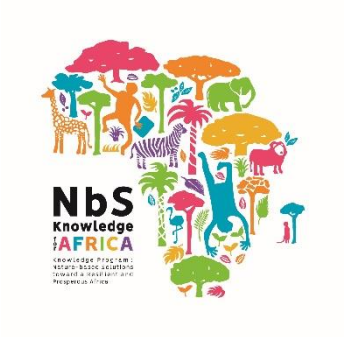


# Knowledge Program: Nature-based Solutions toward a Resilient and Prosperous Africa

## Knowledge Sheets

**Japan International Cooperation Agency (JICA)**

**May**

**2023**

**This publication was supported by:**
**Japan International Cooperation Agency (JICA)**

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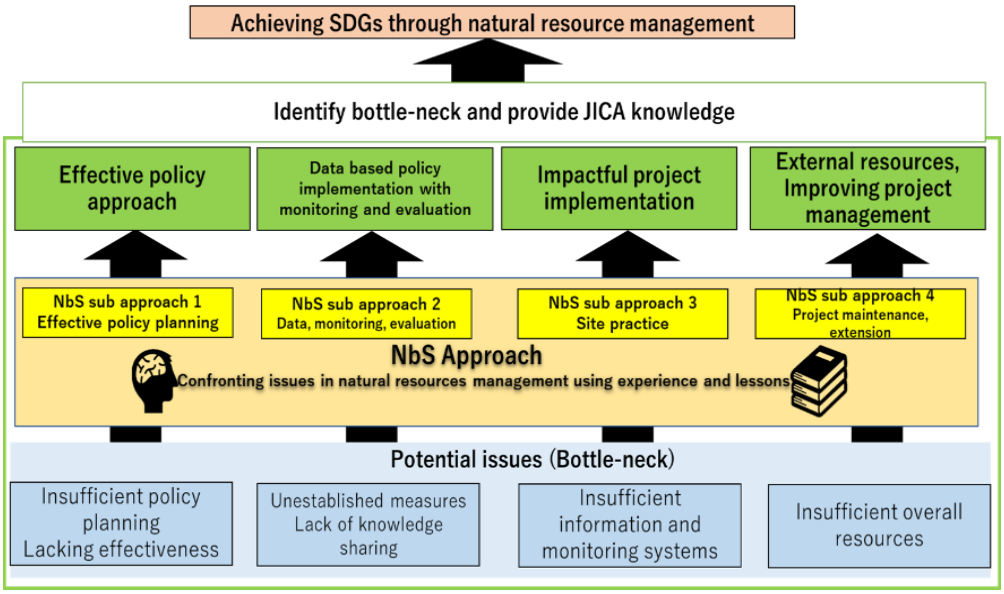
# 1 What is NbS Approach

Recent years have seen the concept of "Nature-based Solutions (NbS)" come increasingly into the spotlight in the quest for a sustainable society in which no-one is left behind.

NbS is defined as **"actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"** (IUCN 2016).

**JICA** has been cooperating with **Africa** in the natural environment sector for many years and accumulated a wealth of collectively nurtured wisdom. In the hope that **the array of different experiences and knowledge co-created by Japan and Africa** can help in handling natural resource management issues in Africa, JICA launched a new program called **"Knowledge Program: Nature-based Solutions toward a Resilient and Prosperous Africa."** This program identifies and introduces the co-created knowledge as an effective approach for NbS (hereinafter referred to as an **"NbS approach"**).




**The process of how the NbS approach contributes to SDGs**

The Figure describes the four **challenges facing African countries** and how the NbS approach can support these challenges and bring global initiatives like SDGs to fruition.

JICA offers insights into how sustainable natural resource management policies can be developed and implemented through the NbS approach. Accordingly, JICA aims to contribute further to Africa's future efforts to address issues like **the SDGs, climate change and ecosystem restoration**.

# 2 Major Challenges and NbS Approach

The study reviewed various reports on natural resource management prepared by international cooperation partners and research organizations to identify the challenges facing African countries and found several issues to address. These can be broadly categorized into four pillars as follows:

## 2.1 Effective policy and regulatory framework

The first step to be tackled in natural resource management is to form policy. Policy formulation and the regulatory framework must be improved to be made more effective.

## 2.2 Credible data and monitoring system

Another major challenge involves developing basic scientific information and credible data which are indispensable for policy formulation and the monitoring process.

## 2.3 Inclusiveness of various stakeholders

Moreover, on a field level, where policies are developed, more effort needs to be made to get various stakeholders with sufficient insight and scope to respond practically and effectively, since otherwise the development of high-impact projects is hindered.

## 2.4 Technical transfer and funds for scaling activity up

Each of the various on-the-ground activities must be sustained, scaled up and replicated elsewhere. Accordingly, a roadmap and measures to achieve this must also be addressed. The following figure shows how the NbS Approach can directly contribute to each of the challenges mentioned above. JICA has accumulated vast knowledge and insights, all of which nurtured with African countries and development partners and contributes strives to address challenges in the above four categories by systematically configuring the NbS Approach.

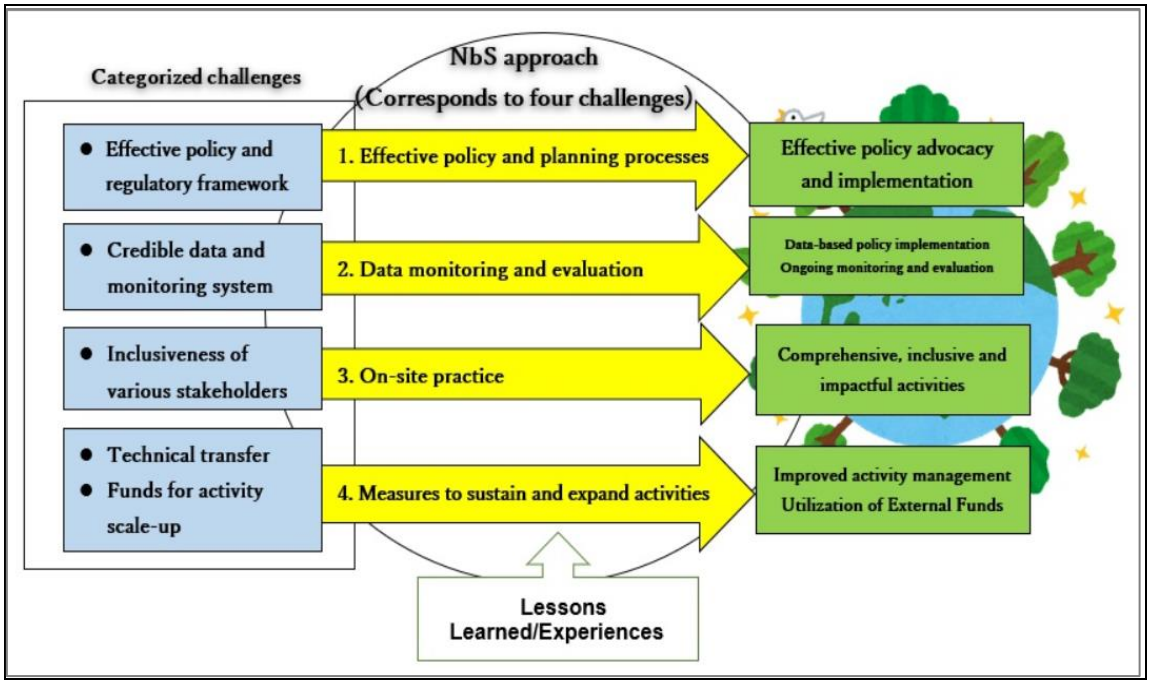



**Image of how the NbS approach contributes to each of the challenges**

# 3 NbS Approach Categorization

NbS Approaches were categorized into four main category and twelve sub-categories as below.

**NbS Approach Category**

| Category | Sub Category | Identified knowledge |
|---|---|---|
| **1 Effective policy and planning processes** | 1-1 Policy and planning | 1. Developing practical forest conservation and management plans with the participation of local residents |
| | 1-2 Collaboration with other sectors | 2. REDD+ Initiative through multi-sectoral collaboration |
| **2 Data- and science-based policy formulation and implementation and monitoring and evaluation** | 2-1 Forest data monitoring | 3. Building and operating a sub-national forest monitoring system |
| | | 4. Establishing a robust national forest inventory utilizing forest GIS database |
| | | 5. Building a system to monitor logging concessions |
| | | 6. SFM using a Fire Early Warning System in sub-Saharan Africa |
| | | 7. Establishing a Forest Reference Emission Level for Policymakers |
| | 2-2 Ecosystem data monitoring | 8. Data-driven participatory wildlife management |
| **3 Inclusive and impactful project implementation** | 3-1 Forest area | 9. Emission Reduction Activities by Improving Agricultural Production methods with the Participation of Local Residents |
| | | 10. SFM through Community-Based Ecotourism Activities |
| | | 11. Institutionally consolidating the Participatory Forest Management (PFM) body |
| | | 12. Challenge to sustainable forest management through participatory forest management |
| | 3-2 Out-of-forest area | 13. Long-rooted seedlings for afforestation in arid and semi-arid areas |
| | | 14. Integrated approach for nationwide dissemination of community forestry in Kenya |
| | | 15. Countermeasures for soil degradation in arid and semi-arid regions |
| | | 16. Next-generation Sustainable Land Management framework that integrates soil-erosion prevention work, land productivity and local communities' livelihoods |

| Category | Sub Category | Identified knowledge |
|---|---|---|
| | 3-3 Protected areas and buffer zones | 17. Integrated management of forest reserve and buffer zone in collaboration with local residents |
| | 3-4 Industrial plantation area | 18. Strengthening capacity on tree breeding techniques for drought-tolerant and good growth trees and promoting commercial forestry |
| | 3-5 Wetland area | 19. Sustainable wetland management plan based on scientific information |
| | | 20. Participatory wetland management through income sources diversification |
| | 3-6 Other crosscutting matters | 21. Creation of a system of natural resource management linked to markets and business and involving the participation of local residents |
| | | 22. An Effective Business Model that Ensures both Sustainable Wood Procurement and Sustainable Forest Conservation |
| | | 23. Natural resource management in partnership with indigenous people |
| | | 24. Promoting practical forest conservation activities with the participation of local communities |
| | | 25. Integrated management of the reforestation approach |
| | | 26. Utilization of Unused Natural Resources through Rice Husk Briquette Machines which Curbs Deforestation and Create New Business and Employment |
| **4 Resources for scaling up operations, etc.** | 4-1 Extension measures | 27. Dissemination of agricultural and forest conservation practices through Farmer Field Schools (FFS) in areas of soil erosion and low agricultural productivity |
| | | 28. Equal opportunity / low-input extension approach, PRRIE |
| | 4-2 Securing funding | 29. Promotion of sustainable forest conservation management by restructuring "various conservation management measures" and "process of securing funds" |
| | | 30. Support for Access to Finance through Guiding, Facilitating and Matching Assistances under a Regional Cooperation Framework |

# 4 NbS Approach

30 NbS approaches listed above are described in below.

# Developing practical forest conservation and management plans with the participation of local residents

## 1. Approach's Outline and Features

To establish a practical means of introducing participatory forest management, which is also promoted by national policy, this approach involves conducting pilot activities in a degrading forest reserve, developing a forest reserve management plan with local residents taking part and developing, disseminating and establishing a method for implementing forest conservation activities based on the same.

The so-called PAFORM participatory approach described comprises four components: 1) Community participation from the planning stage, 2) Tree-planting activities, 3) Livelihood-improvement activities and 4) Deployment of community facilitators.

The government of the Republic of Ghana has highly evaluated and acknowledged the significance of the PAFORM Approach on enhancing community involvement in participatory forest reserve management.

**Keywords**

Forest reserve management plan, PAFORM approach, Participatory forest management, Community Facilitator, Livelihood-improvement

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

**Degraded forest after bush fire (photo: JICA)**

On average, Ghana lost 1.7% (120,000 ha) of its total forest area each year over the period 1990 to 2000. The Government of Ghana outlined the overall policy direction of the forest sector in its Forest and Wildlife Policy 1994, which aims to conserve the nation's forest and wildlife resources and develop them sustainably to maintain environmental quality and ensure an ongoing flow of optimum benefits to all segments of society. In 1999, the Natural Resource Management Plan was formulated as a 10-year plan, followed by the National Afforestation Development Plan, a national afforestation project, in 2001. Although these policies commonly emphasize public participation in forest management, it has proved impossible to find practical operational methods in the field.

Under these circumstances, the Government of Ghana requested that Japan undertake a project to implement sustainable forest management with the participation of local communities. This approach aims to develop the necessary capacity for government officers and community people to cooperate mutually and manage forest reserves by developing the Forest Reserve Management Plan in two pilot areas.

## 2-2. Details of measures taken

- Developing the Forest Reserve Management Plan
  - Forest Services Division (FSD) personnel were trained in Japan and through OJT in collaboration with Japanese experts in the areas necessary to organize the Plan, such as facilitation, mapping, GIS and management. Forest management in the Plan includes establishing a production zone (for Teak timber, fuel wood), landscape conservation zone and riparian zone conservation.

**Teak plantation (photo: JICA)**

**Teak seedlings (photo: JICA)**

  - To get more of the local population involved in forest management, forest conservation management activities, namely i) Green Belt (GB*1) activity and ii) Income-Generating Activities (IGA*2) were also incorporated into the Plan.

*1: GB involves allocating a certain amount of land on the periphery of the forest reserve to neighboring communities and allowing residents to plant and grow fruit trees like citrus and mango.

*2: IGA involves residents' activities of visiting and learning from local philanthropists, training at farms and learning commercial networking, assisted by extension staff of the Ministry of Food and Agriculture (MOFA).

  - Consultation workshops were held in communities in pilot areas to involve the relevant population in the process of formulating the Plan. The workshops helped people understand the Plan and improve their planning capacity.

**Community workshop (photo: JICA)**

- Implementing the Forest Reserve Management Plan
  - The forest conservation management activities (GB and IGA) stipulated in the Plan were implemented with the participation of local residents.
  - Under the forest reserve management plan, resident groups planted citrus, mango and other fruit trees as part of GB and as part of IGA, produced maize, soybeans and nuts and engaged in beekeeping, soap-making and other activities to improve their quality of life by selling these products.
- Establishing partnerships between FSD and local communities
  - Community facilitators were selected from capable personnel in the non-government sector and recruited by the Project. They signed a three-year contract with the Project to help bridge the Forest Service and local communities and promote understanding between both parties.

  - Community facilitators were trained by JICA experts working with forest officers to strengthen their facilitation skills, conflict management and other skills necessary for facilitators.
  - A planning agreement was signed between the community residents and the FSD.
- Proposing a PAFORM Approach to the Government of Ghana
  - The participatory approach developed and implemented by the Project as shown above was integrated as a PAFORM Approach and proposed to the Government of Ghana.
  - Workshops were held for government agencies, communities and private companies to promote understanding and dissemination of the PAFORM approach.

**(Perspectives on sustainability)**

Implementing the PAFORM approach allowed the government staff to acquire the necessary skills to promote participatory forest management together with local residents. The technical support system with the agricultural policy department was also consolidated, which was expected to encourage future self-reliance and development.

- A formal memorandum of understanding was concluded between the FSD and residents to ensure their participation in forest management activities.
- During the forest conservation management activities, the cooperation of related institutions, such as MOFA extension staff providing guidance to community residents, helped sustain the activities.

## 3. Analysis of the approach

### 3-1. Impact

- Economically, of a total of 760 community residents, ten invested in self-financed livelihood-enhancement activities and 360 participated in forest management activities. In the target communities implementing the PAFORM approach, high awareness among participating farmers and technology transfer among farmers within the community was observed, hence further expansion of these efforts was expected.
- Implementing this approach has greatly improved the previously strained relationship between the FSD and community residents and helped foster a collaborative relationship between the two.

### 3-2. Lessons learned

- The project evaluation reported in February 2009 confirmed that the PAFORM approach developed in this project would remain in widespread use as a concrete method for seeking community participation in the preparation of all forest management plans, which has been a challenge for the Ghanaian government.
- Participatory forest management requires commitment from participants but does not expect their efforts to go unrewarded. In this approach, government officials receive cooperation from communities in forest management and communities, in turn, receive support from government officials in livelihood-improvement activities. This win-win relationship between the government and the community is what paves the way for the participatory approach.
- To develop forest conservation area management plans through the PAFORM approach throughout Ghana, community facilitators must enter local communities and engage them in dialog. However, there is also a need to clarify the necessary procedures for entering communities, as each region has its own traditions and norms that should be fully considered.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 1-1.1 |
| Title of the project from which the approach is derived | Participatory Forest Resource Management Project in the Transition Zone of the Republic of Ghana |
| Country | Republic of Ghana |
| Biome | Savanna |
| Implementing term | 2004/3/30 – 2009/3/30 |
| Implementing organizations | Forestry Commission-Forestry Services Division/Ministry of Lands, Forestry and Mines (FC-FSD/MoLFM) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Sanyu Consultants Inc., |
| Report/Tool/Guideline | Project Completion Report (English)<br>Completion Report Attachment 2. An Exit Strategy for the PAFORM,<br>Guidebook for Orientation of Community Facilitator,<br>Technical Manual on How Effectively Apply GIS Techniques for Forest Management Planning (Cover – Section 3),<br>Technical Manual on How Effectively Apply GIS Techniques for Forest Management Planning (Section 4 – Additional Information),<br>How to Solve the Difficulties to Harmonize Items on Manual of Procedures Forest Resource Management Planning and Real Strategic Forest Management Planning in Case of Trial on Tain 1 Forest Reserve, |
| Contributors to this article | Yasuhisa Tanaka / Japan Forest Technology Association (JAFTA) |

# REDD+ initiative through multi-sectoral collaboration

## 1. Approach's Outline and Features

This approach involves providing a pathway to achieve GHG-emission reductions from forests and other land use sectors through multi-sectoral collaboration, including the main relevant sectors of REDD+ such as energy, land tenure, land utilization planning, demographic planning as well as agriculture and forestry. Formulation of a coordination framework within the state government and formulation of a community development committee in the local village are effective policy implementation platforms for multi-sectoral collaboration when executing REDD+ activities.

**Keywords**

Multi-sectoral collaboration, Coordination framework, Thematic working groups, Community development committee, Agroforestry

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

The Democratic Republic of the Congo has the largest forest area among the Congo River Basin countries and it's the second-largest tropical rainforest region in the world after the Amazon. However, more than 300,000 hectares of the country's forests is said to be lost annually due to illegal logging and mining development.

To consolidate the country's capacity to manage its forest resources sustainably, the Japan International Cooperation Agency (JICA) worked in the former Bandundu Province from 2012 to 2017, including forest mapping and development of forest reference emission levels as the basis for a national forest monitoring system (NFMS). Following this, the Project for the operationalizing NFMS and working on a province-level REDD+ pilot project to reduce deforestation and forest degradation targeting Kwilu Province have been conducted since 2019.

This Project aims to develop a simplified land development plan at the village level in coordination with the national land development program and implement pilot activities by promoting agroforestry as part of a plan to promote carbon storage in savanna, reduce deforestation and promote efforts to improve the quality of life of local people.

### 2-2. Details of the measures taken

- A coordination framework was set up that brought together relevant technical departments such as the provincial ministries of environment, agriculture and land management. Within this framework, thematic working groups were established for land development, land management and REDD+, etc.
- Within the thematic working groups, farmers were organized into village-level community development committees. They implemented agroforestry on land targeted by land development plans prepared under the coordination framework and planted exotic tree species in savanna areas and native tree species in the surrounding forests that remained. Fruit tree cultivation was also conducted to improve QOL.

- While implementing the above pilot activities, relevant technical staff of the thematic working groups assisted farmers to secure land use rights, formulate technical guidelines to implement agroforestry and provide guidance on fruit tree cultivation and afforestation techniques for exotic and native tree species.

**Seedlings ready to plant at a nursery (photo: JICA)**

**Local people gathered at an agroforestry site (photo: JICA)**

**(Perspectives on sustainability)**

- To implement activities sustainably, it is crucial to ensure the coordination framework system of multiple departmental stakeholders is sustained and works effectively.
- By organizing farmers as community development committees, it is expected that they will accumulate skills and experience that will make pilot activities feasible at the village level.
- It is also important to highlight collaboration with other programs and projects to be implemented by other technical and financial partners such as restoration of degraded savanna, a land development program, and a land tenure reform program.
- Alongside the land development program, the initiative to establish a plan according to national land development directives must be taken by provincial and community actors.

## 3. Analysis of the approach

### 3-1. Impact

- If 5,000 hectares of agroforestry as planned are realized as a pilot project, there is expected to be scoped to reduce deforestation by 1,250 hectares, equivalent to a reduction of 758,000 $tCO_2$ and to sequester 820,000 $tCO_2$ by plantation, for a total of 1,578,000 $tCO_2$. There is also expected to be 10% improvement in livelihood for people in the province.
- Through the coordination framework activities, it is expected that state government officials from multiple sectors will collaborate in the REDD+ pilot activities, thereby improving the scope of the state government organization as a whole to implement policy.

### 3-2. Lessons learned

- Opportunities for communication between the parties involved as often as possible are key to ensuring such approach works.
- The mid-term evaluation of FONAREDD highlighted the high degree of ownership of certain communities. This is due to repeated training and awareness-raising initiatives by project staff and agents of related technical services.
- Thanks to such efforts, CLD members are well aware of the importance of their activities, which help create social cohesion of the community and solidary initiatives of mutual aid.

**View of the forest conservation site from the sky (photo: JICA)**

**Maize in the agroforestry site (photo: JICA)**

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 1-2.2 |
| Title of the project from which the approach is derived | Project for Operationalization of the national Forest Monitoring System and REDD+ Pilot (Central African Forest Initiative (CAFI), Integrated REDD+ Program in Kwill), Democratic Republic of the Congo |
| Country | Democratic Republic of the Congo |
| Biome | Tropical |
| Implementing term | 2019/4/21 – 2024/4/20 |
| Implementing organizations | Ministry of Environment and Sustainable Development (MEDD), Kwill Provincial Government |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline | Forest and Land Cover Interpretation Book, Forest Inventory QA/QC Handbook, REDD+ Project in Kwill Province Guideline |
| Contributors to this article | Shu Mizushina /JAFTA |

# Building and operating a sub-national forest monitoring system

## 1. Approach's Outline and features

This approach involves formulating a forest-monitoring system by synthesizing a forest stratification map and forest inventory data with a system involving time series analysis of maps and data on a sub-national level. While engaging in this approach, the staff having acquired the skills to interpret the satellite data, conduct the field survey and analyze the data, were able to formulate a forest distribution map capable of serving as basic information for REDD+.

**Keywords**

Forest distribution map, Survey methodology, Inventory database, Forest monitoring system, Off-JT and OJT

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In the Democratic Republic of the Congo, which has the second-largest tropical rainforest after the Amazon, large areas have been deforested due to human activities such as agricultural land development and illegal logging. However, forest inventories, which form the basis for forest management, are old and the technology and capacity required to build them, such as satellite image interpretation, are lacking. In response, the Japan International Cooperation Agency (JICA) has provided technical cooperation in ex-Bandundu Province[1] since 2012 to implement sustainable forest management practices using information obtained through forest mapping and implement national forest monitoring.

### 2-2. Details of the measures taken

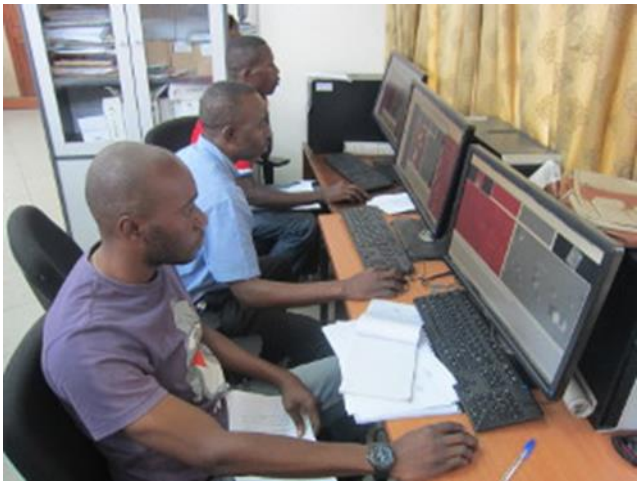
- Using ALOS, SPOT and LANDSAT satellite data, the forest cover status of the target area (former Bandundu Province) was interpreted and incorporated with ground survey results to formulate a forest distribution map as of 2010.
- Based on the forest distribution map, LANDSAT images of the target area in 1995, 2000 and 2014 were interpreted, time series changes were extracted and analyzed and a forest distribution map for each year was formulated.
- Six inventory sites were established in the target area and a pre-inventory field survey was conducted. Based on the results, a forest inventory survey methodology was developed.
- Using the abovementioned survey methodology, a field survey of over 400 sampling plots established throughout the target area was conducted and five carbon pools were measured in the above- and below-ground portions of standing trees, dead trees, fallen trees and litter.
- Training was provided to the staff in biomass calculation using allometric equations with inventory data acquired from the abovementioned survey and the amount of carbon was calculated.

[1] From 2015, this province has been divided into three new provinces: Mai-Ndombe, Kwilu and Kwango.

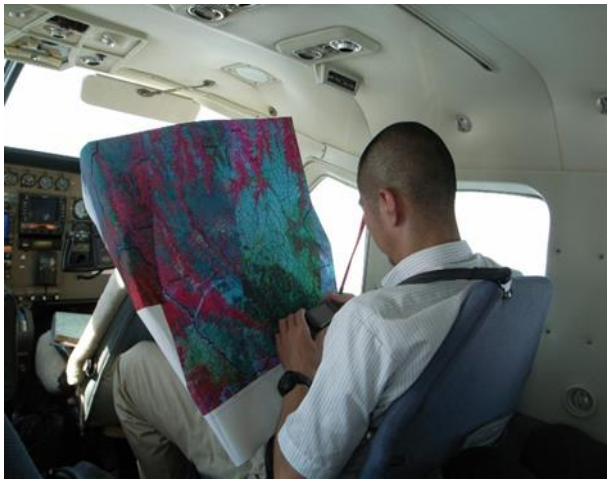
- Data obtained from the surveys were stored in a forest inventory database.
- A sub-national level forest monitoring system was established by linking the three components of formulating the forest distribution map, forest inventory ground survey and forest inventory database as a system.
- When implementing these tasks, off-JT and OJT (on-the-job training) were combined so that the staff involved in the work would acquire field survey techniques and gain data treatment skills.

**Forest Inventory Training: DBH Measurement (photo: JICA)**

**Forest Inventory Training (Height measurement by ultrasound height measuring instrument) (photo: JICA)**



**Remote Sensing Training (photo: JICA)**



**Aerial Survey (photo: JICA)**

**(Perspectives on sustainability)**

For the government technical staff involved in this approach, their capacity to establish and operate a forest monitoring system were improved through off-JT and OJT. In future, it will be necessary to enhance their capacity, not only to participate in the forest inventory and remote sensing analysis work, but also to deal extensively with inventory methodology, budget preparation, schedule management and quality control (QA/QC).

## 3. Analysis of the approach

### 3-1. Impact

As a result of the forest distribution mapping, forest inventory and database development conducted through this approach, the activity data and emission factor required to implement REDD+ were calculated and the forest reference emission level was established at the sub-national level.

