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MINISTRY OF ENVIRONMENT,
PROTECTION OF NATURE, RESERVOIRS
AND ARTIFICIAL LAKES

JAPAN INTERNATIONAL
COOPERATION AGENCY

JICA

Department of Water, Forests, Hunting and Soil Conservation

Integrated Community Forestry Development Project

(PRODEFI)

PRODEFI Model User's Manual

A Guide to Support Community Forestry Development

March 2008

IC Net Ltd.

Integrated Community Forestry Development Project Phase 2

Japan International Cooperation Agency

(JICA)

Department of Water, Forests, Hunting and Soil Conservation

(DEFCCS)

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Table of Contents

* Currency exchange rate: 1 CFA = 0.249 yen (September 2007)

Introduction

(1) Purpose of this document

This document is a guide to support community forestry development. It explains the procedures to implement an integrated community forestry project using the *PRODEFI Model*, a unique approach to rural development developed in Senegal through the joint efforts of the Department of Water, Forests, Hunting and Soil Conservation (DEFCCS), the Ministry of Environment, Protection of Nature, Reservoirs and Artificial Lakes of Senegal, and the Japan International Cooperation Agency (JICA).

Participation of local people has been emphasized not only in the area of forestry and natural resource management but in the development arena in general for a long time for various reasons such as enhancing efficiency and effectiveness of development interventions. Yet practitioners of development projects often find that promoting local participation is by no means straightforward. For example, many efforts to institutionalize tree-planting by local people through training and distribution of seedlings have not materialized. Questions such as "How can the project encourage local people to participate in its activities?" and "How can the project motivate local people to become active and take initiatives?" are commonly heard. This document aims to help address such questions raised by practitioners and administrators engaged in development projects.

Like many other projects, initially, the Integrated Community Forestry Development Project[1] (PRODEFI) struggled to motivate villagers to plant trees. Eventually, through critical review of existing extension practices and the approach employed by the project at the time, the *PRODEFI Model* was developed. The model basically aims to promote rural development by encouraging participation of local people in various activities. The key feature of the model is its training. The model aims to start or boost sustained development processes by holding training sessions 1) based on local needs, 2) using local human and physical resources, 3) at where local people live, 4) without selecting participants, and 5) targeting the mass, giving equal opportunity for everyone to participate.

After introducing the *PRODEFI Model*, PRODEFI succeeded in popularizing seedling production and tree-planting among villagers. The project was able to revitalize and sustain villagers' forestry activities. In particular, during the second phase of the project (PRODEFI II) which continued for three years after closure of the initial phase, more than 2,000 trees were planted on average in each of the 30 project villages every year. Moreover, the project was able to contribute to the development of the villages by promoting activities such as vegetable growing in addition to forestry.

[1] The official French name of the project is 'Projet Communautaire de Développement Forestier Intégré' and PRODEFI is its abbreviation.

This document is written by the consultant team which implemented PRODEFI II. From their experience, the authors believe that the *PRODEFI Model* is an effective approach to promoting community forestry and wish to introduce the model to many people. The authors hope many readers will learn the advantages of the *PRODEFI Model* through this document and will try to utilize the model in their projects.

In this document, the features and the mechanism of the *PRODEFI Model* are first outlined and the method to apply the model to community forestry projects is explained later. In addition, in order to enable readers to clearly understand the benefits of applying this model, major outcomes of PRODEFI II are given. Readers should note, however, that the *PRODEFI Model* is an approach to rural development and is not a community forestry development model. This document aims to help readers understand how to apply the model to community forestry projects.

Although this document is titled 'manual' there is a major limitation. The contents of the document largely rely on the experiences of a single project, PRODEFI. It cannot provide a comprehensive guide or elaborate on all of the many different issues which may arise during implementation of a community forestry project. Instead, it gives detailed descriptions of the measures taken and the processes followed by PRODEFI II in order to provide hints to readers who seek solutions for problems they face during implementing of a project. As the founder[2] of the *PRODEFI Model* suggests, "In order to effectively utilize the model in a project, creativity and innovation to match the given environment is required." The document aims to stimulate such creation and innovation by readers by sharing the experiences of PRODEFI II.

(2) Recommended readers

This document is recommended for officials of developing countries and donor organizations, consultants, and NGO workers involved in planning and implementation of development projects. Although it is mainly targeted towards people who are concerned with community forestry and natural resource management, the document is relevant to those who are interested in people-centered rural development in general as well. The document should serve as a practical guide to those engaged in forestry and natural resource management, and as a reference to those who are interested in rural development.

(3) Structure of this document

This document consists of the main text and the annexes. The main text contains three chapters. Chapter 1 briefly introduces the project PRODEFI, and explains the circumstances under which the *PRODEFI Model* was formulated and the features of the model. Chapter 2

[2] Naoto Noda, former Chief Advisor of PRODEFI

gives step by step guide to implementing community forestry projects using the model. Chapter 3 presents the outcomes of PRODEFI II so that readers can get an idea on what to expect by employing the model in their projects. The actual inputs, outputs and impacts of project activities are complied in the annexes. Also in Chapter 3, by analyzing the experiences of PRODEFI II, limitations and possibilities of the model are considered. In addition, implications of the PRODEFI II experiences are considered from the viewpoint of extension, community development and public service delivery in developing countries in general.

Chapter 1: Background

This chapter introduces the project PRODEFI and the *PRODEFI Model*. It explains the circumstances under which the model was developed and the features of the model. It is based mainly on existing documents written in Japanese and French[3].

1.1. Development of the model

(1) The project PRODEFI

The Integrated Community Forestry Development Project (PRODEFI) was a project requested and implemented by the Department of Water, Forests, Hunting and Soil Conservation (DEFCCS), the Ministry of Environment, Protection of Nature, Reservoirs and Artificial Lakes of Senegal with the assistance of the Japan International Cooperation Agency (JICA). In Senegal, forests were decreasing due to felling, fire, agricultural development and overgrazing. Forest destruction was in turn thought to be contributing to soil degradation, consequently lowering agricultural productivity. In order to reverse such trend, the Senegalese Government requested the Japanese Government for a technical cooperation project. The project was to improve the environment and livelihood of local people through promotion of community forestry and income-generating activities.

Table 1: Summary of PRODEFI

	First Phase	Second Phase
Duration	Five years from January 2000 to January 2005	Three years from April 2005 to March 2008
Objectives	Development of a model to promote natural resource management activities *Formulation of the PRODEFI Model*	Improvement and popularization of the model developed in the first phase *Application and diffusion of the PRODEFI Model*
Target areas	- 9 villages in Nioro Department, Kaolack Region - 3 villages in Fatick Department, Fatick Region - 6 villages in Rufisque Department, Dakar Region	- 30 villages in Nioro Department, Kaolack Region (population of 10,583 in total)
Location of office	Dakar (capital)	Nioro du Rip (244 km from capital)

[3] This User's Manual is also available in Japanese and French. Details of reference materials are given in the Japanese and the French versions.

The first phase of PRODEFI started in January 2000 with a planned lifespan of five years. The project was mandated to develop a model to promote sustainable natural resource management practices in the target area. 'Natural resource management practices' referred to activities related to afforestation and soil conservation. In the first phase, the project was administered in Dakar, targeting three departments with distinct environmental characteristics. The project achieved very little during its initial stages due to its problematic design. However, after restructuring of the project design halfway through the project period, the project started to succeed in promoting tree-planting.

Forestry activities were particularly well received by the villagers of Nioro Department. Hence a decision was made to continue the project for another three years from April 2005 (second phase); this time concentrating all project inputs on villages in Nioro Department. Although the project was discontinued in other departments, the number of target villages was increased from nine to 30 in Nioro. Details on the second phase of the project (PRODEFI II) can be found in Annex (1).

(2) Initial problems of PRODEFI

Initially, PRODEFI had many problems and struggled to popularize activities such as seedling production and tree-planting. Major constraining factors were: 1) target areas were far and dispersed; 2) activity design lacked understanding of socio-economic relationships among local people; 3) responsibilities of the project and the target population was unclear, i.e., it was not clear what roles the project was meant to play and what was expected of project recipients; 4) human resource input was too small compared to the volume of activities planned; and 5) the project could not utilize its material inputs to motivate villagers to initiate and continue natural resource management practices. As such, by two and half years into operation, the project was forced to drastically review its design. The *PRODEFI Mod*el came into being through this restructuring process.

Tree-planting is a need but not necessary a priority for villagers.

In preparation for project restructuring, the then chief advisor analyzed the environment surrounding the project and came up with three principles. Those were: 1) an approach which can encourage and promote development processes by local people was required; 2) PRA (Participatory Rural Appraisal) type approach which requires facilitation skills was not feasible as such skills were not readily available in Senegal; and 3) in order to ensure sustainability, the approach to be developed must be adoptable under various conditions and the users should not be restricted to DEFCCS. In addition, from his past engagement in rural development, the then chief advisor believed that "Although natural resource management is usually one of the concerns of local people, often it is not on top of the priority list. Generally,

cash flow from natural resource management activities is minus or requires a long time to turn to plus. For the poor, such activities are not feasible unless taken together with higher priority activities that generate income in a short time." As a result, the strategy adopted was to formulate a general rural development approach which did not require special facilitation skills or abilities, and to promote natural resource management activities together with other priority development activities within a single approach.

Selective approach to extension is not effective.

Like elsewhere, training was commonly employed to diffuse knowledge and skills in Senegal. Usually, training sessions were held in big towns and cities, inviting selected participants from surrounding villages. The participants were expected to return to their home villages and to teach fellow villagers whatever they learned during the training. Initially, PRODEFI employed this selective approach to popularize tree-planting and seedling production. The result was extremely poor. Several reasons became apparent.

- Training participants were chosen simply because they were village elites. They were not necessarily interested in the training theme nor were they necessarily interested in putting into practice the skills they were going to be taught.
- Some participants had genuine interest in the training theme. However, because they were elites, they were too busy with village affairs to practice or to teach the skills they were taught.
- From each village, only two or three people were chosen to participate in the training. As a result, the participants found it difficult to gather enough people to practice what they learned after returning to their villages.
- Training sessions were held in towns equipped with modern facilities but the situation was different in the villages. Training participants gave up practicing what they learned because they could not replicate the conditions under which the training was held when they returned home.
- Training participants encountered problems in practicing the skills they had acquired. Consequently, they stopped practicing because they could not access the trainer to gain advice as s/he did not live close by.

In the new approach to be developed, the problems listed above needed to be addressed as well. The *PRODEFI Model* was born through careful consideration of such problems, past experiences and the environment surrounding the project.

1.2. Features of the model

(1) Structure of the Model

The PRODEFI Model is a participatory approach to rural development.

It is an approach which leads local people into a development process for the people by the people by drawing out the power people possess and using that power to revitalize the activities of individuals and groups.

The *PRODEFI Model* is composed of two stages as indicated in Figure 1. **In Stage 1, training is conducted to stimulate local people to take action.** Themes that are likely to fulfill the needs of target population are chosen for training and local people are encouraged to take initiatives. If local people become motivated in a particular activity, assistance strategy can advance to Stage 2. If not, Stage 1 is continued using different training themes.

In Stage 2, assistance to help local people realize their goal in their chosen activity is provided. Examples of such assistance include 1) technical follow-up, 2) strengthening of village organizations, 3) access to funds, and 4) establishment of small-scale infrastructure. However, there are no set rules and it is necessary to consider what the best option is in accordance with the prevailing environment. After advancing to Stage 2, **activities are promoted through repetition of input and reaction**.

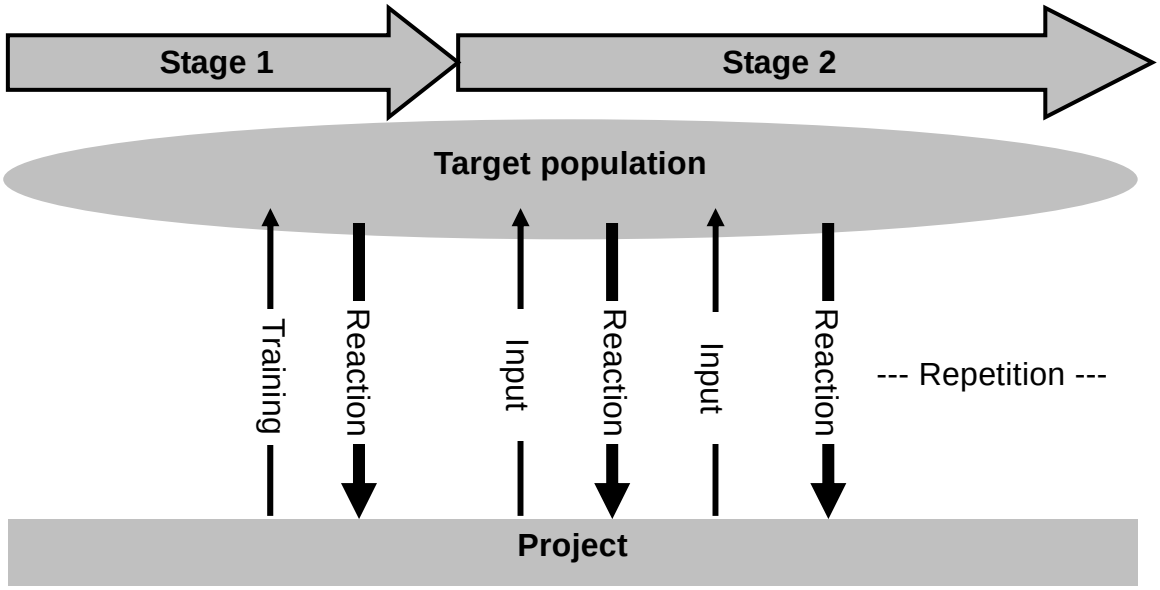


Figure 1: Concept of the PRODEFI Model

In the *PRODEFI Model*, the first input to target population is training. However, inputs after training are not predefined. The model is basically a simple approach which first uses training to prime local people to take actions, and plans for subsequent inputs according to reactions of

local people.

In the *PRODEFI Model*, various themes are chosen for training and themes well received by local people are further promoted through additional assistance. In contrast, themes that fail to generate enthusiasm of local people are abandoned without delay. The model assumes that despite efforts to provide training in themes which match the needs of local people, some themes will still fail. Its strategy is to first invest widely but thinly in many themes, and then select the promising themes for additional investment. The model is very much concerned with minimizing risks and maximizing impacts of project investment.

(2) Users of the Model

This document explains how to utilize the *PRODEFI Model* in community forestry projects. However, the model can be used by individuals and organizations who wish to promote people-centered natural resource management or more broadly, rural development in general. The model can be utilized in projects of various type, sector and size. It can be applied, for example, to forestry or fisheries projects as well as to integrated poverty reduction or rural development projects. As long as some local needs exist, **the model can be applied to any area**.

(3) Training of the Model

In the PRODEFI Model, training is organized 1) based on local needs, 2) using local human and physical resources, 3) at where local people live, 4) without selecting participants, and 5) targeting the mass. The five principles are interrelated and jointly enhance the effectiveness of the training.

1) Based on local needs

Themes for training are decided based on the needs of local people. Priority needs of local people are satisfied first before promoting themes that are not so highly appreciated. Confidence of local people towards the project is gained first by respecting their wishes even if the priorities of the project and local population do not match. Once mutual trust between the project and local people is established, it becomes easy to attract attention of local people to themes that the project attaches high importance but are not necessarily considered a priority by local people.

2) Using local human and physical resources

Trainers are recruited from the vicinity of target villages. The reasons are to ensure training contents are feasible for local application and to establish links between trainers and trainees. Local trainers have good knowledge of local conditions, hence the probability of

being able to teach skills well suited to the local environment is high. Trainers who live close by are easily accessible by local people in case they wish to ask questions after training. Also, in order to further facilitate application of skills local people learn, locally obtainable tools and materials are used to the extent possible.

3) At where local people live

Training is held where local people live or places easily accessible to them. There are four reasons. Firstly, it enables local people to attend training easily. By conducting training where people reside, it provides a better chance for people who cannot travel or cannot leave their home for a long time to participate in training. Secondly, it persuades trainers to teach knowledge and skills taking into account the environment of where people live. Thirdly, it enables to cut the costs related to traveling, accommodation and meals of participants, and hiring of training venue. Fourthly, it helps local people smoothly put into practice what they learned during training. Cooperation and consensus building among villagers necessary to implement activities will be easier as many villagers will learn the same skills at the same time in their own village.

4) Without selecting participants

Rather than selecting representatives to be trained, everyone is given equal opportunity to participate in training. This reflects the lessons learned from past training and extension practices. In the past, when just the chosen representatives were trained, skills rarely trickled down to the mass. In developing countries, the same elites tend to get selected repeatedly while the great majority never gets a chance to attend training, consequently discouraging many people to try new skills and activities. Training of the model encourages and motivates local people by giving everyone an opportunity to get trained.

5) Targeting the mass

Training accommodates everyone who wishes to attend. If necessary, training sessions are repeated until all are accommodated. By targeting the mass, it enables local people to try together the skills they acquired and learn from each other, consequently raising the possibility of skills and activities becoming firmly established. For activities that require group work, consensus building among local people is likely to go smoothly as many people will share the same knowledge, acquired through the same training. In addition, as the mass is trained, the chances of people practicing the activities they learned increases which in turn raises the possibility of such activities being noticed by people who did not get trained. Hence knowledge and skills may be transferred to people who did not attend training from those who did.

By conducting training according to the above principles, effects illustrated in Figure 2 can be expected. The figure compares the training of the *PRODEFI Model* and training which selects representatives to be trained, an approach commonly adopted in developing countries.

The five principles of the training of the *PRODEFI Model* aim to ensure that the knowledge and skills taught during training are disseminated widely among local people.

