. 9 Overall design of nursery site

Consequently, we concluded that the planting activity could be technically implemented as a part of forestry, and the local people understood the requirement of this activity for temporal employment as well as forest conservation. However, it was simultaneously suggested that the financial problems must be solved for continuing the activity due to the required long-term period until growing-up to the harvestable size, estimated as over 70 years.

Table 3 Planned schedule for annual planting activity

Activities	2017									2018												2019			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
0. Nursery Construction																									
1. Area Selection																									
2. Seed and Soil Collection																									
3. Seed Bed Construction																									
4. Early Burnning																									
5. Nursery Operations																									
6. Watering, Weeding, Root Prunning																									
7. Hardeneing																									
8. Planting Out																									

1st Planting (2017-2018)
2nd Planting (2018-2019)

3.5 Possibility of operationalization

To achieve the suggested four businesses, (1) FSC-timber procurement, (2) Processing and planting in local community, (3) Forest management for high-quality timber, and (4) Financial support system based on timber procurement, can lead to the success of forest conservation. Both possibilities of (1) and (2), were figured out in this survey. Their results suggested the possibility to pass from the feasibility study to the implementation on the basis of the present musical instruments business of Yamaha.

Regarding (1) FSC-timber procurement, the preliminary trading was tested with the trial purchasing volume (total 1.2 m^3, i.e. equal to 1000 clarinets) year by year. Although the shipping was delayed in catching up with the planned shipping schedule, total 2.4 m^3 might be shipped until the end of 2019. As previously noted, the fact that ABW timbers is indispensable materials for wood-wind instruments show the importance of sustainable timber procurement. In addition, FSC-certification is also remarkably a helpful system to evaluate forest condition as well as traceability of collected timbers. Therefore, the purchasing volume of FSC-certified ABW will be quadruple by 2023, in cooperation with local partners so that the profit of timber trade can directly contribute to local benefit together with certified traceability. The direct contribution to the local benefit depends on timber processing in local community. However, timber processing generally tends to be conducted at sawmill factory located far from village area due to the accessibility of logistics, whereas timbers are widely collected from the reachable forest including the government forest (non-FSC certified forest). Since the sawmill factory of S&F was constructed in Nanjirinji village according to their own business plan, the possibility of sustainable timber procurement was suggested with the potential of contribution to community benefits. Moreover, the usefulness of planting activity was simultaneously emphasized through pilot business including monitoring as previously noted in 3.4. Further consideration to practice self-management of the activity should be needed in local community, in addition to establish the financial support system, which is related to (4).

Both (3) and (4), which we have not decided to operationalize yet, indicated some problems required for long-term period. (4) showed the serious problem in terms of the contribution to local communities as a musical instruments producer. Yamaha's main business is related to the manufacture of musical instruments, thus we should not aim just supporting but creating added-value to the present timbers by executing the business model described in Fig. 6. The further discussion is now going under consideration, the co-existed business will be constructed and executed in near future.

Regarding (3), our findings suggested the potential of forest management aiming to cultivate high-quality ABW tree. For example, the usefulness of both thinning and pruning, which have applied to general forest management worldwide, were indicated through the forest survey. ABW growth has been currently mentioned as uncontrollable, the complicated growth shape has affected processing operation. However, the tree growth was suggested to become controllable by applying an appropriate forest management, the controlled environment might result in efficient producing of high-quality trees.

3.6 Future challenges

In terms of wood procurement and utilization, there was not any big problems for implementing the suggested business, because the market of musical instruments has been already constructed as a main business of Yamaha. Such stable market can provide a certain amount of annual timber purchasing, the continuous timber trade result in sustainable forest management. However, since overharvesting is now getting critical, the efficient material use should be further discussed with improvement of material yield in production process due to the present limited resource volume in natural forest.

ABW is now only one valuable species to create the continuous local benefit, the appropriate management is required for sustainable material use. It was suggested that both human resource and funding were needed for such management in this survey, however the financial issue remained. The dotted lines described in Fig. 6 indicate that the added value to timbers result in financial support to achieve local activities, the system should be further discussed with the present stakeholders such as Yamaha, S&F and MCDI. In addition, the appropriate forest management should be planned for implementing and monitoring in the future. Recently, some trials including self-implementation of early burning has been locally conducted in MCDI project in addition to the periodical monitoring of planted individuals in this survey. By contrast, the forest management plan has not been described yet. Since there is a few information specialized ABW in particular related to growth trait, the further multiple study should be required for establishing management plan.