Given the capacity development of staff of the Ministry of Environment and Sustainable Development through the pilot project in ex-Bandundu Province, they became aware of how to calculate the activity data and emission factor at national level also.

### 3-2. Lessons learned

During field surveys for forest division mapping and forest inventory, there is a need to be accompanied by a local administrative officer familiar with the local conditions to ensure the safety and efficiency of the survey, including coordination with village residents, information related to local access and avoidance of security risks.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 2-1.3 |
| Title of the project from which the approach is derived | Project for Strengthening National Forest Resource Monitoring System for Promoting Sustainable Forest Management and REDD+ in the Democratic Republic of the Congo |
| Country | Democratic Republic of the Congo |
| Biome | Tropical |
| Implementing term | 2012/5/15 – 2017/12/31 |
| Implementing organizations | Department of Forest Inventory/Ministry of Environment and Sustainable Development (DIAF) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline | Project Completion Report (English Summary),<br>Projet rapport final (Cover – II Rapport Document annexed 3) (French),<br>Projet rapport final (II Rapport Document annexe 4 – Forestiere de base) (French),<br>Remote Sensing Analysis Manual, Forest Resource Inventory Technical Guideline and Manual, Forest Resource Data-Base Technical Guideline and Manual, Forest Reference Emission Level Technical Guideline and Manual |
| Contributors to this article | Shu Mizushina /JAFTA |

# Establishing a robust national forest inventory system utilizing the forest GIS database

## 1. Approach's Outline and Features

This approach aims to establish forest inventory methods while mapping the forest distribution and develop a forest GIS database as part of a National Forest Monitoring System (NFMS).

The first forest distribution map (as of 2015) was prepared as baseline information for the NFMS and a forest GIS database system containing it was designed and developed as a core engine of the NFMS. Using the analytical function of the forest GIS database, 640 random permanent field survey points were designed and prepared. Moreover, a field survey methodology, known as the National Forest Inventory (NFI) system, was developed by introducing Quality Assurance and the Quality Control (QA/QC) mechanism as well.

The NFMS/NFI system developed here can contribute to sustainable operation for managing national forest and range resources, which shall be updated every five years.

**Keywords**

NFI, NFMS, Forest Distribution Map, Forest GIS database, Survey methodology, QA/QC

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Botswana is working on REDD+ under the government's Forest Policy 2011 and the 11th National Development Plan and there was an urgent need to develop a national forest monitoring system to enable science-based reporting. Thus, the Government of Botswana is working to establish a forest resource inventory to scientifically understand the status of its forest resources.

### 2-2. Details of measures taken

- Firstly, a forest distribution map covering the entire forested and non-forested area in Botswana was prepared by interpreting LANDSAT images dating back to 2015 to identify the forest type distribution as a baseline for establishing a robust NFI system.
- Secondly, 640 permanent field survey points were selected on the forest distribution map using a GIS buffer analysis function so that they would be less affected by anthropogenic disturbances. Those points were then registered in a digital format (shape file) in the forest GIS database. Information such as the tree species, height and the volume acquired from each field survey point were stored as attribute data for those points and renewed every five years so that changes could be compared and understood and likewise the data over time in a five-year cycle.

**Satellite image interpretation (photo: JICA)**

- The abovementioned 640 survey points were randomly placed as NFI data by placing 4-km systematic grids on the forest distribution map overlapped with forest types (Riparian Forest, Typical Forest and Woodland).
- As for the field survey methodology, the same practice as adopted in Japan, such as measuring breast height diameter (DBH), tree height and other data was applied. Moreover, maintenance of 200 different tree species codes for field book organization and methodology to reliably identify the survey unit location were transferred to all staff engaged.
- To minimize measurement errors by each team in the field survey, a cross-check survey was conducted by a separate team, which could contribute toward securing QA/QC.

**Forest inventory survey (Photo: JICA)**

**Forest inventory survey (photo: JICA)**

**(Perspectives on sustainability)**

- The forest GIS database developed here which contains comparable NFI data every five years to secure QA/QC can ensure sustainable operation of the robust NFMS.
- The sustainability of the project was ensured by documenting all calculation processes and theories in detailed manuals so that the analytical and calculation methods for the data that was measured and collected would remain clear.
- At the end of the project, only about 400 of the 640 field survey sites were classed as complete, but by March 2021, once the JICA experts had withdrawn, the remaining 240 sites were completed by DFRR staff alone.

## 3. Analysis of the approach

### 3-1. Impact

- The Botswana Forest Distribution Map (BFDM2015), prepared for the NFI survey as of 2015, was the first externally and scientifically verifiable data prepared in Botswana and authorized by the Government of Botswana for reports submitted to the UNFCCC, FAO and other agencies.
- The above BFDM2015 will also have a significant impact in terms of helping formulate national forest and grassland resource policies, such as preparing and updating the national forest and grassland resource master plan, national development plan and so on.
- The forest GIS database developed here can be extended to a core system for the Botswana entire Government Management System in terms of connectivity between the head office and local offices.

### 3-2. Lessons learned

- Introducing a QA/QC mechanism for the NFI survey is important to ensure sustainable operation of the NFMS/NFI system, since that can directly help determine the accurate distribution of national forest and range resources.
- Leaving all the details of techniques in manuals from design to implementation stages is important to maintain a high level of motivation among the technical staff.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 2-1.4 |
| Title of the project from which the approach is derived | Project for Strengthening National Forest Monitoring in Botswana |
| Country | Republic of Botswana |
| Biome | Savanna |
| Implementing term | 2013/July - 2017/December |
| Implementing organizations | Department of Forestry and Range Resources (DFRR)/ Ministry of Environment, Natural Resources Conservation and Tourism (MENT) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Oriental Consultants Global (OCG), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline | Forest Inventory Manual, GPS handling manual, True Pulse Manual, Forest GIS Data Base Operation Manual, FGISDB-PM, NFI Data Use Manual |
| Contributors to this article | Takashi Nanaumi /JAFTA |

# Building a system to monitor logging concessions

## 1. Approach's Outline and Features

A model for monitoring logging concessions was formulated in accordance with a national forest resource monitoring system and in conjunction with the forest inventory.

The approach confirmed applying a logging concession monitoring system using a combination of medium- to high-resolution satellite data and drones would be an effective and efficient method of extracting changes in the target areas.

**Keywords**

Logging concession, National forest inventory, PDCA cycle, QA/QC, JJ-FAST

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Gabon, 80% of which is forested, is one of Africa's leading timber exporting countries, but given risks of rapid deforestation due to overexploitation and other factors, conservation efforts are urgently needed. Accordingly, a national forest resource inventory system and a logging concession monitoring model were established to ascertain the current national status of forests and establish a model for sustainable forest resource management.

Previously, logging concession management was conducted by interviewing concessionaires in the field, then compiling and storing their records in paper form, which inevitably led to the loss of important data. Accordingly, it was decided to streamline this work by acquiring satellite data in the concession area and digitally archiving it.

### 2-2. Details of measures taken

- This approach is based on the national forest resource inventory methodology and the national forest resource database and is intended to develop a model for a monitoring system for logging concessions to create to monitor forest resources appropriately.
- When developing a model for a logging concession monitoring system, key activities included 1) setting model sites, 2) using high- and medium-resolution satellite imagery and 3) verifying the effectiveness of the model.
  - 1) Setting model sites

    The site must be a forest area where a logging concession is established, covered by satellite data and where GIS data such as that of operation plans, etc. are available with the cooperation of the concessionaire.
  - 2) Using high- and medium-resolution satellite imagery

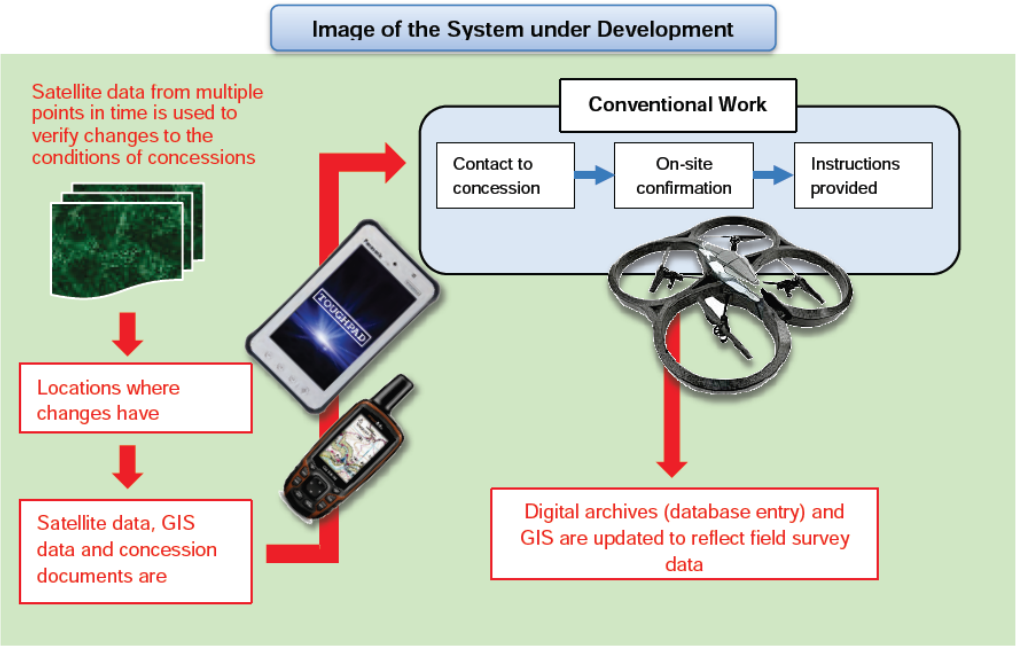
    Since the logging was normally applied by selective cutting in Gabon, there was a need to use satellite images that would allow even a single tree cutting case to be identified. Using PALSAR-2* data (10 m ground resolution), some forest cover change induced from selective logging sites was identified in the field. The main road in the concession and some degree of open space at the selective cutting site were also identified. However, felling of single

trees, roads narrower than around 5 m in width and open spaces less than 50 m or so in diameter could not be identified. Accordingly, the use of a drone was considered and its effectiveness was confirmed by combining it with the use of GPS data.

* PALSAR-2: The PALSAR-2 is a Synthetic Aperture Radar (SAR), which emits microwave and receives reflections from the ground to acquire information. Since it does not need other sources of light such as the sun, SAR has the advantage of providing satellite images, regardless of whether day or night. The frequency at which microwaves are transmitted and received is the L-band, which is less affected by clouds and rain.

➢ 3) Verifying the effectiveness of the model

The model for the logging concession monitoring system was envisioned as shown in the figure below.




- The model should be able to identify single tree harvesting and observe areas that are distant from forest roads. The following procedure emerged as an efficient means of monitoring:
  1. Identify the target area using PALSAR-2 data and specify the change points.
  2. Import the target area coordinates into GPS based on PALSAR-2 imagery.
  3. Raise the drone up to 500 meters from the closest point on the road to the target site.
  4. Adjust the angle of the drone's camera to a slant so that the drone can see a wide area.
  5. Move the drone to a location where the target site can be confirmed, take photographs and return.
- GIS data was also prepared and made available for review on tablet-type mobile terminals, GPS terminals, PCs and other equipment used in the field survey. It was also possible to archive the survey data as digital files using a field survey logbook in Microsoft Excel®.
- These field survey procedures were compiled into the National Forest Resource Inventory Manual.
- To ensure the data remained accurate and ensure resource assessments would be conducted properly in future, corresponding methods for QA/QC (Quality Assurance/Quality Control) were specifically compiled in the manual.
- Through on-the-job training, the technicians learned how to conduct field surveys by referencing

satellite and GIS data transferred to Gyoroman's GyoroMobile AD* in accordance with the developed field survey methodology.

* Gyoroman's Gyoro Mobile AD
Gyoro Mobile AD is a mobile survey tool developed by Gyoroman CO., LTD, Japan. By installing a GIS application on a smartphone and inputting GPS data, this tool can accurately guide the user to the desired point in the forest. Photos and notes can also be recorded along with location information and used to conduct simple surveying.

**Ground survey (photo: JICA)**

**Ground survey (photo: JICA)**

**Ground survey (photo: JICA)**

**View of the forest from drone (photo: JICA)**

Below is the target area captured from the drone according to the procedure described above.

**(photo: JICA)**

**(Perspectives on sustainability)**

- The data recorded in the field ledger by Microsoft Excel®, which was developed as a result of modelling the logging concession monitoring system, is expected to be stored electronically as part of the national forest inventory data. It is expected to dramatically improve the security,

convenience and efficiency of storing and using the data obtained compared to conventional paper-based storage.

- Acquiring satellite data is important to operate the logging concession monitoring system sustainably. In that sense, collaboration with the space policy department, which has scope to receive and process data is important.

## 3. Analysis of the approach

### 3-1. Impact

- It was confirmed that a combination of medium- to high-resolution satellite data and drones could be used to identify target areas and single-tree felling sites by extracting changes and that an efficient and effective logging concession monitoring system has been established.

### 3-2. Lessons learned

- Since it is important to detect where logging has changed the forest in logging concession monitoring, utilizing the JICA-JAXA Tropical Forest Early Warning System (JJ-FAST) would be effective. JJ-FAST is JAXA's web-based system of locating forest cover change based on PALSAR-2 data.
- For the system established in this approach to be positioned as a national forest resource inventory system and ensure continued budgetary action, there is a need to provide a legal basis, such as that stipulated in the Code Forestier (Forestry Code) for the system.
- Through the efforts of this approach for the forest policy department, effective results have been achieved through good relationships and collaboration with the departments handling climate change and space policy.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 2-1.5 |
| Title of the project from which the approach is derived | Project for Strengthening the National Forest Resource Inventory System for Sustainable Forest Management |
| Country | Gabonese Republic |
| Biome | Tropical |
| Implementing term | 2012/8/19 – 2018/2/28 |
| Implementing organizations | Ministry of Water and Forests |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline | Project Completion Report (English),<br>National Forest Resource Inventory Manual,<br>Land Cover Forest Type Map,<br>Ground Truth Survey Manual |
| Contributors to this article | Yasuhisa Tanaka/JAFTA |

# SFM using a Fire Early Warning System in sub-Saharan Africa

## 1. Approach's Outline and Features

This approach involves introducing how to monitor arid/semi-arid wildland fires through a Fire Early Warning System, which equips a region-specific Fire Danger Index (FDI) in sub-Saharan Africa and help manage forest and grassland resources sustainably.

In sub-Saharan Africa, wildland fires can normally be spotted burning in the region each year from around April onwards. However, they tend to expand and intensify starting in August, fueled by dried-out vegetation and fanned by strong winds. These frequent wildland fires can indirectly lead to land degradation and it easily hinder the sustainable management of forests. Oxygen, heat and fuel are often referred to as the "fire triangle". The key thing to note here is this: take any of these three things away and you will not have a fire or the fire will be extinguished. With this in mind, when developing the FDI, the region-specific "fire triangle" information should be taken into consideration as input parameters.

The fire early-warning system based on region-specific FDI will contribute to sustainable forest management (SFM) by helping prevent the incidence of wildland fires by distributing details of fire risks in advance via short message (SMS) to smartphones and tablet terminals.

**Keywords**

Arid/semi-arid, Fire Early Warning, Fire Danger Index, Forest and grassland resource.

## 2. Description of the project from which the approach is derived

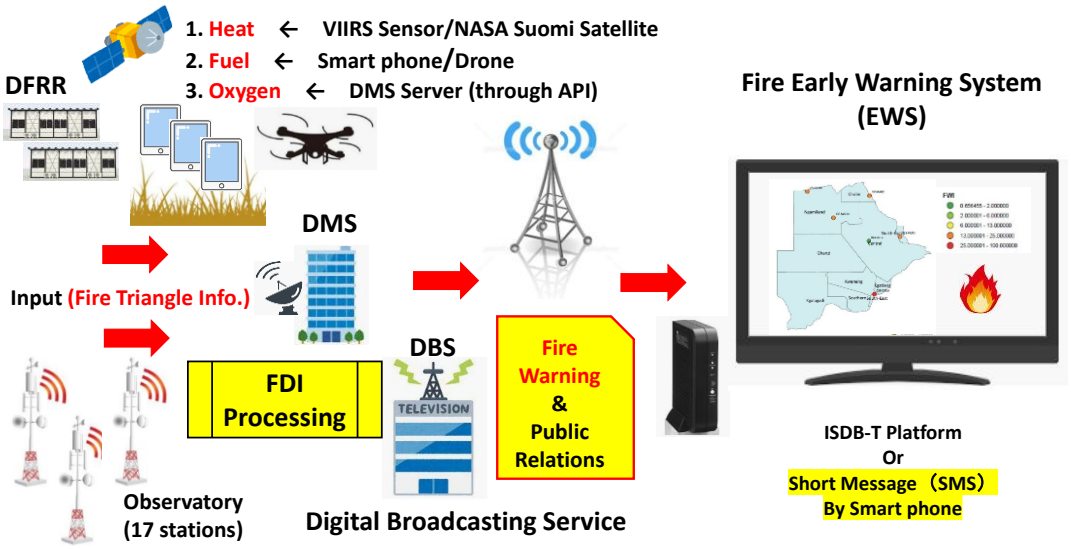
### 2-1. Introduction

In sub-Saharan Africa, including Botswana, forests adjacent to urban areas frequently experience human-induced fires, e.g. those sparked by spreading flames after areas of agricultural land are expanded or charcoal and firewood collected. Although fire burning in arid and semi-arid areas is not necessarily always bad and indeed a crucial means of regenerating endemic species, frequent forest fires are known to degrade the land and weaken the soil, hindering the task of forest regeneration. The Government of Botswana, in technical cooperation with JICA, is working to develop a national forest and grassland master plan and also implementing some pilot activities, which include the abovementioned fire control activity to acquire knowledge on the actual site and strive to make it more practical by reflecting the insights and lessons learned to draft the national forest and grassland master plan.

### 2-2. Details of measures taken

- The project involves developing the Fire Danger Index (FDI) algorithm on Google Earth Engine as the core engine of the Fire Early Warning System. The FDI will incorporate crude heat source data (Heat in "fire triangle") and general combustible material distribution data (Fuel in "fire triangle") by interpreting satellite imagery.
- Detailed data on the distribution of combustible materials (Fuel in the "fire triangle") will be collected by local government offices using tablet PCs and used in the FDI to improve accuracy.

- Weather observation data such as precipitation, wind direction, wind volume, humidity, etc. (Oxygen in the "fire triangle") will be sourced through the Application Program Interface (API) of the server managed by the Department of Meteorological Service (DMS).
- When the FDI exceeds the set threshold and reaches the level at which a fire warning alarm is issued (i.e. Catastrophic Danger, Extreme Danger), the alarm notifies the fire management stakeholders in the area via SMS or other means such as digital broadcasting service.
- A series of operation manuals are to be prepared on the flow of activities upon receiving the fire warning alarm, cooperation with local communities, fire control stakeholders such as local polices, intelligent security services in fire confirmation and firefighting activities.




**(Perspectives on sustainability)**

It is important to manualize a series of mobilization procedures, including actions taken by agencies involved and staffing, after receiving alert information by the Fire Early Warning System, not only developing the system itself.

## 3. Analysis of the approach

### 3-1. Impact

The Fire Early Warning System based on the customized Fire Danger Index, which incorporates region-specific information as input parameters, is a technology that can be widely replicated, not only in Botswana but also in neighboring countries (e.g. SADC Member States) and has the potential to be applied in other arid and semi-arid regions as an efficient means of controlling fires with limited personnel.

### 3-2. Lessons learned

- The Fire Danger Index (FDI) has been developed in Europe, the U.S., South Africa and other countries and we believe that it can be made even more accurate by customizing it to incorporate region-specific information such as local meteorological data and information on combustible materials as parameters.
- When considering the operation of the Fire Early Warning System, another effective approach is to utilize the latest forest distribution map/national forest inventory data to identify priority areas or points for conservation.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 2-1.6 |
| Title of the project from which the approach is derived | Project for Capacity Development for Conservation and the Sustainable Use of Forest and Range Resources through the Process of Master Plan Development |
| Country | Botswana |
| Biome | Savanna |
| Implementing term | 2021/2/2 - 2025/1/31 |
| Implementing organizations | Department of Forestry and Range Resources (DFRR) / Ministry of Environment, Natural Resources Conservation and Tourism (MENT) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA), Nippon Koei Co., Ltd. |
| Report/Tool/Guideline | - |
| Contributors to this article | Takashi Nanaumi /JAFTA |

# Establishing a Forest Reference Emission Level for Policymakers

## 1. Approach's Outline and Features

This approach aims to propose a quantitative evaluation methodology of the applicability of the Emission Reduction Scenario (ERS) and introduce how to design a Forest Reference Emission Level (FREL), focusing on the agricultural sector as the main driver of deforestation for policymakers.

A landscape approach is used to develop a FREL, which is a concept for achieving social, economic and environmental goals on land where productive uses such as agriculture compete with the forest environment and other factors. This approach is characterized by its emphasis on adaptive management, stakeholder involvement and combining the Emission Reduction Activities (ERA) in the agricultural sector.

**Keywords**

Forest Reference Emission Level, Emission Reduction Scenario,
Landscape Approach, Agricultural Sector

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Cameroon, where the population is soaring, deforestation and forest degradation are increasing due to increased agricultural land. The Government of Cameroon is committed to climate change action and REDD+ and has been working with the Japan International Cooperation Agency (JICA) since 2019 on a technical cooperation project on Forest Reference Emission Levels (FREL) in the Emission Reduction Scenario (ERS) target areas to reduce greenhouse gas emissions from agricultural and forest sectors.

### 2-2. Details of measures taken

- Given that increased demand for agricultural land due to population growth and associated deforestation are increasing GHG emissions, population growth, agricultural growth and other factors must be included when developing the FREL methodology.
- A sub-national FREL tool was developed that incorporates several proposed emission reduction activity factors within Cameroon in 2020, such as in the agricultural sector. This tool was developed while referencing the FREL developed by the International Institute of Applied Systems Analysis (IIASA) based on the Global Biosphere Management Model (GLOBIOM) in 2017.
- A landscape approach was used to develop FREL, which is a land management concept intended to achieve social, economic and environmental goals on lands where productive uses like agriculture compete with the forest environment and other factors.
- Pilot activities to reduce deforestation due to pressure from the agricultural sector are being considered for cocoa production under forest shade, improved cassava cultivation methods, afforestation activities in devastated savannas and biochar agriculture. The FREL tool is to be improved, taking into account GHG emission reductions enabled by implementing the pilot activities.

**(Perspectives on sustainability)**

The sustainability of this approach is expected to be boosted by deepening the knowledge and experience of government officials in charge of the FREL construction through training and other activities while formulating the Emission Reduction Scenario to be conducted.

## 3. Analysis of the approach

### 3-1. Impact

The landscape approach used to develop the FREL is characterized by its emphasis on adaptive management and stakeholder involvement. In terms of positive impact, the project would contribute to social welfare, using land in agriculture and forest sectors in the policy of the Cameroon government.

### 3-2. Lessons learned

By helping to develop a tool to calculate FREL for REDD+ by themselves, government agency officials involved in GHG emission reductions in the forest sector will enhance their ability to analyze scenarios for emission reductions and accumulate knowledge and experience of government agencies. The tool developed by the approach would be related to the agricultural sector with verification of ERA and as such, would highlight the usefulness of the FREL-setting in the cross-cutting sector between forests and agriculture.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 2-1.7 |
| Title of the project from which the approach is derived | Capacity Development Project for Sustainable Forest Eco-System Management in the Republic of Cameroon |
| Country | Republic of Cameroon |
| Biome | Tropical |
| Implementing term | 2019/1/20 – 2024/1/19 |
| Implementing organizations | Ministry of Environment, Nature Conservation and Sustainable Development (MINEPDED), Ministry of Forest and Wildlife (MINFOF), Ministry of Economics and Land Use Planning (MINEPAT), Ministry of Agriculture and Village Development (MINADER), REDD+ Technical Secretariat |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline | |
| Contributors to this article | Kazuhiro Yamashita/JAFTA |

# Data-driven participatory wildlife management

## 1. Approach's Outline and Features

Based on an ecological survey of wildlife and surveys on the hunting activities of locals, this approach examines wildlife monitoring methods, in which locals can work proactively on a daily basis to enhance sustainable wildlife management, comply with government regulations and sustain their daily activities.

Counting the number of animals hunted by locals and recognizing the effect of their hunting on animal populations is expected to bring home the impact of their hunting to locals effectively. Once this can be done, wildlife management practices like adjusting the amount of hunted in response to hunting pressure will be established and help encourage sustainable wildlife management across the region.

**Keywords**

Wildlife management, Camera trapping method, Indigenous knowledge

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Some 40% of Cameroon is forested and home to endangered mammals like gorillas, chimpanzees and African forest elephants. The Cameroonian government is striving to protect wildlife and manage its tropical forest resources sustainably by establishing national parks. People living in their vicinity depend on forest resources for much of their food, fuel and other needs. Bushmeat is an important source of protein and a means of income but hunting by locals for personal consumption is subject to government control, which could hinder their livelihoods. To avoid conflict between local people and government, the need to consider measures for sustainable wildlife use based on data collected with local participation has been underlined.

### 2-2. Details of measures taken

- To understand the population of game animals, the camera-trapping method was used to estimate animal distribution, density and activity patterns. Surveys for duikers (small antelope species), the main game species hunted by locals, were conducted using a combination of automatic camera traps and direct observation, whereupon the results were compared. Consequently, the camera trapping method emerged as efficient and accurate.
- To estimate density effectively via the camera trapping method, a manual was developed including information on the number of cameras to be set, duration of setting, personnel and time required for setting and statistical modeling to analyze the videos taken. It is essential to acquire the so-called indigenous knowledge of locals when preparing the manual, particularly regarding information on the location and timing of setting cameras. The manual was intended to be used by local officers and researchers who were going to implement this approach with locals.
- To examine the impact of human activities on the animal population, the location of forest camps used by locals, the nature and timing of their activities at camps and the trajectory of forest trails were investigated and data on forest use by locals were collected. According to this data, the camp sites most frequently used by locals were located in a national park where hunting was

prohibited and situated about 20 km away from their village. Their main purpose was to hunt and gather fruit and nuts etc. The locations of camp sites and the length of their stays varied depending on the animals and plants they were targeting and the season in question.

- Findings from the camera trapping survey were examined while also taking into consideration findings from data on forest use by locals to seek certain indicators to be used as a monitoring method to be conducted by locals. It emerged that the ratio of the number of Red and Blue Duikers hunted (R/B ratio) depended on hunting pressure. The density of large Red Duikers (of 15kg or so in body weight) is low around the villages, while small Blue Duikers (with a body weight of around 5kg) have higher densities. The further away from the village, the higher the density of Red Duikers and the relatively lower the density of Blue Duikers. These trends may be attributed to the high hunting pressure around the villages, which changed the composition of the fauna and resulted in smaller prey. Accordingly, the R/B ratio, obtained by counting the number of Red and Blue Duikers hunted by locals, would allow locals to easily assess the impact of their own hunting pressure.
- To monitor wildlife populations with local participation, it is preferable to use indicators obtained by monitoring locals' daily activities. The R/B ratio obtained here is a desirable monitoring indicator because it uses the number of animals hunted, as obtained from the locals' daily hunting activities.
- To manage wildlife sustainably using the indicators (R/B ratio) presented here, the following points need to be considered:
    1) Creating criteria for decision-making, such as adjusting hunting pressure using the indicators obtained;
    2) Options for restricting hunting methods and establishing no-hunting zones according to management objectives;
    3) Stakeholders who should participate in management activities implementation;

**(Perspectives on sustainability)**

Due to human resource development, some researchers in Cameroon have learned the camera trapping method and become capable of setting up camera traps and estimating wildlife density.