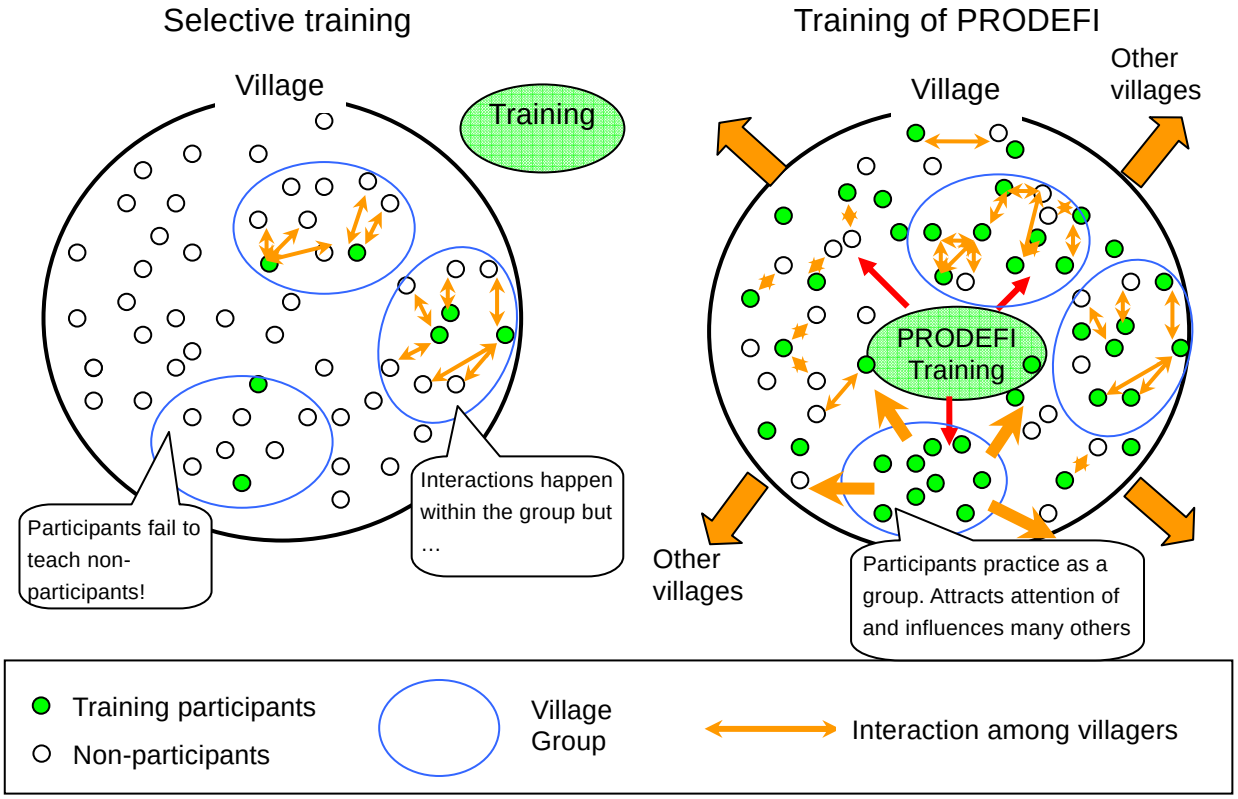


Figure 2: Effects of selective training and training of PRODEFI

(4) Advantages of the Model

1) Probability of knowledge and skill dissemination is high

By applying the *PRODEFI Model*, knowledge and skills are likely to be disseminated with higher certainty compared to traditional extension practices. In extension and training methods commonly adopted in developing countries, representatives from local population are selected and trained, and eventually, the skills and knowledge are expected to be transmitted to the mass. This type of approach assumes that skills will be transferred from experts to extension workers to progressive farmers and finally to the mass. However, to make this happen, many conditions must be fulfilled. For example, 1) the right extension workers and progressive farmers can be identified; 2) the selected extension workers and progressive farmers are motivated to teach others; 3) the selected extension workers and progressive farmers have mobility; 4) the selected extension workers and progressive farmers are trusted by local people; 5) the selected extension workers and progressive farmers do not migrate; and 6) the skills to be taught have absolute advantage, just to name a few. Such conditions may be regarded as hypotheses. The more hypotheses an approach relies on, the less likely it is to function. In the *PRODEFI Model*, the probability of

knowledge and skills being disseminated widely is raised by eliminating many of the hypotheses inherent in extension methods commonly practiced. By targeting the mass and directly training everyone who whishes, the model increases the likelihood of skills being adopted by local people.

2) Local people are likely to become enthusiastic about project activities

Local people are likely to become enthusiastic about participating in activities that the project promotes because, in the *PRODEFI Model*, training is conducted respecting the needs of local people and providing opportunity for everyone to participate. As the priority needs of local people are first addressed in the training, their confidence towards the project is strengthened which in turn leads to active participation of local people in project activities.

Frictions among local people can be avoided because both elites and non-elites are given equal opportunity to acquire knowledge and skills. With training that selects participants, all too often, the better educated are selected and political power and patronage greatly influence the selection. While opportunities are dominated by a small number of elites, there are people who are interested or talented in learning and applying new skills but do not have the right connection. However, it is generally unwise to select just the latter type of people as it may cause frictions among local people. The *PRODEFI Model* avoids such problem by opening the training to all. At the same time, it satisfies the great majority of local population who wished but never had the chance to attend training.

3) Investment risk can be reduced

With the *PRODEFI Model*, investment risk of the project is reduced by restricting the initial input to training and considering additional inputs depending on how local people react to the initial input. The model assumes that reaction of local people to external inputs can never be predicted with 100 % certainty hence the strategy is to start small and invest more only in promising activities. The model does not assume that every training theme will be supported and put into practice by local people. Instead, it selects themes that are likely to be greeted with enthusiasm and continues inputs to themes that actually succeed but discontinue inputs to themes that do not. With such strategy, the project can efficiently use its resources.

4) Preparation time is short

Project inputs to local people can start within a short time as application of the *PRODEFI Model* requires little preparation. In the beginning, the only preparation required is planning for the initial training. Basically, all that is required is to identify the local needs, set the training theme accordingly, procure trainers and training materials, and prepare for the training. There is no need to do a detailed survey or extensive planning.

5) Implementation is easy

Implementation of Stage 1 of the *PRODEFI Model* does not require special abilities. The model does not require special facilitation skills or subject specialists who have advanced knowledge and techniques in a specific area. As long as the training needs can be identified and training can be planned and conducted according to the needs, the model can be implemented. In many contexts, training can be easily organized as counterparts of projects who are in many cases officials of government organizations in a developing country, are usually not only used to attending training but have experience in planning and implementation of training.

6) Planning is possible to a certain degree

A high level of planning is usually required for aid projects. In reality, little can be planned with certainty in participatory development projects. With the *PRODEFI Model*, planning is possible to some extent. In Stage 1, if the target population and the training themes can be identified, the size, the quantity and the budget of training can be clarified and planning is possible. For Stage 2, detailed planning becomes possible through observation of reactions of local people during Stage 1. As inputs to local people in Stage 2 are planned based on the results of Stage 1, however, it is not possible to draw a plan for Stage 2 prior to project implementation.

(5) A word of caution

- **The *PRODEFI Model* is a development approach and was not designed for direct application to projects.** The training of Stage 1 or the activities of Stage 2 can be planned and implemented separately as projects. However, as the main activities and the required inputs of Stage 2 cannot be accurately predicted prior to implementation of Stage 1, the model cannot be utilized in complete by projects that require detailed planning prior to implementation.

- The *PRODEFI Model* is basically a theory that explains how aid recipients will behave when aid providers approach recipients in a particular manner. **Project implementation procedures and activity contents are not included in the model.** Those who wish to implement a project using the model must decide on the implementation structure and the activities to be carried out in accordance with prevailing conditions surrounding the particular project.

- The *PRODEFI Model* contains general principles which can be applied widely to various situations. In order to attain good results, however, **creativity and innovation that correspond to the prevailing project environment are required**.

In order to respond to the questions that the above comments may generate, in Chapter 2, the

procedures to plan and implement a project using the *PRODEFI Mode*l, and the steps and the innovative measures taken by PRODEFI II will be explained.

Chapter 2: Application

This chapter explains the procedures to implement a community forestry project utilizing the *PRODEFI Model* introduced in Chapter 1. The steps involved in applying the model, innovative measures that can be tried and lessons learned during project implementation are explained referring to the experiences of PRODEFI II. A flowchart summarizing the steps is given below. The steps described in this chapter, however, are not necessary specific to projects using the *PRODEFI Model*. Many things explained here may be standard procedures in other projects.

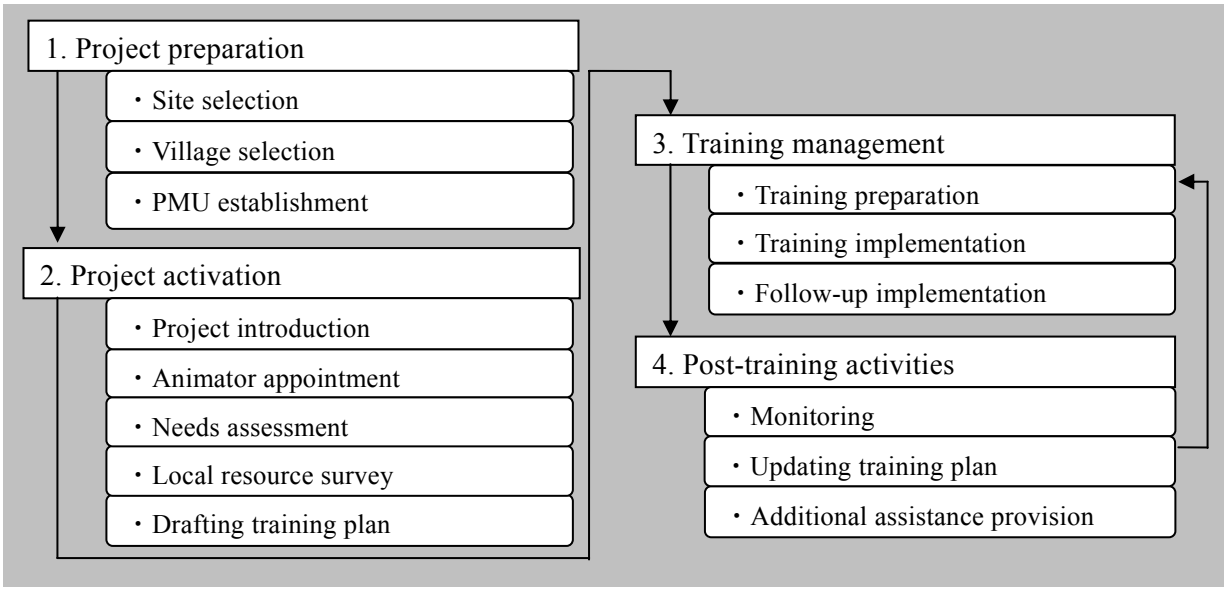


Figure 3: Steps to run a project using the PRODEFI Model

2.1. Project preparation

2.1.1. Selection of project site

<< Tips >>

・ Pick areas with needs (the needs can be potential needs)

The target area(s) should be selected from places where local residents feel that there are problems regarding the natural environment in one way or another or areas where people are interested in tree-planting because the *PRODEFI Model* capitalizes on the needs and awareness of the problems of local people in order to motivate people to take initiatives. However, the needs neither have to be explicit nor the utmost priority of local people.

The target area(s) should be selected from places where local residents feel that there are problems regarding the natural environment in one way or another because the

PRODEFI Model capitalizes on the needs and awareness of the problems of local people in order to motivate people to take initiatives. However, the awareness does not necessarily have to be translated into physical action by local people. The model can be applied as long as some needs exist or it can be judged that needs could be easily created, through analysis of the external environment as explained below. Needless to say, if areas with high potentials and much needs regarding forestry can be selected, the chances of successfully completing the project becomes high. Then, how can potentials and needs be identified?

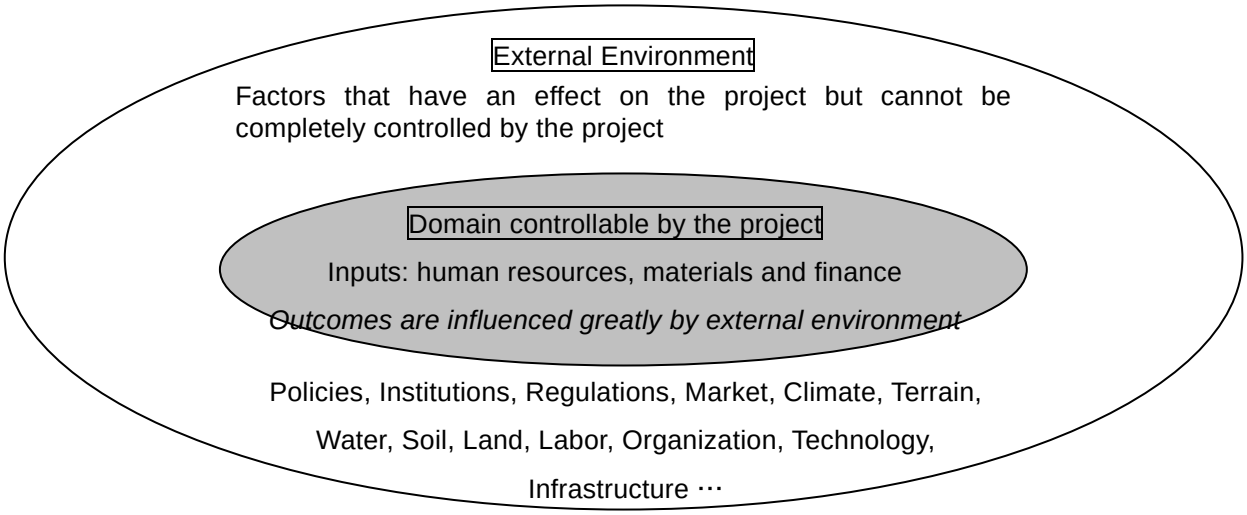


Figure 4: Project and the external environment

The external environment, illustrated in Figure 4, which includes the institutional framework of the natural environment sector, the market, the natural environment, land, organizations and applicable technology in the country or the region where the project is planned should be examined. Below, the major factors are listed and examples of conditions that normally raise the potentials or the needs regarding forestry are given together. It must be noted, however, that the factors and the conditions presented here are only indicative. Although it can be safely assumed that conditions such as assurance of ownership over trees planted and availability of enough land to plant trees are integral conditions for promoting forestry activities by local people, it is not possible to present a universal standard. Each project will need to make its own judgment about the needs and the potentials.[4]

a) **Policies, institutions and regulations:** public organizations are providing seedlings free of charge or at low cost; rights of local people over land and trees are assured; regulations on processing, circulation and sales of timber and forest products are relaxed.
b) **Market:** prices of forest products such as timber and charcoal are rising; inputs for afforestation such as pots and seeds are easily obtainable.

[4] If the areas in question are known to have forestry needs, the degree of the needs and the potentials should be analyzed.

c) **Natural environment:** precipitation is sufficient for growing trees; negative effects on agriculture and life such as soil erosion, wind damage and salt damage are visible.
d) **Land:** land is abundant.
e) **Labor market:** available labor is small in relation to land area.[5]
f) **Organization:** forestry extension workers are stationed; extension workers regularly visit the field; no organizations are promoting natural resource management activities by providing cash incentives.
g) **Technology:** low-cost, well-established forestry skills are available.
h) **Infrastructure:** access to markets and extension organizations are easy.

Field visits and interviews with central and local government organizations, NGOs and local people should be conducted bearing in mind the above conditions in order to identify areas with high potentials and needs.

Analysis of the external environment is also vital for formulating assistance strategies that will enhance the sustainability of activities by local people because project resources are finite and outcomes of a project are greatly influenced by its external environment (Figure 4). Results of the external environment analysis are also used to decide training themes and contents (Stage 1 of the model), and inputs to local people after training (Stage 2 of the model).

The case of PRODEFI II

From the three target departments of the first phase of PRODEFI, Nioro Department, which had relatively high forestry potentials, was selected for PRODEFI II.[6] The external environment of the target area is summarized in Table 2.

- Nioro Department has a government nursery and can distribute seedlings free of charge to local people in accordance with prevailing forest policies.
- Land which does not compete with agriculture is abundant in the project area and local people can utilize such land relatively freely in groups or individually.
- Riverbeds of Bao Bolong River[7] and its tributaries are not suited for agriculture because of salinity and seasonal flooding but are good for growing eucalyptus trees.[8]
- Timber is high in demand in Senegal and eucalyptus is not an exception.
- Afforestation techniques of eucalyptus are well established and the trees are merchantable in about five years after planting.
- Although felling of trees is restricted, the ownership over planted trees is vested in the planters.

For the above reasons, it can be concluded that an area with relatively high forestry potentials and needs was selected as the target area of PRODEFI II

[5] As forestry is not as labor intensive as agriculture, land less suited for cropping tends to get converted into forests if labor force decreases.

Table 2: The external environment of PRODEFI II

Item	Features
Policies, institutions and regulations	▲Forest policies promote afforestation: seedlings are distributed free of charge ▲Rights to land are relatively clear ▲Rights to planted trees are clear ▼Felling of trees, and transportation and sales of timber require authorization
Market	▲Eucalyptus timber is high in demand ▼Pots to grow seedlings are not easy to purchase
Natural environment	▲Rain is sufficient for trees to grow ▼Drought and torrential rain are not uncommon ▼Locust and termites frequently cause damage to plants
Land	▲Land is abundant
Organizations	▲Foresters are stationed at department and county level ▼DEFCCS lacks operational budget
Technology	▲Propagation and afforestation techniques of eucalyptus are well established
Infrastructure	▲DEFCCS operates government nursery in Nioro Department ▲Access to Dakar, where great quantity of timber is consumed, is relatively good

Note: ▲ and ▼respectively indicate positive and negative conditions for promoting sustainable forestry by local people.

2.1.2. Selection of target villages

<< Tips >>

- **The unit of intervention should be decided based on the daily activity limits and the unit of decision-making of local people**
- **Villages with serious conflicts, target villages of projects that provide material and monetary incentives to mobilize villagers, and villages difficult to reach should be avoided**
- **Villages with abundant land and water, villages in which people are concerned about the natural environment, villages that rely on forest products, and villages with active group activities should be given priority**

Once the target area is decided, the target villages can be selected. In this document, a village is assumed as the unit of intervention. However, the unit can be a commune, a hamlet or a ward. It does not have to be a unit of modern or formal governance. The point is to **observe the daily activity limits, the unit of decision-making, activities and events of local people,**

[6] In PRODEFI II, the target department was reduced to one but the target villages were increased from 18 to 30.
[7] Bao Bolong River, which flows through the center of the project area, is a tributary of Gambia River.
[8] The most common species for afforestation in this area is eucalyptus.

and to adopt a unit that seems most common.

Table 3: Points to consider when selecting target villages

Item	Note
Conflicts among local people	**Are there conflicts over land?** Likelihood of conflicts over ownership of trees planted is high in areas with many conflicts.
Ongoing assistance by other projects and NGOs	**Are there competing projects?** Competition with projects with similar focus and projects that provide material and monetary incentives should be avoided.
Access from project office	**Is access particularly difficult?** Transportation of seedlings and provision of technical advice to villages difficult to access during the rainy season are problematic.
Land suited for afforestation	**Is there enough land that does not compete with other land use?** In areas with many livestock, attention should be paid to grazing activities as well.
Availability of water	**Is water very scarce?** In order to propagate seedlings, water must be available during the dry season. In villages which do not even have sufficient water for humans and livestock, seedling production is not feasible.
Interests of local people towards the natural environment and tree-planting	**Are there progressive tree-planters?** Villages with groups and individuals experimenting with seedling propagation and tree-planting have better chances of succeeding in community forestry.
Use of forest products	**Do local people rely on forest products?** If so, people are more likely to take forestry activities seriously.
Group activities	**Are group activities active?** Villages which are active in group activities are likely to succeed in community forestry as activities such as afforestation are easier to start in groups.

The target villages should be selected by conducting field visits bearing in mind the points outlined in Table 3. Villages with serious conflicts and target villages of projects with similar focus or projects that provide material and monetary incentives to mobilize villagers should be avoided. Villages inaccessible during the rainy season should also be dropped. Ideally, the target villages should have abundance of land that does not compete with other land use such as agriculture and livestock grazing. However, as tree-planting needs other than afforestation such as for boundary demarcation, fencing and shades can be expected, the size of free land can be small as one hectare as it would generally be sufficient to kick-start tree-planting by local people. With regards to water supply, if watering is possible twice a day once in the morning and once in the evening, seedlings can be grown. Unless the shortage is severe, water shortage is not a constraining factor. Even if seedlings cannot be grown in the village, if there is a nursery nearby that is accessible during the rainy season, forestry activities can still be promoted. Villages with high reliance on forest products and villages with active group

activities tend to have better chances of succeeding in community forestry.