The long-term agreement with local people is surely required for sustainable forest conservation, especially the local forestry in the origin area of ABW, Kilwa district, Lindi, Tanzania, must be co-existed with local agricultural activities. The forest area has been dynamically replacing to the farming area, therefore the efficient agricultural activities should be considered in technical improvement at the same time as the attempt to manage

healthy forest in where the high-quality timber can be produced. Although this BOP business survey could indicate only the initial possibility for achieving sustainable forest, we expected that the sustainable forest has the potential to create the social impact in local communities as the long-term business model.

4 List of Abbreviations

BOP	Base of Pyramid
FSC	Forest Stewardship Council
NGO	Non-Government Organization
ABW	African blackwood
IUCN	International Union for Conservation of Nature
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
MCDI	Mpingo Conservation & Development Initiative
PFM	Participatory Forestry Management System
JIFPRO	Japan International Forestry Promotion and Cooperation Center
DBH	Diameter of Breast Height
VNRC	Village National Resource Committee
S&F	Sound and Fair, Ltd.

5 References

1. Cunningham AB (2016) Trade study of selected east African timber production species. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Seventeenth meeting of the Conference of the Parties, 24 September – 5 October, 2016, Johannesburg, South Africa

2. Gregory A, Ball SMJ, Eziefula UE (1999) Tanzanian Mpingo 98 Full Report. Mpingo Conservation Project, Tanzania

3. Opulukwa MJ, Hamza KFS, Malende YHMB (2002) Inventory of *Dalbegia melanoxylon* (Mpingo) in the southern part of Tanzania: the case of Nachingwea. Afri Std Monog, 23(1): 1-10

4. Mariki AS, Wills AR (2014) Environmental Factors Affecting Timber Quality of African Blackwood (*Dalbergia melanoxylon*). Mpingo Conservation & Development Initiative, Tanzania

5. Nakai K, Ishizuka M, Ohta S, Timothy J, Jasper M, Lyatura NM, Shau V, Yoshimura T (2019) environmental factors and wood qualities of African blackwood, *Dalbergia melanoxylon*, in Tanzanian Miombo natural forest. J of Wood Sci 65(1): 39. https://doi.org/10.1186/s10086-019-1818-0

6. Sacandé M, Vautier H, Sanon M, Schmit L (eds) (2007) *Dalbergia melanoxylon* Guill. & Perr. Seed Leaflet 135

7. Lovett J (1988) Tree of the month: *Dalbergia melanoxylon*. Miombo 2: 3

8. Lovett J (1987) Mpingo – the African blackwood. Swara 10: 27-28

9. Gregory A, Ball SMJ, Eziefula UE (1999) Tanzanian Mpingo 98 Full Report. Mpingo Conservation Project, Tanzania

10. Cunningham AB, Manalil S, Flower K (2015) More than a music tree: 4400 years of *Dalbergia melanoxylon* trade in Africa. South African Journal of Botany 98: 167

11. Jenkins M, Oldfield S, Aylett T (2002) International trade in African blackwood. Fauna & Flora International, Cambridge

12. Hamisy WC, Hantula J (2002) Characterization of genetic variation in African Blackwood, *Dalbergia melanoxylon* using random amplified microsatellite (RAMS) method. Plant genetic resources and biotechnology in Tanzania, Part 1: biotechnology and social aspects. In: Proceedings of the Second National Workshop on Plant Genetic Resources and Biotechnology, Arusha, Tanzania, 6-10 May 2002

13. World Conservation Monitoring Centre (1998) *Dalbergia melanoxylon*. The IUCN Red List of Threatened Species 1998. http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T32504A9710439.en. Accessed 10 June 2018

14. UNEP-WCMC (2017) Review of selected *Dalbergia* species and *Guibourtia demeusei*. UNEP-WCMC, Cambridge

15. MCDI (2015) Combining REDD, PFM and FSC certification in South-Eastern Tanzania, Final Report. Mpingo Conservation & Development Initiative, Tanzania

16. Miya M, Ball SMJ, Nelson FD (2012) Drivers of deforestation and forest degradation in Kilwa District. Mpingo Conservation & Development Initiative, Tanzania