## 3. Impact

There is a need to ensure active local involvement when establishing locals-centered management. As mentioned above, it emerged that the R/B ratio could be used as an indicator to estimate the duiker density. Accordingly, the locals' routine hunting activities can be part of the monitoring activities and it would be possible for locals to explain management options to wildlife management authorities based on the data.

### 3-1. Lessons learned

Locals can play a key role in wildlife management once they recognize the usefulness of hunting data and how to utilize it. To establish a sustainable wildlife management system, there is a need for administrative officials to acknowledge locals' roles and support them in participating in the management process.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 2-2.8 |
| Title of the project from which the approach is derived | Co-creation of innovative forest resource management by integrating indigenous knowledge and ecological methods |
| Country | Republic of Cameroon<br>Republique du Cameroun |
| Biome | Tropical |
| Implementing term | 2018/7/15 – 2023/7/4 |
| Implementing organizations | Ministry of Scientific Research and Innovation (MINRESI), Institute of Agricultural Research for Development (IRAD), University of Dschang, University of Douala, University of Yaounde |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Science and Technology Agency (JST), Center for Africa Area Studies of Kyoto University |
| Report/Tool/Guideline | Camera Trap Methodology for Wildlife Density Estimation with the REST Model – A Handbook Focusing on Rainforest Mammals |
| Contributors to this article | Yasuhisa Tanaka, Junichiro Matsumoto/Japan Forest Technology Association (JAFTA) |

# Emission Reduction Activities by Improving Agricultural Production Methods with the Participation of Local Residents

## 1. Approach's Outline and Features

This approach is to develop a community-based initiative on reducing GHG emissions in forests by focusing on the agricultural sector as the main deforestation driver in Cameroon. It aims to both conserve the forest and boost local livelihood by renovating agricultural production systems.

Given competing land uses, e.g. agricultural and forestry, renovating the agricultural production system with a view to cultivating without any deforestation may be an effective way to curb deforestation and improve agricultural production.

**Keywords**

Deforestation driver, Emission-Reduction Activities, No deforestation cultivation, Livelihood

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Cameroon has been working on climate change countermeasures and Emission Reduction Activities (ERA) to cope with an expanded scope of deforestation and forest degradation due to the increase in agricultural land. Reduction efforts made in agricultural and forestry sectors are considered key parts of Cameroon's overall greenhouse gas emission reduction initiative. In this context, the Government of Cameroon requested that Japan undertake a technical cooperation project that would help build the capacity of relevant institutions and promote forest conservation by enhancing the sustainable forest management capacity and implementing state-level sustainable forest management plans. In response, a technical cooperation project focusing on balancing agricultural development and forest conservation was initiated in 2019 for the Central Province, which has a high deforestation rate due to agricultural development. The project will help promote activities to reduce greenhouse gas emissions from the agricultural and forestry sectors by implementing pilot projects.

**【Targets for implementation】**

The pilot projects were conducted by local villagers' groups in two categories: 'Local group' and 'Community agricultural organization'.

In Cameroon, the basic local group is called GIC (Groupe d'Initiative Commune) and registered to the district office by law. Areas that are wealthier due to agriculture, meanwhile, have a community agricultural organization called SOCO (Cooperative Society), which comprises several local groups in the same area. It is registered to the province and they have rules to facilitate communication with each district office and local government.


**The relationship between the Local group and Community agricultural organization and the district office, local government**

## 2-2. Details of measures taken

The Emission Reduction Activities will be accommodated in the state-level GHG emission reduction scenarios (ERS) for the agricultural and forestry sectors.

Local community organizations (SOCO) or local groups (GIC) implement pilot projects which include exemplary Emission Reduction Activities (ERA).

To identify ERAs in line with this approach, the deforestation drivers in the target provinces were surveyed. Based on the results, the ERAs were adopted, provided the feasibility and implementation effectiveness could be assured. The specific implementation measures for each activity are as follows:

(1) Cocoa production without any deforestation cultivation

- Intensification of cultivated land by boosting cacao productivity
- Enhancing vegetation density by planting and leaving other trees
- Growing and selling plantain, cassava and yams which are grown among young cacao as a means of income during the cacao juvenile stage

(2) Afforestation of degraded savanna

- Planting a combination of high tree species for carbon fixation and as a useful tree species to help improve the livelihoods of local residents.
- Practicing low-carbon agroforestry techniques such as growing trees with cover plants and intercropping with legumes to improve soil fertility.

**Site of afforestation of degraded savanna (photo: JICA)**

(3) Cassava production targeting deforestation control

- Managing farmland according to an appropriate plan in the crop rotation

(4) GHG emission-reduction through biochar-based agriculture

- Biochar application in the target area to improve soil moisture

**Site of biochar application (photo: JICA)**

**(Perspectives on sustainability)**

As residents in local communities see their livelihoods improve thanks to the boost in agricultural production, it is expected that the local organizational structure will be strengthened by improved revenue, thus allowing renovated farming activities to be sustained.

## 3. Analysis of the approach

### 3-1. Impact

The output of the interview conducted with the stakeholders shows some positive signs as below:

**(Perspective from the Community agricultural organizations)**

- Using biochar can help save on fertilizer costs, which are rising yearly and improve our livelihoods.
- Biochar application shows soil recovery and higher yields are expected.
- Agricultural improvement will make no-deforestation cultivation possible.

**(Perspective of the community village leaders)**

- Locals will be able to raise other grants through the project experiences.
- Information will be shared more easily with the government than before.

### 3-2. Lessons learned

When choosing ERA activities, the local agricultural condition will be an indicator, helping indicate the optimal study approach.

It was expected that any pilot project applied in areas of high agricultural activity would be effective. High effectiveness was also observed in biochar application and improving cacao production in particular. In such areas, community agricultural organizations are organized and cooperate with the local government, making it easier to obtain government support.

Conversely, in areas where land suitable for agriculture is scarce and agricultural activities are not very active, tree plantation in degraded lands is considered appropriate. In these areas, the infrastructure was underdeveloped, the ties between individual local groups were weak and support from the local government was lacking. Accordingly, a facilitator was considered necessary to connect the regional administration and local groups.

Accordingly, to decide on a practical approach in the target area, the current agricultural condition and existing local organization's connection between locals and government should be clarified.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-1.9 |
| Title of the project from which the approach is derived | Capacity Development Project for Sustainable Forest Eco-System Management in the Republic of Cameroon |
| Country | Republic of Cameroon |
| Biome | Tropical |
| Implementing term | 2019/1/20 – 2024/1/19 |
| Implementing organizations | Ministry of Environment, Nature Conservation and Sustainable Development (MINEPDED), Ministry of Forest and Wildlife (MINFOF), Ministry of Economics and Land Use Planning (MINEPAT), Ministry of Agriculture and Village Development (MINADER), REDD+ Technical Secretariat |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline | - |
| Contributors to this article | Hiroshi Sasakawa/JAFTA<br>Chika Sasahara/JAFTA |

# SFM through Community-Based Ecotourism Activities

## 1. Approach's Outline and Features

This approach introduces how to promote SFM through community-based ecotourism activities in a state forest, balancing utilization and protection.

The Government of Botswana is trying to revise the Forest Act in Parliament to open up the state forest for ecotourism activities and thereby improve the quality of life of the local community. A framework and implementation plan of Community-based Ecotourism (CBE) in a specific state forest, which contributes to Sustainable Forest Management (SFM), are about to be developed. When developing the CBE implementation plan from the sustainability perspective, it is important to devise attractive ecotourism activities such as 1) Introduction of a Visitor Center, 2) Local specific cultural tourism, as opposed to ongoing activities (Game Drive, Boat Cruise, etc.) implemented in another National Park. Transparency of benefit distribution to local community would be equally key to success.

**Community-based state forest management through the platform that has Visitor Center function, Gateway function (Project)**

**Attracting tourists through local-specific cultural tourism (Project)**

**Keywords**

Community-based Ecotourism (CBE), SFM, livelihood improvement

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Botswana is a global wildlife habitat, including elephants and various antelopes and ecotourism is flourishing in state-managed wildlife national parks such as the World Natural Heritage-listed Okavango Delta. Conversely, in Chobe District, which is home to wide-ranging wildlife, there is a mosaic of wildlife national parks where ecotourism is already practiced and state-owned forests (covering a total of 422,500 ha) where it is strictly prohibited under the Forest Act. There is a growing need and momentum to partially open up state forests to ecotourism activities from the perspective of boosting the quality of life of the local community. With this background, the Government of Botswana is currently striving to address local needs by amending the Forest Act.

## 2-2. Details of measures taken

- Review a benchmark document like a state forest management plan, which includes ecosystem maintenance processes to retain the wildlife dispersal corridor and stimulate surrounding tourism by offering unique and community-based ecotourism products in a wild and unspoiled setting.
- Confirm the overall framework of the plan, e.g. governance, institutional arrangements and legal framework.
- The following elements should be considered when designing the planning framework:

1) Zoning: It is based on attributes (habitat diversity, pans and wetlands, tourism value) while the constraints are to be mapped out as fencing, noise and livestock incursions into the state forest.

2) Core infrastructural developments and entry controls: Among the requirements to manage the state forest are the provision of access tracks and posting of signboards at entry points. An outline of access permit management is also prepared.

3) CBNRM[1] and Community: A CBNRM program is to be developed to promote change through a more inclusive approach, with community more involved in day-to-day operations and management through economic development, while acting as the first port of call for all activities to the state forest.

4) Conservation and Management: Conservation focuses on the primary values of the state forest, namely that of a wildlife dispersal corridor and a safe heaven for rare and endangered species. It should address the management of alien and invasive species, fire management, provision of artificial wildlife water points, control of problem animals, natural resource harvesting and waste management.

5) Ecotourism: The development of sustainable ecotourism requires stricter control and a phased approach.

   Phase 1; Lightly approach where developments are non-intrusive and complimentary to biodiversity and forest integrity. Suggested ecotourism activities include high-end lodge based Open Safari Vehicle (OSV) experiences, self-drive tracks, guided walking trails, heritage visits, camping for the mobile safari sector and a hunters road wilderness experience.

   Phase 2; Propose expanding the scope of ecotourism adventure activities, increasing the number of experiences and adapting the plan to more successful tourism offerings. Phase 2 also aims to increase community control over the tourism activities and thereby boosting the economic returns to the community.

6) Marketing: A market segmentation exercise should be undertaken to package the proposed ecotourism activities and strategic and investment markets through attractive state forest website and apps to be developed, information maps to be developed and disseminated at key access points, a proper and user-friendly online booking and permit system to be established and niche tourism packages offered in partnership with existing sectoral role-players. Visitor feedback will be an essential part of managing a state forest and should be acted on regularly to keep up to speed with visitors' demands.

[1] CBNRM : Community Based Natural Resources Management (CBNRM) aims to get communities actively involved in natural resource conservation. For the approach to be successful, the benefits must exceed the costs of conservation to communities. It is therefore advisable for the commercial rights of the state forest to be properly leased to the Community Based Organization (CBO). The following would be key to motivating CBO and successful CBNRML revenue generation, optimal use of under-performing assets, job creation and poverty alleviation, biodiversity protection, collective conservation efforts and alternative livelihood options.

7) Monitoring and Research: To develop an effective and efficient management-oriented monitoring system, all visitors, guides and staff are to be encouraged to log issues and biodiversity sighting via dedicated apps developed for this purpose. State forest coordinators will monitor all reports using simple and temporarily efficient responses.
8) Budget: Income, capital expenses, operation expenses, regional spinoff value and real value to the region should be addressed when considering the budget. The income generation of the community during Phase 1 is supposed to be far less than the development and operational cost. For the forest and community development to succeed, it is crucial to identify one or more funder(s) to support these operations. Securing transparency of benefits distributed to the local community is equally important.

**(Perspectives on sustainability)**

It is important to confirm the overall plan framework, including aspects such as governance, institutional arrangements and legal framework.

## 3. Analysis of the approach

### 3-1. Impact

- Partial opening of state forests to ecotourism activities will pave the way for positive opportunities as shown:

1) Attracting quality business investments for small, micro and medium enterprises (SMMEs).
2) Maximize job creation.
3) Provide skills training and long-term career paths for local communities. Empower surrounding communities.
4) Secure long-term income from the concessionaires.
5) Help boost and improve government tax revenues.

### 3-2. Lessons learned

- Non-consumptive tourism[2] has the potential to increase the value of the state forest to both communities and the government.
- The development of sustainable ecotourism and multiple uses of state forests are positive developments, but care has to be taken to ensure biodiversity and the forests' integrity are maintained, based on the precautionary principle and limits of acceptable change (LAC).
- A visioning document such as a state forest management plan should be prepared and shared with all key stakeholders, including government departments, the general public, tourism industry and NGOs.
- The above visioning document should include zoning (attributes such as habitat diversity, pans and wetlands, tourism value), Institutional structures, Core infrastructural developments and controls, CBNRM and community, conservation and management, ecotourism, marketing, monitoring and research, budget and so forth.

[2] Non-consumptive tourism: Refers to holiday business done without being engaged in hunting. It can also be known as photographic tourism. Non-consumptive tourism includes activities like trail walking, sightseeing, horse-riding, canoeing, surfing, wildlife photography and visiting heritage sites.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-1.10 |
| Title of the project from which the approach is derived | Project for Capacity Development for the Conservation and Sustainable Use of Forest and Range Resources through the Process of Master Plan Development |
| Country | Botswana |
| Biome | Savanna |
| Implementing term | 2021/2/2 - 2025/1/31 |
| Implementing organizations | Department of Forestry and Range Resources (DFRR) / Ministry of Environment, Natural Resources Conservation and Tourism (MENT) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA), Nippon Koei Co., Ltd. |
| Report/Tool/Guideline | — |
| Contributors to this article | Takashi Nanaumi /JAFTA |

# Institutionally consolidating the Participatory Forest Management (PFM) body

## 1. Approach's Outline and Features

This approach combines work to establish a participatory forest management organization alongside an initiative to produce and market agriculture and coffee as a way of incentivizing forest management and managing forests sustainably in areas where natural forest is declining.

As well as establishing a WaBuB (**Forest Management Association**) for **Participatory Forest Management (PFM)**, the approach aims to build farmers' capacity to analyze production systems, identify problems, test possible solutions and ultimately encourage them to adopt practices best suited to their farming systems.

**Forest Management Associations were established and empowered through technical training**

**Keywords**

Forest management association, Participatory forest management, Forest management agreement, Forest coffee, Farmer Field School

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Estimates indicate that 5,000-10,000 hectares of forest in the Oromia Region are being lost each year due to agricultural expansion, inappropriate land use and excessive deforestation. Accordingly, the Regional Government requested that the Japanese government implement the first phase of "The participatory forest management project in the Belete-Gera regional forest priority area in the Oromia Region", a technical cooperation project aimed at encouraging local farmers to manage the forest in line with the results of a JICA survey in 1998. The initial project phase was implemented for three years, from October 2003.

To further extend Participatory Forest Management (PFM) to other settlements in the Forest Priority Area, a second phase of the project was implemented for four years from October 2006.

- **The project's purpose**: WaBuB Participatory Forest Management (WaBuB PFM) is developed in selected areas in Belete-Gera RFPA (Regional Forest Priority Area).
- **Project Periods**: Phase 1: Oct. 2003 – Sep. 2006, Phase 2: Oct. 2006 – Mar. 2012
- **Biome**: Highland (forest coffee area / mountainous)

## 2-2. Details of measures taken

- The Project promoted and realized the demarcation of forest boundaries to conserve the natural forest. A provisional forest management agreement (P-FMA) was also concluded between the WaBuB and forest administration bodies such as Oromia Forest and Wildlife Enterprise (OFWE).
- The Project strengthened the capacity of the forest administration institution/agencies and WaBuB through training.
  - ➢ Training for forest administration
    - ✧ Training for Trainers (Farmer Field School, project management and participatory forest management etc.), Training in Japan, Third-country training (Kenya, Uganda and Thailand)
  - ➢ Training for WaBuB
    - ✧ Participatory forest management, forest certification, tree and fruit nursery, fodder bank, cultivation of fruit and vegetables, woodlot, tree intercropping,
- The Farmer Field School was adopted for the capacity development for the WaBuB.
- A benefit-sharing mechanism was introduced in the Belete-Gera forest area.
- The Project has utilized and developed a system of traditional local knowledge, particularly in forest protection and utilization for sustainable forest management such as follows:
  - ➢ Felling big trees is taboo within the Oromo community.
  - ➢ Tree bark must be properly utilized while preparing traditional beehives.
  - ➢ Regeneration protection: Regeneration is associated with children among residents (Oromos).
  - ➢ Cultural and administrative gatherings take place under trees, so major trees are considered a source of shade and shelter.
  - ➢ Farm tools made from old and fallen trees.
  - ➢ Awareness that deforestation can cause drought.
  - ➢ Banning any hunting of wildlife unless harmful to the community.

**Forest coffee (photo: JICA)**


**WaBuB members (photo: JICA)**

**(Perspectives on sustainability)**

- In the field manual, forest management monitoring and feedback activities are included with numerous pictures and photos.
- This project was conducted in collaboration with Zone and District (Jimma Zone, Gera and Shabe Sombo Districts) stakeholders.

## 3. Analysis of the approach

### 3-1. Impact

- The establishment of 124 WaBuBs and establishment and registration of seven cooperatives.
- All cooperatives participating in the forest coffee certification program sell coffees at premium rates.
- All target WaBuBs have sustained FMA, even after the termination of the Project.

### 3-2. Lessons learned

- A participatory forest management approach, in which forest users participate at each stage of forest management, such as planning, implementation and monitoring & evaluation, is necessary and effective for sustainable forest management. This is because involving local communities in forest governance helps develop a sense of responsible ownership. In turn, increasing awareness of ownership helps ensure sustainability.
- Simultaneously helping conserve the forest and generate income by producing premium-priced forest coffee and implementing the WaBuB Farmer Field School would be an ideal PFM model that would also incentivize participants to join in forest conservation activities. Establishing the FMA allows WaBuB members to harvest forest coffee in the forest areas. That income may also represent an economically solid incentive to participate in the FMA for the local community. Accordingly, under the FMA, it is expected that WaBuB will participate in forest management together with the forest administration body such as OFWE and the natural forests in the area can be monitored and conserved sustainably. FFS served as an extension tool for WaBuB to learn new agriculture or forestry practices requiring long-term interaction.
- Developing manuals and guidelines in the local language with photos and drawings paves the way to understand the contents. Moreover, such manuals can also be used as means of monitoring and feedback in PFM activities and would be very effective in promoting and sustaining PFM.
- Local knowledge and cultural authority were incorporated into the participatory forest management structure. Such efforts can promote sustainability and coordinate opinions among forest user group members.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-1.11 |
| Title of the project from which the approach is derived. | The participatory forest management project in Belete-Gera regional forest priority area in the Oromia Region, Ethiopia |
| Country | Ethiopia |
| Biome | Montane |
| Implementing term | Phase 1: October 2003 – September 2006<br>Phase 2: October 2006 - March 2012 |
| Implementing organizations | Phase 1: Oromia Agriculture and Rural Development Bureau<br>Phase 2: Oromia Forest and Wildlife Enterprise |
| Supporting organizations | Japan International Cooperation Agency (JICA) |

| | |
|---|---|
| Report/Tool/Guideline | ・ Project Brochure on FFS (Farmer Field School) Approach for Agroforestry and Naturel Resource Development<br>・ Project Brochure on WaBuB PFM in Belete-Gera Regional Forest Priority Area<br>・ Project Brochure / Participatory Forest Management Project in Belete-Gera Regional Forest Priority Area Phase 2<br>・ Summary Sheet for Terminal Evaluation (2010)<br>・ Internal Ex-Post Evaluation for Technical Cooperation Project (2019)<br>・ [AI-CD Website]: Participatory Forest Management Project in Belete-Gera |
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# Challenge to sustainable forest management through participatory forest management

## 1. Approach's Outline and Features

This approach establishes a model for sustainable forest management through participatory forest management and consolidating measures to improve livelihoods and incentivize forest conservation, by the Forest Management Group called WaBuB.

Having obtained legal status, this group is now guaranteed forest use rights through periodic forest monitoring under a forest management agreement.

**Elected Forest Management Group (WaBuB) Board members of Participatory Forest Management (PFM) Cooperatives**

**Keywords**

Participatory Forest Management, Forest Management Group, Livelihood improvement, Legal status, Forest Management Agreement, Institutionalization, Joint Forest Monitoring

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Deforestation caused by excessive timber harvesting and the expansion of farmland in response to population growth have become urgent issues for the Ethiopian government. Accordingly, it is striving to stop deforestation by introducing forest management involving residents` participation and disseminating such initiatives. In the Belete-Gera region of Oromia, southwest Ethiopia, where natural forests are in decline, a forest management group called WaBuB was established in all 124 villages to promote participatory forest management. This approach aims to spread sustainable rural development in harmony with forest management by establishing a sustainable forest management model in the region.

- **The project's purpose**: to develop an appropriate Sustainable Forest Management (SFM) mechanism, which balances forest management and livelihoods in both Forest Coffee and Highland areas with differing natural conditions and agricultural activities
- **Project Period**: from July 2014 to November 2020
- **Biome**: Highlands (forest coffee area / mountainous)

### 2-2. Details of measures taken

- Extension agents and the provincial technicians involved in project activities acquired the necessary skills by attending training courses on livelihood improvement, land use and extension.
- WaBuB, a voluntary group without any legal status, has undergone the necessary procedures to become a cooperative for participatory forest management (PFM) with legal status and can now conclude forest management agreements (FMAs). These agreements define forest boundaries and zoning and allow the WaBuB to collect and use non-timber forest products (NTFPs) such as

forest coffee, honey, spices, medicinal plants and more. Conversely, WaBuB must report on the forest status annually by monitoring forests and illegal activities like deforestation.

- Given institutionalization based on the FMA, WaBuB can use forest resources - mainly NTFPs - and implement forest management activities like forest monitoring. An FMA was concluded between the WaBuB, OFWE (Oromia Forest and Wildlife Enterprise, responsible for the forest administration in Oromia) and OEFCCA (Oromia Environment Forest and Climate Change Authority, responsible for the environment and climate change affairs in Oromia).
- In highland areas where no forest coffee is produced, the Project introduced various activities to boost livelihoods without deforestation, encouraging better beekeeping, grain production, fruit tree and vegetable cultivation and bamboo resource restoration in particular. These highland area activities are intended to ease the pressure on forest resources and offer an alternative to deforestation.
- The forest management group members obtained the necessary skills and knowledge through the training. (forest monitoring, quality control of forest coffee, improved beekeeping, improved crops combining with green manure, community nursery of avocados/apples, vegetables in a home garden and rehabilitation of highland bamboo)
- To cope with forest degradation, the Project institutionalized Joint Forest Monitoring (JFM), which involves annual monitoring to assess compliance with the FMA. The Project also promoted efforts to conduct the JFM in ten WaBuBs.

**(Perspectives on sustainability)**

- A budget was allocated to implement the FMA via the forest administration body such as OFWE and its Action Plan was developed.
- Two WaBuB PFM Cooperatives, comprising 124 sub-villages, were established as legally effective forest management organizations.
- From a longer-term perspective, the project prepared a draft forest coffee management guideline and Internal Control System (ICS) to ensure the sustainability of the Forest Coffee Certification Program (FCCP), which helps conserve the forest and produce forest coffee harmoniously.

**Training on the Internal Control System (ICS). A tablet system was introduced in all WaBuBs for more streamlined and accurate forest coffee monitoring**

## 3. Analysis of the approach

### 3-1. Impact

- To legalize the FMA, two WaBuB PFM Cooperatives, supervising all 124 WaBuBs, were established in December 2019 as legally approved organizations by the Oromia Regional Justice Office. All 124 WaBuB representatives signed the legal document for the PFM Cooperatives.
- As livelihood improvement activities were intensified, the following high percentage of WaBuBs were recorded as engaging in the following activities out of a total of 57 WaBuBs in the montane regions by the end of 2019:
    1) Improved beekeeping: 39 WaBuBs
    2) Improved crops in green manure: 47 WaBuBs

3) Community fruit tree nursery: 50 WaBuBs
4) Vegetable cultivation in home garden: 39 WaBuBs
5) Rehabilitation of highland bamboo for use in residences: 14 WaBuBs (100%, all WaBuBs in bamboo production areas)

- The Provincial Agricultural Bureau's survey found that the average annual income of montane region residents having participated in activities to improve their livelihoods increased from 12,000 ETB in 2017 (average of sample farmers) to nearly triple and 37,932 ETB in 2019.

### 3-2. Lessons learned

- To motivate local government and extension agents at the field level, the establishment of the Steering Committee (SC), by official agreement of central government, effectively delegates some responsibility and promotes collaboration among local governments and forest users. It also paved the way to allocate the budget for Joint Forest Monitoring (JFM)
- The following aspects can be highlighted in the project implementation, which aimed to develop an appropriate Sustainable Forest Management (SFM) mechanism:
  - This approach allows residents to become bearers of a legal forest management agreement by organizing them as a forest management group (WaBuB). Once the FMA has been signed, the forest management group has the explicit right to use the forest and can benefit economically from it. Conversely, it also obliges them to monitor and conserve their local forest, while allowing them to participate proactively in its management.
  - Establishing a sustainable model by harmonizing forest conservation with economic activities to incentivize forest conservation.

**JFM Review meeting**
**While the PFM aimed to monitor and control illegal activities by the government, it is desirable for the WaBuB to carry out regular monitoring independently to promote a sense of forest management among residents.**

### 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-1.12 |
| Title of the project from which the approach is derived | 1) Ethiopia Project for Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion<br>2) Participatory Forest Management Project in Belete-Gera Regional Forest Priority Area Phase 2 |
| Country | Ethiopia |
| Biome | Montane |
| Implementing term | 1) July 2014 - November 2020<br>2) October 2006 - March 2012 |
| Implementing organizations | 1) Oromia Environment, Forest and Climate Change Authority (OEFCCA), Oromia Forest and Wildlife Enterprise (OFWE)<br>2) Oromia Bureau of Agriculture and Natural Resources (OBANR) |

| | |
|---|---|
| Supporting organizations | 1) Japan International Cooperation Agency (JICA), Japan International Forest Promotion and Cooperation Center (JIFPRO), Appropriate Agriculture International Co., Ltd. (AAI)<br>2) Japan International Cooperation Agency (JICA), IC Net Ltd. |
| Report/Tool/Guideline | 1) Project Completion Report<br>2) 1. Project Brochure on FFS (Farmer Field School) Approach for Agroforestry and Naturel Resource Development<br>2. Project Brochure on WaBuB PFM in Belete-Gera Regional Forest Priority Area<br>3. Project Brochure / Participatory Forest Management Project in Belete-Gera Regional Forest Priority Area Phase 2<br>4. Summary Sheet for Terminal Evaluation (2010)<br>5. Internal Ex-Post Evaluation for Technical Cooperation Project (2019)<br>6. [AI-CD Website]: Participatory Forest Management Project in Belete-Gera |
| Contributors to this article | TEJIMA Shigeharu, Oriental Consultants Global Co., Ltd.<br>TANAKA Yasuhisa, Japan Forest Technology Association (JAFTA) |

# Long-rooted seedlings for afforestation in arid and semi-arid areas

## 1. Approach's Outline and Features

This approach involves accelerating afforestation in arid and semi-arid areas with long-rooted seedlings that would expand the available land areas for tree plantations. Their long roots could enhance the survival rate during the dry season and their drought tolerance is reportedly relatively higher than normal seedlings. Although the long-rooted seedlings technique remains in the experimental phase in Botswana, it is expected to be applicable as a means of enhancing afforestation in similar environmental regions in Africa.