Care must be taken, however, as the above statements only point out some of the many important factors that should be taken into account when selecting the target villages. The selection criteria are site specific. The above information should be supplemented with general and local knowledge on forestry.

The case of PRODEFI II

Twenty-one new villages were selected at the start of PRODEFI II. The criteria were:

(1) Geography
  1) Access is not difficult

(2) Resource
  1) Land suitable for planting trees is available
  2) Water is not severely short in supply

(3) Organization
  1) Activities of village organizations are active
  2) People are practicing or interested in forestry and natural resource management

(4) Assistance
  1) No projects or NGOs are supporting natural resource management practices

2) People's impressions on the first phase of PRODEFI are positive

Point (1) was used to prescreen and drop areas that were far and difficult to access. Points (2) and (3) were used to list the candidate villages. Point (4) was used to avoid competing with other assistance efforts, paying particular attention to criterion 1).

2.1.3. Establishment of implementation structure

<< Tips >>

- **Establish PMU and appoint project manager, accountant, animators and supporting staff**
- **Establish structure that enables close monitoring of concerns and reactions of local people → adopt animators or community workers to ensure link between the project and local people**
- **Establish structure that enables proper management of inputs such as training and human resources → a manager with sound managerial skills and staff capable of handling the logistics efficiently is a must**

In this document, the structure to manage a project will be referred to as project management unit (PMU). PMU may be established within an existing organization such as regional or district offices of central government agencies or as a standalone project office directly

administered by the headquarters of a central government agency. If the *PRODEFI Model* is to be used continuously to deliver public services to local people[9], the former setting is desirable. If the model is to be employed by a time-bounded project[10], both options are feasible.

As the *PRODEFI model* aims to motivate initiatives of local people, project activities are implemented paying careful attention to the concerns and the reactions of local people. For this reason, PMU must be equipped with at least the following two functions. The first function is particularly relevant to projects that utilize the *PRODEFI Model*. The second is common to many other projects but nevertheless very important.

1) Concerns and reactions of local people can be closely monitored
→ Animators or community workers who link the project and local people should be adopted.

If personnel such as extension workers who can communicate and coordinate with local people, and monitor and facilitate problem solving of local people exist in the organization in which PMU is established, such people can be utilized by the project. If not, animators[11] should be employed in order to ensure communication between the project and local people.

The number of animators or community workers required for a project varies depending mainly on: 1) the number of target villages; 2) access to the villages; and 3) intensity of project inputs such as training. For example, if the traveling time to the target villages is about one hour by motorcycle and one training session is conducted every one and half months during the agricultural off-season, one animator can probably look after five villages. Functions of animators are explained later.

2) Inputs such as training and human resources can be appropriately managed
→ Manager with sound managerial skills and staff capable of handling the logistics efficiently is a must.

Proper management of human resources, materials and budget is vital, as with other projects. In projects utilizing the *PRODEFI Model*, many people are involved because many training sessions are held and close monitoring of local people is required. Management of materials and budget require much time and effort because in the model, many small inputs are repeatedly made in order to motivate local people. The *PRODEFI Model* is a simple and effective approach. However, the magnitudes of impacts generated by the model depend greatly on the management. As such, a project manager with sound managerial skills and staff

[9] For example, the forestry department may be mandated to popularize forestry and may wish to systematically improve its extension services through application of the *PRODEFI Model* by local extension offices, or a local government body may wish to promote forestry and natural resource management as part of its public service by utilizing the model.
[10] With projects with very limited lifespan, if the capacity of the existing organization in charge of the project area is weak, it is probably wise to set up a standalone PMU rather than trying to enhance the capacity of the existing organization.
[11] In francophone Africa, animator generally refers to rural development extension workers. In this document, an animator is a person who facilitates communication and coordination between the project and local people.

capable of handling the logistics efficiently are required. Particularly, for the positions of project manager and accountant, highly qualified individuals should be appointed, for example, by providing attractive incentives and recruiting through open competition.

PMU will require a project manager, an accountant, animators and supporting staff such as clerk at a minimum. Obviously, the number of staff required will increase according to the number of the target villages and the intensity of project activities.

The case of PRODEFI II

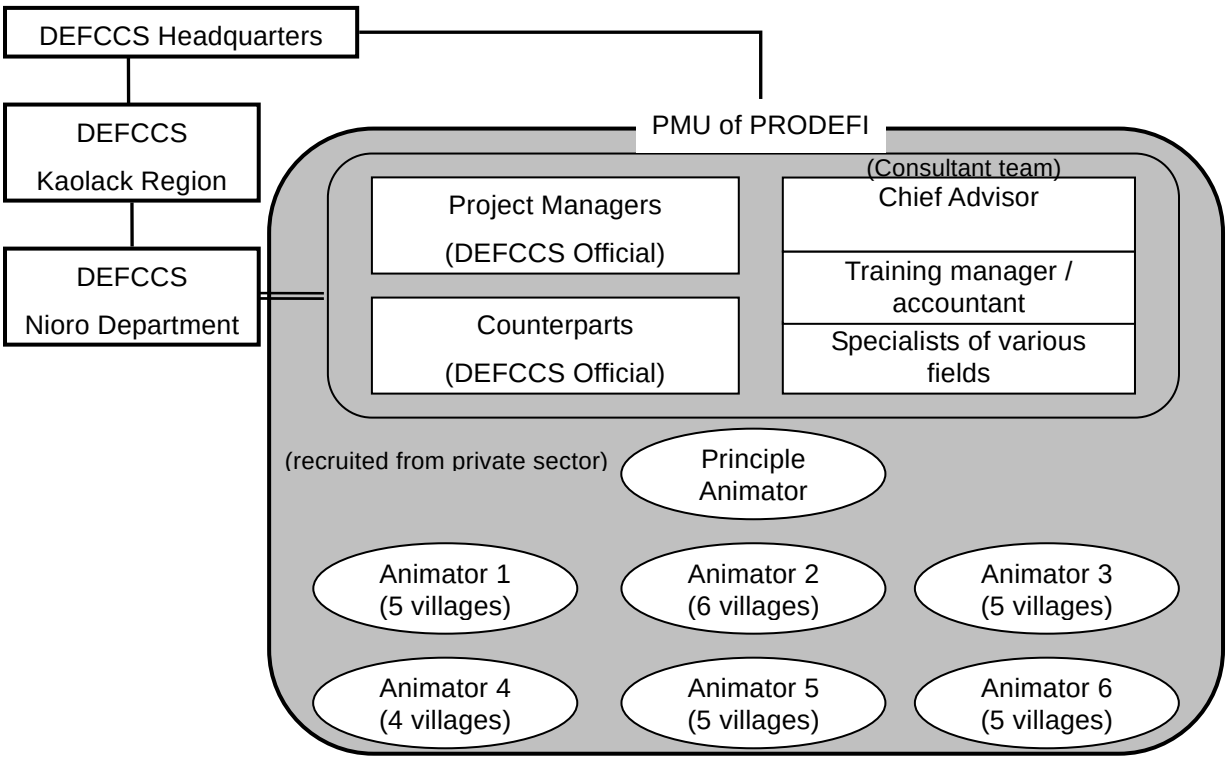


Figure 5: Project Management Unit of PRODEFI II

The PMU of PRODEFI II is given in Figure 5. This is a stand-alone PMU. A full-time project manager and a deputy project manager as well as two foresters who were in charge of the target area were appointed by DEFCCS as counterparts. Animators were recruited locally as the Nioro DEFCCS did not have a sufficient number of staff members who could communicate and coordinate with local people for the project. In the project, planning was jointly done by the project manager and the consultant team, and field level project activities were implemented and monitored through the command line of the project manager – the principle animator – the animators. The counterparts mostly played the role of technical advisor to PMU staff and local people. Execution of the budget and accounting was the responsibility of Japanese consultants as a large part of the operational budget was provided by the Japanese Government through the consultant team.

In PRODEFI II, usually two to three consultants were stationed at the project site in order to measure the effects of the *PRODEFI Model* and to do research and development type of activities such as

drafting of this document. If it was just to run the project, probably, a chief advisor who decides the general direction of the project along with counterparts and an accountant would have been sufficient.

2.2. Project activation

2.2.1. Introduction of the project

<< Tips >>

- **Clearly convey what the project can do and cannot do**
  → Only promise training and not machinery, money or infrastructure

After establishing PMU and deciding on the target villages, the project should inform local people and local authorities on the selection outcome, and the objectives and the scope of the project. PMU members should visit all target villages and explain the project to local people. **It is very important to clearly convey the scope of the project, i.e., what the project can do and cannot do, in presence of many villagers as possible in order to eliminate overly high expectation. The project should inform villagers that, basically, the only project input will be training. It should not promise provision of equipment or cash.** When conveying the message, it is very important that all PMU members have a common understanding regarding the objectives and the principles of the project. In addition, the project should gain full support of organizations that administer the project at a higher level as well by explaining the objectives and the principles in detail.

The case of PRODEFI II

In PRODEFI II, the consultants and the counterparts formed two teams and visited every target village to convey the following message.

> Your village has been chosen as a target village. Inputs that the project can provide are basically restricted to training. We cannot give you money, machinery or building. Instead, we provide you with knowledge and skills through training. The project will assist you in improving your livelihood and living conditions through acquisition of knowledge and skills. However, it is up to you to practice the skills that you will learn. The project can assist your spontaneous efforts, but if you do not try, the project cannot help you.
>
> Training themes will be set based on your interests. Afforestation is one theme but that is not the only theme. Training will be held in your village and everyone is welcome. It is open to all who have interest in the theme. Later on, field workers will visit your village to find out your interests and needs. The project will draft a training plan based on that information and start the training.

2.2.2. Appointment of animators

<< Tips >>

- **Appoint individuals who: 1) can read and write; 2) live in one of the target villages or have good knowledge of the target villages; 3) are very good at communicating with local people**

In order to ensure smooth communication with local people, animators should be recruited. If the organization in which PMU is established has staff members who can act as animators, no new recruitment is necessary. **The main roles of animators** are outlined below.

- **Facilitate timely communication between the project and local people.**
- **Coordinate activity schedules of the project with local people.**
- **Assist implementation of project activities in the villages such as training.**
- **Monitor the activities of local people after training and report to PMU.**

For the above the reasons, **animators must 1) be able to read and write, 2) live in one of the target villages or have good knowledge of the target villages, 3) be very good at communicating with local people**.

Animators should be selected through open competition. The above expected roles and conditions should be communicated through local government bodies and village heads to prospective animators. In order to select the appropriate individuals, selection process should include screening of CV, interview, test on writing, and test on fieldwork. In addition, a trial period should be set before formal appointment in order to confirm the qualifications.

The case of PRODEFI II

In PRODEFI II, four animators were newly recruited. Together with the animators recruited during the first phase, six animators looked after 30 villages. Basically, the above criteria were used for the new recruitment. However, as the project was going to lend motorcycles to enhance the mobility of animators, the ability to ride motorcycles was added to the criteria. Furthermore, the ability to communicate in French was added as the Japanese consultants in PMU did not speak the local language.

The candidates were screened through examination of CV, writing test, interview and field test in which they had to gather information from villagers. Furthermore, the candidates were dispatched to the field for two weeks for a trail. Each candidate was assigned several villages to carry out the job specified by the project. The performance of the candidates was judged based on the reports submitted to PMU and interviews on the work of the candidates with villagers by a PMU member. After formal appointment, by adopting measures such as work evaluation and gradual increment of salary, efforts were made to objectively evaluate the performance of the animators and to make sure

the animators focused on generating good outputs.

2.2.3. Identification of local needs

<< Tips >>

- **Simply identify major concerns and desires of local people first (other information will naturally accumulate as project unfolds)**

Training is the initial input in the *PRODEFI Model*. In order to make the training effective, needs and problems of local people should be understood. However, it is not necessary to conduct a detailed survey. **As long as major concerns and desires of local people are identified and enough information to plan for the first several training sessions is gathered, it is sufficient.** The reason is that the conditions of the villages and their people, and information regarding potentials and problems accumulate with time, as the project will continuously conduct training sessions and observe the reactions of local people. Training themes can be added or modified as new information on the villages and their people become available. No costly and extensive survey is necessary.

The case of PRODEFI II

In the baseline survey of PRODEFI II, the following issues were covered.

1) In order to consider the training theme, activities that the villagers are engaged in or are interested in were identified along with the constraints and problems people are facing in implementing such activities.
2) In order to promote activities related to forestry, land use, rules for utilizing land and natural resources, access to water and problems felt by local people regarding the natural environment and natural resources were studied.
3) In order to schedule the training at the right timing when many people can easily attend, daily activity patterns of men and women, and annual, monthly and weekly events of the villages were studied. Timings inappropriate for training such as peak-agriculture season, major events, market days and time of the day spent for water fetching and cooking were identified.
4) In order to ensure information regarding training is disseminated to the majority of local people, information flows and decision-making mechanisms of the villages were studied.

A baseline survey was conducted in PRODEFI II as the project needed a benchmark to properly evaluate its effects. However, the application of the *PRODEFI Model* itself does not require a detailed survey.

2.2.4. Survey of local resources

<< Tips >>

- **Accumulate profiles of potential local trainers**
- **Identify resources available in the villages**

In order to plan and implement training, trainers, training materials, tools and venues need to be prepared. Resources necessary to conduct training on themes that are likely to be of interest to local people should be identified. The whereabouts of human and material resources are listed by conducting a survey.

The first objective of the survey is to **accumulate profiles of potential trainers**. The important point here is to list individuals who live within or close to the target villages. In order to smoothly conduct training and follow-up, and for local people to gain advice after training easily, trainers who live close by are desirable. Candidates for trainers include extension workers and researchers of public organizations, NGO workers, progressive farmers and entrepreneurs.

The second objective of the survey is to **identify resources available in the villages**. Resources available in the villages are listed prior to training because in the training, such resources are used as much as possible in order to enhance sustainability of activities by local people after training. The survey should be carried out by organizations or individuals knowledgeable about the target area.

The case of PRODEFI II

The following is the scope of the local resource survey of PRODEFI II.

1. Survey item

(1) Potential trainers

- Name, Age, Address, Telephone number, Occupation, and Organization
- Experience in practicing
- Experience in training / teaching
- Themes which can be taught and deemed feasible for application by local people

(2) Natural resources, raw materials and tools that may be used during and after training

(3) Places where goods necessary for activities can be obtained and their prices

2. Survey area

- 30 target villages and the surrounding area
- Weekly markets and towns and cities frequently visited by people of the target villages

2.2.5. Drafting of training plan

<< Tips >>

- **Make a calendar marked with training themes and timing**
- **Respect desires and needs of local people in selecting training themes**

However, the training plan drafted here is simply a draft at the time and it should be updated in accordance with the reactions of local people.

After identifying the needs of the villagers and local resources, a training plan should be drafted. **Training themes and implementation timing of each theme should be planned for each village.**

When selecting the themes, **the desires of local people should first be respected**. The reason is that the driving motor that sustains an activity by local people is the desire of local people wanting to carry out that particular activity. By reflecting the desires of local people into the training plan first, the project can earn trust of local people. After gaining trust, the project can promote activities to which it attaches importance. The idea is to draw attention of local people to the project and prime them to become interested in forestry and natural resource management by first conducting training on a theme they attach high priority to.

Nevertheless, even if local people have a strong interest in a particular theme, if trainers are difficult to find in the local area or materials are not easy to obtain, or the economic viability of the activity in question is problematic because, for example, the price of outputs are lower than the costs of inputs, such theme should be dropped.

Once the themes are selected, taking into account the nature and seasonality of the theme, and schedules of local people such as agricultural peak periods, the implementation timing should be decided. Considering the resources available to the project such as staff, vehicles and budget as well, a training plan with a horizon of six to twelve months should be drafted. If training themes that require some time to yield results such as vegetable growing and seedling production are selected, it is wise to plan for a follow-up after training. If there are other organizations operating in the target area, coordination is necessary to avoid duplication and competition.

It should be noted, however, that the training plan drafted here is simply a draft at the time. The training plan will require constant modification in accordance with the reactions of local people. The plan should be updated with new information regarding needs, potentials and constraints that become clear each time training is conducted. When applying the *PRODEFI Model*, the premise is that no matter how big a budget is spent to do a detailed survey, it is not possible to correctly identify all the needs of local people prior to project implementation. It is the same for potentials of villages and problems that villagers face. As such, the training plan is reviewed periodically in tandem with implementation of training and

subsequent monitoring of reactions by local people.

The case of PRODEFI II

As illustrated in Figure 6, in PRODEFI II, 1) demand of local people, 2) conditions and problems regarding the natural environment and natural resources, 3) available resources in the villages, 4) trainers and materials obtainable in the target area, 5) economic viability and risks of activities, and 6) ongoing activities by other organizations, were considered in order to select the training themes. Information on points 1) and 2) were obtained from the baseline survey, 3) and 4) from the local resource survey, and 5) and 6) from experiences of the first phase of PRODEFI and through information exchange with other organizations.

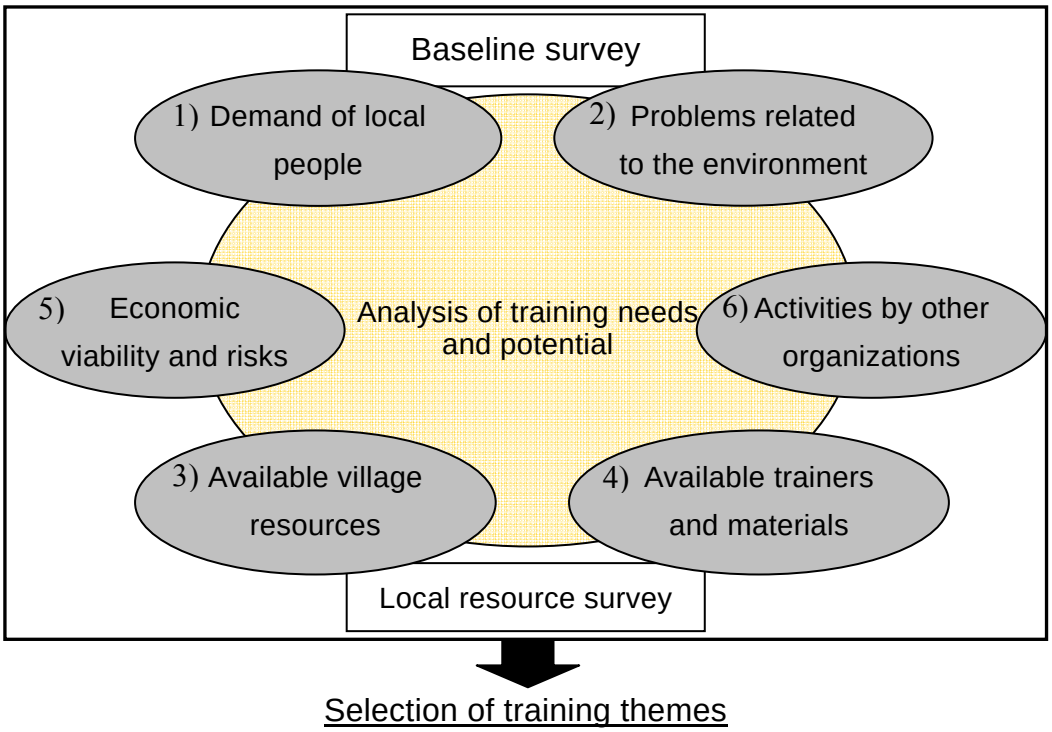


Figure 6: Process of training theme selection

The following are the training themes adopted by PRODEFI II during its three years of operation.
*Afforestation; *Seedling production; *Plantation management; *Carbonization; *Soil conservation (stone line, frame dam and millet fence); *Vegetable growing and compost making; *Fruit tree cultivation; *Livestock fattening; *Microcredit for livestock fattening; *Fruit and vegetable processing; *Planning; *Improved cooking stove; *Color dying and Beads

2.3. Training management

2.3.1. Preparation of training

<< Tips >>

Preparation with trainers

- **Select trainers locally but avoid family and personal connections**
- **Issue TOR outlining objectives and expected outputs of the training and fee**
- **Inform trainer that sudden change of training schedule may be requested**
- **Mock training to examine capacity of trainers and TOT to supplement knowledge and skills lacking in local trainers may be held**

Preparation with villagers

- **Use animators to motivate villagers to start preparation for training**

(1) Preparation with trainers

The process of training preparation is summarized in Figure 7. First of all, potential trainers are identified using the list generated by the local resource survey and subsequent word-of-mouth communications. Objectives and expected outputs of the training along with the fee are then presented. It is advisable to **issue a simple terms of reference (TOR)**. In response, candidate trainers are expected to submit a proposal including training contents and materials to be used. The project should check if the proposal covers the TOR.