**Keywords**

Arid/semi-arid, Plantation, Long-rooted seedling

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Africa, drylands have been severely degraded due to population growth and economic development and it has proved difficult to help land having passed the tipping point to naturally recover to the original ecosystem (IPCC, 2021).

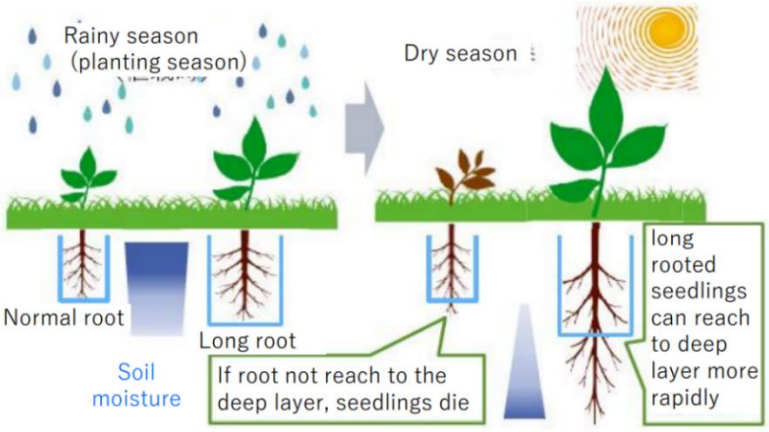
Throughout the nation, Botswana has shown trends of drying up, such as decreased rainfall and rainy days of increasing magnitude (Batisani and Yarnal, 2010). Semi-arid regions in the southwest and northeast are particularly affected by climate change and areas where desertification has intensified.

While natural regeneration has attracted attention, there is increasing awareness of the need for human intervention to restore degraded lands (Palomeque et al., 2017). Long-rooted seedlings (hereafter "LRS") are set in special containers to let their roots extend over 40 cm for enhanced drought tolerance and allow restoration in a dry environment. This pilot project is implemented to help meet the need for reforestation and afforestation in semi-arid areas in Botswana under the JICA project "Project for Capacity Development for the Conservation and Sustainable Use of Forest and Range Resources through the Process of Master Plan Development (2021-2025)". It is the first national government- and international donor-funded project to experiment with LRS to grow on the ground in Botswana.

### 2-2. Details of measures taken

- Preparation of LRS – Approximately 1000 seedlings are set in special long containers (Multi-Stage Adjustable Rolled Container) with cocopeat and fertilizer. Cocopeat is a common soil medium in Africa, with good drainage.
- They are grown for a single season at the nursery until their roots reach over 40cm, while the normal seedlings have just several centimeters, so that they can reach the deep-layer soil where soil moisture is stable after planting. The root length depends on the tree species, environment, or general ease of handling.
- Identifying the project site – LRS has a long main root, hence people need to dig a deep hole with an auger. Accordingly, the soil should not be excessively hard so that digging is impossible.
- Plant long-rooted seedlings on the ground and monitor their growth. The tree density when

planting will be determined through consultation with the counterpart in light of the growth rate, site environment and so on.




**Concept of the long-rooted seedlings (credit: JIFPRO)**

**Place a seedling into the container (Project)**

**Long-rooted Seedling in the container (Project)**

**(Perspectives on sustainability)**

- The sustainability of this activity would depend on:
  - Awareness of potential and available areas for LRS;
  - A clear exit strategy drawing funds obtained from the private sector;
  - Accessibility of tree species data in the country or other countries with a similar environment;
  - An appropriate system for monitoring and accumulating data during the implementation.

## 3. Analysis of the approach

### 3-1. Impact

- The LRS technique is expected to extend lands for afforestation and reforestation in arid and semi-arid areas in Africa.
- Accelerating afforestation and reforestation may generate an additional carbon sequestration volume to help address climate change and contribute to the Nationally Determined Contributions (NDCs) under the Paris Agreement in African countries.

### 3-2. Lessons learned

- The inputs from a knowledgeable center in the implemented country (e.g. the Botswana National Tree Seed Center) help considerably when selecting tree species for LRS.
- The LRS technique could be applied using both indigenous and exotic tree species to help secure carbon sequestration to some extent and enhance the adaptability of trees to a harsh environment.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-2.13 |
| Title of the project from which the approach is derived | Project for Capacity Development for the Conservation and Sustainable Use of Forest and Range Resources through the Process of Master Plan Development |
| Country | Republic of Botswana |
| Biome | Savanna |
| Implementing term | 2021/2/2 - 2025/1/31 |
| Implementing organizations | Department of Forestry and Range Resources (DFRR) / Ministry of Environment, Natural Resources Conservation and Tourism (MENT) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA), NIPPON KOEI Co., Ltd. |
| Report/Tool/Guideline | - |
| Contributors to this article | Misaki Matsuo /JAFTA |

# Integrated approach for nationwide dissemination of community forestry in Kenya

- Synergy of hands-on training and technical development through trial silviculture at pilot forest -

## 1. Approach's Outline and Features

This approach focuses on the introduction and dissemination of community forestry, which is a method of supplying timber for local consumption through silvicultural practices that take place at community grassroots level. A series of training sessions to trainers and encouraging interaction between those involved in technical development for community forestry can help disseminate the relevant practices nationwide, to secure sustainable forest resources and prevent deforestation in Kenya.

**How can this approach help efforts to disseminate community forestry nationwide in Kenya?**

- **By assessing training needs and developing a training program that is well considered in the preparatory phase:** A master plan of the whole program should be developed, taking nationwide dissemination of community forestry into consideration at the very beginning of the project.
- **By conducting trial silviculture at the pilot forest and applying the lessons learned to training:** The local counterpart can improve its scope to train trainers and develop techniques and methods to promote community forestry.

**Keywords**

Dissemination of Community Forestry, Training of Trainers, Technical Development on Community Forestry, Pilot Forest

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Kenya, a soaring population has fueled growing domestic demand for timber, particularly firewood, and it is estimated that around 19,000ha of forest land were being lost each year in the 80s and 90s due to over-logging. In response, the concept of social forestry, now known as community forestry, emerged as an alternative to traditional forestry that had failed to supply urgent timber needs and secure sustainability of national forest resources at the same time.

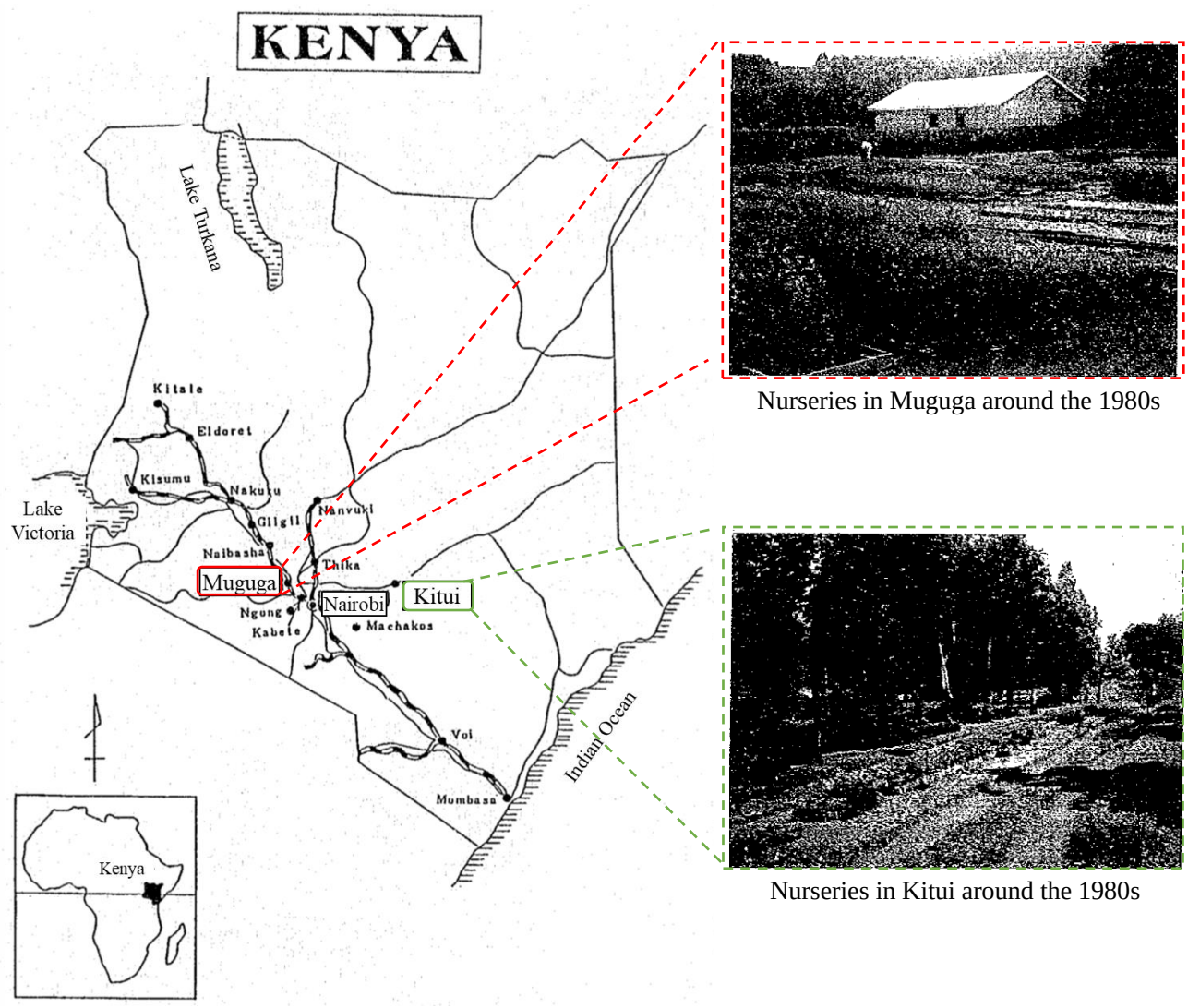
Community forestry is a method of supplying timber for local consumption through silvicultural practices taking place at community grassroots level. It has the potential to prevent further deforestation if implemented nationwide in Kenya. To disseminate the knowledge and methods country-wide, the main activities to be implemented are (1) development and continual improvement of forest plantation and seedling cultivation practices, (2) training of personnel tasked with disseminating the insights and techniques to locals, and (3) dissemination by trained trainees. These activities are then aligned to generate synergy as part of efforts to realize a goal of "local people

gaining suitable skills in tree planting and seedling cultivation", when introducing pilot forestry activity to the whole program.

The local counterpart of this program, the Kenya Forestry Research Institute (KEFRI), has served as a hub for personnel training and technical development through implementation of the program. Right from the start, KEFRI participated and learned how to develop silvicultural techniques and disseminate them strategically, working alongside experts dispatched from the Japan International Cooperation Agency (JICA). Prior to the main phase, a two-year preliminary project "Nursery Training and Technical Development Project for Social Forestry in Kenya (Preparatory Phase)" was implemented to develop a master plan for the whole cooperation program, while taking the nationwide dissemination of community forestry into consideration.

### 2-2. Details of measures taken

- Assessment of training needs and development of a training plan
  - A survey was conducted to develop a training plan, targeting 100 respondents including managers, officers, frontline workers of the Forest Department (predecessor of the current Kenya Forest Service) and farmers in local communities. The survey results spotlighted developing human resources as a crucial factor for the nationwide dissemination of community forestry.
  - Seedling cultivation techniques were developed for both highlands and semi-arid lands. Muguga was specified as a suitable area in which to implement hands-on training of the seedling techniques for highlands and Kitui was also specified as a suitable venue for semi-arid land.




Nurseries in Muguga around the 1980s

Nurseries in Kitui around the 1980s

- Organizing lectures on the concept of community forestry as well as its applicability to policies:
  - Lecture for senior- and mid-level staff of the Forest Department (FD):
    [Phase 1] 598 participants (26 sessions), [Phase 2] 325 participants (13 sessions)
  - Lecture for frontline FD staff:
    [Phase 1] 324 participants (12 sessions), [Phase 2] 325 participants (13 sessions)
- Conducting hands-on training on practical and fundamental knowledge of community forestry
  - Training for community leaders and teachers:
    [Phase 1] 154 participants (7 sessions), [Phase 2] 525 participants (21 sessions)
  - Training for farmers and females
    [Phase 1] 230 participants (10 sessions), [Phase 2] 598 participants (23 sessions)
- Conducting trial silviculture at the pilot forest, combined with hands-on training
  - Development and improvement of community forestry techniques, such as:
    - ✧ Tree-planting techniques, particularly ground preparation, timing for planting, planting spacing, hole size and water catchment

- ✧ Nursery techniques, particularly pre-germination treatments, pot size, canopy, stamped seedlings, nursery standards, root cutting, hardening treatments, nutrient propagation and disease and insect control
- ✧ Seedling production for use in dissemination activities

➢ Dissemination of community forestry techniques to locals, such as pre-germination treatments, root cutting and disease and insect control, by:

- ✧ Incentivizing people to participate in trial plantations such as seedlings and distributing a technical leaflet describing planting and nursery techniques
- ✧ Distributing seedlings, particularly for those who had difficulty in purchasing seedlings, to raise their awareness of tree planting and nursery
- ✧ Model farmers having participated in hands-on training and learned the knowledge and techniques of community forestry effectively

**(Perspectives on sustainability)**

- The project provided KEFRI, whose main focus had been on research, with opportunities to reconsider its own role in technical dissemination and acquire fresh know-how. This paved the way for KEFRI to gradually extend its scope of work and underpinned its organizational development as a central institution for forestry research and dissemination of output to people in Kenya. Ultimately, KEFRI recognized dissemination of forestry knowledge and techniques as a key component of research activity and thus proactively got involved.
- The project made it easier for KEFRI to involve the local authorities handling the implementation and dissemination of community forestry in the field (i.e., FD) by providing technical training sessions where KEFRI served as Trainer and FD as Trainee. This helped them develop their human networks and generate momentum for the nationwide dissemination of community forestry in Kenya.
- It was confirmed that the knowledge and skills gained from that training are still being used at the individual level and have been developed into small businesses such as seedling sales.

## 3. Analysis of the approach

### 3-1. Impact

- Comparing the results of the questionnaire survey before and after training for farmers, those who planted 100 to 499 trees increased by 15% points, and the survival rate of those trees also improved by 16% points. Similarly, those who planted 500 or more trees increased by 17% points, and the survival rate increased by 14% points.
- About 80% of all trainees passed on the knowledge and techniques of community forestry gained from training to their families and neighbors. This spillover effect contributed to the overall goal of "ensuring local people gain suitable skills in tree planting and seedling cultivation."
- Consequences of the improved awareness of community forestry after implementing this program meant further increased community demand for forest conservation in Kenya as well as reaffirming the need to strengthen KEFRI's capability. In response, the subsequent grant aid by JICA to enhance KEFRI training capability and research facilities was officially implemented.

### 3-2. Lessons learned

- **Selection of model farmers**: Model farmers were expected to play a leading role in the sustainable dissemination of afforestation and nursery techniques (e.g., pre-germination treatments, root cutting, and disease and insect control) at village level. On completion of the project, it was expected that community forestry would continue to be practiced at a local level, spearheaded by model farmers, to achieve the overall goal of "equipping rural Kenyans with appropriate skills related to trees and their management".
- In anticipation of this role, an attempt was made to select model farmers based on the survival rate of planted trees, but an excessively low survival rate made meeting the criteria too difficult. Accordingly, model farmers should not be selected based primarily on the success or failure of their community forestry practices (e.g. survival rate of planted trees), because failure in practice does not necessarily render the person concerned ineligible as a model farmer in community forestry. Rather, it is advisable to select model farmers based on their willingness to participate in community forestry or their positive attitude toward practices.
- **Securing financial sustainability of the counterpart's activities**: While project-based financial support is often necessary until candidates for dissemination are trained and systems are in place, it is essential to ensure appropriate budget allocations are secured for the institutions responsible for dissemination so that they can continue their dissemination activities independently after termination of the project.

### 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-2.14 |
| Title of the project from which the approach is derived | ▪ Nursery Training and Technical Development Project for Social Forestry in Kenya (Preparatory Phase)<br>▪ Social Forestry Training Project (1st Phase)<br>▪ Social Forestry Training Project (2nd Phase) |
| Country | Republic of Kenya |
| Biome | Semi-arid land, Highland |
| Implementing term | ▪ Preparatory phase: 1985/11 – 1987/3<br>▪ 1st phase: 1987/11 – 1992/11<br>▪ 2nd phase: 1992/11 – 1997/11 |
| Implementing organizations | Kenya Forest Research Institute (KEFRI),<br>Forest Department (FD) |
| Supporting organizations | Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | ▪ JICA, A Summary of the Findings and Recommendations Made by the JICA Consultation Team on the Nursery Training and Technical Development Project for Social Forestry in Kenya, May 1987.<br>▪ JICA, Report of the Terminal Evaluation Survey of Social Forestry Training Project in Kenya (1st Phase), October 1992.<br>▪ JICA, Report of the Terminal Evaluation Survey of Social Forestry Training Project in Kenya (2nd Phase), March 1998. |
| Contributors to this article | Kei Kawamura/Oriental Consultants Global<br>Leo Watanabe/Oriental Consultants Global |

# Countermeasures for soil degradation in arid and semi-arid regions

## 1. Approach's Outline and Features

This approach involves pilot activities in which forest officers and villagers learn techniques to address poverty issues in areas with significant deforestation and soil degradation, then work to control land degradation and promote effective land use.

The approach comprises the following two pillars:

**[Development and improvement of applicable techniques]**

The residents of each village must take the initiative to tackle soil degradation state-wide. Accordingly, the approach identified useful and applicable techniques for local villagers to control land degradation and promote effective land use, while taking the types of degradation into account.

**[Development of a system to disseminate applicable techniques and countermeasures]**

Among the administrative departments of the state, the education sector forms a comprehensive network connecting each village. The will of the villagers, as the key stakeholders for implementing the activities, has been relatively well communicated to the executive branch on a state level via the education sector network. In response to their requests, the state executive branch has provided material and financial support, as well as technical assistance from the state outposts of the Forestry and Agriculture Departments.

This approach leveraged these educational sector networks to provide technical and financial support for villagers' activities, which underpinned the dissemination of techniques and methods.

This system of dissemination is called AVLOS (Actions Vertes Locales et Scolaires). (See 2-2)

**Keywords**

Soil degradation, Water erosion, Soil fertility, Education sector involvement

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

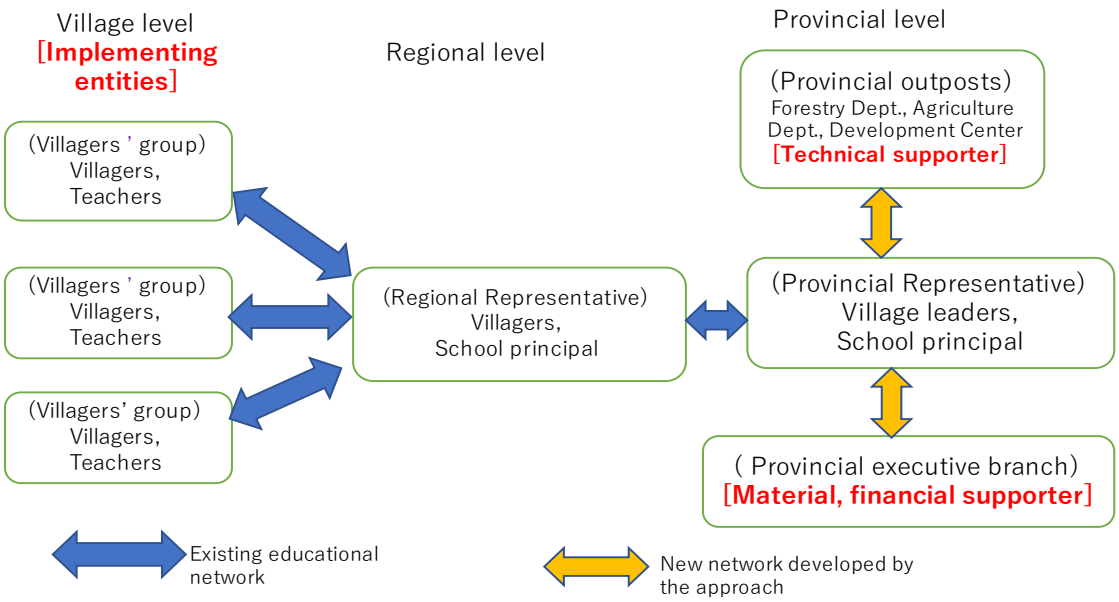
**Water erosion (photo: JICA)**

Key problems in Senegal include expanding unproductive grassland, salinization and soil degradation of farmland, all of which end up impoverishing farmers. In response, the Senegalese government requested capacity-building on the part of forest officers and villagers to control land degradation and promote effective land use. JICA also launched a technical cooperation project named "Capacity-building Project for the control of land degradation and the promotion of land recovery in degraded-soil areas" in March 2011.

## 2-2. Details of measures taken

- In the Fatick and Kaolack regions of the Republic of Senegal, where the project was implemented, 100 villages where soil degradation was progressing significantly and needed to be addressed were selected as priority areas and 20 were selected as pilot sites in which to implement pilot activities.
- JICA experts and forestry officers reviewed literature and the achievements of projects that were previously implemented to identify techniques to control land degradation and promote effective land use that would be feasible to apply at a local level. Consultations with villagers in the pilot site were also conducted to obtain their consent for a combination of techniques adapted to the area. The identified techniques were then organized according to soil degradation types, namely water erosion, wind erosion, salt damage and soil fertility loss.
- Accordingly, techniques appropriate to the situation in the pilot areas were identified and the pilot activities were determined as follows:
  - Water erosion control: measures to prevent soil runoff using civil engineering works with wooden frames, sandbags and stones and contour cultivation of multiple grains (millet and nieve).
  - Soil fertility improvement: producing compost by applying livestock manure and grain residues and excreta from residents' toilets (ECOSAN (Ecological Sanitation) toilets).
  - Afforestation/agroforestry: windbreaks, restoring vegetation, introducing salt-tolerant species, rearing seedlings.
  - Livelihood improvement: planting eucalyptus trees as construction material and fruit trees (mango, cashew), cultivating vegetables.
- JICA experts worked with forest officers to organize the results of the pilot activities and prepared a technical manual and catalogue.
- JICA experts and forestry officers worked with the education sector to develop an approach, "Action for Schools and Communities/Green (AVLOS)", to disseminate technical information and other support throughout the region. Within this dissemination structure, the roles of the parties involved were clarified.
- Within each village, groups of villagers are the main actors in implementing activities to control land degradation. Villagers and teachers are linked by a local network based on school.
- The Provincial executive branch and Provincial outposts, such as Forestry or Agriculture Departments will provide material financial support and technical advice and guidance, respectively.
- The willingness of village groups to implement activities is communicated from village to regional and provincial level via an educational network. The will of the villagers that reaches the provincial level is conveyed to the provincial outposts and local governments, which then provide them with the necessary support.

**Image of the AVLOS approach**




**Construction of stone barriers (photo: JICA)**

**Production of vegetables (photo: JICA)**

**Village nursery (photo: JICA)**

**Reforestation in a cereal field (photo: JICA)**

**(Perspectives on sustainability)**

- Implementing simple techniques that local villagers, as the implementing entities, can apply and increasing the opportunities for on-site technical guidance by forest officers through the AVLOS approach have promoted the dissemination of such techniques.

- The sustainability of planting eucalyptus is underpinned by villagers' awareness of the advantages of the plantation in protecting their villages against salinization and wind, which was raised after sensitizing the local population, as well as their realization that exploiting eucalyptus would be profitable.

## 3. Analysis of the approach

### 3-1. Impact

**[Achievements in disseminating techniques to control land degradation]**

- Among 100 villages designated by the project as priority areas, a high percentage (81%) had adopted and utilized controlling land degradation techniques. This result shows that the extension approach, AVLOS, could effectively disseminate techniques adopted in the pilot sites elsewhere.
- With six (6) years having elapsed since the project's completion, the eucalyptus plantation continues; underpinned by villagers' awareness of its benefits. The techniques of stone bands and framed bands also remain in use as means to protect the fields and villages against wind.

**[Improving soil fertility by utilizing human waste]**

- By applying compost from human waste (via an ECOSAN latrine), lettuce and millet yields increased by 2.6 times and 1.3 to 1.6 times, respectively.
- Obtaining understanding of the advantages of this technique which utilizes human waste proved a major challenge, given the cultural and religious background of the residents. However, through training sessions and sensitization, users came to understand the advantage and accept the techniques. This approach achieved remarkable results in terms of behavioral transformation.

### 3-2. Lessons learned

- Establishing a dissemination system was key to this approach. JICA experts visited both forestry and education departments, where contacts had previously been limited and spent sufficient time in dialog to gain their understanding. Consequently, the relevant organizations reached consensus and the outputs of this approach were well received.
- To create a solid working relationship with other sectors in implementing the approach, all parties involved in each field must recognize their respective roles and fulfil their respective responsibilities. For example, in the case of this project, forest and agricultural sectors were technical advisors, the local government was the financial supporter and the educational sector was the mediator.
- The economic benefit was one of the key factors behind sustainability and the way techniques were disseminated with this approach. The villagers' awareness of economic as well as environmental benefits has been contributing to the continued plantation of eucalyptus trees, whereas details of the ECOSAN latrine were not disseminated widely due to the cost of its installation, despite villagers realizing its environmental, agricultural and hygienic benefits.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-2.15 |
| Title of the project from which the approach is derived | Capacity-building Project for the control of land degradation and the promotion of land recovery in degraded soil areas |
| Country | The Republic of Senegal |
| Biome | Savanna |
| Implementing term | 2011/3- 2016/3 |
| Implementing organizations | Commission of Forestry, Hunting and Soil conservation of the Ministry of Environment and Conservation of Nature |
| Supporting organizations | Japan International Cooperation Agency (JICA), Earth and Human Corporation |
| Report/Tool/Guideline | Rapport Final : Projet de renforcement des capacities pour le controle de la degradation des terres et la promotion de leur valorisation dans les zones de sols degrades<br><br>(The materials shown below are contained in the above report)<br><br>- MANUEL TECHNIQUE SUR LES OUVRAGES DE DIGUETTE EN CADRE<br>- Manuel du Caisson de Compost du CODEVAL<br>- LUTTE CONTRE LA DEGRADATION DES TERRES et LEUR VALORISATION -GUIDE PRATIQUE-<br>- Techniques et mesures de lutte contre la degradation des terres et de promotion d'un Meilleur avenir dans le monde rural<br>- GUIDE D'UTILISATION DES OUTILS DE SENSIBILISATION <<SARAR/CODEVAL>> Contrôle participative de la Dégradation des terres dt de la promotion de leur Valorisation<br>- PLAN DETAILLE DE LA LATRINE VIETNAMIENNE |
| Contributors to this article | Yasuhisa Tanaka /Japan Forest Technology Association (JAFTA)<br>Takuya Shiraishi/Oriental Consultants Global |

# Next-generation Sustainable Land Management framework that integrates soil-erosion prevention work, land productivity and local communities' livelihoods

## 1. Approach's Outline and Features

This approach aims to develop a new **Sustainable Land Management (SLM) framework** that integrates and promotes efforts to prevent soil erosion, improve land productivity and boost the quality of life of local communities by **linking research and development**.

**The new SLM framework** comprises (i) SLM technologies to prevent soil erosion and increase land productivity and (ii) Approaches to disseminate those SLM technologies; synthesizing both for end users in the form of a policy brief or guidelines.

**Creation of novel scientific value in SLM technologies**: Although SLM has been widely implemented worldwide to deal with desertification, it has yet to be scientifically verified as sustainable and effective in an integrated manner. This approach has helped consolidate the scientific value of SLM technologies such as techniques to prevent soil erosion, improved feeding systems and foraging species on grazing land, income-generating activity and an innovative approach to increase farmers' participation in SLM activities.

**Development of an integrated SLM framework and upscaling through widespread extension**: This approach integrated individual research results to create the Next-Generation SLM Guidelines and policy brief. It also fostered momentum for discussions on upscaling through widespread extension among stakeholders, dialog with government officials and other relevant development partners. As part of these efforts, a partnership agreement among key stakeholders with clear roles and responsibilities is being discussed and prepared for implementation.

**Keywords**

Sustainable Land Management (SLM), Soil erosion, Land productivity, Livelihood, Evidence-based development

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

The degradation of natural resources (land, water and vegetation) is the biggest environmental problem in Ethiopia, with land degradation caused by water erosion the most alarming element.

**Soil erosion Blue Nile upriver region (Source: JST)**

Within sub-Saharan Africa, Ethiopia is considered one of the countries worst affected by land degradation, which is mainly attributable to soil erosion. Currently, around 300,000 hectares are thought to be affected each year, as well as an average 1.5 billion tons or so of soil eroded nationwide. If such huge soil losses continue unabated, the Ethiopian Highlands could lose nearly all its topsoil within a century.

The causes are multifaceted: traditional cultivation methods, limited choice of Sustainable Land Management (SLM) technologies, historical and changing patterns of land ownership and limited

investment in agriculture and animal husbandry. The degrading impact of these human-induced causes is further exacerbated by natural factors such as steep topography and erosive rainfall.

Against this backdrop, the project named "Development of a Next-Generation SLM Framework to Combat Desertification" emerged; targeting an Ethiopian SLM model expected to improve the acceptance rate and sustainability of interventions by integrating economic, social and environmental aspects.

## 2-2. Details of measures taken

The purpose of the research project is to propose a **next-generation SLM framework** comprising (i) **SLM technologies** to reduce soil erosion and improve land productivity, while simultaneously initiating the socioeconomic empowerment of women and youth and (ii) **SLM Approaches** to spread those SLM technologies with four specific outputs:

1) A reduction in soil erosion by improving soil-erosion assessment and control methods

- Development of (1) an affordable and accurate soil-erosion monitoring system (2) soil-erosion assessment framework and (3) soil-erosion prevention techniques.
  - Experimentation on optimal bund spacing.

2) Boosting land productivity by harmonizing crop cultivation and livestock farming

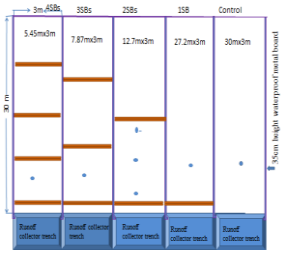
- Development of (1) comprehensive soil fertility management and retaining of reduced tillage methods on arable land, (2) improved feeding system and forage species in the grazing land and (3) land-restoration techniques for degraded hills.
  - Experimentation to determine the effectiveness of soil amendments using polyacrylamide (PAM), lime; gypsum, biochar and manure.

3) Enhancement of farmers' livelihoods by economic and social empowerment.

- Elucidation of the socioeconomic structure and the causes of poverty.
- Development of (1) income-generating activity and (2) an innovative approach to increase farmers' participation in SLM activities.

4) Development of integrated watershed management technologies and approach.

- Development of (1) multiple future watershed development scenarios, (2) an SLM approach through establishing an Innovation Platform and (3) next-generation SLM guidelines and policy brief.
  - Modelling of the impact of watershed management practices on flow and soil erosion
  - Dissemination of effective soil amendment practice (i.e. PAM plus lime) at farmers' field day
  - Research institutions such as Bahir Dar University and Amhara Regional Agricultural Research Institute and agricultural administration agencies like the Amhara Bureau of Agriculture have mutually agreed on the "Regional Research Based Sustainable Land Management (SLM) Partnership" to ensure the approach remains sustainable and attain the following objectives:
    1. To exchange progress and the results of research and activities to build a common understanding of key issues.
    2. To plan, review and monitor joint activities or ongoing projects/programs.

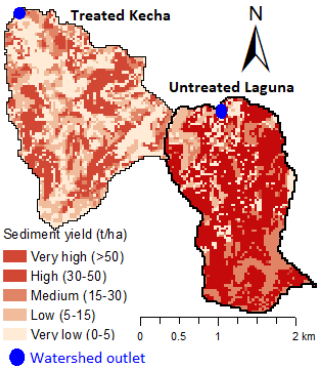



**Experiment on optimal bund spacing**
**Runoff plots in croplands**

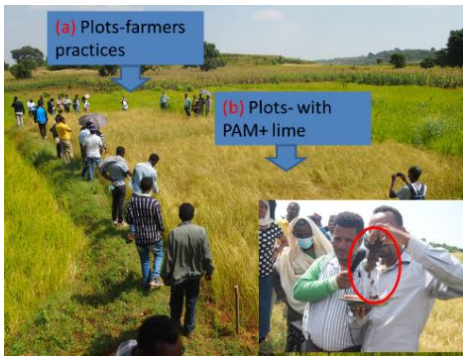

**Experiment on the effectiveness of soil amendments**
**C: Control; PAM: Polyacrylamide, G: Gypsum**




**Community-initiated Gully Management**




**Modelling: The impact of watershed management practices on flow and soil erosion**




**On-site demonstration of the effects of polyacrylamide during the farmers' field day**

**(Source: Research team)**

**(Perspectives on sustainability)**

- **Economic incentives for the community**: Numerous SLM programs in Ethiopia have been implemented on the premise of free assistance from the local community, which has hampered sustainability. Conversely, the approach of this project emphasizes efforts to incentivize local communities by improving agricultural productivity and economic issues affecting the vulnerable.
- **Extension of the new SLM framework:** Aiming to ensure the sustainability of diverse activities under the new SLM framework, this approach tried to mainstream the new SLM framework in Ethiopia by developing guidelines and a policy brief and coordinating with national stakeholders such as the Ministry of Agriculture and SLM national program coordinator.
- A framework for the partnership was established between the research institution and the agricultural administration body.

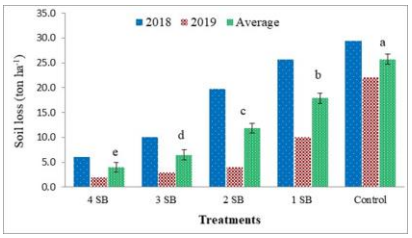
## 3. Analysis of the approach

### 3-1. Impact

- **Creation of novel scientific value in SLM methodologies**: Although SLM is widely implemented worldwide as a means of mitigating desertification, its effectiveness and sustainability have not been sufficiently scientifically verified. This approach has helped underpin their scientific evaluation and improvement. In particular, it has helped create novel scientific value in SLM methodologies, including improvement of the cultivation and agronomic practices of Teff crop - the main staple in Ethiopia - and improving the livelihood of inhabitants.

  ➢ **Optimal Bund spacing**

  Taking the entire set of economic, environmental and social factors into consideration, a set-up of **two bunds spaced 12.7-m apart within each 30-m study plot** was considered optimal.




**Efficiency of different soil bund-spacing treatments in terms of the percentage reduction of runoff and soil loss (Simeneh et al., 2022).**

  ➢ **Effectiveness of soil amendments**

  **PAM plus lime improved the soil pH and aggregate stability** that led to reduced runoff and soil loss and increased biomass and crop yield.

  ✧ Amendments **reduced the soil loss by 13–53%,** compared to the control (Kebede et al., 2021) and **improved crop yield by 19–37%** (Mulualem et al., 2021).

**Dairy farming in Avagarima**

  ➢ **Income-generation activities**

  The number of beneficiaries of dairy cows increased from eight in the previous year to 18 in Avagarima.

- Development of an integrated SLM framework and momentum for its extension fostered: This approach integrated individual research results to create the Next-Generation SLM Guidelines and policy brief, while also fostering momentum for discussions on upscaling through widespread extension among stakeholders, through dialog with government officials and others.

  ➢ Regional innovation platforms were developed, including on a local level, through which research results and information were shared, demonstrated and exchanged with local institutes and farmers.

### 3-2. Lessons learned

- Clarifying the responsibilities of the relevant institutions and the path to social implementation (i.e. effective measures with specific conditions and measures) was crucial to develop and extend the next-generation SLM framework.
- Regarding the existing national SLM program, it was valuable, not only to promote cooperation for the social implementation of the new SLM framework, but also to mutually consolidate such cooperation so that the results and funds of said program could be utilized in the target areas of this research project.

- Scope to apply scientific findings to actual farming practices depends on the regional SLM-related institutes collaborating. A supportive structure of continuous cycles is needed, enhancing scientific knowledge and actual practice on the farm, with multi-level collaboration (even after the project).
- Evidence-based SLM development and planning are essential and its framework should be developed.
- Considerable funding is required to widely disseminate economic incentives for farmers (e.g. dairy cow/farming cooperation, etc.). Accordingly, it was important to build a mechanism to secure funds after the project is completed by reflecting research results such as economic incentives in policies based on academic values.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-2.16 |
| Title of the project from which the approach is derived | Development of Next-generation Sustainable Land Management (SLM) Framework to Combat Desertification |
| Country | Federal Democratic Republic of Ethiopia |
| Biome | Dryland (the Upper Blue Nile River Basin) |
| Implementing term | 2016/6 – 2023/3 |
| Implementing organizations | Bahir Dar University, Tottori University, Shimane University, University of Tokyo |
| Supporting organizations | Japan Science and Technology Agency (JST),<br>Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | List of publications<br>(55 papers published as of July 2022).<br>Project Website |
| Contributors to this article | Takuya Shiraishi, TEJIMA, Shigeharu/Oriental Consultants Global Co., Ltd. |

**List of publications**

- Multidimensional Poverty and Inequality: Insights from the Upper Blue Nile Basin, Ethiopia
- Changes in ecosystem service values strongly influenced by human activities in contrasting agro-ecological environments
- Application of an optical disdrometer to characterize simulated rainfall and measure drop-size distribution
- The Influence of Income and Livelihood Diversification on Health-Related Quality of Life in Rural Ethiopia
- Influence of raindrop size on rainfall intensity, kinetic energy, and erosivity in a sub-humid tropical area: a case study in the northern highlands of Ethiopia
- Evaluation of lag time and time of concentration estimation methods in small tropical watersheds in Ethiopia
- Economic and financial sustainability of an Acacia decurrens-based Taungya system for farmers in the Upper Blue Nile Basin, Ethiopia
- Soil Structure Stability under Different Land Uses in Association with Polyacrylamide Effects
- Exploring Drivers of Livelihood Diversification and Its Effect on Adoption of Sustainable Land Management Practices in the Upper Blue Nile Basin, Ethiopia
- The impacts of Acacia decurrens plantations on livelihoods in rural Ethiopia
- Small-Scale Woodlot Growers' Interest in Participating in Bioenergy Market In Rural Ethiopia
- Effects of land use and sustainable land management practices on runoff and soil loss in the Upper Blue Nile basin, Ethiopia
- Effectiveness of Polyacrylamide in Reducing Runoff and Soil Loss under Consecutive Rainfall Storms
- Welfare effects of small-scale farmers' participation in apple and mango value chains in Ethiopia
- Exploring land use/land cover changes, drivers and their implications in contrasting agro-ecological environments of Ethiopia
- Determinants of small-scale farmers' participation in Ethiopian fruit sector's value chain
- Exploring the variability of soil properties as influenced by land use and management practices: A case study in the Upper Blue Nile basin, Ethiopia
- Spatial distribution and temporal trends of rainfall and erosivity in the Eastern Africa region
- Effect of subsurface water level on gully headcut retreat in tropical highlands of Ethiopia
- Morphological characteristics and topographic thresholds of gullies in different agro-ecological environments
- Determining C- and P-factors of RUSLE for different land uses and management practices across agro-ecologies: case studies from the Upper Blue Nile basin, Ethiopia
- The dynamics of urban expansion and land use/land cover changes using remote sensing and spatial metrics: the case of Mekelle City of northern Ethiopia
- Hydrological responses to land use/land cover change and climate variability in contrasting

agro-ecological environments of the Upper Blue Nile basin, Ethiopia

- Agroecology-based soil erosion assessment for better conservation planning in Ethiopian river basins
- Evaluating runoff and sediment responses to soil and water conservation practices by employing alternative modeling approaches
- Examining the Impact of Polyacrylamide and Other Soil Amendments on Soil Fertility and Crop Yield in Contrasting Agroecological Environments
- Yield Potential and Variability of Teff (Eragrostis tef (Zucc.) Trotter) Germplasms under Intensive and Conventional Management Conditions
- Effects of Land Use and Topographic Position on Soil Organic Carbon and Total Nitrogen Stocks in Different Agro-Ecosystems of the Upper Blue Nile Basin
- Factors influencing small-scale farmers' adoption of sustainable land management technologies in north-western Ethiopia
- Tillage and crop management impacts on soil loss and crop yields in northwestern Ethiopia
- Biomechanical Properties and Agro-Morphological Traits for Improved Lodging Resistance in Ethiopian Teff (Eragrostis tef (Zucc.) Trottor) Accessions
- Tillage and sowing options for enhancing productivity and profitability of teff in a sub-tropical highland environment
- Effect of Soil Microbiome from Church Forest in the Northwest Ethiopian Highlands on the Growth ofOlea europaeaandAlbizia gummiferaSeedlings under Glasshouse Conditions
- Effects of substituting concentrate mix with water hyacinth (Eichhornia crassipes) leaves on feed intake, digestibility and growth performance of Washera sheep fed rice straw-based diet
- Agro-Economic Evaluation of Alternative Crop Management Options for Teff Production in Midland Agro-Ecology, Ethiopia
- FARMERS' PERCEPTION ABOUT SOIL EROSION IN ETHIOPIA
- Evaluation of satellite rainfall estimates over the Lake Tana basin at the source region of the Blue Nile River
- Exploring the variability of soil nutrient outflows as influenced by land use and management practices in contrasting agro-ecological environments
- Analysis of long-term gully dynamics in different agro-ecology settings
- Effect of exclosure on subsurface water level and sediment yield in the tropical highlands of Ethiopia
- Impact of Soil and Water Conservation Interventions on Watershed Runoff Response in a Tropical Humid Highland of Ethiopia
- Characterizing shallow groundwater in hillslope aquifers using isotopic signatures: A case study in the Upper Blue Nile basin, Ethiopia
- Mitigating the anti-nutritional effect of polyphenols on in vitro digestibility and fermentation characteristics of browse species in north western Ethiopia
- Analyzing the variability of sediment yield: A case study from paired watersheds in the Upper Blue Nile basin, Ethiopia

- Smallholder farmers' willingness to pay for sustainable land management practices in the Upper Blue Nile basin, Ethiopia
- Efficiency of soil and water conservation practices in different agro-ecological environments in the Upper Blue Nile Basin of Ethiopia
- Cropland expansion outweighs the monetary effect of declining natural vegetation on ecosystem services in sub-Saharan Africa
- Effects of farmyard manure and Desmodium intercropping on forage grass growth, yield, and soil properties in different agro-ecologies of Upper Blue Nile basin, Ethiopia
- Exploring teff yield variability related with farm management and soil property in contrasting agro-ecologies in Ethiopia
- Spatial variability of soil chemical properties under different land-uses in Northwest Ethiopia
- Factors Affecting Small-Scale Farmers' Land Allocation and Tree Density Decisions in an Acacia decurrens-Based taungya System in Fagita Lekoma District, North-Western Ethiopia
- Laser methane detector-based quantification of methane emissions from indoor-fed Fogera dairy cows
- Restoration efficiency of short-term grazing exclusion is the highest at the stage shifting from light to moderate degradation at Zoige, Tibetan Plateau
- Comprehensive assessment of soil erosion risk for better land use planning in river basins: Case study of the Upper Blue Nile River
- Global analysis of cover management and support practice factors that control soil erosion and conservation

# Integrated management of forest reserve and buffer zone in collaboration with local residents

## 1. Approach's Outline and Features

A study was conducted to develop a guideline for a participatory forest reserve management plan as well as implementing zoning land to prevent deforestation and degradation in forest reserves as part of efforts to address unsustainable agriculture and cattle ranching in northern Benin.

Plans were made to establish a residents' organization to organize residents' activities within the forest reserve and establish a forest management fund to cover the costs of such activities through residents' organization. The work is to be funded by income and payments from residents' activities within the forest reserve.

**Keywords**

Zoning, Forest reserve management plan, Livelihood improvement, Residents' organization, Forest management fund

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Benin, deforestation is proceeding rapidly due to the expansion of agricultural lands, burning, overgrazing associated with population growth. Forest reserves are state-owned forests that are supposed to function in the public interest, but local residents have been entering and converting them to agricultural land, logging and grazing in an unregulated manner, which has inevitably resulted in degradation of the forest reserves. The government of Benin enacted the Forest Law in 1993, followed by a Forest Policy in 1994 allowing local residents to use forest reserves. The Policy stipulates the formulation of a forest management plan to harmonize agriculture, cattle-raising and forestry and encourage local residents to get involved in forest management. This research program involves studying a method to sustainably manage and operate efforts to formulate and implement a forest management plan targeting three forest reserves and their peripherals as a buffer zone in northern Benin.

### 2-2. Details of measures taken

- Studying the current status of the forest
  - Soil maps and forest distribution maps in the targeting forest reserves were prepared by JICA experts in collaboration with forest officers based on topographical maps, forest stand maps, tree species composition and other data required to formulate a forest management plan.
  - Workshops were held to explain the idea of the draft plan and exchange opinions with local residents. The survey and workshop outputs were incorporated into the draft forest management plan.

**Workshop at the village (photo :JICA)**

- Formulating the forest management plan
  - The main issues with the forest management plan are: 1) conservation of forests in water source areas, 2) enhancing forest productivity, 3) conversion from shifting farming to intensive permanent farming and 4) shifting from unregulated grazing to intensive cattle grazing.
  - The areas were to be managed under the following zoning categories:

1) Forest zone
(Conservation forest, Production forest)

1-1) Conservation forests shall be protected, particularly to protect water sources and logging is prohibited as a general rule.

1-2) In Production forests, logging for timber and firewood is allowed.

2) Village forest zone
- The village forest zone can be used by local residents for cultivating land, beekeeping, charcoal production and taking firewood for personal use.

3) Silvo-pastoral zone
- The silvo-pastoral zone can be used to create artificial grassland and livestock (cattle, sheep, goats) grazing in the forest.

* Riparian forests near rivers were to be treated as conservation forests in both the village forest and silvo-pastoral zones.

**Tectona grandis plantation in Production forest (photo: JICA)**

**Natural regeneration stand in the Silvo-pastral zone (photo: JICA)**

- Showing the forest reserves boundary
- Boundary marker stones and signboards were installed to help local residents understand the existence of forest reserves.

**Boundary marker stone showing the forest reserve border (photo: JICA)**


**Signboard of the forest reserve (photo: JICA)**

- Establishing buffer zones
- Buffer zones were established at a 7km perimeter of the forest reserve. Within the buffer zone, residents are free to cultivate, graze and gather fruit. Agroforestry is especially recommended. Riparian forests in buffer zone are to be handled as conservation forest.
- The forest reserve is managed and operated in line with the forest management plan
- A resident organization manages, operates and maintains the forest reserve under agreement with the Department of Forest.
- Establishment of a forest management fund
- A forest management fund is established as a financial resource to manage the forest management plan autonomously.
- A portion of the revenues from producing timber, firewood and fruit from forest reserves, as well as charges for grazing use, are used to fund the Forest Management Fund.
- The Forest Management Fund is used for firewood and charcoal production projects conducted by the resident organization in the forest reserve and to make small loans to residents.

**(Perspectives on sustainability)**

- Forest management plans are developed and implemented by agreement between the Department of Forest and community organizations. Since residents are the main actors in the process, forest officers have to instruct them on the necessary skills. Accordingly, during the survey period, Japanese experts provided training to transfer skills related to the following items to forest officers through technical transfer workshops, on-the-job training and training in Japan.
  - ✓ Forest management plan formulation method
  - ✓ Aerial photo interpretation method
  - ✓ Survey methods of local residents
  - ✓ Cultivation and grazing methods

    etc.

## 3. Analysis of the approach

### 3-1. Impact

Since this approach involves forest officers developing a forest management plan in collaboration with local residents, residents have to fully understand the forest plan and participate in its implementation. Forest officers worked with JICA experts to prepare a draft forest management plan and ultimately complete the plan through workshops and other dialogue and discussions with local people. Through this process, forest officers were recognized as having gained the capacity to develop forest management plans for forest reserves with residents' participation.

### 3-2. Lessons learned

- Aerial photo interpretation was used to design forest cover maps showing the forest distribution. When the draft zoning plan was presented at a workshop to explain the draft forest management plan to the villagers, these maps were very effective in enhancing their understanding of the plan, as it gave them a concrete understanding of the local situation. This was recognized as F-PIC (Free and Prior Informed Consent) at the time and remains useful to this day as a means of promoting this approach involving local residents, even when aerial photography is replaced with satellite imagery.

- In this approach, resident organizations are responsible for implementing the management plan for the forest reserve. Until residents become accustomed to the operation of these organizations, it is advisable for a technical expert from the Department of Forest to provide general guidance and advice to resident organizations on how to formulate and implement work plans and collect, manage, and distribute forest management funds.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-3.17 |
| Title of the project from which the approach is derived | The study on cartography, inventory and management of classified forest in Northern Benin |
| Country | Republic of Benin |
| Biome | Savanna |
| Implementing term | 1998/October – 2000/December |
| Implementing organizations | Department of Forest, Ministry of Rural Development, Remote Sensing Forest Cover Research Center |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA), Sanyu Consultants, Aero Asahi Corporation |
| Report/Tool/Guideline | Project Final Report: main text,<br>Improvement Plans,<br>Forest Management Guidelines |
| Contributors to this article | Yasuhisa Tanaka /JAFTA |

# Strengthening capacity on tree breeding techniques for drought-tolerant and good growth trees and promoting commercial forestry

## 1. Approach's Outline and Features

**Experts explaining grafting techniques**
**(Source: JICA Website)**

This approach focuses on the breeding of *Melia Volkensii*, a fast-growing indigenous tree, resistant to drought, on arid and semi-arid land.
The timber produced from *Melia Vokensii* is hard and high quality. Thanks to tree breeding, the offspring generation of selected plus trees with superior phenotypes for growth, form, wood quality, or other desired characteristics, are said to have a 14% higher stem volume compared to the parental generation.

- Main tree-breeding processes

  Tree-breeding activities include: selecting candidate-plus trees, establishing clonal seed orchards, and selecting drought-tolerant trees from candidate-plus trees.

- Promotion of improved trees

  - Guidelines for seedling production and distribution were developed as part of efforts to establish a quality seed and seedling supply system.
  - Commercial forestry was promoted in collaboration with private companies.

**Keywords**

Tree breeding, Clonal orchard, Seed and seedling supply system, Plus tree, Indigenous species, Collaboration with private companies, Arid and semi-arid land

## 2. Description of the projects forming the basis for this approach

### 2-1. Introduction

In Kenya, arid and semi-arid lands (ASALs) comprise 80% of the country's land area, and only 7% is forested. About 70% of the energy consumed in Kenya is generated by fuel wood, placing considerable pressure on forest resources. In response, Kenya's national development program, Vision 2030, aims to achieve a forest/tree cover equivalent to at least 10% of the land area for sustainable resource use.

*Melia volkensii* is one of the first-choice tree species when planting in ASAL in Kenya because it is fast-growing, drought-resistant, and produces high-quality timber. The Kenya Forestry Research Institute (KEFRI) already launched a study on plus tree selection for *Melia volkensii* but lacked sufficient experience to evaluate growth and other traits for drought tolerance.

With the situation in mind, "Project to Develop Drought-Tolerant Trees for Adaptation to Climate Change in the Drylands of Kenya" was conducted from 2012 through 2017 to boost the capacity of

tree-breeding research and establish a system to increase the number of improved seeds of indigenous species.

After this project, the "Capacity Development Project for Sustainable Forest Management (CADEP or CADEP-SFM)" was also implemented from 2016 to 2021, targeting capacity-building for sustainable forest management in Kenya, and one of the main activities was tree breeding.

### 2-2. Details of measures taken

- Tree breeding
  - Selecting candidate-plus trees of Melia volkensii
    Selecting 100 candidate-plus trees
  - Establishing clonal seed orchards
    1) Preparation of root stocks, 2) Scions collection of candidate-plus trees, 3) Grafting propagation for clonal seed orchards, 4) Site preparation of clonal seed orchards and 5) Planting seedlings in the clonal orchard
  - Evaluation of plus trees of Melia volkensii based on progeny performance
  - Selecting those candidate-plus trees that are drought-tolerant
  - Improving clonal seed orchards

- Promotion of improved trees of *Melia Volkensi*i

  [Establishing a quality seed and seedling supply system]
  - Review, analyze and document the current status of seed and seedling production and distribution
  - Developing a guideline to secure the production and distribution of seeds and seedlings
    1) Explain the Japanese system of quality seed and seedling production and distribution as a good example. 2) Draft the guideline based on 1) and finalize it as a "Seed distribution guideline".

  [Promoting commercial forestry by collaborating with private companies]
  - Holding a workshop for government institutions, private companies and NGOs to discuss possible means of collaboration with private companies and NGOs in tree growing.
  - Holding a seminar for private companies and NGOs/CBOs to disseminate technology, skills and knowledge on growing and management of Melia volkensii.
  - Coordinating signing of an MOU between research institutions and private companies.
  - Providing 300 improved Melia volkensii seedlings to a private company for trial plantation.

**Seedlings of *Melia volkensii***

**Nursery to manage grafted clones**

**Launching a Participatory Forest Management Plan**

**Interviewing a trader of *Melia volkensii***

**(Source: JICA report)**

**(Perspectives on sustainability)**

- Focusing on the capacity-building of the counterpart (KEFRI) for tree breeding, so that KEFRI can handle tree breeding independently after the project ends.
- Using free and generic tools to analyze data related to tree breeding so that KEFRI can use the tools long term.
- Making guidelines like a "Seed distribution guideline" to convey knowledge and experience of tree breeding and distribution of seed/seedlings to stakeholders.
- Through a technical tie-up with the Project for Strengthening Forestry Sector Development and Community Resilience to Climate Change through Sustainable Forest Management and Landscape Restoration (SFS-CORECC), a private company is about to launch the production of high-quality seedlings.
- Various forestry-related technical books have also been developed and published on the KEFRI website for anyone to access and use.