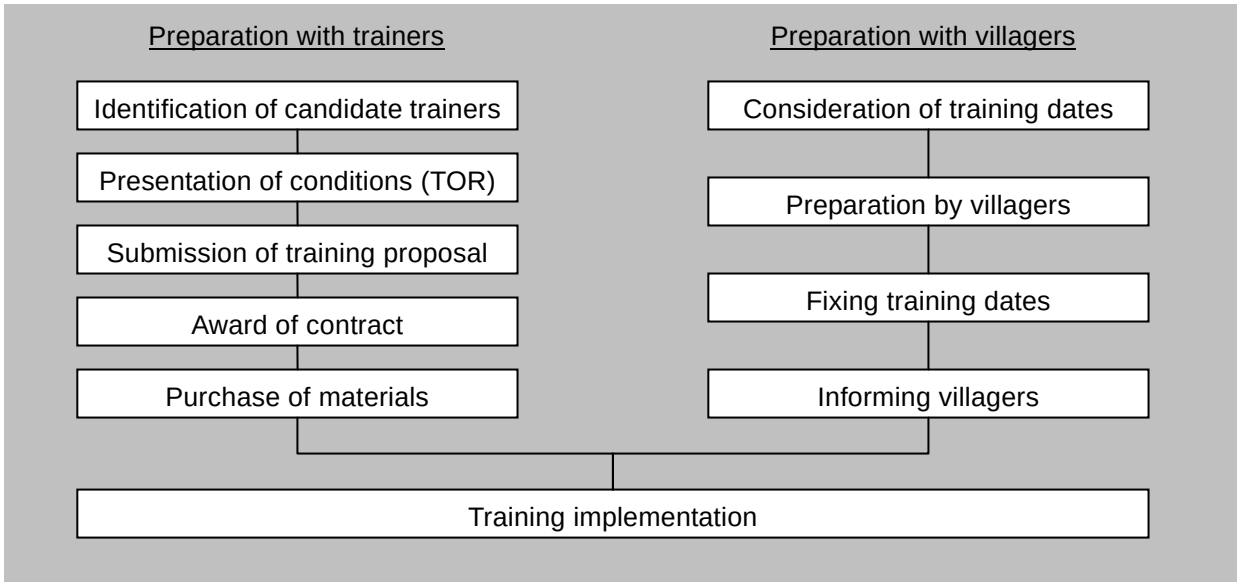


Figure 7: Preparation flow of training

In order to enable local people to smoothly continue on with the activity initiated by the training, the trainer should be asked to 1) allocate as much time as possible to practice of skills, 2) use materials obtainable in the villages or the surrounding area to the extent

possible, and 3) teach participants how such materials can be obtained. After discussing and agreeing on the particulars of the training, the contract should be awarded.

Materials to be used in the training should be proposed by the trainer together with the estimated costs. Discussions with the trainer should be held to make sure only the necessary items are purchased. From the management point of view, it is probably more efficient to instruct the trainer to purchase the materials, but it is important to make sure that the purchase is justified.

Trainers should be selected from the local area whenever possible but hiring through personal connections must be avoided if at all possible. The reason is that crucial actions such as terminating a contract when the performance is poor might become tricky. If a relative of a PMU member is nominated as a potential trainer, it is very important to examine whether he or she really has the right qualifications.

When signing the contract with the trainer, the project should inform the trainer that a sudden change of training schedule might be requested. The trainer is requested to agree to postpone the training in case a misfortune occurs in the village. This sort of flexibility becomes possible because local trainers who do not have to travel long distances are hired.

(2) Preparation with villagers

The animators should approach the villagers to start the preparation for training including identification of the right timing and the venue. In the villages, the animators motivate the villagers to take part in preparation by suggesting that the training to be held is what they wished for. At the project office, a scheduling meeting is held in order to decide the dates of training for each village. All animators attend this meeting and consider together the schedules of the villagers, the number of available trainers and the availability of vehicles to transport the trainer and materials in order to decide on the dates. After the meeting, the animators inform the villages of the dates fixed.

(3) Optional preparation activities

If there are doubts regarding the capacity of local trainers, a mock training session may be conducted to examine their ability. Training of trainers (TOT) may be held to complement their lack of knowledge and skills. Such measures should be adopted when the capacity of trainers are weak even if the theme to be taught by the trainers is very important for the project.

If the appropriateness of the technology to be taught in the training is unclear, trial training may be organized. The results of the trial training can be referred to in order to

decide whether to hold the training, to improve the existing technology, or to choose the right technology out of several options.

Such options, however, should only be implemented if the benefits justify the costs involved.

The case of PRODEFI II

In PRODEFI II, trainers were asked to understand the objectives and the principles of the project in addition to the expected outputs by including background information in TOR. The maximum duration of training for one theme was set to three days considering the concentration and absorption capacity of local people.

The fee for the trainer was already set by the first phase of PRODEFI at 15,000 CFA per day. However, it was possible to negotiate a lower fee of 7,500 CFA per day for follow-up. The negotiation took place after finishing the training on vegetable growing and compost making. At first, the trainers refused to perform the follow-up for half the price of training. Later, seeing the project try to provide follow-up to the villagers by utilizing its own staff, the trainers changed their mind. In countries like Senegal where unemployment is high, expensive fees are not necessary because opportunity for cash income is limited. Projects with plentiful budget in particular need to take care not to inflate the fee standard by paying overly high fees as it will have negative effects on other similar initiatives. From such point of view, the fee standard set by the first phase probably had a distorting effect on the fee market.

Purchasing of training materials was done based on the list which included prices produced by the trainer. The project examined the items and quantity listed and removed materials deemed unnecessary. The trainer was asked to purchase only items that were absolutely required. The project sometimes conducted price surveys in order to check if the price on the list reflected market prices. Though efficiency gains may be high to ask the trainer to purchase the training materials as the transaction costs involved can be saved by the project, the project must make sure that only the necessary materials are purchased at reasonable prices.

In PRODEFI II, often, the villagers were asked to make contributions in kind or labor because the project believed that there should be inputs from villagers as it is the villagers who requested the training. For example, in vegetable growing training, the villagers were asked to build the fence to surround the vegetable garden. In soil conservation training, the villagers gathered 20 cart loads of stone which was required in the training. In livestock fattening training, villagers were requested to select volunteers who were willing to provide cattle or sheep required in the training. Such contribution can be taken as a sign of desire to have the training and also indicates the probability of the activity being continued after training.

In order to raise awareness of the training among villagers as well as to estimate the number of training participants, animators made a list of people who wished to attend the training.

In PRODEFI II, TOT was conducted before plantation management training. A specialist was recruited from the capital to teach local trainers who did not have sufficient knowledge on timber markets. In preparation for carbonization training, a Senegalese specialist was asked to conduct trials to identify the technology most suited to the target area. At the same time, local trainers were trained. For soil conservation training, three methods were tested. The capacity of local trainers were examined and enhanced. The appropriateness of the methods was examined in terms of physical effects and attractiveness to local people. A Japanese specialist was deployed as the right person could not be identified in Senegal.

2.3.2. Implementation of training

<< Tips >>

- **Training should be executed by trainers**
- **The project should stick to logistics**
- **In case of misfortune, postpone training**
- **If participants exceed the planned size, hold additional training**

Execution of the training is basically the domain of trainers. The project ensures that the trainer and the materials are delivered to the village on time. At the training venue, the animator distributes training materials and fills an attendance list. If villagers are slow to come out, the animator goes around encouraging people to attend. If there is a misfortune and many people cannot participate, the training is postponed. If the number of people wanting to participate end up exceeding the planned size of training, additional training is organized later.

The project should ensure that the tools provided to the villagers during the training are properly kept. The project may ask representatives of the village to ensure this by submitting a receipt. The project should keep track of the tools provided to each village and make sure it does not provide the same tools to the same village later on.

The case of PRODEFI II

On the day of training, the trainer reported to the project office in the morning and traveled to the village on a project vehicle together with the materials kept in the store. For large villages, sometimes two trainers were sent. On several occasions two training sessions were held for the same theme.

Training organized by PRODEFI II did not provide allowances or food. The project wanted the villagers to come to the training for skills and knowledge and not cash. The project believed that many villagers will come even without the monetary incentive because the project implemented training that addressed the needs of the villagers. In the beginning, the counterparts were wary of the

villagers not attending because many other projects provided lunch to training participants. However, such wary turned out to be groundless and one year later, the counterparts were proudly presenting the outcomes of the project to visitors saying “our project is a great success although we don’t provide lunch.” The decision not to provide lunch and allowances cut down the costs of training.

2.3.3. Implementation of follow-up

<< Tips >>

- **Training follow-up should be executed by trainer**
- **The project should stick to logistics**
- **Only implement follow-up for themes requiring long-term commitments**

Objectives

- Provide technical advice that cannot be provided within the short duration of the training
- Teach measures to counter problems faced after training
- Enhance sustainability of activities by local people

Training follow-up is implemented in order to provide technical advice that cannot be provided within the short duration of the training and to teach measures to counter problems faced during application of the skills learned in the training. However, follow-up is not necessary for all themes. It should be adopted for themes such as vegetable growing in which all relevant skills cannot be covered within the training period which usually lasts for two to three days. The contents of follow-up should be decided through discussions with the trainer. After agreement, a contract should be signed.

In order to effectively promote activities of local people, balancing of training and follow-up is important. On one hand, in training, local people are taught knowledge and skills within a short period. However, depending on the nature of the theme, it is not possible to practice the skills on the spot. Also, concentration of local people might not last throughout the training session. For example, when seedling propagation techniques are explained, local people will get bored easily unless the seeds sown germinate and plants start to grow. On the other hand, in follow-up, although time spared for each visit is short, it is repeated over a long period. For this reason, it is possible for local people to gain advice for example, at various growth stages of plants and to learn how to counter problems as they actually occur. **For activities that require commitments for a relatively long time such as vegetable growing and seedling production, the sustainability of activities by local people can be enhanced by taking measures such as provision of regular follow-up.**

The case of PRODEFI II

In PRODEFI II, follow-up was provided for training on vegetable growing, fruit tree cultivation and seedling production. For vegetable growing, the training which lasted for three days covered lecture on cultivation skills, soil preparation and seed sowing. After the training, follow-up was conducted for eight weeks. The trainers visited each village at least once a week and gave advice on transplanting, thinning, watering, fertilizing and pest control. The trainers also organized exchange visits for villagers having trouble so that they can learn from advanced villagers.

2.3.4. Management of training and follow-up

<< Tips >>
Operation management
- **Coordinate timing, secure trainers, acquire materials and exchange contract**

Quality control of training and follow-up
- **Use TOR, proposal, oral communication and training completion report**
- **Do not intervene in execution of training**

(1) Management of training and follow-up operation

1) Management of trainers

The trainers are managed by the contract and oral instructions, the fee being the strongest management tool. Before commencing the training, **the project should confirm with the trainers on the communication protocol, preparation of materials, training schedule, assembly time, reporting protocol and other conditions deemed necessary to smoothly implement the training. It should be made clear that the fee will not be paid if such conditions are not adhered to.**

2) Management of staff and equipment

The animators and other PMU members are mobilized to coordinate with the villagers and to transport the trainers and materials in order to smoothly implement training and follow-up. **A regular meeting is held to give instructions and to monitor the progress.** If the animators can be provided with transport and communication means such as motorcycles and mobile phones, coordination will become easier. Drivers are instructed to transport the trainers and materials without delay by giving training schedules. Particularly for large projects with many target villages, **securing qualified staff with high management capacity is crucially important** in order to efficiently manage allocation of transport means, acquisition of materials and equipment, and stock.

(2) Quality control of training and follow-up

The quality of training and follow-up is basically controlled by TOR, training proposal submitted by trainers, oral instruction and reporting, and training completion report. On the final day of each training session, the trainers conduct a simple survey to measure the achievements of participants and submit the results to the project.

The project does not control the contents and the quality of training by intervening in its execution. The reason is simple. If the project was to control the quality of training very stringently, expensive domestic and international specialists will be required, consequently raising the cost of the project. Basically, available resources should be spent on holding as many training as possible for as many people as possible in order to increase the options for livelihood improvement and natural resource management rather than on improving the quality of training. However, it does not mean that quality does not matter. The costs involved in controlling the quality and the benefits that can be gained through such investment should be weighed to decide the inputs for quality control.

The case of PRODEFI II

In PRODEFI II, the trainers were asked to report orally every day after the training. In addition, they were asked to submit a training completion report after finishing all training under the contract.

The animators were asked to carry a mobile phone so that in case of problems or misfortune, they can immediately contact PMU and rearrange the training dates.

2.4. Post-training activities

2.4.1. Monitoring of activities by local people

<< Tips >>

- **Monitoring is done by animators**
  - **1) Is the activity introduced by the training practiced?**
  - **2) Is the activity spreading?**
  - **3) Are villagers facing any problems?**
  - **4) Is the activity effective?**
  - **5) Is the activity viable?**

After training implementation, the reactions of local people are monitored. **Monitoring is basically done by the animators. Activities of the villagers are continuously monitored from viewpoints such as:**

1) Is the activity introduced by the training practiced?

2) Is the activity spreading?
3) Are villagers facing any problems?
4) Is the activity effective?
5) Is the activity viable?

Monitoring items may include 1) number of individuals and groups practicing the activity, 2) number of operations, 3) monetary inputs put into the activity, 4) volume of production, 5) sales volume and revenue, 6) use of revenue generated, and 7) problems encountered, though it depends on the nature of activity. The animators are asked to present their findings at the regular meeting.

Through monitoring, **factors that constrain the sustainability of local people's activities are identified**. Furthermore, the options which the villagers may possess and the options that the project can provide for eliminating such constraints are considered. **Monitoring results are used to update the training plan and to consider assistance besides training.** If the problem identified in monitoring is a simple technical problem, the project can contact the trainer for advice and convey the solution to the villagers through the animators. For bigger problems, new training themes or follow-up might be considered.

The case of PRODEFI II

In PRODEFI II, six animators monitored the activities of villagers under supervision of the principle animator. In order to improve mobility, the animators were provided with motorcycles. The animators 1) gathered quantitative data on monetary inputs by villagers, production and sales revenue using a standardized format, 2) identified problems and desires of local people, and 3) noted down good practices of villagers that may serve as examples for other villagers. Such information was shared during the regular weekly meeting of PMU and complied into the monthly report of each animator. This weekly meeting and monthly report were important tools for continuous monitoring.

In addition to monitoring by the animators, 1) a study to enhance the sustainability of afforestation activities, 2) a study on soil conservation and erosion control, and 3) a study on economic activities and cash flow in the villages were conducted by Japanese consultants. The environment surrounding the activities of local people was analyzed from the point of view of technology, institutions, policies and markets. The results were used to update the training plan and to draft the exit strategy, which is explained later on.

2.4.2. Updating of training plan

<< Tips >>

- **Referring to the local needs, potentials and constraints which become apparent through implementation of training and monitoring:**
  - **reconsider the appropriateness of training themes from the viewpoint of needs of local people, sustainability of the activity and objectives of the project**
  - **revise the training schedule making sure it is feasible for both the project and the villagers**

Through implementation of training and monitoring, local needs, potentials and constraints become clearer. The training plan is updated accordingly. The appropriateness of training themes is reconsidered from the viewpoint of needs of local people, sustainability of the activity and objectives of the project. Needless to say, particular emphasis should be put on enhancing the sustainability of forestry and natural resource management activities. **The training schedule should also be revised making sure it is feasible for both the project and the villagers.** If for example, it turned out that there were many village events, access to villages was poor, trainers were difficult to secure, obtaining materials was cumbersome or transportation means were lacking, the intensity of training should be decreased. In an opposite scenario, the intensity of training can be increased.

The case of PRODEFI II

In PRODEFI II, the training plan was revised every six months. Examples of revisions made are given below.

- For activities with relatively long production cycle such as vegetable growing and seedling production, it was judged that continuous follow-up was effective. Therefore, part of the project resources were moved from holding training on new themes to conducting follow-up on themes already taught. For this reason, the training intensity was decreased from one theme per one and half months to one theme every two months.
- In order to enhance the sustainability of afforestation activities 1) follow-up was added to the seedling production training, and 2) carbonization trail and training was added to enhance the chances of earning income from afforestation activities.
- With regard to soil conservation, in order to come up with an effective method which can be employed by villagers to counter gully erosion, testing of frame dam using eucalyptus trees was planned in addition to the existing training on stone line.
- Poultry training was dropped because bird flu cases were observed in Africa.
- Regarding vegetable growing, training was additionally held in the villages in which the villagers originally judged vegetable growing was not feasible due to water shortage. The

change was made because there were strong demands from villagers who saw the achievements of villagers trained in the subject.

2.4.3. Provision of assistance besides training

<< Tips >>

- **Adapt to circumstances, considering project scope and available resources**
- **Project should help villagers make requests to relevant organizations for issues beyond scope of the project**
- **Engage permanent local organizations such as local government**

Up to this point, mainly the procedures to apply the Stage 1 part of the *PRODEFI Model*, which consists of training implementation and monitoring of reactions, have been explained. In order to further enhance the sustainability of activities of local people, application of Stage 2 of the model, which is assistance besides training, is considered based on the outcome of Stage 1. Various cases are possible. For example, when an activity is not going well due to a quarrel among villagers, the project can assist problem solving by instructing an animator to mediate talks between the parties involved. The animator may help villagers solve issues such as disrespect of watering duty by individuals in a nursery group, quarrel over land use by those who want to plant trees and those who want to graze, disappearance of savings from vegetable sales, and so on. The project may arrange heads of local government and leaders to mediate if the problem is complicated. Another example is provision of small-scale infrastructure. The project may assist establishment of wells or ponds necessary for expanding seedling production, fruit tree cultivation or vegetable growing. **Although many different scenarios are possible, the principle is to consider the scope and available resources of the project and adapt to circumstances.**

If the problem or the demand of local people identified through monitoring is beyond the scope of the project, the project should assist the villagers in making requests to relevant organizations. In order to enhance sustainability of activities by villagers, it is important to engage permanent local organizations such as local government in the project.