## 3. Analysis of the approach

### 3-1. Impact

[Tree breeding]

- It is estimated that the timber volume of *Melia Volkensii* increased by 14% after selecting the second generation of plus trees.

[Promotion of improved trees of Melia Volkensii]

- Establishing a quality seed and seedling supply system for indigenous species
  - ➢ The Seed Distribution Guideline was published.

- Promoting commercial forestry by collaborating with private companies
  - ➢ KEFRI established a basis for cooperation with private companies to promote improved *Melia Volkensii* in Kenya.
  - ➢ Boosting awareness of improved *Melia Volkensii* among private companies.

### 3-2. Lessons learned

- Indigenous tree species such as *Melia volkensii* are familiar to local people and quality seeds and seedlings of these species developed through tree-breeding activities are easily acceptable. Accordingly, strengthening the supply system of improved seeds and seedlings of indigenous species can promote efforts to restore tree cover.
- However, when breeding trees, the trees grow very slowly in a process that is not complete within one short project period. The tree-breeding project plan should be established for over a decade, and its progress needs to be regularly monitored.
- Since this approach targets wide-ranging components (e.g. tree breeding, seedling production and distribution and promotion of commercial forestry), collaboration with many stakeholders, such as the government, private sector and local people is necessary.
- As well as providing seedlings to private companies, ongoing technical support for tree planting is needed to promote commercial forestry, given the importance of monitoring and follow-up after the planting process to encourage the growth of trees. In fact, its efforts have already been initiated by the SFS-CORECC.
- Providing information such as a growth curve to explain the benefits of introducing improved tree species compared to non-improved ones to private companies is helpful because private companies can easily understand the advantages.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-4.18 |
| Title of the project this approach derived from | (1) Development of Drought Tolerant Tree for Adaptation to Climate Change in Drylands of Kenya<br>(2) Capacity Development Project for Sustainable Forest Management (CADEP or CADEP-SFM)<br>(3) Project for Strengthening Forestry Sector Development and Community Resilience to Climate Change through Sustainable Forest Management and Landscape Restoration (SFS-CORECC) |
| Country | Republic of Kenya |
| Biome | Desert/Semi-desert |
| Implementing term | (1) 2012/July – 2017/June<br>(2) 2016/July- 2021/October<br>(3) 2022/January-2027/January |
| Implementing organizations | (1) Kenya Forestry Research Institute (KEFRI)<br>Kenya Forest Service (KFS)<br>(2) Ministry of Environment and Forestry (MoEF)<br>Kenya Forestry Research Institute (KEFRI)<br>Kenya Forest Service (KFS)<br>County Governments (Embu and Taita Taveta) |

| | |
|---|---|
| | (3) Ministry of Environment and Forestry (MoEF)<br>Kenya Forestry Research Institute (KEFRI)<br>Kenya Forest Service (KFS) |
| Supporting organizations | Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | ・ Guidelines for Conservation of Genetic Diversity (2017)<br>・ Market Research (Production, Management and Distribution of Seeds and Seedlings) (2014)<br>・ Guidelines for the Extension of Superior Seeds and Seedlings (2017)<br>・ Guideline on clonal propagation of *Melia Volkensii* (2021)<br>・ Genetic performance and plus tree traits table for *Melia Volkensii* in the drylands of Kenya (2021)<br>・ Manual for establishing and managing *Melia Volkensii* (2021)<br>・ Participatory Forest Management Plan (PFMP)<br>・ Seed Distribution Guideline |
| Contributors of this article | Takamasa Noro, Leo Watanabe, TEJIMA Shigeharu /Oriental Consultants Global |

# Sustainable wetland management plan based on scientific information

## 1. Approach's Outline and Features

This approach helps create a plan to manage wetlands in Uganda 1) based on scientific information and 2) sustainably with its organization.

**1) Wetland Management Plan based on scientific information**

Scientific data were collected and input into the upgraded National Wetland Information System (NWIS), based on which the wetland management plan was created.

**Wetland in Uganda (photo: JICA Website)**

**2) Sustainable Wetland Management Plan with government organization**

- **Capacity-building for government officers**

  Capacity-building for government officers was implemented with the following procedures:

  a) Conducting a capacity-training needs assessment
  b) Developing a Wetland Management Manual
  c) Implementing training programs in Uganda and Japan

- **Harmonization of the wetland management plan with existing policies, laws and regulations**

  Existing policies, laws and regulations considered as having the potential to impede efforts to implement the wetland management plan were identified and reviewed. Based on the result, certain recommendations to avoid friction between these policies and the plan were put forward.

**Keywords**

Sustainable Wetland Management Plan, Wetland Assessment, Scientific information, Capacity-Building

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Uganda, given the lack of a proper wetland management plan and the required information and data, land was cleared without evaluating the conservation value of the wetland. This raised concerns that the soil and water of the wetlands would be excessively disturbed, harming the habitat of the birds, fish and amphibians that call it home. Accordingly, the project named "National Wetlands Management Project in the Republic of Uganda" was implemented to promote sustainable management of wetlands based on scientific data and create wetland management plans in the Namatala-Doho Wetland and Awoja Wetland systems.

## 2-2. Details of measures taken

- **Upgrading the National Wetland Information System (NWIS)**

  The existing NWIS was upgraded by assessing where scientific information was lacking and re-designing the system.

- **Collecting scientific wetland information**

  Scientific data on national wetlands were collected by reviewing existing information and implementing wetland surveys. The major survey items were described below:

  - Ecosystem Assessment
  - Wetland Use and Livelihood Assessment
  - Assessment of the Flood-Control Function
  - Preliminary Assessment of Soil Erosion and Sediment Yield
  - Sedimentation Monitoring
  - Water Quality Assessment
  - Rural Biomass Energy Assessment

- **Creating a Wetland Management Plan**

  Based on the above scientific wetland information, the project supported efforts to create the wetland management plan. The project discussed the key issues of managing the wetland with community members, then reflected them in the management plan.

  After creating the Wetland Management Plan, the project supported efforts to create the Sub-County and District Wetland Action Plan. All the stakeholders, including community leaders, participated in the process of creating these plans.

- **Implementation of pilot activities**

  The project implemented the pilot activities based on the Sub-County wetland action plan in the selected pilot sites.

- **Harmonization of the wetland management plan with existing policies, laws and regulations**

  The project made some recommendations to the Ugandan government to strengthen the policy framework, given certain issues with existing policies, laws and regulations for managing wetlands sustainably. For example, the project highlighted no reference made to the need to protect biodiversity in the existing government wetland guideline. Accordingly, the project suggested that it should be included in the same.

- **Capacity-building for government officers**

  The project implemented capacity-building for government officers via the following procedures:

  a) Conducting a capacity training needs assessment
     The project issued questionnaires and interviews to determine the capacity and needs of government officers.

  b) Developing the Wetland Management Manual
     The project created the Manual and submitted it to the local government officers.

  c) Implementing training programs in Uganda and Japan
     The project conducted nationwide wetland management training three times in Uganda, in which a total of 314 District officers participated. The project also held training programs in Japan, in which a total of ten government officers participated.

**(Perspectives on sustainability)**

This approach made the NWIS data open to the public and accessible without using specific software to ensure as many people as possible could refer to the same.

**Training for the wetland management department**

**Awoja Wetland in Uganda**
**(One of the project sites)**
**Source (JICA web site)**

## 3. Analysis of the approach

### 3-1. Impact

- The ecological character of the wetland was improved by creating protection zones and planting trees along with pertinent water bodies in the pilot sites.
- The project questionnaire revealed that over half the central and local government officers overseeing pilot sites became able to understand and utilize wetland management manuals.
- The community's awareness of wetland conservation was enhanced by 18% compared to 2015 and 2016.

### 3-2. Lessons learned

- Creating an effective wetland management plan depends on considering wetland-related plans, like natural resource management.
- Adopting the wetland management plan into the local government development plan is important to ensure the plan works practically.
- There is a need to carefully select the stakeholders involved in the planning process of the wetland management plan, given that management plan affects wide-ranging stakeholders.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-5.19 |
| Title of the project from which the approach is derived | National Wetlands Management Project in the Republic of Uganda |
| Country | Republic of Uganda |
| Biome | Wetland / Savanna |
| Implementing term | 2012/March – 2016/December |
| Implementing organizations | CTI Engineering International Co., LTD<br>OYO International Cooperation<br>Earth & Human Cooperation |
| Supporting organizations | Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | ・ Project Completion Report<br>・ National Wetland Information System<br>・ Decision Support System (DSS)<br>・ District Wetland Action Plans<br>・ Sub-county Wetland Action Plans<br>・ Wetland System Management Plans<br>・ Community-based wetland management plans<br>・ Wetland Management Manual |
| Contributors to this article | Leo Watanabe /Oriental Consultants Global |

# Participatory wetland management improvement through income sources diversification

## 1. Approach's Outline and Features

To balance efforts to improve livelihoods and conserve mangrove ecosystems, a village activity package combining income-boosting and conservation activities, such as afforestation and firewood reduction, was established as an initiative which the residents themselves could manage.

While implementing the approach, spontaneous organizational change unfolded in one village and a young man with a vision to jointly manage local natural resources with surrounding villages spearheaded the village development, supported by the elderly who had been in leadership roles. Recognizing that outside support for afforestation activities was causing conflict between groups in another village, the target village voluntary implemented afforestation activities without outside support to restore unity and pride in the village.

**Keywords**

Livelihood improvement, Mangrove ecosystem conservation, Environmental fund, PDCA cycle, Residents' organization

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Senegal, mangrove areas have been declining and sustainable management has been a challenge. The Senegal Forest Policy (Politique Forestière du Sénégal) formulated in 2005, recommends that natural resource management be carried out with the participation of local residents. In response, the Senegalese government requested that JICA, which had conducted mangrove resource surveys from 2001 to 2005, assist in a project which would involve managing mangroves sustainably with the participation of local residents. This project involved targeting sustainable mangrove resource management by creating opportunities to improve livelihoods in the Saloum Delta, situated in the southwestern part of the Republic of Senegal.

### 2-2. Details of measures taken

- Residents' activities within the target villages to manage natural resources sustainably were implemented by appropriately combining "rational use" and "conservation". The specifics of each activity were as follows and residents learned and mastered the necessary skills:
  - Rational uses of mangrove ecosystems include oyster farming, shellfish processing and the production of fishing baskets and ecotourism, etc. to ease the pressure on mangrove resources and improve livelihoods.
  - Conservation activities include introducing improved stoves for household cooking and fish smoking to reduce firewood use, planting mangroves and establishing village forests as sources of charcoal, as a substitute for mangrove firewood.
- An environmental fund managed by village residents was established to redirect income generated from product sales during the above livelihood improvement activities to help fund afforestation activities.

To support the above activities and help manage the Environmental Fund, work to consolidate the scope for organizational and financial management got underway, centering on the experiential learning cycle (PDCA cycle). Specifically, while supporting on-site activities, the project asked residents to plan and hold periodic meetings to present the results of their activities at their own initiative; encouraging them to reflect on and conceptualize their activities.

- In addition, several methods of dialogic organization development: AI (Appreciative Inquiry), World Café, Future Search and Action Learning, were introduced to strengthen the capacity of management to adapt to the ever-changing natural surroundings and prevailing socioeconomic environment.

**Making fishing baskets (photo: JICA)**

**Oyster farming (photo: JICA)**

**Fish smoking stove (photo: JICA)**

**Planting *Rhizophora* (photo: JICA)**

**Planted *Avicenia* (photo: JICA)**

**Village forest for charcoal production (photo: JICA)**

**(Perspectives on sustainability)**

- At the end of the project, all target villages decided to distribute revenues to the Environmental Fund and two had already invested in the Environmental Fund. Accordingly, upon receiving income, it is expected that local residents will continue to draw on the Environmental Fund to help conserve the mangrove forests and restoration activities.

## 3. Analysis of the approach

### 3-1. Impact

- During the project period, reforestation work of mangrove species (Rhizophora spp. and Avicennia spp.) and the establishment of village forests for charcoal production progressed in all target villages. At the end of the project, residents had acquired skills and village residents' organizations were functioning as a result of capacity building through experiential learning cycles. The total income from livelihood improvement activities in the entire target village was 1,647,400 FCFA.
- The change in local residents' mentality brought by the project underpins the continued plantation of mangrove. The villagers, who used to think that trees belonged to the foresters, came to understand that planting and taking care of trees is for their own benefit in terms of protecting their environment and generating income.

### 3-2. Lessons learned

- The multifunctional aspects of mangrove ecosystems can be broadly divided into forest, fishery and tourism resources respectively. Reflecting on how to conserve each resource and use it rationally helps safeguard various options for adaptive and sustainable management. Conversely, the diverse deployment of resources has created diverse supply chains and stakeholders in terms of time and space and village-level efforts represent very partial trials. To maximize the profitability of the activities introduced by local residents, further and wider-scale efforts, such as assistance in accessing external markets, would be desirable.
- The potential area for mangroves has tended to change and decline following the degradation of the growing environment that began with the drought in the 1970s and the sea level rise in future. This project has seen afforestation techniques for *Avicennia spp*. developed and practiced, with some success. However, further research and innovative technologies, including work to enhance varieties, must be adapted to prevent the above changes.
- A series of processes, including awareness-raising activities by the project, residents' own experiences of environmental and economic benefits and sharing of experiences among other residents, are considered to have helped the mangrove plantation remain in place. The awareness-raising activities involved residents being encouraged to understand the environmental and economic benefits of mangrove plantations. At that point, however, it remained "theoretical knowledge" rather than facts backed up by experience. Later, some of the residents having experienced the benefits shared their experiences with others. This was considered key to sufficiently motivating the residents to continue their activities voluntarily.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-5.20 |
| Title of the project from which the approach is derived | Enhancement of Sustainability in the Mangrove Forest Management of Saloum Delta in the Republic of Senegal |
| Country | The Republic of Senegal |
| Biome | Savanna |
| Implementing term | 2005/11 – 2008/3 |
| Implementing organizations | Department of Waters, Forests, Hunting and Soil Conservation, Ministry of Environment, Protection of Nature, Reservoirs and Artificial Lakes |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA) |
| Report/Tool/Guideline (Scheduled) | Technical manuals of each activity |
| Contributors to this article | Junichiro Matsumoto/JAFTA<br>Takuya Shiraishi/Oriental Consultants Global |

# Creation of a system of natural resource management linked to markets and business and involving the participation of local residents

## 1. Approach's Outline and Features

This approach involves introducing a "**Forest Coffee Certification Program (FCCP)**" as a mechanism for local farmers (cooperative or forest users' group), both to help conserve forest and boost livelihoods through forest coffee production.

- **Wild coffee marketing conserves the forests**: This involves the unique approach of conserving areas where forest coffee proliferates while simultaneously promoting community livelihoods and establishing market linkages to premium value specialty coffee.
- **Private sector collaboration**:
  - **UCC Ueshima Coffee Co., Ltd**., Japan's leading coffee company, cooperates with the project by providing technical instruction to boost quality. The coffee produced is sold in Japan as specialty coffee through UCC.
  - **Rainforest Alliance (RA),** The project supported the efforts of the Forest Management Group (WaBuB) to obtain an **RA certificate** to increase the products' value, competitiveness and sustainability.
- **Premium value profit returned to farmers**: Realized export by adding premium value from the conventional low-quality domestic consumption. Returned profit from the premium to the farmers.

**Keywords:**

Forest conservation, Forest Coffee Certification, Internal Control System, Participatory Forest Management, Agroforestry, Private sector, Rainforest Alliance

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In the Belete-Gera region of Ethiopia, from where Arabica coffee originates, namely in a forest coffee area, a project to introduce the FCCP program was implemented with links to international marketing via a partnership between the local government and farmers. The forest coffee was also certified as environmentally friendly by obtaining Rainforest Alliance certification and implementing a certification system including evidence of compliance with environmental protection requirements.

- **The project's purpose:** to develop an appropriate Sustainable Forest Management (SFM) mechanism, which balances forest management and livelihoods in both Forest Coffee and Highland areas with differing natural conditions and agricultural activities
- **Project Period:** from July 2014 to November 2020
- **Biome:** Highland (forest coffee area / mountainous)

### 2-2. Details of measures taken

**Supporting the capacity development training on coffee certification program**

- FCCP was developed as an approach to promote forest coffee production and sell through business with overseas coffee companies while conserving forests. The Project also collaborated with **RA certificates**, developed a **quality-driven supply chain and post-harvest quality management** and organized a **coffee-cupping event** to ascertain the coffee quality.
- FCCP realized **Participatory Forest Management (PFM) and** the project adopted a **Forest Management Agreement (FMA)** as a tool **to incentivize forest conservation by connecting farmers to international specialty forest coffee markets.**
- Capacity development for the Cooperatives. Two **WaBuB PFM Cooperatives** were established as legal authorities and oversee the implementation of PFM activities based on the Forest Management Agreement for sustainable forest use.

**(Perspectives on sustainability)**

- Developing an FCCP mechanism through collaboration involving the public forest management body, the farmers' group and the private sector, including international standards body such as RA.
- Developed business-oriented structures such as an Internal Control System (ICS) to secure the Rainforest Alliance (RA) standard and traceability in marketing.
- From a longer-term perspective, the project prepared a draft forest coffee management guideline and revised ICS system to ensure the sustainability of FCCP, which successfully conserves the forest and produces forest coffee in a harmonized manner.

## 3. Analysis of the approach

### 3-1. Impact

The project spawned positive outcomes, in helping to conserve the forest and boost livelihoods. The details are as follows:

- Belete-Gera forest coffee attracts Japanese consumers and an "**Ethiopian Coffee**" brand, developed by the Ethiopian government through consultation with JICA, was launched.
- As of now, WaBuB (the Forest Management Association) monitors forests according to the **internal control system (ICS) developed under the project**, obtains the **Rainforest Alliance** certificate and while managing the forest appropriately, coordinates forest coffee production with high added value.
- A total of 12,160 (2014-2020, average 2,100/year) **coffee producers benefitted from the FCCP** (e.g. technical support from the Project and premium payment from buyers).
- **The deforestation rate declined** from 1.16% of the annual average from 1995 to 2000 to 0.6% in 2019, which suggests that deforestation has been mitigated in the Belete-Gera forest area.

### 3-2. Lessons learned

- Enhancing options such as the sales channel with farmer (coffee) cooperatives can mitigate risks and further diversify options for coffee farmers.
- An effort to showcase the forest products' story, value and uniqueness can attract domestic and international market buyers /consumer and help ensure a fair price and proper understanding.
- Deforestation-free forest utilization and management like this FCCP, working with public and private sectors, can help improve the forest environment.
- The Internal Control System (ICS) through the use of a tablet may be used not only for the forest coffee certification, but also for forest monitoring purposes.
- The assignment of a forest coffee expert in the implementation agency is desirable for the smooth and timely management of the project and the networking of the coffee-related society and market.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-6.21 |
| Title of the project from which the approach is derived | 1) Ethiopia Project to Support Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion<br>2) Participatory Forest Management Project in Belete-Gera Regional Forest Priority Area Phase 2 |
| Country | Ethiopia |
| Biome | Montane |
| Implementing term | 1) 2014/7/6 – 2020/11/30<br>2) 2006/10/1- 2012/3/31 |
| Implementing organizations | 1) Oromia Environment, Forest and Climate Change Authority (OEFCCA), Oromia Forest and Wildlife Enterprise (OFWE)<br>2) Oromia Bureau of Agriculture and Natural Resources (OBANR) |
| Supporting organizations | 1) Japan International Cooperation Agency (JICA), Japan International Forestry Promotion and Cooperation Center (JIFPRO), Appropriate Agriculture International (AAI)<br>2) JICA, IC Net Ltd. |
| Report/Tool/Guideline | 1) Project Completion Report<br>2) FFS (Farmer Field School) Approach for Agroforestry and Naturel Resource Development<br>WaBuB PFM in Belete-Gera Regional Forest Priority Area<br>Participatory Forest Management Project in Belete-Gera Regional Forest Priority Area Phase 2 |
| Contributors to this article | TEJIMA Shigeharu, Oriental Consultants Global Co., Ltd. |

# An Effective Business Model that Ensures both Sustainable Wood Procurement and Sustainable Forest Conservation

- Partnership among local community/NGO and private enterprises-

## 1. Approach's Outline and Features

This approach is a business model created by a Japanese private company that ensures sustainable timber procurement while maintaining sustainable forest conservation through collaboration with a private company, NGO and community that are all local.

**How can this approach secure sustainable timber procurement?**

- **Forest management:**
  - A local NGO in Tanzania manages FSC- (Forest Stewardship Council) certified forest where timber is procured. FSC is a certification to guarantee sustainable forest management.
  - To ensure the forest is replenished, the local community engages in afforestation with technical support from a local NGO.
- **Involvement of the local community**: A local private company employs local people to saw up logs, which boosts local development.
- **Better traceability:** Transparent traceability is ensured through direct procurement from local entities (i.e. the local community and a private company).

**Keywords**

Forest certification / FSC / Afforestation / Cooperation between a private company and community / sustainable business model

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

The African blackwood (hereinafter referred to as ABW, *Dalbergia melanoxylon*) is now widely distributed through sub-Saharan African countries such as Tanzania, Mozambique, Kenya, Nigeria and even Senegal. It is commonly known as Mpingo in Swahili (trade name, grenadilla) and generally used to manufacture wood-wind instruments like clarinets, oboes, piccolo and bagpipes. Since ABW is the only species capable of meeting the requirements for specific musical instrument production, it is crucial to conserve this timber resource to keep the music industry sustainable.

However, intensive harvesting has raised social concerns about the sustainability of ABW resources. Nowadays, this species has been designated as "Near Threatened" on the IUCN red list since 1998.

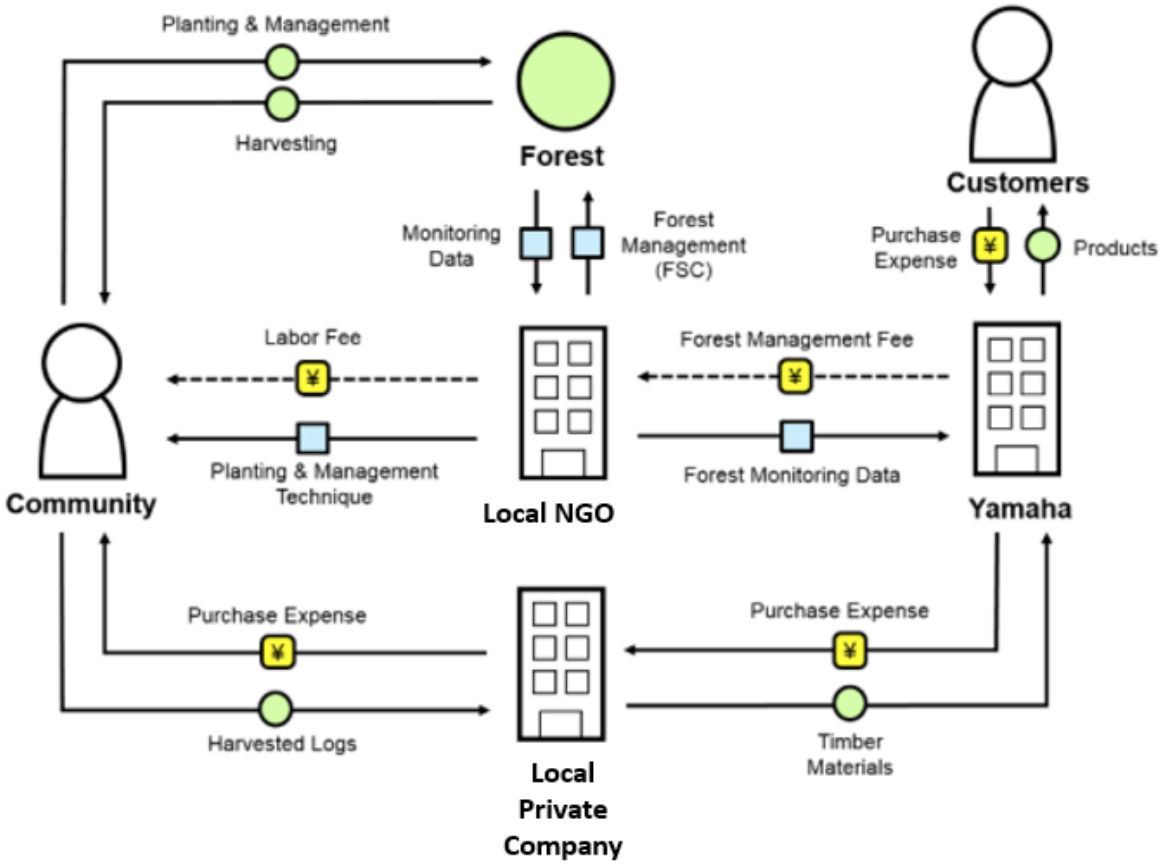
Yamaha Corporation (hereinafter referred to as Yamaha), a Japanese musical instrument manufacturer and seller, purchased ABW timber from Eastern African countries like Tanzania and Mozambique, over 20 years ago. To ensure sustainable ABW procurement, Yamaha focused on procuring FSC-certified ABW timber which could be directly supplied from local community forests in Tanzania. Based on the above background and with the relevant issues in mind, Yamaha aimed to develop a business model that harmonizes sustainable timber procurement and forest conservation through JICA's private-sector business promotion scheme.

**Tree trunk shape of African blackwood (photo: JICA)**

**Shape of each part of the clarinet material (photo: JICA)**

## 2-2. Details of measures taken

- Survey for African Blackwood habitat
  - Since the local NGO was already FSC-certified before the project, the amount of ABW was secured. However, checks to ensure the quality would suffice for use as a musical instrument were not conducted. Accordingly, the project team sought to find an appropriate environment in which to grow good-quality wood.
- Timber Procurement Trial from Forest Communities
  - As a trial, Yamaha procured ABW from the community through a local private company on the project site as part of efforts to establish a new value chain from the community to Yamaha
- Afforestation with the community
  - YAMAHA implemented ABW afforestation as a pilot project with communities to conserve forests and incentivize the communities to help conserve forests.
- Design a business model for sustainable ABW procurement
  - Yamaha designed the business model below for sustainable ABW procurement. With it, Yamaha can procure good-quality ABW by involving the community to manage the forest, while the community can earn an income along the two (2) value chains: (i) Labor fees from the local NGO for planting, managing and harvesting ABW and (ii) Selling harvested ABW to a local private company.




**(source: JICA (partially revised by the contributor to this article))**

**(Perspectives on sustainability)**

- Helping incentivize the community to preserve forest contributes to sustainable forest management because the community is the main group using the forest, including ABW. To do so, Yamaha increased the community's capacity to provide quality ABW by themselves on a sustainable basis. For example, boosting their capacities to breed seedlings and plant trees by organizing joint afforestation activities with the company. These activities helped the community earn income from planting, managing and selling good-quality ABW and incentivized the community to preserve forest, as described in the above business model.
- Yamaha selected a local NGO, which is in a close relationship with the community, to transfer tree planting & management techniques to the community.