The case of PRODEFI II

In PRODEFI II, animators frequently assisted problem solving of villagers by recalling the instructions given by trainers without consulting with PMU. Good animators were able to help the villagers without the support or instructions from PMU because they had acquired sufficient knowledge and skills by attending every training sessions held in their jurisdiction.

One animator encouraged problem solving by threatening the villagers that the project will pull out

if they did not make efforts to talk to each other to find a solution when quarrels among the villagers did not resolve for a long time. This tactic was effective in making the villagers come out to talk.

In PRODEFI II, through observation of bookkeeping by villagers regarding their activities, it became apparent that needs for literacy training was high. The project conveyed the demands of the villagers to an organization operating in the same area and as a result, literacy training was held in several villages.

It also became clear that in order to improve the profitability of economic activities, organizational management capacity of villagers needed upgrading. The project requested for assistance to a project specialized in organizational strengthening.

With regards to afforestation, the project helped the villagers apply to the DEFCCS nursery for seedlings and pots. The project also assisted the spontaneous efforts of the villagers by providing its vehicle to transport seedlings from the nursery to the villages provided that the villagers paid for the fuel.

Furthermore, some villagers wanted to protect a road that was very important to them from erosion using the technique that was demonstrated by the project in the erosion control training. As the road was a public good benefiting many people, the project took the request to the local government who was basically responsible for such issues. As a result, through joint assistance by the local government and the project, the villagers were able to construct a frame dam to protect the road.

2.4.4. Exit strategy

<< Tips >>

- **In addition to making sure that necessary skills are learned, local people should be enabled to utilize existing public services and market mechanisms in order to enhance sustainability of activities**

In order to sustain the activities of villagers after the closure of the project, an exit strategy should be developed. The idea is to develop and implement an assistance plan so that local people can continue on with the activities initiated during the project even after withdrawal of project assistance. **In the exit strategy, in addition to making sure that local people learn the skills necessary for forestry and natural resource management, it is also necessary to make local people capable of utilizing existing public services such as free distribution of seedlings and market mechanisms including sales and purchases of timber, charcoal, seeds and pots.**

More generally, in order to enhance the sustainability of economic activities, strengthening of local people's capacity in financial and organizational management skills such as the ability to

plan, to monitor cash flow, and to produce and sell as a group is important. The project should assist local people gain such ability through monitoring conducted after training. The animators should be trained to attain the capacity necessary to execute such tasks if time and resources permit.

Moreover, the project should on one hand disseminate the activities of the villagers to officials of local public organizations that are responsible for assisting local people through publicity activities such as site visits and increase the number of organizations which may support the villagers. On the other hand, the independence of villagers should be raised by encouraging the villagers to demand support to their activities to public organizations and donors. It is important, however, to make the villagers discuss the things that they can do first and then request assistance for areas that require outside support.

The case of PRODEFI II

The exit strategy of PRODEFI II regarding community forestry activities is illustrated in Figure 8.

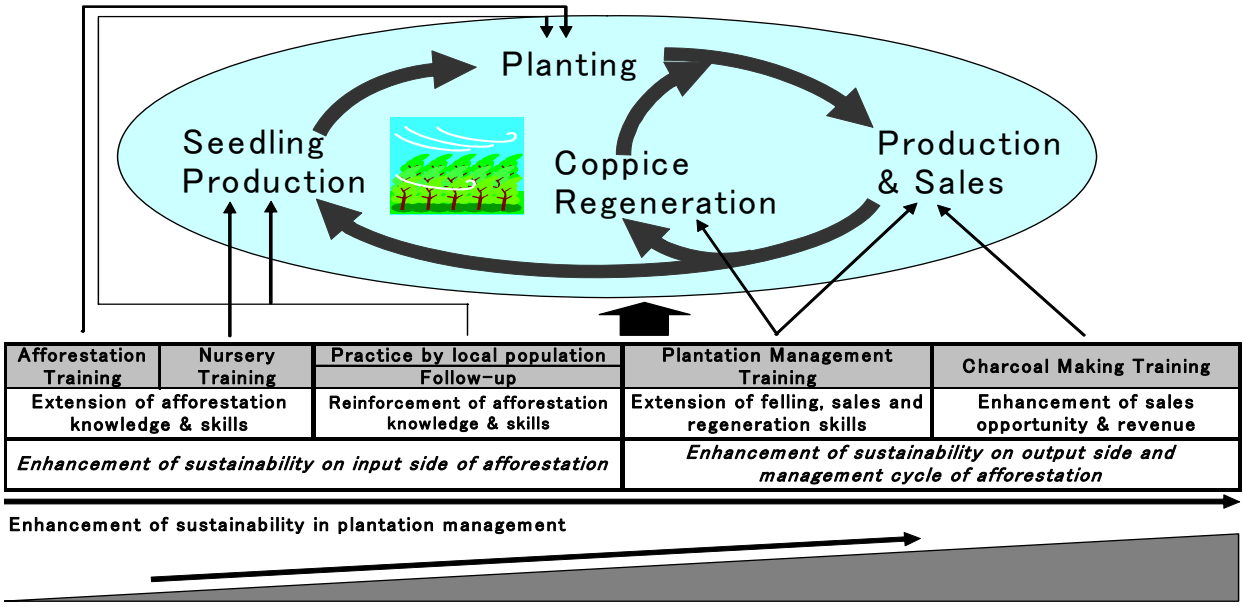


Figure 8: Strategy to enhance sustainability of community forestry

1. Input side of afforestation

1) Disseminate knowledge and skills on seedling propagation and afforestation

In addition to afforestation training which mainly teaches the skills required to plant trees, seedling production training was held to equip the villagers with propagation techniques. In the latter training the idea of planning was introduced. The villagers were taught how to set afforestation targets and seedling production targets.

2) Reinforce knowledge and skills on seedling propagation and afforestation

Follow-up was conducted during propagation period of seedlings and at the time of planting in order to reinforce the relevant skills. Technical advice was given throughout various stages of propagation

and planting so that the skills taught during the training were reinforced.

2. Output side of afforestation

1) Disseminate skills on felling, sales and regeneration

By conducting plantation management training, skills on felling and regeneration, and knowledge on timber sales and circulation were disseminated. By conducting this training, teaching of knowledge and skills necessary in forestry ranging from seedling production to felling and regeneration was completed.

2) Enhance sales opportunity and revenue

Carbonization training was held to increase sales options of timber. In Senegal, charcoal is consumed extensively in the cities while natural trees which are the main source of charcoal are on the decline. Thus producing charcoal from eucalyptus planted by villagers is promising. The project first considered the institutional framework, technology and social issues related to carbonization as carbonization was not a common activity in the target area. In the end, the project decided to hold training on carbonization using the technique which utilizes old used barrels.

Chapter 3: Outcomes and implications

In this chapter, results of PRODEFI II are presented so that readers can judge the effectiveness of a community forestry project that utilizes the *PRODEFI Model*. The reasons why such outcomes were produced is elaborated so that readers can gain hints to apply the model effectively. The limitations and possibilities of the model are also elaborated from project experiences and the implications are considered from the viewpoints of extension, community development and public service delivery in developing countries in general.

3.1. Outcomes of PRODEFI II

In this section, the effects of the *PRODEFI Model* observed during PRODEFI II are presented.

(1) Forestry

1) Tree-planting

The number and the area of trees planted in the target villages of PRODEFI II[12] are summarized in Table 4. The number of seedlings produced by the villagers and obtained from the DEFCCS nursery is provided in Table 5. Inputs and outputs of afforestation training are given in Annex 2. The villagers planted a total of 62,636 trees in 2005 when the project started. This is roughly 100 hectares if the number is converted into area. Out of this area, 24 hectares was planted during the afforestation training and the remainder was planted through the initiatives of villagers who obtained seedlings from the DEFCCS nursery and other sources. Although the seedlings are free, transportation is the responsibility of the villagers. A total of 243,425 CFA was borne by the villagers as the cost of fuel necessary for transporting seedlings by a truck. In 2005, 39 groups and 224 individuals, or a total of roughly 2,000 people, planted trees after the training.

In 2006, the total number of trees planted increased by 40 % to 87,495 plants or 140 hectares in area. Seedling production training was conducted during this year resulting in villagers acquiring two options to obtain seedlings: 1) transport from the DEFCCS nursery, and 2) produce in the village. The number of seedlings obtained from the DEFCCS nursery decreased in 2006 due to addition of the second option despite the increases in the number of trees planted. During the year, 112 groups and 979 individuals took part in tree-planting.

In 2007, the number of trees planted increased by more than 50 % compared to 2005 to 94,959 plants or 152 hectares in area. Each village planted 3,165 trees or 5.1 hectares on average. Roughly nine trees were planted by each person in the target villages on average. The number

[12] PRODEFI II targeted 30 villages including nine villages selected during the first phase. The total population of the 30 villages is 10,583.

of seedlings obtained from the DEFCCS nursery was similar to that of the previous year and the amount local people paid for the transport was 126,650 CFA. The numbers of groups and individuals that planted trees are 53 and 716, respectively.

Table 4: Afforestation in the target villages of PRODEFI II

Year	Number of trees planted		Area planted in hectares	
2005	62,636	(2,088)	100	(3.3)
2006	87,495	(2,917)	140	(4.7)
2007	94,959	(3,165)	152	(5.1)

Note 1: Figures in parentheses represent outcome per village.
Note 2: In 2005, afforestation training was held in the 21 new villages of PRODEFI II.
Note 3: In 2006, seedling production training was held in the 21 new villages of PRODEFI II.
Note 4: Area planted was calculated using the 625 trees per hectare conversion rate from the actual number of trees planted. The area was not surveyed. Trees planted in lines such as boundary planting and live fence are included in the number of trees planted.

The proportion of people with tree-planting experience increased from 81 to 94 % for men and from 59 to 92 % for women according to the project impact survey.[13]

The most common species planted is eucalyptus by far but more than 10 other species including acacia, Indian jujube, cashew and mangos are planted. The purposes of planting include timber production, windbreak, fruit production, demarcation, fencing, and shade creation.

The survival rates of seedlings planted in 2005 are 57 % after one year and 49 % after two years. The survival rate of seedlings planted in 2006 is 71 % after one year. The reason why the survival rate of 2005 is lower than that of 2006 is because Bao Bolong River was blocked downstream for construction work and many plantations along the river were inundated for a long period.

2) Seedling production

Seedling production gained momentum in 2006 as shown in Table 5. In 2006, seedling production training was held and 68,234 plants in total were produced in the target villages. This comes down to 2,274 plants per village. During the training, 29 community nurseries were established. Later, 200 individuals and groups followed suit.

In 2007, roughly the same number of seedlings as 2006 was produced by the villagers with 300 individuals practicing the activity. Although 27 species including mango and cashew were produced, eucalyptus represented more than 80 % of the total seedlings produced. Pots were

[13] Interview surveys using questionnaires were conducted. The surveys were carried out in July 2005 and two years later in the target villages. Ten villages were selected from the 21 new villages and 30 individuals were sampled in every village totalling 300 respondents of which 127 were male and the remainder female. Missing data in the 2007 survey is 14 %. In addition to the above, four villages outside the target area were selected and surveyed as control villages.

obtained freely from DEFCCS but seeds were collected or purchased by the villagers. Inputs and outputs of seedling production training are summarized in Annex 2.

According to the project impact survey, the number of villagers practicing seedling production increased from 51 to 76 % for men and 47 to 81 % for women.

Table 5: Seedling production in the target villages of PRODEFI II

Year	Number of nurseries		Number of species	Number of production	Number obtained from DEFCCS
	Groups	Individuals			
2005	0*	9*	Unknown	1,304*	45,292
				(145)	(1,510)
2006	29	200	18	68,234	36,743
				(2,274)	(1,225)
2007	25 approx	300 approx	27	70,181	35,933
				(2,339)	(1,198)

Note 1: Figures in parentheses represent outcome per village.

Note 2: * Figures represent data of nine villages continued from the first phase only. Seedling production training was conducted in the first phase in these villages.

Note 3: Seedling production training was held in the 21 new villages of PRODEFI II in 2006.

3) Timber sales

The trees planted during PRODEFI II are yet to be felled. However, plantations established earlier including those established during the first phase have been cut and sold.

In PRODEFI II, the villagers were taught tactics to sell timber at favorable prices through the plantation management training. As a result, the villagers started to pay more attention to market prices of timber and started selling timber by cut logs instead of whole trees. This enabled the villagers to fetch better prices. Inputs and outputs of plantation management training are summarized in Annex 4.

As of 2007, a eucalyptus log with a dimension of three meters length and ten centimeters diameter at the small end is traded at 300 to 400 CFA per long in the target villages. It can be estimated that roughly 100,000 CFA is can be earned per hectare of eucalyptus plantation.

By referring to the actual sales transactions and the afforestation achievements of the villagers, it can be estimated that, five years after the initial planting, each village can earn about 400,000 CFA per year on average through felling of eucalyptus plantations. The assumptions for this estimation are summarized in the box below. Details of the assumptions and the calculations are given in Annex 14 as 'Analysis of Synthetic Impacts of Forestry Related Trainings.'

< Assumptions for calculating revenue from felling of eucalyptus plantation >

1) Analysis period is from 2005 to 2024. Investments during the five year period from 2005 to 2009 and subsequent revenue up to 20 years into the future are considered.
2) For number of trees planted, actual figures are used for 2005, 2006 and 2007. For 2008 and 2009, average figure of 2005, 2006 and 2007 is used.
3) First felling is projected at year 5. Felling method is clear cutting. Regeneration is by natural sprouting and two cycles are expected. Second felling is projected at year 10. Third felling is projected at year 15.
4) Proportion of sellable trees at first felling is projected at 40 % of initially planted trees.
5) Number of sellable sprouts at second and third felling is assumed to be the same as first felling.
6) For cost of felling, the cost of obtaining permission to fell is accounted. Fuel cost for foresters to travel to the felling site for inspection is accounted.
7) Basically, sales revenue from eucalyptus timber sold as poles is only considered. The price is set to 450 CFA per tree.

4) Charcoal production

In PRODEFI II, charcoal making skills using used oil barrels were taught in 28 villages. During the period of seven months after the training, charcoal making was practiced 137 times by the villagers of 15 villages. In the most active village, the total value of production reached 110,000 CFA. Charcoal production technology is increasing the sales channels of plantation timber. Inputs and outputs of carbonization training are summarized in Annex 5.

In response to the success of the training, DEFCCS relaxed the regulations on charcoal production using planted trees as illustrated in the box below. This has an effect of enhancing the sustainability of forestry activities by local people.

< Change in the way regulations on charcoal production is applied >

The project believed selling eucalyptus as charcoal was promising. However, because promotion of carbonization may promote illegal felling of natural trees, the project did not take a firm stance in promoting the activity in the beginning. Furthermore, as carbonization permits were only obtainable from the regional DEFCCS office which was a full-day distance from the target villages, the project thought that, even if the villagers obtained the skill, it would not be practical for the villagers to practice carbonization. Such concerns were shared with counterparts and the chief of the regional DEFCCS. In response, DEFCCS suggested that 1) the project should teach carbonization because it is beneficial for both the villagers and DEFCCS, 2) DEFCCS can make sure that the villagers only use planted trees and apply for permission, and 3) such permission can be given at the department level. Subsequently, the project held training on carbonization and once local people started practicing, DEFCCS actually started giving permits at the department office.

(2) Soil conservation

1) Conservation of individual farmland

In PRODEFI II, training to counter soil erosion on farmland was held in 19 villages. Stone line[14] was constructed in 18 villages and millet fence in one village. In the 18 villages, the villagers gathered the stones required and built 777 meters of stone line in total or 43 meters per village. However, the skill was only practiced by a very small fraction of the villagers since the training. Soil conservation on farmland was probably not a high priority when compared to other activities because, despite the intensive labor necessary to implement stone lines, the effects are not easily felt. As this example suggests, some themes were not enthusiastically supported by the villagers despite the project's judgment that local needs existed. Inputs and outputs of training on stone line are summarized in Annex 6.

2) Protection of roads

In PRODEFI II, training to counter gully erosions was also conducted. As a start, two demonstration sessions were held to identify the technologies that matched the local needs and reality. Frame dams[15] using eucalyptus trees were constructed.

As a result, many villagers of four villages expressed interest. Unlike the stone line which aimed at conserving individual farmlands, the frame dam was thought to be an effective intervention to protect roads and village compounds from erosion by the villagers. It is likely that many people became interested in constructing frame dams because of the high public nature of roads and village compounds.

In addition to those constructed during the demonstrations, six frame dams were constructed in the four villages by October 2007. The villagers provided labor and materials necessary for construction. Cash contribution of the villagers ranged from 14,000 to 30,000 CFA per dam. The project provided technical advice by sending a trainer. Positive effects resulting from control of erosion activities have been observed after the construction. For example, a section of a road that was difficult to pass during the rainy season is now easily passable by horse carts. Inputs and outputs of training on frame dam are summarized in Annex 7.

(3) Economic Activities

1) Vegetable growing

Of all the themes selected for training by the project, vegetable growing has been the most successful in terms of economic returns. Sales revenue of the activity was 3,044,865 CFA in total in the 12 villages trained in 2005 and 1,885,120 CFA in the eight villages trained in 2006

[14] Stones are placed along the contour lines to stop soil erosion by surface water.
[15] Small-scale dam to control soil erosion

as shown in Table 6. On average, roughly a profit of 200,000 CFA was made in each village in the year training was held.

In the following year, expenditures increased on one hand while revenues decreased on the other. The reason for the increase in the expenditures is because the villagers had to buy inputs such as seeds and pesticides that were provided by the project in the year the training was held. The main reasons for the decrease in the revenue are: 1) some villages gave up the activity completely; 2) damage was caused by insects and livestock; and 3) motivation of groups involved shrunk. Nevertheless, the average profit per village came to about 120,000 CFA. If only the villages that successfully continued the activity are considered, the profit is 140,000 CFA. Inputs and outputs of the training on vegetable growing and compost making are summarized in Annex 8.

Table 6: Revenue and expenditure of vegetable growing in the target villages of PRODEFI II

Unit: CFA

Year	12 villages trained in 2005		8 villages trained in 2006	
	Expenditure	Revenue	Expenditure	Revenue
2005-6	358,525*	3,044,865	—	—
	(29,877)	(253,739)		
2006-7	553,875	1,991,535	221,055*	1,885,120
	(46,156)	(165,961)	(27,632)	(235,640)

Note 1: Figures in parentheses represent outcome per village.
Note 2: *Most of the inputs such as seeds were provided by the project during the training.
Note 3: Only the results of the villages trained by PRODEFI II are shown.

2) Other economic activities

The effects of other activities promoted by the project are not as evident as that of vegetable growing. Fruit and vegetable processing training was held in 21 villages, of which 13 went on practicing after the training. However, each operation only yielded an average profit of 4,600 CFA. As such, the activity was not popularized in the majority of the villages. The most active village practiced this activity 24 times during 18 months and made a profit of 103,055 CFA in total. Inputs and outputs of fruit and vegetable processing training are summarized in Annex 11.

Livestock fattening, which is basically an activity to gain cash by fattening cows or sheep and selling them during the festive seasons when the prices are high, was held in 21 villages. During the one year after the training, 42 individuals and groups in 17 villages were practicing the activity. However, at least 17 had practiced this activity before the training was held. Although the profit from a single operation is high, averaging 70,000 CFA, as the activity

requires a relatively large capital, it was probably not feasible for the majority of the villagers to practice. For those who did practice, the training had the positive effect of providing proper knowledge and skills which in turn enhanced the profitability and sustainability of the activity. Inputs and outputs of livestock fattening training are summarized in Annex 10.

3) Indirect effects of the activities supported by the project

Indirect economic effects of the activities supported by the project were also observed. In a few villages, new cash flows have occurred owing to the profits generated through the activities that the project promoted. For example, in some villages, the profits from vegetable growing were used as a source of village loan scheme. In 2006, a total of 1,383,657 CFA was financed to 475 individuals in eight villages. In 2007, a total of 1,030,925 CFA was financed to 418 individuals in seven villages. Revenue from sales of timber and vegetable are generally invested in economic activities such as petty trade and the main livelihood activity, agriculture.

3.2. Reasons for the outcomes

In the previous section, the effects observed in the target villages of PRODEFI II were presented. In this section, the reason why such effects appeared is discussed.

3.2.1. Overview

As a precondition, in order for an activity such as forestry to become popular, needs of local people for the subject in question must exist to some extent, though it may not be very evident. In addition, 1) **contents**: applicable technology and knowledge, and human resources; 2) **system**: a system to deliver such technology and knowledge; and 3) **management**: the capacity to manage the system are required.

In short, PRODEFI II was able to produce the effects presented above because it chose an area with needs, utilized existing extension contents and human resources, adopted the *PRODEFI Model* as the extension system, and effectively managed the model.

To start with, the site selection was appropriate. Local people of the target area were concerned about the environment and were interested in tree-planting. Secondly, the technologies and knowledge to be applied existed. Thirdly, the *PRODEFI Model* functioned well as an extension system. This point is elaborated later. Fourthly, in PRODEFI II, project management was emphasized and the model could be effectively applied. This point is also elaborated later.

In order to deepen the understanding on why the effects stated above appeared, processes that took place in PRODEFI II are explained in more detail taking the forestry activities as an

example. The idea is illustrated in Figure 9.

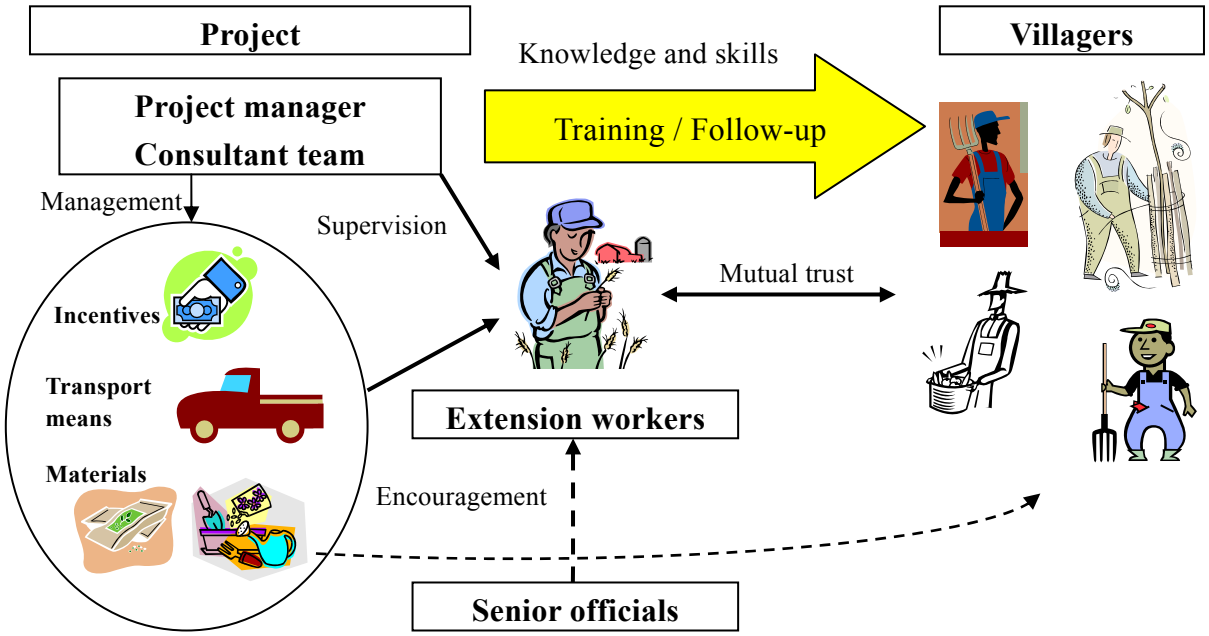


Figure 9: Extension mechanism in PRODEFI II

1) **Contents**: In the target area of the project, office and nursery of DEFCCS existed and several foresters equipped with appropriate forestry skills were stationed.

2) **System**: The *PRODEFI Model* was adopted as a system to convey the contents.

3) **Management**: The project utilized the foresters as if they were extension officers by hiring them as trainers and sending them to villages to conduct training and follow-up. The foresters were provided with transport means to get to the villages, equipped with materials necessary to teach forestry skills, and given cash incentives in the form of fee. In addition, they were supervised by foreign consultants from time to time.

Incentives and tensions created by such measures gradually heightened the motivation of the foresters to carry out forestry extension activities. As a result, local people were able to gain knowledge and skills together with materials necessary for forestry, which in turn enabled the foresters to gain trust from local people. As the effects of the project became more visible, visits by high-ranking people such as the head of DEFCCS increased. The trust of local people and the visits by high-ranking officials further motivated the foresters, which in turn had the positive effect of providing active extension services to local people. A positive cycle was formed. Such cycle contributed greatly in producing the outcomes of PRODEFI II illustrated earlier.

3.2.2. Effects of the training

In the previous sub-section, it was suggested that the *PRODEFI Model* was an effective system to convey extension contents. This section explains the effects of the training which is the core of the *PRODEFI Model*.

(1) Impact on training participants

The results of the training impact survey[16] are summarized in Table 7. According to the survey, the attendance rate of the villagers varied from 25 to 72 % depending on the training theme. On average, more than half of the villagers participated. Female participants outnumbered male participants in all training themes.

Table 7: Impact of training on participants

Unit: %

Theme / Year	Participation in training	Proportion of female participants	Practiced at least once after training	Practiced the theme for the first time	Practice continued (in 2007)
Afforestation 2005	64	73	88	63	53
Fruit and vegetable processing 2005 & 2006	64	83	48	100	10
Vegetable growing 2005 & 2006	72	75	75	60	49
Livestock fattening 2006	39	68	21	63	11
Seedling production 2006	68	71	75	73	49
Stone line 2006	68	64	23	93	15
Fruit tree 2006	46	74	55	63	29
Plantation management 2006	25	59	22	100	-
Carbonization 2007	38	65	19	95	-

Out of those who participated in training, the proportion of those who practiced the skills learned after training at least once was 47 % on average. The lowest theme was carbonization

[16] Interview survey using questionnaires was conducted focusing on the main training themes. The survey was carried out in September 2007. Ten villages were selected from the 21 new villages and 30 individuals were sampled in every village totalling 300 respondents of which 101 were male and the remainder female.

with 19 %; and the highest, afforestation with 88 %. Many of those who practiced the skills did so for the first time. The proportion of first-time practitioners was 100 % for fruit and vegetable processing, over 90 % for carbonization and soil conservation, and over 60 % for other activities.

Those who continue practicing the skills learned one to two years after training is on average 31 % of those who attended the training. Although the figures are lower than that of the participants who practiced at least once, the figures are still relatively high for afforestation, seedling production and vegetable growing indicating that these activities are well-established in the target villages. For afforestation, more than half the training participants still practiced the activity two years on.

(2) Impact on others

The effects of the training extended to people who did not attend the training Table 8 suggests. In case of afforestation, on one hand, 16 % of the participants conveyed what they learned during the training to those who did not attend. On the other, 17 % of those who did not attend the training practiced afforestation by learning the skills from the participants. Although the figures are smaller, similar phenomenon can be observed for seedling production.

The training of the *PRODEFI Model* implemented by PRODEFI II provided opportunity for many villagers including women to acquire new skills and knowledge, and increased the activity options of local people. The training gave chances to villagers who were interested in starting new activities to try, and successfully encouraged quite a few to continue on with what they had started. The training was also successful in encouraging skill and knowledge exchange among local people. The positive outcomes of PRODEFI II are supported by the effectiveness of *PRODEFI Model* as a system to convey extension contents.

Table 8: Impact of training on those who did not participate

Unit: %

Training theme	Proportion of participants who conveyed to non-participants	Proportion of non-participants who learned from participants
Afforestation	16	17
Seedling production	11	12

3.2.3. Management

In sub-section 3.2.1, it was suggested that the project attached importance to management and effectively applied the *PRODEFI Model*. In this sub-section, some of the management tactics

and hints are described.

(1) Management of human resources and division of labor

Management of human resources such as PMU members and trainers requires appropriate incentives and supervision that will heighten job performance and maintain motivation. Recruitment must be based on merit and hiring by personal connections should be avoided. It is important to appoint individuals with sufficient qualifications to manage the project even if this meant spending much money. The *PRODEFI Model* functioned effectively as a system to convey extension contents because much investment went into management.

The principle tool to manage human resources is the contract. In PRODEFI II, even if the work lasted only for several days, a contract outlining the working conditions and contents of work was exchanged. A template contract was drafted at the beginning of the project with advice from a Senegalese lawyer and was reviewed from time to time with the support of a notary public to make sure that the contracts exchanged by the project did not have legal shortfalls. In Senegal, there is a law dictating that if an employer exchanges a time-limited contract with the same individual several times, the third contract will be deemed a permanent contract. This law was problematic to the project as it needed to hire project staff by the Japanese fiscal year. Such concerns were consulted with the lawyer in order to avoid problems.

The contracts were usually countersigned by the Senegalese project manager, a representative of the Japanese consultant team and the employee or the contractor such as trainers. This measure was intended to ensure that all parties understood that they were all responsible for smoothly implementing the activities.

In PRODEFI II, the division of labor within PMU was defined so that the project would run efficiently. The six animators were responsible for preparation and implementation of training, and subsequent monitoring in the villages. The principle animator gave instructions to the animators and summarized monitoring data submitted by the animators. The project manager steered the regular weekly meeting, gave instructions to PMU members, and was in charge of final selection of the trainers and issuing of TORs. The regular meeting was an opportunity for all PMU members including the animators who spent most of their time in the villages to come together and share information. The animators usually reported the situation in their villages to the counterparts and the project managers, and they in return gave advice and instructions. The counterparts provided the necessary technical advice according to the status of the village activities. Owing to the initiatives of the Senegalese PMU members, PRODEFI II was able to implement intense project activities in 30 villages.

In PRODEFI II, the Japanese consultant team had two major roles. One was project

coordination and accounting. At least one consultant was always stationed at the project office to support the counterparts in organizing activities such as training and to ensure the budget was properly executed. The other was implementation of research and development type of activities. Japanese consultants from several different disciplines developed training contents so that the effects of the *PRODEFI Model* will be enhanced. They also conducted surveys and analyses on the effects of the training and the project, and the subsequent sustainability of activities by the villagers so that the effectiveness of the model can be objectively captured. Through these exercises, training themes such as soil conservation by frame dam and charcoal making using used oil barrels were developed. Data necessary to compile this document was also collected.

The activities of PRODEFI II were maintained through combined efforts of the Senegalese PMU members and the Japanese consultant team. The training and the subsequent monitoring were basically managed by the Senegalese PMU members who implemented the day to day operations with the support of Japanese coordinators. Provision of technical advice in specific areas where local knowledge was lacking and research on the effects of the *PRODFI Model* was the domain of the Japanese consultants who were given specific TORs and limited timeframe.

(2) Management of budget

Public service organizations as well as development projects such as PRODEFI must provide benefits to as many people as possible with the least amount of budget. Unfortunately, leakage[17] tends to be large in developing countries. If the volume of leakage is large, the inputs that reach local people become smaller which in turn compromises development. It is therefore very important to manage and execute the budget properly. PMU must be equipped with an accountant who can objectively carry out his/her task without being influenced by private interests of parties such as other PMU members, trainers, and contractors. In order to appoint a qualified accountant, the related costs should not be spared.

In PRODEFI II, the Japanese consultants played the roles of the coordinator and the accountant, managing all project activity budgets as explained earlier.[18]

When actually managing the budget, much energy was spent to properly manage the expenses related to the training and the follow-up. Project activity costs were lowered by for example,

[17] Leakage refers to the practice of spending budget on unintended items. For example, if a budget for extending skills and knowledge to local people is used for purchasing irrelevant goods, providing irregular allowances or dining and wining, it is a leakage. Private use of public funds is also a leakage. The problem is not restricted to developing countries. However, it is a major factor of high public service cost relative to the size of the budget in developing countries.

[18] The budget was controlled by the Japanese consultants because all project activity budgets such as that for the training were borne by the Japanese side, and it was culturally very difficult for a Senegalese to refuse requests from relatives, colleagues, supervisors or those connected with the project for loans or lease of vehicles if he/she was in charge of managing the project budget and assets.

cutting the fee for follow-up to half the price of training through negotiations, as described earlier. Also, by breaking the norm of providing meals during training sessions, the cost for providing lunch to more than 10,000 participants was saved.

Materials for training were usually purchased by the trainers on behalf of the project. Sometimes, the quotations produced by the trainers seemed to be inflated. In such cases, the accountant or other PMU members checked the market price. If there was a problem with the quotation, PMU members did the purchasing under direct control of the accountant and tried to make sure that there was no leakage. However, this sort of measure has the negative effect of increasing the management cost of the project.

In addition, efforts were made to make sure that the daily expenses were also appropriately executed. For example, in the case of fuel, the secretary was sent to the petrol station to observe the refueling of the vehicles, and use of fuel tickets were cross checked with the trip reports. For repairs of vehicles and purchases of goods, as the prices of goods and services were hardly fixed in the area where PRODEFI II was operating in, efforts to cut down costs were made by utilizing Senegalese PMU members who were used to price bargaining.

(3) Management of assets

It is important to manage the assets of the project such as vehicles properly along with the budget. PRODEFI II had five four-wheel drive vehicles and ten motorcycles. In order to smoothly conduct project activities such as training and monitoring, these transportation means needed to be properly maintained and managed.

In PRODEFI II, each driver was assigned to a particular vehicle and was made responsible for that vehicle. Use of vehicles was controlled by the coordinator and all PMU members including the Japanese consultants had to obtain permission if they wanted use a car. The keys to the vehicles were kept by the coordinator and given to the drivers only when it was necessary so that private use of the vehicles can be avoided. When motorcycles were lent to the animators, they were asked to sign a contract outlining the rules of motorcycle use. They were also required to keep note of where they traveled.

3.3. Limitations

From the experiences of PRODEFI II, it has become clear that the *PRODEFI Model* is a valid system to convey extension contents. In this section, limitations of the model are explained.

(1) Development of extension contents

The *PRODEFI Model* is a system to convey skills and knowledge. The development of the

extension contents is beyond its scope. In other words, the development of the skills to be taught and the ways such skills are taught to local people are not covered by the model. Development and improvement of for example, afforestation techniques or tree breeding are not covered. The preconditions for application of the model are the existence of knowledge and skills to be extended and the human resources to convey such extension contents.

If a project applying the *PRODEFI Model* encounters a case in which extension contents that meet local needs are lacking, appropriate measures must be taken. In such a case, as PRODEFI II did, options such as holding training sessions to train promising local individuals to become trainers and conducting trials to develop technologies suited to the project area by inviting experts from in and out of the country can be tried.

(2) Improvement of management capacity

Potential users of the *PRODEFI Model* are government organizations, donors and NGOs. As repeatedly stated, because the *PRODEFI Model* is simply an extension system, it cannot enhance the capacity of such organizations in managing the system. It is possible to reduce the cost of extension services or to enhance the impact of extension activities by application of the model but the model itself does not have a function to strengthen the organizational capacity of the model users or the capacity of their staff.

In order to effectively apply the *PRODEFI Model*, much thought and innovation will likely to be required in management. From the experiences of PRODEFI II, it can be concluded that resources for management such as securing qualified personnel may not be spared if the model was to function.

(3) Identification of themes to convey

Even if the training is conducted based on the needs of local people, some themes may not be supported by local people. Such issue is built into the *PRODEFI Model*. However, the project must monitor whether the theme adopted in the training was supported, analyze the reason for whatever outcome, and decide on the next action. The model users must be able to terminate support to activities that stand little chance of being sustained by local people and to further invest in only the activities that gained momentum. In PRODEFI II, the stone line technique for soil conservation is one example of investment termination.

(4) Influence on gender and social relationships

The *PRODEFI Model* is an extension system that provides equal opportunity for local people to acquire knowledge and skills. However, the model does not have a function to intervene in

social relationships of local people including gender relationships. The model itself cannot change unfair relationships among local people. Application of the model cannot change the situation, for example, of women having less free time compared to men because of household chores.

Nevertheless, by scheduling the training at timings convenient for everyone, those who are disadvantaged such as women and young people gain a better chance of acquiring new knowledge and skills. In reality, in PRODEFI II, female participants outnumbered male participants in almost all training themes and opportunities for women to start activities that were previously conducted by only men have increased.

(5) Influence on institutions and market

The *PRODEFI Model* is a system to promote various activities including community forestry and natural resource management. However, whether the activities initiated through the training are sustained depends greatly on the institutional framework and the market of the country or region. The project can analyze the institutions and the market, and teach local people to capitalize on the opportunities they create but it is not possible to make a big change to the institutions and the market. For example, although it is possible to promote seedling production by capitalizing on the free distribution of pots by DEFCCS, it is not possible to make the market trade pots which are currently nonexistent. Thus it is important to understand well the institutional framework prior to project implementation.

3.4. Implications and possibilities

In PRODEFI II, DEFCCS, which is a governmental organization, applied the *PRODEFI Model* and promoted forestry, natural resource management and economic activities by local people in the form of a project with assistance from Japan. In this section, the activities and the outcomes of PRODEFI II are analyzed from the viewpoint of public investment and public service delivery, and the possibility of applying the *PRODEFI Model* to rural development initiatives by public administration is considered.

(1) The PRODEFI Model and public service delivery

In PRODEFI II, the *PRODEFI Model* was used to provide training and follow-up to local people, and to monitor their reactions and provide additional assistance. Such activities may be regarded as provision of public service. The activities implemented by PRODEFI II that are related to forestry can be regarded as forestry extension service, and activities such as training and follow-up on vegetable growing, fruit tree cultivation and livestock fattening can be

regarded as agriculture extension service. Similarly, training on fruit and vegetable processing and improved cooking stove, and frame dam construction may be regarded as livelihood promotion service and public works service, respectively.