## 3. Analysis of the approach

### 3-1. Impact

- The local community and project staff already implemented afforestation for 6.5 ha (12,000 trees).
- A monitoring system for the planted trees was created.
- A procurement system of ABW from the community via a local private company was established.
- Establishment of an FSC-certified wood export network between the Japanese company and the wood export company.

### 3-2. Lessons learned

- To ensure a sustainable timber supply, a forest management system including premier provision should be discussed among stakeholders like forest communities, a timber export company and other relevant companies.
- It is advisable to develop a scheme that combines FSC certification with other management techniques to produce even better-quality wood.
- A more efficient monitoring system for planted trees is necessary to expand the afforestation area. For example, planted areas and tree growth should be monitored to evaluate planted trees appropriately.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-6.22 |
| Title of the project from which the approach is derived | Business Preparatory Survey on Sustainable Timber Procurement from FSC-Certified Forests in Tanzania (Promotion of BOP Business Collaboration) |
| Country | United Republic of Tanzania |
| Biome | Savanna |
| Implementing term | 2017/1 – 2019/9 |
| Implementing organizations | Mpingo Conservation & Development Initiative (MCDI) |
| Supporting organizations | YAMAHA Corporation, Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | Final Survey Report<br>https://openjicareport.jica.go.jp/pdf/1000042012.pdf |
| Contributors to this article | Leo Watanabe /Oriental Consultants Global (OCG) |

# Natural resource management in partnership with indigenous people

## 1. Approach's Outline and Features

This approach involves studying the use of wildlife and forest resources by local people, including indigenous hunter-gatherers and developing and implementing a model to manage tropical forests sustainably.

Long-term interrelationships among humans, wildlife and plants have shaped the local natural environment, as local peoples' activities in the forest have helped regenerate the diversified forest. With this in mind, an approach that respects and utilizes the traditional knowledge and practices of local people, rather than enclosing forests through zoning, would contribute toward managing forest resources sustainably.

**Keywords**

Sustainable forest resource management, Indigenous people, Hunter-gatherer, Wildlife, NTFPs

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Although around 40% of Cameroon's land area is forested, recent years have seen severe deterioration and loss, mainly due to timber harvesting and the expansion of farmlands and plantations, particularly since the mid-1990s. Since 1994, the government of Cameroon has been managing the forests with a zoning system and restricting their usage based on the land classification. As a land classification, forests are broadly divided into Permanent and non-Permanent forests. Permanent forests include State forests and Council forests. State forests are further subdivided into Protected areas and Forest reserves, including production forests. Non-permanent forests include Unclassified State forests, Community forests and Private forests. However, some local people have lived in protected areas before land classification and routinely used non-timber forest products (NTFPs) for food, fuel and medicine, among others. There are also concerns that strict government land use restrictions are interfering with their livelihoods. All this underlines the need for measures to manage forest resources more sustainably via collaboration among government, local people and other stakeholders.

### 2-2. Details of measures taken

- A study of the potential of NTFPs, including wildlife and their use by local people in a village in southeast Cameroon was conducted and revealed the following:
  - Local people (agricultural people and hunter-gatherers) depend on NTFPs for most of their food, tools and medicine.
  - The share of NTFPs as a proportion of hunter-gatherer cash income is about 90%. NTFPs vary widely by the year, season and species and access to wide-ranging forests (Approx. 400 km2, including adjacent logging and protected areas) must be guaranteed to obtain NTFPs in sufficient quantity while avoiding over-extraction of the resource.
  - The highest tree diversity indexes are found in non-permanent forests used by local people. Interventions in forests do not necessarily imply a loss of biodiversity - on the contrary, they may contribute to its maintenance. A striking example is how tree species distributed as NTFPs often germinate and grow on camp sites in forests.

- The use of vegetative NTFPs only covers a small percentage of potential production in the forest. The risk of depletion due to utilization is low with vegetative NTFPs, but high with animal NTFPs like Red duikers or Blue duikers, for example,

**Baka people squeezing oil out of *Baillonella toxisperma* seeds at their camping site (left) and *Baillonella toxisperma* seedling (right) (photos : JICA)**

Based on the above results, the following measures are in place:

- To devise a sustainable wildlife use model, animal ecological surveys mainly using the camera trapping method, observation of the hunting activities of local peoples and devised indicators for community-based monitoring are being conducted.
- To devise a production and processing model to improve cash income from vegetable NTFPs, surveys on the distribution of vegetable NTFPs in domestic and international markets as well as work to investigate the potential of promising vegetable NTFPs and standardizing production and processing technologies.

**Example of NTFPs traded in south-eastern Cameroon market**

| Species | Family | Market Name | Portion used |
|---|---|---|---|
| Monodora myristica | Annonaceae | Djingo | nuts |
| Scorodophloeus zenkeri | Leg. Caesalpinioideae | Platplat | nuts |
| Pentaclethra macrophylla | Leg. Mimosoideae | Mbalaka | nuts |
| Tetrapleura tetraptera | Leg. Mimosoideae | Quatre côté | nuts |
| Baillonelle toxisperma | Sapotaceae | Moabi | nuts |
| Aframomum spp. | Zingiberaceae | Tondo court (Mbongo) | fruits |
| Aframomum spp. | Zingiberaceae | Tondo long | fruits |
| Aframomum spp. | Zingiberaceae | Tondo diamant | fruits |
| Piper guineense | Piperaceae | Poivre noire | fruits |
| ? | ? | Kutu | mushroom |


To propose the implementation of a sustainable forest resource management model including the above model to the Cameroonian government, a survey of existing community organizations, developing human resources to coordinate the interests of the various managerial actors and examining and piloting an appropriate platform are all being conducted.

**Holding a workshop at the village (photo : JICA)**

**(Perspectives on sustainability)**

- It is important to incorporate forest management practices developed through this approach into community forest management plans.
- When using NTFPs in protected areas like national parks, it is important that both community organizations and neighboring national park authorities agree on their use. If this approach is successful, it is expected to be reflected in the national park management plan. Also crucial for locals is earning the trust of private forest owners like logging companies or travel agencies, so that they can use NTFPs unhindered.

## 3. Analysis of the approach

### 3-1. Impact

- The items, volumes, prices and regional differences in vegetable NTFPs traded in markets in Cameroon and abroad were determined. The products were further sub-classified into three groups:
  - Species Group I, which is seasonal and provides considerable cash income, particularly during good harvests
  - Species Group II, which is perennial and has stable prices
  - Species Group III, which compensates for losses during bad harvests in Species Group I or provides an occasional source of cash income when the product value suddenly increases
- The study also revealed the existence of several vegetable NTFPs with high commodity value that were consumed mainly within the households of local people but which are expected to generate fresh cash income.

### 3-2. Lessons learned

- In a workshop in which diverse stakeholders involved in forest resource management participate, clashes of opinion are likely depending on the participants' positions and perspectives. A common shared vision is imperative when it comes to building collaborative relationships and this is why facilitators adopting a neutral position are needed.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-6.23 |
| Title of the project from which the approach is derived | Co-creation of innovative forest resource management by integrating indigenous knowledge and ecological methods |
| Country | Republic of Cameroon<br>République du Cameroun |
| Biome | Tropical |
| Implementing term | 2018/7/15 – 2023/7/4 |
| Implementing organizations | Ministry of Scientific Research and Innovation (MINRESI), Institute of Agricultural Research for Development (IRAD), University of Dschang, University of Douala, University of Yaounde |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Science and Technology Agency (JST), Center for Africa Area Studies of Kyoto University |
| Report/Tool/Guideline | - |
| Contributors to this article | Junichiro Matsumoto/Japan Forest Technology Association (JAFTA) |

# Promoting practical forest conservation activities with the participation of local communities

## 1. Approach's Outline and Features

This approach involves promoting activities aiming to establish sustainable forest management with the participation of local residents by formulating organization among local communities in the forest reserve which is at risk of deforestation and desertification.

In participatory forest management, three pillars are important: 1) capacity-building of the people involved, 2) practice of economic activities, 3) creation of mechanisms among those involved such as farmers, manufacturers and buyers involved in building relationships with private companies and organizations.

In implementing this approach, villagers acquired skills in manufacturing products from forest resources and networks with local businesses and organizations were established, allowing stable and continuous procurement of raw materials and product sales and helping manage forest resources sustainably.

**Making shea butter products (photo: JICA/Akio Iizuka)**

**Keywords**

Participatory forest management, Local Community organization, Livelihood improvement, Forest management fund

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Burkina Faso is facing serious desertification problems due to its soaring population, slash-and-burn shifting cultivation and rough livestock farming and deforestation. The government has adopted policies aiming to prevent desertification, stabilizing the income of local communities and promoting the rational use of forest resources in the development of agriculture, forestry and livestock farming. In this context, an attempt was made to manage the forest reserves in the Comoé district of the country sustainably, which is under strong anthropogenic pressure, involving the participation of locals.

### 2-2. Details of measures taken

- To ensure that activities for sustainable forest management were continuously carried out in the target area, this approach focused on implementing livelihood improvement activities at the village level, building the organization of local communities as an executing body and building the capacity of people involved.
- Livelihood improvement activities focused mainly on activities like producing firewood and charcoal, beekeeping and producing and selling shea butter (produced from the seeds of *Vitellaria paradoxa*) and Sumbara (a common fermented seasoning made from the seeds of *Parkia biglobosa*), which have traditionally been promoted by women.
- To strengthen the organization of local communities, training was provided by JICA experts

working alongside local forest officers in areas such as activity record keeping and book-keeping and strengthening the capacity to disseminate and share such information. These elements were essential to ensure the management of local community organizations remained transparent. Local community organizations and the forest authorities engaged in forest management activities by clarifying their mutual responsibilities through a partnership agreement.

- Administrative officials, members of local community organizations and other concerned parties deepened their understanding of participatory forest management by attending seminars and joining in Off-JT and OJT. The training recipients disseminated the results to other residents and practiced the activities together. This helped build capacity of relevant people in the activities.

**(Perspectives on sustainability)**

- The system was designed to ensure continuity of forest management activities by having local community organizations conduct economic activities in forest reserves and contribute a portion of their income to a forest management fund, while providing working capital to cover the expenses of their activities, including the cost of maintaining and replacing equipment.

**Soap products (photo: JICA/Akio Iizuka)**

**Managing the forest reserve (photo: JICA/Akio Iizuka)**

## 3. Analysis of the approach

### 3-1. Impact

- In Burkina Faso, the 1997 Forest Law established a legal framework for participatory forest management and although local community organizations were supposed to be in charge of implementing the framework, only a few such organizations have been established. However, owing to this approach, this legal framework was established nationwide.

**Discussing the activity plan (photo: JICA/Akio Iizuka)**

- Examples of how local community organizations have successfully expanded the market for their products through this approach are given, working alongside private companies and organizations.
  - Phytofla, a company that manufactures and sells medicines and other products using local medicinal plants, is pioneering this field in Burkina Faso. Through the company training, the local community groups learned techniques for collecting and cultivating medicinal plants,

subjecting them to primary processing and preserving the same and Phytofla purchased primary-processed medicinal plants from local community groups. The company purchases *Cochlospermum planchonii*, a medicinal plant with anti-malarial properties, which it then processes into a compound said to be effective against malaria and sold within Burkina Faso.

- The training center of the Lakieta Association, a local social association, produces shea butter soap and began sourcing shea butter as an ingredient from local community groups which were trained by the center. The training center building and equipment were donated by Japan's Grassroots Human Security Grant Aid. ADANSE Co. Ltd., a Japanese company, has partnered with Lakieta Center to import and sell shea butter soap in Japan.

### 3-2. Lessons learned

- When acting as an organization, it is essential to ensure transparency in fund management. Otherwise, sustainable forest management that incorporates local input will be difficult.
- Working closely alongside local companies and organizations allows local community organizations to access sales destinations more easily and thus stabilize their income opportunities. It will also make it easier for them to respond to problems as they arise due to their familiarity with local conditions and boost regional development as a whole.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-6.24 |
| Title of the project from which the approach is derived | Participatory and Sustainable Forest Management in the Province of Comoe, Burkina Faso |
| Country | Burkina Faso |
| Biome | Savanna |
| Implementing term | 2007/June - 2012/December |
| Implementing organizations | Ministry of Environment and Sustainable Development (MEDD) |
| Supporting organizations | Japan International Cooperation Agency (JICA), Japan Forest Technology Association (JAFTA), IC-Net Co. |
| Report/Tool/Guideline | Project Completion Report (French)<br>Forest management associations' Field Manual<br>Farmers School Manual<br>Organizational Capacity Building Manual |
| Contributors to this article | Yasuhisa Tanaka /JAFTA |

# Integrated management of the reforestation approach

- Combining reforestation and community development -

## 1. Approach's Outline and Features

This is an integrated reforestation approach, combining technical components, such as tree-planting, with socioeconomic components, like improving livelihoods.

- The integrated management approach in the forestry development sector in Tunisia was standardized in the Project.
- The integrated management approach combines technical and socioeconomic development components to improve the living conditions of local residents in forest zones, aiming to ease their pressures on natural resources and manage forests more sustainably.
- The Agricultural Development Group (ADG), comprising local community forest users, was established and collaborated with agricultural agencies and NGOs to take account of residents' needs and ensure they are reflected in the Community Development Plan (CDP).

**Keywords**

Reforestation, Community Development, Livelihood Improvement, Integrated Management, Tree Planting, Non-Timber Forest Product

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

The forest area in Tunisia decreased from 1.25 million hectares at the beginning of the 20th century to 368,000 hectares in the mid-1950s. Therefore, reforestation had to be further promoted with the need to prevent soil erosion and conserve the natural environment in mind. The Project aimed to prevent soil erosion, increase the forest area and improve socioeconomic conditions and the natural environment through reforestation and regional development in the four regions of northwestern Tunisia.

**Afforestation area in North-western Tunisia (photo: JICA)**

### 2-2. Details of measures taken

This integrated management approach was standardized for the forestry development sector in Tunisia by combining technical and socioeconomic development components, as part of efforts to ease the pressure on natural resources by improving the living conditions of local residents in forest zones. The socioeconomic component included the establishment of 13 Agricultural Development Groups, each of which formulated a Community Development Plan (CDP) in a participatory manner, while the Project supported the realization of the CDP. This was a strategy to manage the forest more sustainably by diversifying and improving residents' income through socioeconomic development and easing the pressure on the natural environment.

**Technical components**

| Sub-components | Main Activities | Achievement |
|---|---|---|
| A. Forest infrastructure development | A1: Forest road construction<br>A2: Forest road maintenance<br>A3: Firebreak construction<br>A4: Firebreak maintenence<br>A5: Forest officer station construction<br>A6: Forest officer station maintenance<br>A7: Fire watch tower construction<br>A8: Fire watch tower maintenance<br>A9: Construction of water reservoir tank,<br>and others | A1: 106 km<br>A2: 155.5km<br>A3: 91<br>A4: 1,111.5km<br>A5: 6<br>A6: 15<br>A7: 8<br>A8: 10<br>A9: 24 |
| B. Forestry improvement | Forest management of pine (B1), cork oak (B2) and accasia (B3) stand; Assisted natural regeneration (B4 Pine/ B5 cork oak); improvement of plant health (B6) and others | B1: 9,002 ha<br>B2: 1,911 ha<br>B3: 2031 ha<br>B4: 6,963 ha<br>B5: 320 ha<br>B6: 11,500 ha |
| C. Forest ecosystem rehabilitation | Forestry plantations; plantation on wadi banks; reservoir protection; pastoral planting; seed orchards management; modernization of nurseries; nature reserves management | 5,915 ha |
| D. Soil and water conservation | Soil and water conservation (terrace construction; gully control (gabion); protection of lake (reservoir) | 6,306 ha |
| E. Forest-related research | Technical guide for reforestation in Tunisia; Strategic research for sustainable development of cork oak forests; Guide for the Community Development Plan Development and Implementation and others | 13 themes, Seven seminars, etc. |

**Socioeconomic components**

| Sub-components | Main activities | Achievement |
|---|---|---|
| Socioeconomic development, | Establishment of the ADG, Development of the Community Development Plan (CDP), with the livelihood improvement program such as water point development; live fence creation; fruit tree plantation; construction of training centers; creation of small-scale nurseries; improved cook stoves; livestock farming, beekeeping, vegetable and fruit tree cultivation and trail road development | • 13 ADGs were established, each of which developed its CDP.<br>• 14 water points were developed.<br>• Live fence: 2,965 ha<br>• Fruit tree plantation: 1,566 ha<br>• Seven training centers<br>• Two nurseries<br>• 30.2 km of trail road constructed and maintained |

Community awareness program (photo: JICA)

Community awareness program (photo: JICA)

Pasture restauration project (photo: JICA)

Beekeeping training in Nefza (photo: JICA)

**(Perspectives on sustainability)**

- The Agricultural Development Group (ADG) was established and collaborated with agricultural agencies and NGOs to take account of residents' needs and reflect them in their Community Development Plan (CDP). The ADG is a community-based organization comprising forest users. Each ADG developed its development plan based on its needs and cooperating related governmental technical agencies such as an agricultural office.

## 3. Analysis of the approach

### 3-1. Impact

- Including the socioeconomic component has reduced residents' pressure on forest resources. (89% of the respondents in the beneficiary survey answered that the natural environment had improved)
- It is acknowledged that developing forest firefighting infrastructure (i.e. fire breaks and watchtowers) helped reduce the spread of forest fires.
- The volume of illegal logging incidents in the Project area decreased from 2,298 cases in 2002 to 1,703 cases in 2007.
- Tunisia's forest area increased from 959,000 ha in 2000 to 1,200,000 ha in 2007. Of the increased 241,000 ha, the Project contributed 2.5%. The total area planted by the Project was 5,915 ha.

### 3-2. Lessons learned

- The integrated approach clearly improved the population's living conditions: they confirmed that their activities had diversified and their incomes had increased.
- In projects that adopt "integrated management", it is expected that activity proposals exceeding the original functional scope of the implementing agency will emerge. Accordingly, there is a need to build a system capable of cooperating with other stakeholders within the executing agency.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-6.25 |
| Title of the Project from which the approach is derived | Integrated Reforestation Project / Projet de Gestion Intégré des Forêts (TS-P20) |
| Country | Republic of Tunisia |
| Biome | Mediterranean forest/woodland, arid and semi-arid forest/woodland |
| Implementing term | 2000-2007 |
| Implementing organizations | General Directorate of Forest, Ministry of Agriculture, Hydraulic Resources and Fisheries |
| Supporting organizations | ・ Japan International Cooperation Agency (JICA)<br>・ PCI (Oriental Consultants Global Co., Ltd.) - ExA Consult - Japan Forest Technology Association |
| Report/Tool/Guideline | ・ Reforestation Guide<br>・ Development and Implementation Guide for the Community Development Plan<br>・ Ex-post evaluation of JICA ODA loan project "Integrated Reforestation Project." |
| Contributors to this article | TEJIMA Shigeharu /Oriental Consultants Global Co., Ltd. |

# Utilization of Unused Natural Resources through Rice Husk Briquette Machines which Curb Deforestation and Create New Business and Employment

## 1. Approach's Outline and Features

This approach is a business model created by a Japanese company that produces solid briquette fuels from rice husks as underutilized natural resources, by grinding and compressing them in a machine (hereinafter referred to as a "Grind Mill"). Rice husk briquettes can curb the demand for firewood and charcoal, preventing further deforestation, while producing and selling the briquette fuels creates new business and employment.

**Curbing the demand for firewood and charcoal by producing underutilized natural resources**

Based on the Japan Grind Mill Model, a locally customized Tanzanian model was developed with local needs in mind and technical training on how to operate and maintain it was provided to counterpart organizations.

**Creation of a new business model and employment in collaboration with local manufacturers**

Dissemination of a locally manufactured Grind Mill, including briquette machines and briquettes themselves, is an alternative to the costly business model whereby a Grind Mill is manufactured in Japan and exported to Tanzania. A collaborative model was proposed with local machinery manufacturers, who would build the machines using parts provided by the Japanese company.

**Keywords**

Rice husk briquette, Alternative fuel, Creation of a new local business model and employment

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

In Tanzania, one of Africa's leading rice-growing countries, bulk disposal of rice husks has become problematic. Conceivably, introducing a machine to convert rice husks into solid briquette fuel would help: 1) solve the problem of rice husk disposal, 2) produce alternative fuels to firewood, 3) reduce deforestation by generating firewood and 4) create jobs. To establish the business plan, Tromso Co., Ltd, a Japanese SME (Small- and Medium-Sized Enterprise), conducted a Project Formulation Survey in 2013 and a Verification Survey in 2014 to investigate the business feasibility, including the development of a locally customized Grind Mill, providing technical training to local engineers on how to manufacture, assemble and maintain Grind Mill and the dissemination of Grind Mill and solid briquette fuel.

**Rice husks loaded on wagons outside rice mills for disposal (photo: JICA)**

**Grind Mills at the Mbeya project site (photo: JICA)**

**Test marketing of rice husk briquettes in Morogoro (photo: JICA)**

**Shipping of rice husk briquettes (photo: JICA)**

## 2-2. Details of measures taken

- Verification of Grind Mill and development of its locally customized model
  - Researching needs and issues.
  - Installing and demonstrating the Grind Mill (Japan Model) at the target site.
  - Developing a more affordable and simplified Tanzanian model of Grind Mill, commensurate with Tanzanian conditions and requirements.
  - Providing technical training on how to operate and maintain the Grind Mill to counterpart organizations
- Verification of the rice husk briquette manufacturing business
  - Negotiating with local manufacturers and selecting partners
  - Estimating market size
  - Surveying appropriate pricing and specifications of Grind Mill
  - Comparing with conventional fuels
  - Surveying the availability and usage of rice husks in major rice production areas
  - Evaluating the profitability of the rice husk briquette manufacturing business

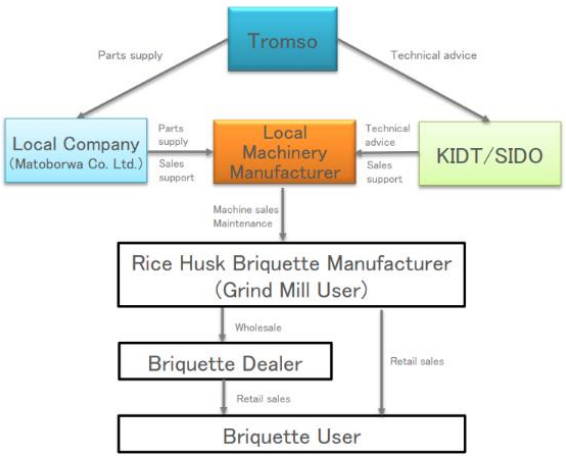
**(Perspectives on sustainability)**

- The specifications of Grind Mill were simplified to meet local needs, which facilitated its dissemination in local markets.
- The maintenance system was verified by screening and specially selecting machine manufacturers.
- A business model was developed through cooperation with multiple local stakeholders, including manufacturers.

## 3. Analysis of the approach

### 3-1. Impact

- The capacities of counterpart organizations and local machinery manufacturers were strengthened by providing technical training on how to operate and maintain Grind Mill.
- The counterpart organizations operated Grind Mills and marketed the rice husk briquettes they made for 200-300Tsh/kg. Most of the sales were for commercial users, primarily schools, hospitals, restaurants and other institutions with large kitchens for cooking meals.
- Disseminating the briquette machines and briquettes themselves would depend on both being affordable in the Tanzanian market. As an alternative to an export business model, in which Grind Mill is manufactured in Japan and exported to Tanzania, a collaborative model with local machinery manufacturers, who would build the machines using parts provided by Tromso, was proposed. Local machinery manufacturers would source common parts in Tanzania, excluding the core parts which grind and compress rice husks and some electrical parts unavailable on the local market.




**Proposed Business Scheme (Source: JICA)**

### 3-2. Lessons learned

- The availability of consumables and other key parts impacts both the initial and running cost of Grind Mill, which may limit its profitability. Accordingly, further efforts to localize them and reduce the overall cost are imperative.
- To ensure self-reliant and continuous activities by counterpart organizations, it is recommended that organizations further transfer technology acquired from the project to the private sector.
- Besides affordability, ongoing efforts such as organizing promotional seminars are necessary to lower the bar for local residents to accept rice husk briquettes, despite the smoke and odor emitted while using them.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 3-6.26 |
| Title of the project from which the approach is derived | Verification Survey with the Private Sector for Disseminating Japanese Technologies for the Utilization of Resources through Rice Husk Briquette Machines in Tanzania<br>"Project Formulation Survey" under the Governmental Commission on the Projects for ODA Overseas Economic Cooperation in FY2013: Study on an Introduction of a Rice Husk Briquette Machine |
| Country | United Republic of Tanzania |
| Biome | Savanna |
| Implementing term | Project Formulation Survey : 2013/11 – 2014/3<br>Verification Survey : 2014/9 – 2017/5 |
| Implementing organizations | Kilimanjaro Industrial Development Trust (KIDT)<br>Small Industries Development Organization (SIDO) |
| Supporting organizations | TROMSO Co., LTD.,<br>Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | Summary report : Tanzania, verification survey with the private sector for disseminating Japanese technologies for utilization of resources through rice husk briquette machines<br>UNIDO, Sustainable Technology Promotion Platform (STePP) |
| Contributors to this article | Takamasa Noro /Oriental Consultants Global (OCG)<br>Takuya Shiraishi / Oriental Consultants Global (OCG) |

# Dissemination of agricultural and forest conservation practices through Farmer Field Schools (FFS) in areas of soil erosion and low agricultural productivity

## 1. Approach's Outline and Features

The Farmer Field School (FFS) approach is a suitable extension methodology for promoting agroforestry and sustainable natural resource management, as farmers frequently apply the skills they learn in the process, such as soil conservation, agroforestry practices, fruit tree planting, vegetable farming, perennial fodder production and woodlot development. The following issues underpin this approach:

- Capacity-building and empowerment of farmers through participatory learning.
- On-site tree seedling production by farmers themselves.
- Monitoring of planted trees and crops through ongoing and long-term interaction with farmers.
- Diversification of crops and income sources in combination with trees and permanent crops.

**Tree intercropping; Although people used to protect trees on the farm, frequent cultivation and free grazing made them disappear. Tree intercropping is one way to rehabilitate such farmland**

**Keywords**

Farmer Field School, Soil Conservation, Capacity-building, Natural resource management, Agroforestry, Woodlot development,

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Ethiopia is one of the countries in Sub-Saharan Africa most seriously affected by land degradation, which, in turn, is a key cause of the country's low and declining agricultural productivity, persistent food insecurity and rural poverty.

The Oromia Region is among the most degraded lands nationwide, with large amounts of soil being washed away on scattered communal lands after being mismanaged. The use of wood and other biomass for fuel and the expansion of agriculture into forested areas foster a high rate of deforestation. Ultimately, this results in the land being stripped of vegetative biomass and exposed to high levels of soil erosion.

Accordingly, the region needs to manage natural resources sustainably to conserve the soil while also boosting agricultural productivity. In this context, the Project strengthened the capacity of the relevant stakeholders of East Shewa, West Hararge and West Arsi Zone within the semi-arid area of the Oromia Region and promoted sustainable natural resource management, including agroforestry and soil conservation measures, through FFS.

### 2-2. Details of measures taken

- Combating land degradation through sustainable natural resource-management learning activities to improve soil erosion and the recovery of natural resources, such as perennial fodder grass and trees, fruit tree planting, seedling production and small-scale afforestation, micro water catchment, or natural regeneration management.
- The Farmer Field School (FFS) approach is an innovative, participatory and interactive learning approach that emphasizes problem-solving and discovery-based learning.
- The FFS approach aims to build farmers' capacity to analyze production systems, identify problems, test possible solutions and eventually encourage them to adopt the best practices for their farming systems.