As already explained, the *PRODEFI Model* is an extension system to convey skills and knowledge to local people and the contents to be conveyed must be decided by the model user. Organizations wishing to assist local people by using the model can choose the contents according to their mandates. Considering the fact that the *PRODEFI Model* is a process based approach that starts by providing training, and then monitors the activities of local people triggered by the training, and in turn decides the next input according to the monitoring results, public organizations responsible for overall development of a particular area such as local governments and regional development departments can employ the model to provide public services. In reality, despite being a project implemented by a forestry organization, PRODEFI II promoted contents beyond forestry and though it was just three year, it promoted integrated development of the target area.

As the above suggests the *PRODEFI Model* can be utilized as a system to provide public services such as agriculture extension and area development by not only forestry departments but by public organizations engaged in agriculture or livestock production and so on.

(2) The PRODEFI Model and impact of public investment

Here, the inputs of PRODEFI II are considered as public investment and the returns are examined.

1) Activities related to forestry[19]

If the calculation period is set to 20 years from commencement of the project, the total revenue per village is expected to reach 6,098,755 CFA against the total investment of 498,811 CFA per village by the project. As the investment of the villagers is estimated to be 110,969 CFA per village, the overall returns to the investment by the project and the villager is 5,488,975 CFA per village for the 20-year period. However, as time lag between investment and return is relatively long in forestry, interest rates must be considered. If the figures are discounted using a commonly applied interest rate in Senegal, the net present value comes to 3,500,105 CFA. The internal rate of return is roughly 30 %.

In the above estimation, however, the personnel costs of Japanese consultants are not included. If the costs related to the Japanese consultants who managed the training are included, the net present value comes to 1,092,742 CFA. The internal rate of return is roughly 7 %.

[19] Refer to Annex 14, 'Analysis of Synthetic Impacts of Forestry Related Trainings.'

2) Vegetable growing[20]

In the case of vegetable growing, the project invested 272,859 CFA per village on average. The revenue raised by the villagers was 217,520 CFA per village in the year the training was held. From the second year onwards, the villagers are expected to make a profit of roughly 120,000 CFA per village each year. As such, the return to the investment turned to plus within two years. In the above estimation, the profits made by groups are only considered. If the activities by individuals are taken into account, the return to the project investment is even better.

However, again, the above estimation does not consider expenses related to the Japanese consultants. If this is included, the project investment is 1,054,520 CFA per village and the return to investment becomes plus only after seven years.

3) Protection of public assets[21]

The experiences of PRODEFI II suggest that public works to protect assets such as roads can be efficiently implemented by adoption of the *PRODEFI Model*. In PRODEFI II, demonstration training was first held to show the frame dam to local people and to see if they express any interest. Few villagers took interest. Later, in response to the request made by the villagers wishing to build a frame dam to protect the road they used, the project successfully helped the villagers construct the dam through their initiative.

In the demonstration, the villagers provided 27 % of the total construction cost in labor as they were well aware of the problem and the consequences of gully erosion. Later, after seeing the positive effects of the frame dam, the villagers constructed another one, this time contributing the cost of materials and fuel for transporting the materials as well. In this round, the villagers contributed 48 % of the total construction cost. As this illustrates, the project was able to implement construction activities with smaller inputs by mobilizing labor and cash of villagers through the use of the *PRODEFI Model*.

(3) The PRODEFI Model and efficiency of public service

In the *PRODEFI Model*, local people are not simply beneficiaries but are agents of local development. In other words, local people are seen as entities that are pursuing better economic status and secure livelihood, and making efforts to meet their goals. The model captures such aspect of local people and encourages self-help, and by utilizing local people as agents of local development, effects such as 1) raising the economic return per unit of public investment, or 2) decreasing the service delivery cost per unit of public works can be expected. Consequently, the efficiency of public service is enhanced. In reference to the experiences of

[20] Refer to Annex 8 'Inputs and Outputs of Vegetable Growing and Compost Making Training.'
[21] Refer to Annex 7 'Inputs and Outputs of Soil Conservation Technique (Frame Dam) Demonstration.'

PRODEFI II, forestry and vegetable growing are examples of the former effect, and frame dam construction the latter.

Particularly in developing countries like Senegal, it is very important to make the most out of the limited public finance. The government must expand the economy through provision of public services and increase the tax revenue, and move away from relying on the donors. The *PRODEFI Model* presents one way of efficiently utilizing the limited public finance to develop the economy and increase public goods.

The experiences of PRODEFI II suggest that there are many advantages in the *PRODEFI Model* which can enhance efficiency of public service. Firstly, the model can lower the initial investment cost. Because the *PRODEFI Model* starts inputs to local people by training which only requires a small budget, public service provision can be started easily.

Secondly, the model enables reduction of ineffective investments. By using the *PRODEFI Model*, public inputs can be decided through exchanges with local people. Through careful monitoring of reactions of local people, activities that local people have strong interest are supported, activities with no needs are scrapped, and inputs into activities not supported by local people are immediately terminated, and the probability of wasting resources by investing in activities not supported by local people can be lowered.

Thirdly, the cost of public service can be kept low because, basically, the *PRODEFI Model* is used in a way that capitalizes on the will of local people. For activities that gained support through implementation of training, even in cases when additional inputs were required to enhance sustainability, the cost to the public administration can be lowered as local people are most likely to bear some of the costs. More activities can be implemented with smaller budget as the money saved can be spent on other services.

Fourthly, the impacts of assistance can be expected to be greater as the *PRODEFI Model* ends up only supporting activities that local people are willing to do. In other words, economic returns from the public investment can be expected to rise because local people will choose the best option from the options presented by public administration in the form of training based on necessity and economic viability taking into account their opportunity cost as well.

(4) The PRODEFI Model and public service delivery structure

In order to make the *PRODEFI Model* function effectively, there should be a function to enable close information exchange between local people and public organization, like the animators of PRODEFI II. Depending on the context, extension workers employed by the government or motivated local individuals may take on this role. It may be feasible for the government to employ local people as animators.

The experiences of PRODEFI II suggest that animators are an effective means of facilitating information exchange and public service delivery. The animators of the project not only enhanced communication between the project and local people but gave technical advice to local people on the themes adopted in training and comprehensively attended to concerns of local people, becoming the driving force to local development. Obviously, the knowledge of the animators did not match that of the trainers in terms of specialty; however, they were playing an important role in facilitating development of the villages they looked after. Animators or community development workers who can comprehensively facilitate rural development are required in many developing countries. Although animators are not a part of the *PRODEFI Model*, it is highly recommended to use them in combination with the model.

(5) Conclusions

From the above arguments, the activities implemented by PRODEFI II can be supposed as provision of public service by a public organization and the effects are valid from the point of view of public investment. The experiences of PRODEFI II imply that the *PRODEFI Model* can contribute to enhancing efficiency of public service. As such, the *PRODEFI Model* can be applied to provision of public services including local development.

Annex to PRODEFI Model User’s Manual

List of information contained

* Currency exchange rate: 1 CFA = 0.249 yen (September 2007)

Annex to PRODEFI Model User's Manual

(1) Project Area and Villages of PRODEFI II

1. Target Area

Nioro Department, Kaolack Region

2. Project Office

Nioro (244 km from Dakar)

3. Target Villages

Thirty villages listed in Table 1 and indicated on Figure 1

Table 1: List of target villages of PRODEFI II

District	Commune	No	Village	Population	Zone
Paoskoto	Paoskoto	**1**	**Médina Ndawène**	**148**	Firgui
		2	**Firgui Gawane**	**109**	
		3	**Firgui**	**360**	
		4	**Keur Abdou Boury**	**188**	
		5	**Bahou**	**521**	
		6	Médina Nguèyene(Boudouck)	174	Kantora
		7	Kantora Diassé	406	
		8	Kantora Ly	421	
		9	Keur Ndioba Rip	223	
		10	Darou Rahmane	72	
	Prokhane	**11**	**Keur Birane Dia**	**523**	Mamby
		12	**Keur Nalla**	**329**	
		13	**Keur War**	**417**	
		14	**Mamby Wolof**	**260**	
		15	Daga Albouri	393	
		16	Keur Alssane Khodia	520	
		17	Mbappe	218	Mbappe
		18	Keur Sette Diakhou	896	
		19	Keur Sountou	737	
		20	Sotokoye	222	
		21	Boulboki	260	Keur Tamba
		22	Keur Babou Diop	502	
		23	Keur Diatta	326	
		24	Keur Tamba	402	
		25	Manka Kounda Rip	162	
Médina Sabakh	Médina Sabakh	26	Ndiakhène	470	Médina Sabakh
		27	Yongo	332	
		28	Ndiagnène	187	
		29	Falifa	694	
		30	Ngayène 2	111	
Total				10,583	

* **Villages in bold letters**: Target villages of PRODEFI I as well

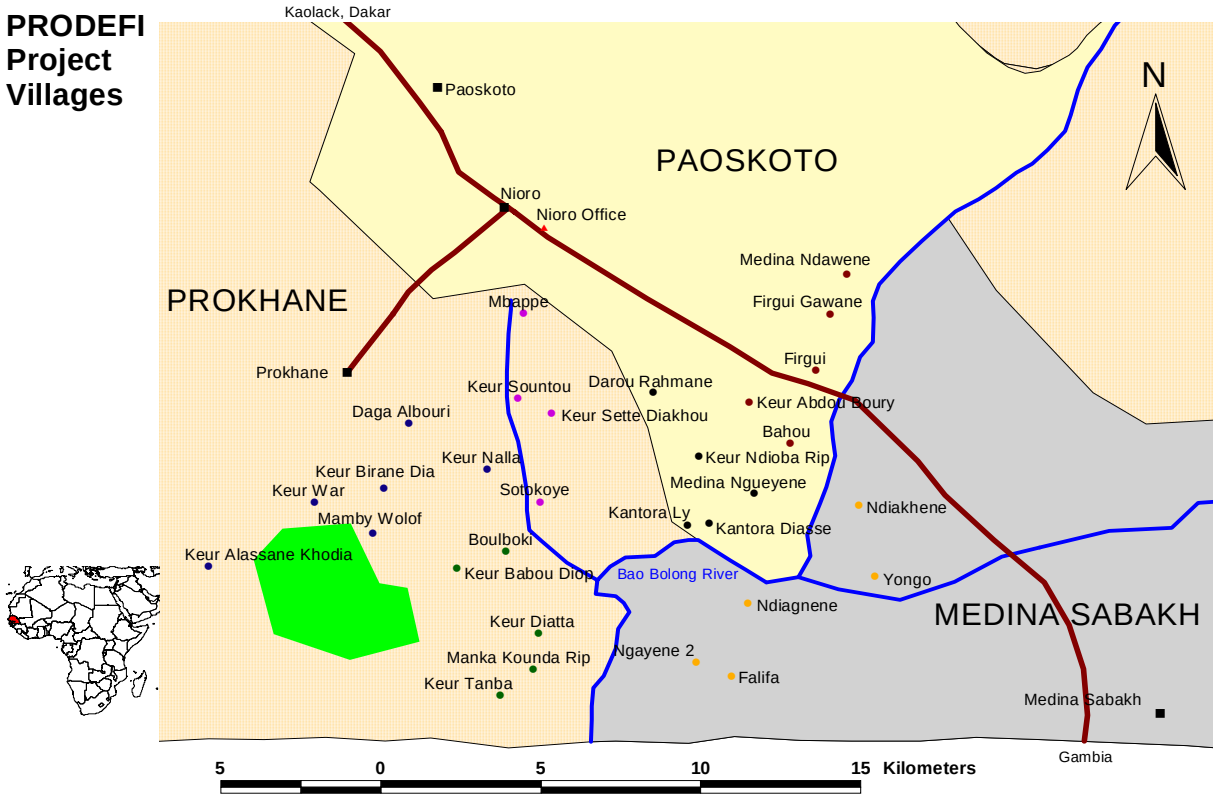
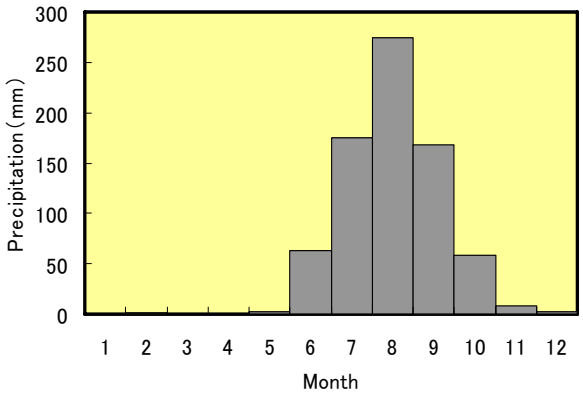


Figure 1: Map of target villages of PRODEFI II

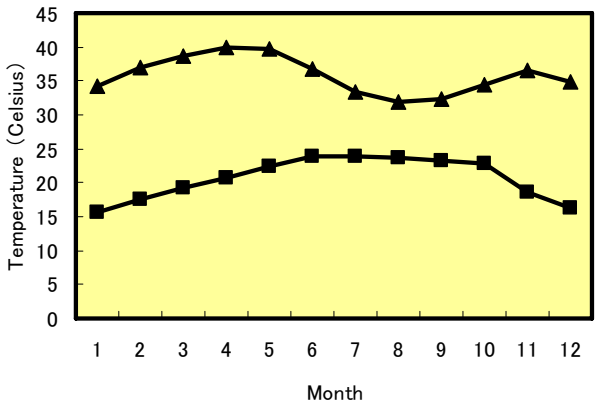
4. Natural Conditions of the Project Area

(1) Climate

Nioro Department is situated in the inland of the Groundnut Basin in Senegal and is bounded by Gambia to the south. The area is in the Sudano-Sahelian Climate Zone. As seen in Figure 2a, almost all rainfall occurs during June to October. Average annual rainfall over the past twenty years is 754 mm. However, precipitation fluctuates greatly from year to year with minimum of 513 mm in 1991 and maximum of 1035 mm in 1999. As seen in Figure 2b, maximum temperature reaches above 40 ° C during the dry season while in the rainy season it comes down to 32 °C.



2a Precipitation



2b Maximum and minimum temperatures

Data source: Direction de la Météorologie Nationale

Figure 2: Climate of Nioro (average of 1985-2004)

(2) Terrain, Soil and Vegetation

Nioro Department is largely flat with no major hills or valleys. The Bao Bolon River flows through the middle of the project area. The river is a tributary of Gambia River. The total length of the Bao Bolon is roughly 50 km. River width is 2 to 3 km in the mid- and down-stream sections. Due to the limited rainfall in the watershed and the extremely gentle gradient of the river, salt water from the Atlantic Ocean runs back through Gambia River into the Bao Bolon at times. As such, salinity of the Bao Bolon is high, especially during the dry season when evaporation is significant. For this reason, local people in the area rely on groundwater. In the Gambia River watershed area, groundwater table is believed to be descending by 17 cm each year.

The project area belongs to the savannah-scrub thicket vegetation belt. Common natural vegetation is combination of grass and woody shrubs of about five-meters tall. However, the dominant form of land use is farmland and forest cover is 2 % or less. According to a research, forest cover was 40 to 70 % in 1943. Later, in 1950s and 60s, forests were progressively converted into farmland with the expansion of groundnut production. By 1990s all arable land was converted into farmland and only small number of trees remained. Researchers believe population pressure, droughts and groundnut production which was strongly encouraged by the government, extinguished the traditional cultivation and fallow agriculture system which used to maintain trees on farmland.

The main soil type of the area is ferruginous tropical soil. Although the problem of nutrient washing is not serious, due to high content of sand, the soil is vulnerable to water and wind erosion. In sloped areas, soil erosion is observed. On land along the Bao Bolong and its tributaries, salt accumulation is observed. On hilltops, topsoil has been lost and weathered base rock is exposed.

(3) Land Use and Forest Resources

In Nioro Department, land use priority is given to agriculture and forests are very limited. Groundnut, millet, maize and sorghum are the major crops cultivated during the rainy season. In areas where water is readily obtainable, dry season vegetable cultivation is practiced. Rocky land, gullies and salinity affected land are not suitable for agriculture. Usually, these lands are common land of the village. Common land may sometimes carry trees but usually shrubs only. Common land is used for grazing and collection of firewood. In the Mamby zone, there is a Forest Reserve but no big trees can be seen.

For land along the Bao Bolong: 1) land use does not compete with agriculture because the land is not good for cultivation; 2) planting is easy due to lack of vegetation cover; 3) competition with other plants is very limited because weeds and shrubs cannot grow; and 4) damage from livestock is less likely as grazing is not so common. Thus land along the Bao Bolong is suitable for afforestation. The main reason for the above features is that land along the Bao Bolong suffers from high salinity and is seasonally flooded. For this reason, the only species suitable for afforestation is eucalyptus (*Eucalyptus*

camaldulensis) at the moment.

For villagers who do not have access to land along the Bao Bolong or its branch, it is difficult to secure appropriate place for afforestation. However, since the government-set producer price of agricultural products is low these days, villagers' interests in afforestation are increasing. Boundary planting and agro-forestry combined with fruit tree cultivation are becoming popular, and some have started to plant trees on individually owned land.

Annex to PRODEFI Model User's Manual

(2) Inputs and Outputs of Afforestation Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	34,286	Participants 96 people	1) Trees / planted area Training year (2005) 1,588 trees / 2.54 ha One year after training (2006) 2,917 trees / 4.67 ha Two years after training (2007) 3,165 trees / 5.06 ha
Materials (b)	65,520	Trees / planted area 714 trees / 1.14ha	
Logistical support (c)	25,766		2) Revenue projection 400,000 CFA each year from 2010 onwards
Management (d)	893,327		
Total	1,018,899		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	July-August 2005
Target	21 New villages (24 sessions in total[1])
Duration	2 days
Training Content	Lecture and practice on afforestation techniques
Preparation	None
Follow-up	None

2. Inputs by Project

(1) Training

Trainer	34,286 CFA (15,000 CFA x 2 days x 24 sessions / 21 villages)
Materials	65,520 CFA (Tools: 56,000 CFA[2], Consumables: 9,520 CFA[3])
Driver	11,986 CFA (5,244 CFA x 2 days x 24 sessions / 21 villages)
Fuel	6,747 CFA (2,592 CFA x 2 round trips x 24 sessions / 21 villages)

[1] Two sessions were held in three villages due to popular demand.
[2] As afforestation training was the first training provided by the project, shovels, wheel barrows, tape measures, and other tools and equipments were provided. These were used in subsequent training sessions such as vegetable growing and seedling production.
[3] Six hundred and twenty-five eucalyptus seedlings, which is a standard number to afforest one hectare, were provided by the Forest Department.