**A county livestock specialist lecturing on silage (photo: JICA)**

**Analyzing the crops and growing conditions suited to the land (photo: JICA)**

**(Perspectives on sustainability)**

- Supplementation by FFS to the government's extension system and efforts to incorporate it into government activities were carried out to obtain budget allocation as a governmental activity.
- A “Farmer Field School-based extension system plan for upscaling” was developed by the regional technical agency with the collaboration of the Project.
- A number of master trainers have been trained, although it is thought that the number needs to be gradually increased to cope as the FFS approach is upscaled across the region.
- Various manuals have been drafted as future reference for facilitators and other personnel concerned.

## 3. Analysis of the approach

### 3-1. Impact

The following effects of the Project have been observed, mainly in aspects of FFS participants and community members related to capacity development, such as rethinking their behavior and mindsets.

- Increased awareness of FFS participants towards natural resource management as they started producing seedlings from tree seeds. (An end-line survey showed an 82% practice rate of new techniques among FFS farmer-participants having applied new techniques introduced by the FFS).
- Increased communication and collaboration of males and females in farming activities and acknowledgement of the importance of equal rights.

- Recognition of the importance of inclusive development in the community by some farmer facilitators.
- Improved awareness of time management and the start of off-farm season livelihood activities.
- Recognition of the importance of equal rights for women and men and time management by some farmers.
- Diversification of nutritious food sources by introducing vegetables and fruit trees.
- Increased earning opportunities by selling products from homesteads.
- Discovering, experimenting with and disseminating indigenous knowledge to deal with plant diseases and pests.

**FFS members growing (avocado) fruit trees on their farms after FFS graduation (photo: JICA)**

**FFS graduates working to rear tree seedlings in their group nursery (photo: JICA)**

As mentioned above, FFS promoted various positive effects and changed behaviors and mindsets for participants and their community members.

## 3-2. Lessons learned

- **Taking time to develop human resources**

  The bottleneck for upscaling FFS over a wider area is the year or so required to develop FFS-related human resources such as master trainers, facilitators and others. It is also important to refrain from efforts to achieve numerical targets by short-term investment in funds and extension workers alone.

  As part of efforts to upscale the FFS project, the project execution body shall assign human resources with extensive FFS experience in implementation and operation from the planning stage and develop human resources as the FFS program is implemented alongside. It is also crucial to have a program that gradually increases the number of FFS implementations over several years.

- **Consideration of gender through FFS**

  In the Project, FFS group members were selected to ensure an even gender balance of men and women. Configuring the groups to allow men and women to learn together increased women's awareness and self-confidence and improved their presentation skills.

- **Adopting a phased and gradual approach to introduce a new method with a specific objective (FFS with natural resource management) to a government with an existing system and an institution**

  When establishing a cornerstone by implementing FFS on natural resource management, the extension departments at regional and zonal levels were not involved. Later, upscaling saw collaboration from regional and zonal extension departments. Such step-by-step efforts have been successful. It is also effective to reach out to upper government management when upscaling and organizing workshops and study tours.

- **Cooperation with relevant donors**

  The FAO aims to institutionalize FFS and cooperation with FAO worked as a pipeline with central ministries and agencies (holding joint seminars, etc.), effectively promoting FFS.

- **Consideration of rights to use community land**

  Difficulties arose in applying the FFS approach to communal land managed by groups like cooperatives, given the lack of explicitly guaranteed long-term rights to use such land and forest resources like planted trees as timber.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 4-1.27 |
| Title of the project from which the approach is derived | Sustainable Natural Resource Management Project Through Farmer Field School (SNRMP) in the Rift Valley Area of Oromia Region |
| Country | Ethiopia |
| Biome | Desert/Semi-desert, Montane |
| Implementing term | June 1 2013 – March 31 2018 |
| Implementing organization | Oromia Bureau of Agriculture and Natural Resources (OBANR) |
| Supporting organization | Japan International Cooperation Agency (JICA),<br>IC Net Ltd. |
| Report/Tool/Guideline | ▪ Project Completion Report<br>▪ FFS implementation guide<br>▪ Project Brochure<br>▪ [AI-CD Website]: Sustainable Natural Resource Management Project Through Farmer Field School (SNRMP) in the Rift Valley Area of Oromia Region |
| Contributors to this article | TEJIMA Shigeharu /Oriental Consultants Global Co., Ltd. |

# Equal opportunity / low-input extension approach, PRRIE

## 1. Approach's Outline and Features

This is a community-based extension approach named **PRRIE**, or **P**articipatory **R**ural Development and **R**esource Management by **I**ntegrated Training for **E**qual Opportunity. It involves harmonizing efforts to conserve soil and boost the quality of life of local communities by assuring **equal opportunities for all** in a **highly cost-effective manner**.

- **How does PRRIE assure equal opportunities economically?**
  - **By providing wide-ranging training themes for the local community:** More than 800 local trainers provided neighbouring villagers with training on **simplified techniques** such as tree planting, control of land degradation damage, energy-saving cooking stoves, lychee farming and aquaculture.
  - **Training organised based on five simple principles:** (i) Organize training sessions where relevant people live, (ii) Use locally available resources, (iii) Meet local needs first, (iv) Do not select participants and (v) Target as many people as possible.
  - **Expanding the target area when reaching a certain diffusion/adoption rate:** Not targeting 100% diffusion/adoption is one of the points for extension in broad area to ensure high cost-effectiveness.
- **Major accomplishments using the PRRIE approach**: Planting 2.38 million trees and encouraging leadership and initiative of local communities

**Keywords**

Extension approach, Participatory model, Equal opportunity, Cost-effectiveness

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

Madagascar has more than 250,000 species of wild animals and plants, approximately 80% of them are endemic. However, forest trees are disappearing under ever-increasing deforestation pressure. This, in turn, is attributable to the growing demand for land due to soaring human population, conversion of forest land to farmland, slash-and-burn farming and fuel wood collection among others. Land degradation caused by deforestation is particularly prominent in the upstream central highlands, where bare hills are widespread and spectacular gullies known as "lavaka" (a Malagasy word for "hole") are often seen.

**Lavaka and sediment runoff flowing into paddy fields**

As a general rule, those populating upstream areas are poor. And unfortunately, the fact that their agricultural practices, especially rice farming, are being impeded by the formation of lavaka is leaving them more impoverished than ever. Lavaka formation results in sediment running off from collapsed hillsides, from where it flows into farmland, bodies of water, irrigation waterways and roads. Furthermore, a huge amount of the sediment is carried by rivers and streams and spread over

downstream paddy fields. This situation shows how soil conservation and people's lives are closely interlinked. Under this backdrop, there is a need to develop a participatory model to promote soil conservation and boost livelihoods.

## 2-2. Details of measures taken

- This is a community-based rural development approach named PRRIE, or Participatory Rural Development and Resource Management by Integrated Training for Equal Opportunity, which has been applied to two JICA projects in Senegal and Malawi to date.
- PRRIE is a training-based approach to ensure **Equal Opportunities for All** with **high cost-effectiveness** and comprising: Capacity-building for the local community through a series of integrated training sessions; monitored and followed up by local trainers.
- The Ministry of Environment, Ecology and Forests (MEEF) and Ministry to the Presidency in charge of Agriculture and Livestock (MPAE) selected and trained more than 800 local trainers.
- Local trainers, supervised by the MEEF/MPAE, provided training sessions for the local community (i.e. tree planting on degraded slopes, control of land degradation (lavaka)-causing damage, fabrication of energy-saving cooking stoves, lychee farming and aquaculture), monitoring and follow-up.
- Training sessions are organized based on the following five simple principles and always open to the public to assure equal opportunities for all while achieving high cost-effectiveness:
  - Organize training sessions where the relevant people live
  - Use locally available resources
  - Meet local needs first
  - Do not select participants
  - Target as many people as possible


**Training on tree plantation**

**Training on control of land degradation-causing damage**

**Training on energy-saving cooking stoves**

**Air-layering or marcottage of lychees**

**Royal carp produced by a villager**

**(Perspectives on sustainability)**

- Creating a certain number of local trainers who function as drivers to promote tree growing and new livelihood improvement activities introduced by external agents using locally available resources.
- Support for access to microfinance institutions and relevant subsidies to sustain villagers' short-cycle income-generating activities such as rice or fish farming.

## 3. Analysis of the approach

### 3-1. Impact

**[Training]**

- 800 local trainers were created
- 8,500 training sessions were organized with 143,000 participants over five years

**[Actions by local residents]**

- 2.38 million trees were planted, 100 lavaka were treated, 21,000 energy-saving cooking stoves were made, 23,000 lychee seedlings were produced and >122,000 carp fry were raised.

**[Feedback from local residents]**

- "Unlike previous aid projects, everyone can equally acquire skills and even help people in trouble. We are glad about it.

### 3-2. Lessons learned

**Incentives to Continue Actions**

- Encouraging people to create **new activities to boost livelihoods, generate income** and simultaneously help villages develop is what allows local trainers to maintain their motivation to function as knowledge and information hubs and thus spark ongoing actions on the part of the community.

**Scaling-Up**

- **Simplifying techniques to a level the local community** can handle and **expanding the target area when reaching a certain diffusion / adoption rate** but not targeting 100% diffusion / adoption are keys when scaling-up to a broad area with high cost-effectiveness.
- Proactively presenting the approach's advantages in quantitative and qualitative terms to potential users (i.e. donors, NGOs and private companies working on CSR activities, etc.) is key to attracting their attention and **mainstream and scaling up the approach**.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 4-1.28 |
| Title of the project from which the approach is derived | Project of Integrated Development Approach to Promote Environment Restoration and Rural Development (PRODAIRE) |
| Country | Republic of Madagascar |
| Biome | Montane |
| Implementing term | 2012/2/10 – 2018/3/31 |
| Implementing organizations | Ministry of Environment, Ecology and Forests (MEEF), Ministry to the Presidency in charge of Agriculture and Livestock (MPAE) |
| Supporting organizations | Japan International Cooperation Agency (JICA) |
| Report/Tool/ Guideline | • LIFE Model(*) User Manual (French)<br>(*) LIFE model is a Madagascar type model that adopts PRRIE<br>1. Main Body<br>2. Complementary work<br>2-1. Data Book<br>2-2. Users' Manual of the LIFE Model<br>2-3. Annex<br>• [Publication] Promoting more sustainable tree growing by smallholder farmers in remote areas: an insight from Madagascar https://www.tandfonline.com/doi/abs/10.1080/14735903.2021.1914447<br>• [AI-CD Website] Stop Land Degradation while Improving the Livelihood of Local Communities Through the Equal-Opportunity-for-All Approach http://aicd-africa.org/archives/1598 |
| Contributors to this article | Takuya Shiraishi/Oriental Consultants Global |

# Promotion of sustainable forest conservation management by restructuring "various conservation management measures" and the "process of securing funds"

## 1. Approach's Outline and Features

This is an integrated approach to manage forest conservation more sustainably, which includes developing a long-term strategic plan to restructure the activities of governmental organizations and communities and establish its implementation structure and underpinning financial mechanisms in collaboration with multiple stakeholders, including the private sector.

- Restructuring of the activities of governmental organizations and communities to develop into a long-term plan:
  - Monitoring and facilitating law enforcement activities by the Department of Forestry (DOF) (i.e., forest rangers' patrol in Dzalanyama Forest Reserve or DFR).
  - Promotion of community activities such as charcoal production, apiculture and tree-planting.
  - Coordination among stakeholders (i.e., government and communities) and restructuring of their activities to develop into a Long-term Plan (LTP) with the results of pilot activities taken into consideration
- Establishment of a financial mechanism to underpin the Long-Term Plan:
  - Private sector contributions such as an Eco-labelling scheme, Corporate Social Responsibility (CSR) and/or Creating Shared Value (CSV) scheme.
  - Utilization of Government Financial Resources.
  - Establishment of a structure to manage funds and implement the Long-term Plan: Dzalanyama Catchment Conservation Trust (DCCT).

**Keywords**

Sustainable Forest Management, Long-Term Plan, Financial Mechanism

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

The Dzalanyama Forest Reserve (DFR), a water source forest near a capital city with a rapidly growing population, is undergoing severe deforestation and degradation, due mainly to illegal charcoal production and firewood collection. The Malawi government is considering and promoting various measures, but the mid- to long-term planning and coordination among stakeholders do not suffice and the situation for sustainable output is not promising. This project helped the DFR efforts to manage conservation sustainably by developing a long-term strategic plan to restructure the activities of governmental organizations and communities and establish an implementation structure and financial mechanisms underpinning the same, in collaboration with multiple stakeholders and including the private sector.

**Overview of Dzalanyama Forest Reserve (photo: JICA)**

## 2-2. Details of measures taken

**Patrolling by forest rangers in DFR by DOF (photo: JICA)**

**Legal and sustainable charcoal production in DFR (photo: JICA)**

- There were two (2) pillars of project activities, targeting the conservation and sustainable management of DFR and Dzalanyama Watershed Areas.
  - ➢ Following-up of counterpart activities to stop deforestation and forest degradation in DFR
    - ✧ Monitoring and facilitation of law enforcement activities by the Department of Forestry (i.e., forest rangers' patrol in DFR)
  - ➢ Activities for sustainable forest management in DFR through cooperation with communities
    - ✧ Legal and sustainable charcoal production and trial sales
    - ✧ Introducing apiculture and "Dzalanyama honey" marketing
    - ✧ Improving tree-planting by singling out
    - ✧ Boundary tree planting
- The following activities underpinned the two (2) pillars:
  - ➢ Financial mechanism
    - ✧ Private sector contribution
      - ✓ Eco-labelling scheme
        - Companies are entitled to display the "Eco-label" logo mark on their products or advertisements in return for donating a set percentage of their sales.
      - ✓ Corporate Social Responsibility (CSR) and/or Creating Shared Value (CSV) scheme.
        - Mowing work was conducted in the boundary forest plantation using the CSR budget of a private company.
      - ✓ Utilization of Government Financial Resources
        - Facilitation was given to the DOF to arrange and utilize existing government financial resources (Public Sector Investment Program (PSIP), etc.) to conserve and manage DFR, including forest protection.
    - ✧ Establishment of a structure to manage funds: Dzalanyama Catchment Conservation Trust (DCCT)

**Logo-design symbolic of DFR conservation and rehabilitation (photo: JICA)**

**Eco-labelling on bottled water (photo: JICA)**

  - ➢ Institutionalization
    - ✧ Formulation of a Long-term Plan (LTP) to conserve and sustainably manage DFR and Dzalanyama Watershed Area with the results of pilot activities taken into consideration.
    - ✧ Establishment of a structure to implement the Long-term Plan.
  - ➢ Public relations and environmental education

**(Perspectives on sustainability)**

- The Dzalanyama Catchment Conservation Trust (DCCT) was established as a permanent framework and organization to manage funds and activities related to forest conservation according to the Long-term Plan.

## 3. Analysis of the approach

### 3-1. Impact

- With the aim to conserve and sustainably manage DFR and Dzalanyama Watershed Area, a combination of a long-term strategic plan, its implementation structure and its underpinning financial mechanisms was tested in an integrated manner and partially from a functional perspective.
  - The Long-term Plan (LTP) to conserve and sustainably manage DFR and Dzalanyama Watershed Area was drafted with the results of pilot activities taken into consideration. The LTP comprises: (i) Protection of DFR, (ii) Legal and sustainable charcoal production, (iii) Apiculture, (iv) Promoting honey business, (v) Boundary tree planting, (vi) Riverside tree planting along the Lilongwe River, (vii) Implementing public relations activities and (viii) Forest monitoring of DFR.
  - Financial mechanisms to draw private sector contributions were tested with some success through Eco-labelling and CSR schemes. Furthermore, the eco-labelling scheme was disseminated to the general public by distributing posters in public places and venues.

### 3-2. Lessons learned

- Securing funds, as seed money for the Trust, remains a key factor for the DCCT to implement activities and manage the Trust sustainably and stably.
- It is better to introduce locally produced beehives, such as a Kenyan-type, which are not the traditional type, inexpensive, and relatively easy to handle for beekeeping because it fits the local technical level and economic situation.
- Law enforcement activities to reduce illegal charcoal production should be combined with legal charcoal production. This is because legal charcoal cannot be spread if illegal charcoal is still available in the market.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 4-2.29 |
| Title of the project from which the approach is derived | Project to Conserve and Sustainably Manage Dzalanyama Forest Reserve (COSMA-DFR) |
| Country | Republic of Malawi |
| Biome | Savanna |
| Implementing term | 2016/7 – 2022/6 |
| Implementing organizations | Department of Forestry, Lilongwe Waterboard |
| Supporting organizations | Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | - |
| Contributors to this article | Takuya Shiraishi, Takamasa Noro/Oriental Consultants Global (OCG) |

# Support for Access to Finance through Guiding, Facilitating and Matching Assistances under a Regional Cooperation Framework

-African Initiative for Combating Desertification [AI-CD]-

## 1. Approach's Outline and Features

This approach involves supporting concerned countries for **access to finance by guiding, facilitating and matching assistance** but not direct financing under a regional cooperation framework. The approach was organized through trial and error within the framework of the **A**frican **I**nitiative for **C**ombating **D**esertification to Strengthen Resilience to Climate Change in the Sahel and the Horn of Africa (**AI-CD**), in which the Secretariat team assumed a guiding/facilitating role while **respecting the initiatives and ownerships of member countries**.

- **Assistance for Project Development and Application**: Developing and refining Project Concept Notes (PCNs), facilitating matching meetings between the Focal Points of participating countries and International Technical and Financial Partners (ITFPs) and bringing their PCNs to formal funding applications.
- **Matching with the Private Sector**: Providing matching opportunities of Focal Points with private companies' products and technologies that may be useful to address desertification (e.g. organizing product exhibitions and presentations at various events)
- **Building networks and knowledge-sharing efforts underpinning project development and application**: Organization of annual regional forums, high-level events at international conferences, in-country workshops and a Knowledge-Sharing Webinar and creation of Short Films to present their challenges and efforts in combating desertification to ITFPs.

**Keywords**

Access to Finance, Regional Cooperation Framework, Facilitation, Matching, Ownership

## 2. Description of the project from which the approach is derived

### 2-1. Introduction

The Sahel and the Horn of Africa regions face mounting development challenges. Most of the region is desert or arid and thought to be degraded. The region has also been affected by frequent and severe droughts in recent years, which will likely be exacerbated by the recent climate change. As locals on a low income in the region heavily depend on natural resources, persistent drought has further worsened their livelihoods. Poverty in the region could result in growing insecurity and fuel the number of refugees and the risk of terrorism.

**(Source: JICA Project Experts)**

Addressing desertification properly and consolidating ways to mitigate climate change are key to helping nations in the region develop sustainably while contributing to local and global peace and

stability. Despite the importance and urgency, droughts and desertification have not been given sufficient international attention and adequate finance to address these issues remains pending.

Against this backdrop, the Government of Kenya, the Government of Senegal, JICA and the UNCCD with partner African countries and development partners officially announced the launch of the **A**frican **I**nitiative for **C**ombating **D**esertification to Strengthen Resilience to Climate Change in the Sahel and the Horn of Africa (**AI-CD**) at TICAD VI in Nairobi in August 2016.

## 2-2. Details of measures taken

- AI-CD aimed 'help ensure nations and communities can consolidate climate change by promoting measures to combat desertification in the Sahel and the Horn of Africa'.
- Participating countries (*Regional Hub countries).
  - Horn of Africa: Djibouti, Eritrea, Ethiopia, Kenya*, Somalia, South Sudan, Sudan
  - Sahel: Burkina Faso, Cameroon, Chad, Mali, Mauritania, Niger, Nigeria, Senegal*
- AI-CD comprised three pillars:
  - Improving access to finance
    - ✧ **Assistance for project development and applications**
      - ✓ Secretariat assisted the participating countries to develop and refine their Project Concept Notes (PCNs)
      - ✓ Secretariat coordinated and had a series of preparatory meetings with International Technical and Financial Partners (ITFPs)
      - ✓ Secretariat facilitated matching meetings between the Focal Points of participating countries and ITFPs
      - ✓ Secretariat assisted the participating countries to bring their PCNs to formal application to funding schemes and facilitated dialog with ITFPs to integrate PCNs into ITFP's existing projects or programs.
    - ✧ **Information sharing on funding opportunities and assistance for project applications**
      - ✓ The Secretariat circulated information on funding opportunities (i.e. open and competitive calls by development partners)
      - ✓ Based on the Focal Points' requests, the Secretariat supported some NGOs in their countries to refine their application. Three NGOs applied and one was selected.
    - ✧ **Matching with the Private Sector**
      - ✓ The Secretariat provided, as technical support, matching opportunities for Focal Points with private companies' products and technologies that may be useful to address desertification (i.e. organization of exhibitions, presentation of products and technologies at different events, etc.)
    - ✧ **Elaboration of Access to Finance Guidebook**
      - ✓ The Secretariat developed an Access to Finance Guidebook to assist Focal Points in acquiring basic information on funding opportunities, including relevant financial schemes ranging from financial mechanisms for environmental conventions (e.g. GEF, GCF), the Multilateral Development Banks (e.g. WB, AfDB) and others.

**Project Concept Note developed by a Participating Country**


**Access to Finance Guidebook**

**Exhibition for Matching with the Private Sector**

**Small-Scale On-the-Ground Test of a Product introduced by Secretariat**
**(Source: JICA Project Experts)**

- Building networks
  - The Secretariat assisted the participating countries to organize annual regional forums, high-level events at international conferences and in-country workshops, which **underpinned the "Access to Finance activities" by building networks with international and in-country cross-sectoral stakeholders.**
- Knowledge-sharing
  - The Secretariat assisted the participating countries to share their knowledge which **supported "Access to Finance activities" by attracting attention from stakeholders using visual information and SNS tools and providing opportunities to learn from best practices collected by partner organizations.**
    - ✓ The Secretariat assisted the participating countries to create Short Films to present their challenges and efforts in combating desertification to ITFPs.
    - ✓ The Secretariat assisted the Sahel Regional Hub (i.e. Senegal) to organize a Knowledge-Sharing Webinar in collaboration with the Permanent Interstate Committee for Drought Control in the Sahel (CILSS).
    - ✓ The Secretariat assisted the participating countries to share their knowledge on websites and with SNS tools.

**Executive Secretary of UNCCD attending an AI-CD high-level event**


**Short Film made by Mali Focal Point**

**(Source: JICA Project Experts)**

**(Perspectives on sustainability)**

- Respecting the initiatives and ownership of the member countries by the Secretariat adopting a guiding/facilitating role was the key principle of AI-CD that encouraged member countries to act on their own initiative.
- Rather than direct financial support for PCNs, the Secretariat played a "Go-Between" function of Focal Points and ITFPs to facilitate project development and application.

## 3. Analysis of the approach

### 3-1. Impact

- **Member countries' ownership and regional hub countries' strong leadership** were fostered.
- Networks within the region and between international partners at both political and working levels were consolidated and newly developed.
- Engagement of domestic cross-sectoral stakeholders to engage in dialog and seek collaboration was enhanced.
- **PCNs were developed by all member countries** allowing concrete discussions and consultations to be concluded with ITFPs for project formulation.
  - One country submitted the PCNs to partner organizations to find funding.
- **One case of success in access to finance**: Following circulation of information on funding opportunities (i.e. open and competitive calls by development organizations) by the Secretariat, Focal Points of some member countries voluntarily informed and encouraged NGOs in their own countries to apply for the fund and requested that the Secretariat support efforts to refine their application. Eventually, one NGO managed to obtain funding.
- **Matching with the private sector spawned concrete actions**
  - Products and technologies that may be useful to address desertification were introduced and discussed in the AI-CD online training program. One of the participants from the relevant ministries of the member countries found **the potential of a product** presented and began to **consider incorporating it into programs in his/her country**.
  - Following a series of preparatory meetings with cross-sectoral stakeholders, **several actors started small-scale on-the-ground tests of a product** introduced by the Secretariat in a member country **aiming to boost relevant international initiatives** such as the Great Green Wall Initiative.
  - The research institute which collaborated in said on-the-ground test stressed that collaboration with researchers was the key to testing as well as validating new technologies and disseminating them, regionally as well as throughout a single country. Meanwhile, the agency related to the Great Green Wall emphasized that investment decisions concerning the introduction of new technologies would need to be made on an evidence-based and cost-effective basis and underlined the importance of promoting the dissemination of technology in a scheme that will develop autonomously by involving local beneficiaries.

### 3-2. Lessons learned

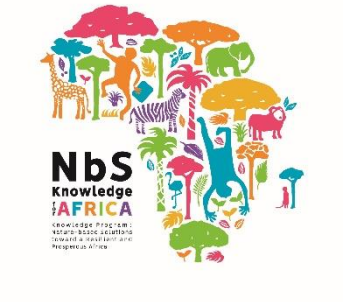
- **PCNs are useful tools to seek funding opportunities**: A series of matching meetings of Focal Points with ITFPs were organized to discuss the Focal Points' PCNs and explore possible collaboration. Some member countries highlighted the fact that assistance in developing and refining PCNs, sharing information on funding opportunities, and matching partners were useful

when formulating projects and applying for funds. Other member countries suggested that similar to the support provided for holding country workshops, small-scale financial support for implementing micro-projects based on PCNs would be preferable, as it would be a stepping stone to obtaining larger funding later on. In addition, requests were made for capacity-building support to elaborate proposals for ITFPs.

- **Contacts with ITFPs on the occasion of their Country Strategies renewal**: ITFPs prepare Country Strategies which identify the objectives and development results for relevant countries and under which projects are developed. The Country Strategy is usually renewed every four to six years, which is optimal timing for Focal Points to initiate contacts with ITFPs and seek the potential for their PCNs to be incorporated into ITFP's project formulation under the new strategy.

## 4. Relevant information

| | |
|---|---|
| NbS Approach Category | 4-2.30 |
| Title of the project from which the approach is derived | African Initiative for Combating Desertification to Strengthen Resilience to Climate Change in the Sahel and the Horn of Africa (AI-CD) |
| Country | Horn of Africa – Djibouti, Eritrea, Ethiopia, Kenya*, Somalia, South Sudan, Sudan<br>Sahel – Burkina Faso, Cameroon, Chad, Mali, Mauritania, Niger, Nigeria, Senegal*<br>(*) Regional hub of each region |
| Biome | Savanna, Desert/Semi-desert |
| Implementing term | 2016/August – 2022/August |
| Implementing organizations | Government of Kenya, Government of Senegal, JICA, United Nations Convention to Combat Desertification (UNCCD) |
| Supporting organizations | Japan International Cooperation Agency (JICA) |
| Report/Tool/Guideline | • AI-CD Website<br>• Policy Guidelines<br>➢ Horn of Africa Region<br>○ Guideline on Effective Measures for Combating Desertification for Achieving Sustainable Development in the Horn of Africa<br>○ Measures for Combating Desertification: Case Studies from Horn of Africa<br>➢ Sahel Region<br>○ Knowledge and Policy Brief<br>•Short Film<br>➢ Nigeria<br>➢ Mali<br>○ Short Version<br>○ Long Version |
| Contributors to this article | Takuya Shiraishi/Oriental Consultants Global |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