Animator 7,033 CFA (3,077 CFA x 2 days x 24 sessions / 21 villages)

Management 893,327 CFA (781,661 CFA x 24 sessions / 21 villages)

3. Outputs of Training

Participants 96 people (women: 63, men: 33)

Trees / area planted 714 plants / 1.14 ha

4. Impacts of Training[4]

(1) Activities carried out by villagers after training (actual)

1) Trees / area planted by villagers[5]

2005 1,588 trees / 2.54 ha
(Survival rate at June 2006: 57 %, September 2007: 49 %)

2006 2,917 trees / 4.67 ha
(Survival rate at September 2007: 71 %)

2007 3,165 trees / 5.06 ha

2) Seedlings obtained and cost borne by villagers

2005 1,812 trees
Transportation cost: 10,163 CFA (5.6 CFA per tree)

2006 1,225 trees
Transportation cost: 5,052 CFA (4.1 CFA per tree)
(In addition, eight individuals in three villages obtained 916 wildings)

2007 1,198 trees
Transportation cost: 4,222 CFA (3.5 CFA per tree)

* Seedlings were obtained from the Forest Department. Seedlings are provided free of charge but villagers must bear transportation cost.

* Seedling production by villagers expanded from 2006. This is recorded in the impact of seedling production training.

(2) Future activities by villagers (projection)

1) As suitable land for tree planting will decrease with progress of afforestation, number of trees planted each year is expected to lessen in the near future. However, harvesting and selling activities will expand as plantations become mature.

[4] Activities carried out and achievements attained by villagers after training is summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

[5] Planting categories include square planting, windbreak, boundary planting, orchard, live fence and shade trees. However, area planted is calculated using the 625 trees per hectare conversion rate from the actual number of trees planted.

2) Harvesting and sales of eucalyptus

From 2010 onwards, sales revenue of roughly 400,000 CFA per village can be expected.

Main assumptions for the above projection

First felling: Year 5 Second Felling: Year 10 Third felling: Year 15

Felling: Clear cutting Regeneration: Natural regeneration by sprouting, twice

Revenue: Account only sales of poles

Number of sellable trees at first felling: 40 % of initially planted trees

Number of sellable sprouts at second and third felling: Same number as first felling

Unit sales price: 450 CFA / stem

Cost of sales: 4,500 CFA / sales (cost to cover visit of forester for felling authorization)

(3) Social and environmental impacts: voices of villagers

- ✧ Time and efforts spent on obtaining firewood reduced.
- ✧ Leaves of eucalyptus can be used as medicine.
- ✧ Wildlife such as hares, monkeys, and boars can be observed again.
- ✧ Salt damage and soil erosion decreased in and around the plantation. Vegetation has started to recover in the formerly bare land between the plantation and the farmland.
- ✧ Fertility of land close to the plantation has improved.
- ✧ Wind speed has reduced due to the planting of trees, and salt, sand, dust and heat brought by the wind has reduced. The salt from the Bao Bolon riverbed has stopped reaching the farmland and as a result, productivity has improved.
- ✧ Before, millet stems fell down prior to harvesting due to strong winds but after planting trees, the situation has improved.

(3) Inputs and Outputs of Seedling Production Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	77,586	Participants 67 people	1) Year of training Seedlings produced outside village nurseries 702
Materials (b)	139,619	Seedling production in village nurseries 1,652	2) One year after training Seedlings produced 2,339
Logistical support (c)	72,607		
Management (d)	781,661		
Total	1,071,473		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	February-March 2006
Target	21 New villages
Duration	3 days
Training Content	Villagers learned how to: obtain materials necessary for seedling production such as pots and seeds; plan for seedling production; establish village nursery; and propagate seedlings.
Preparation	None
Follow-up	During April to August of 2006, trainers visited 20[6] new villages and 9 old villages approximately 20 times each to give technical support to villagers. Skills on germination, pricking, transplanting, watering, shading and pest control were taught.

2. Inputs by Project

(1) Training

Trainer	45,000 CFA (15,000 CFA x 3 days)
Materials	124,887 CFA (Tools: 107,567 CFA, Consumables: 17,320 CFA)
Driver	15,732 CFA (5,244 CFA x 3 days)

[6] Excluding Darou Rahmane.

Fuel	7,776 CFA (2,592 CFA x 3 round trips)
Animator	9,231 CFA (3,077 CFA x 3 days)
Management	781,661 CFA

(2) Follow-up

Trainer	32,586 CFA (7,500 CFA x 126 days / 29 villages)
Materials	14,732 CFA (416,800 CFA / 29 villages)
Driver	22,697 CFA (5,244 CFA x 126 days / 29 villages)
Fuel	17,171 CFA (3,952 CFA x 126 days / 29 villages)

3. Outputs of Training

Participants 67 people (women: 47, men: 21)

Average seedling production in village nurseries (per village)

Species	Number	
Eucalyptus camaldulensis	1,172	
Anacardium occidentale	162	* species included in others *Mangifera indica* *Detarium microcarpum* *Carica papaya* *Moringa oleifera* *Psidium guajava* *Parkia biglobosa* *Terminalia Mantaly*
Acacia mellifera	122	
Acacia holosericea	56	
Zizyphus mauritiana	46	
Gmelina arborea	28	
Citrus limon	26	
Others	40	
Total	**1,652**	

4. Impacts of Training[7]

(1) Activities carried out by villagers after training (actual)

1) 2006

A. Average seedling production in nurseries other than village nurseries created during training (per village)

Species	Number	Number of seedlings produced by individuals and groups
Eucalyptus camaldulensis	424	* species included in others *Zizyphus mauritiana, Acacia holosericea* *Acacia mellifera, Gmelina arborea* *Citrus limon, Detarium microcarpum* *Carica papaya, Psidium guajava* *Parkia biglobosa, Annona reticulata* *Terminalia Mantaly, Cola cordifolia*
Mangifera indica	151	
Anacardium occidentale	84	
Others	43	
Total	**702**	

[7] Activities carried out and achievements attained by villagers after training is summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

B. Sales of seedlings

7 individuals and groups in 5 villages sold seedlings.

Total number sold: 1,624

Total revenue: 129,290 CFA (unit price 80 CFA / seedling)

2) 2007

A. Seedling production (per village)

2,339 (individual: 1,618, group: 721)

B. Seedling sales

7 individuals and groups in 6 villages sold seedlings.

Total number sold: 1,345

Total revenue: 99,700 CFA

(2) Future activities by villagers (projection)

- ✧ Seedling production is expected to continue at similar scale to that of 2007.
- ✧ For villages close to Nioro Forest Department Nursery, as long as the Forest Department maintains the policy of free seedling distribution, villagers' incentive to grow their own seedlings in the village will remain moderate. By contrast, in villages far from Nioro Nursery and have plenty of land for planting trees, seedling production will continue.

(4) Inputs and Outputs of Plantation Management Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	19,100	Participants 53 people	Villagers started negotiating for fairer price with buyers using knowledge of market price
Materials (b)	51,750		
Logistical support (c)	16,157		
Management (d)	781,661		
Total	868,668		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	1) February 2006	2) November-December 2006
Target	1) 9 Old villages	2) 21 New villages
Duration	1 day	
Training Content	Felling and regeneration techniques; required paperwork and related regulations on felling, transporting and sales of timber; use, demand, price and trade of timber; and tactics to sell timber at higher price were taught through lecture.	
Preparation	Training of trainer was held for one day. Training focussed on providing knowledge on timber market. Master trainer was officer of the Forest Department Headquarters.	
Follow-up	None	

2. Inputs by Project

(1) Training

Trainer	15,000 CFA (15,000 CFA x 1 day)
Materials	51,750 CFA (saw, hatchet, helmet, etc.)
Driver	5,244 CFA
Fuel	2,592 CFA
Animator	3,077 CFA

Management 781,661 CFA

(2) Preparation (Training of Trainers)

Trainer 4,100 CFA (123,000 CFA / 30 villages, cost include travelling from Dakar)

3. Outputs of Training

Participants 51 people (women: 33, men: 18)

4. Impacts of Training[8]

(1) Impacts on sales of timber: voices of villagers

- ✧ Villagers can now negotiate fairer price with buyers due to knowledge of market price. Villagers stopped selling at extremely low prices. For example, villagers did not sell when offered 300 CFA per tree but sold at 500 CFA later.
- ✧ Villagers started negotiating prices based on per log instead of per tree[9].

[8] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

[9] Generally, two to three logs can be produced from one tree. In the market, timber is traded in logs. As such, villagers are generally better-off if they negotiate price in terms of logs rather than trees.

(5) Inputs and Outputs of Carbonization Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	58,143	Participants 51 people	Production during the seven months after training 137 operations with production of 182 sacks in 15 villages Sales revenue 1,750 - 2,250 CFA per sack
Materials (b)	50,207		
Logistical support (c)	21,826		
Management (d)	781,661		
Total	911,837		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	January-February 2007
Target	9 Old villages and 19 New villages[10]
Duration	2 days
Training Content	Technique to carbonize eucalyptus wood was taught. Preparation of wood and firing of kiln were taught on Day 1. Kiln was opened on Day 2 and additional advice on improving production was given.
Preparation	Trial to identify appropriate technology was conducted. Training of trainers was held alongside.
Follow-up	None

2. Inputs by Project

(1) Training

Trainer	30,000 CFA (15,000 CFA x 2 days)
Materials	36,211 CFA (1,013,900 CFA / 28villages, used oil drums etc.)
Driver	10,488 CFA (5,244 CFA x 2 days)
Fuel	5,184 CFA (2,592 CFA x 2 round trips)

[10] Excluding Keur Babou Diop and Darou Rahmane.

Animator 6,154 CFA (3,077 CFA x 2 days)

Management 781,661 CFA

(2) Preparation

1) Field observation for site selection of trial

Trainer 3,857 CFA (108,000 CFA / 28 villages, includes travelling expenses from Dakar)

2) Trial and Training of Trainers

Trainer 24,286 CFA (680,000 CFA / 28 villages, includes travelling expenses from Dakar)

Materials 13,996 CFA (391,900 CFA / 28 villages)

3. Outputs of Training

Participants 51 people (women: 34, men: 17)

One drum-full of charcoal

4. Impacts of Training[11]

(1) Activities carried out by villagers after training (actual)

Achievements during the seven months from March to September 2007

Number of operation 137 times in 15 villages

5 times per village if all 28 trained villages are considered

9 times per village if only the 15 villages which practiced carbonization are considered

Production 182 sacks in 15 villages (50 kg rice sacks are generally used)

7 sacks per village if all 28 trained villages are considered

12 sacks per village if only the 15 villages which practiced carbonization are considered

Sales revenue 1,750 - 2,250 CFA per sack

14,000 CFA per village if all 28 trained villages are considered

24,000 CFA per village if only the 15 villages which practiced carbonization are considered

(2) Future activities by villagers (projection)

Carbonization will become more and more popular as eucalyptus plantation matures.

[11] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(6) Inputs and Outputs of Soil Conservation Technique (Stone Line) Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	77,586	Participants 76 people	
Materials (b)	139,619	Structure constructed 42 meters	
Logistical support (c)	72,607		
Management (d)	781,661		
Total	1,071,473		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	May-June 2006
Target	19 New villages[12]
Duration	3 days
Training Content	Lecture on soil conservation was given and a level was made on Days 1 and 2. Practice was done on Day 3. Lecture covered mechanism of soil erosion, agriculture and construction techniques for various types of erosion, integrated measures to fight soil erosion, and use of the level. In practice, all but one village constructed stone line. One village constructed millet fence.
Preparation	Villagers selected site and collected materials for construction such as stones. Trainer supervised.
Follow-up	Vetiver was planted along constructed structure. Monitoring was carried out to examine effectiveness.

2. Inputs by Project

(1) Training

Trainer 45,000 CFA (15,000 CFA x 3 days)

[12] Excluding Keur Alssane Khodia and Darou Rahmane.

Materials	58,600 CFA (Tools: 44,600 CFA, Consumables: 14,000 CFA)
Driver	15,732 CFA (5,244 CFA x 3 days)
Fuel	7,776 CFA (2,592 CFA x 3 round trips)
Animator	9,231 CFA (3,077 CFA x 3 days)
Management	781,661 CFA

(2) Follow-up[13]

A. Vetiver Planting

Trainer	5,000 CFA (105,000 CFA / 21 villages)
Materials	22,800 CFA (478,800 CFA / 21 villages)
Driver	1,748 CFA (5,244 CFA x 7 days / 21 villages)
Fuel	1,317 CFA (3,952 CFA x 7 days / 21 villages)

B. Survey (twice)

Trainer	2,857 CFA (60,000 CFA / 21 villages)
Driver	1,998 CFA (5,244 CFA x 8 days / 21 villages)
Fuel	1,506 CFA (3,952 CFA x 8 days / 21 villages)

(3) Preparation[14]

Trainer	10,227 CFA (225,000 CFA / 22 villages)
Driver	3,575 CFA (5,244 CFA x 15 days / 22 villages)
Fuel	2,695 CFA (3,952 CFA x 15 days / 22 villages)

3. Outputs of Training

Participants	76 people (women: 50, men: 26)
Structure constructed	42 meters (stone line or millet fence)
Soil conservation effect	Vegetation recovered around constructed structures

4. Impacts of Training[15]

(1) Activities carried out by villagers after training (actual)

✧ Some villagers practice the activity but it is not very commonly practiced.

[13] Total cost is divided by 21 as follow-up was done in conjunction with other training theme.
[14] Total cost is divided by 22 as preparation was done in conjunction with other training theme.
[15] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(7) Inputs and Outputs of Soil Conservation Technique (Frame Dam) Demonstration

(Figures shown are per village unless otherwise stated)

Summary

Inputs (for one frame dam)		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	34,286	1) First Demonstration Participants 37 people 1 frame dam	Six frame dams constructed by villagers of four villages
Materials (b)	65,520		
Logistical support (c)	25,766	2) Second Demonstration Participants 47 people 3 frame dams	
Management (d)	893,327		
Total	1,018,899		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

1) First Demonstration

Training Period	May 2006
Target	2 New villages[16]
Duration	2 days
Training Content	Construction of dam made of eucalyptus frame filled with stones aimed at controlling gully erosion. Demonstration was conducted by Japanese Consultant in order to test validity of method and to train local trainers.
Preparation	Identification of construction site and collection of construction materials such as stones were done by villagers. The trainer supervised.
Follow-up	Vetiver was planted around constructed dam to strengthen and stabilize the structure. Survey was carried out to confirm effectiveness of the structure.

2) Second Demonstration

Training Period	October 2006
Target	1 New village[17]

[16] Keur Sountou and Ndiakhène
[17] Keur Babou Diop

Duration	6 days
Training Content	Demonstration was conducted to examine validity of putting three frame dams to control single gully erosion. Japanese Consultant conducted the demonstration and trained local trainers.
Preparation	Collection of construction materials such as stones was done by villagers. Supervision was done by trainer.

2. Inputs by Project

(1) Training

1) First Demonstration

Trainer[18]	60,000 CFA (15,000 CFA x 2 days x 2 trainers)
Materials	76,500 CFA (Tools: 18,000 CFA, Consumables: 58,500 CFA)
Driver	10,488 CFA (5,244 CFA x 2 days)
Fuel	5,184 CFA (2,592 CFA x 2 round trips)
Animator	6,154 CFA (3,077 CFA x 2 days)
Management	781,661 CFA

2) Second Demonstration

Approximately three times the cost of the First Demonstration as three dams were built

(2) Follow-up[19]

1) First Demonstration

A. Vetiver Planting

Trainer	5,000 CFA (105,000 CFA / 21 villages)
Materials	22,800 CFA (478,800 CFA / 21 villages)
Driver	1,748 CFA (5,244 CFA x 7 days / 21 villages)
Fuel	1,317 CFA (3,952 CFA x 7 days / 21 villages)

B. Survey (twice)

Trainer	2,857 CFA (60,000 CFA / 21 villages)
Driver	1,998 CFA (5,244 CFA x 8 days / 21 villages)
Fuel	1,506 CFA (3,952 CFA x 8 days / 21 villages)

[18] Cost of Japanese Consultant who led the demonstration is not included.
[19] Total cost is divided by 22 as follow-up was done in conjunction with other training theme.

(3) Preparation[20]

1) First Demonstration

Trainer	43,977 CFA (225,000 CFA / 22 villages + 67,500 CFA / 2 villages)
Fuel	20,000 CFA (fuel for pickup truck to collect stones)
Driver	14,063 CFA (5,244 CFA x 15 days / 22 days + 5,244 CFA x 2 days)
Fuel	10,599 CFA (3,952 CFA x 15 days / 22 days + 5,244 CFA x 2 days)

2) Second Demonstration

Approximately three times the cost of the First Demonstration as three dams were built

3. Outputs of Training

1) First Demonstration

Participants	37 people (women: 0, men: 37)
Structure constructed	1 frame dam

2) Second Demonstration

Participants	47 people (women: 1, men: 46)
Structure constructed	3 frame dams

4. Impacts of Training[21]

(1) Activities carried out by villagers after training (actual)

- ✧ Six frame dams in total have been constructed by villagers of four villages as of October 2007.
- ✧ After the first demonstration, the villagers of Ndiakhène and Ndiba Ndiayene initiated and made efforts to construct a frame dam to protect the road connecting the two villages. The construction was done in July 2006 with the support of Nioro Office of the Forest Department, Médina Sabakh Rural Commune and the project.
- ✧ In Keur Sountou, water that flowed through the village during heavy rain eased. This made possible the repairing of a road which had been eroded continuously. Villagers could not take such action before as they thought that it would be a waste of effort because the water flow would wash away whatever efforts they made.
- ✧ After the second demonstration, four villages requested assistance for frame dam construction. Five frame dams were constructed with the villagers contributing labour and materials. The project provided technical assistance only.

[20] Total cost is divided by 22 as preparation was done in conjunction with other training theme.

[21] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(2) Social, economic and environmental impacts: voices of villagers

- ✧ Strong water flow in the village which used to occur during heavy rain fall disappeared.
- ✧ The sound of water flowing during heavy rain stopped and now people can sleep peacefully during night.
- ✧ The road erosion stopped.

5. Cost of villager-initiated frame dam construction

The table presented in the next page summarizes the actual costs of the two villager-initiated frame dam construction carried out by the villagers of 1) Ndiakhène and Ndiba Ndiayene; and 2) Keur Sountou. Such initiatives imply the following.

- ✧ The villagers contributed labor and materials necessary for the construction which amounts to roughly half of the total construction cost. This implies that in places where the demand for a frame dam is high due to erosion problems, the government can provide such infrastructure with smaller input.
- ✧ The main cost borne by the project is the fee for the trainer. This cost may be decreased if more trainers become available.
- ✧ The materials used in the frame dam are locally obtainable. Therefore, the villagers can easily contribute materials.

Cost of villager-initiated frame dam construction (CFA)

1. Villages	1) Ndiakhène & Ndiba Ndiayene; 2) Keur Sountou					
2. Dimensions		1)	2)			
	Height	0.6 m	0.5 m			
	Length	5.2 m	4.8 m			
	Width	1.2 m	1.1 m			
3. Cost of construction	Quantity 1)	Quantity 2)	Total quantity	Unit cost	Total cost	Cost per dam
Total					299,000	149,500
(1) Contribution of villagers					149,000	74,500
Materials					90,000	45,000
Stones	7 m^3	6 m^3	13 m^3			
Eucalyptus logs	34 poles	27 poles	61 poles	500	30,500	15,250
Waste oil	18 liters	12 liters	30 liters	250	7,500	3,750
Wire (# 14)	2 rolls	2 rolls	4 rolls	3,000	12,000	6,000
Fuel (for transportation of stones)	1 truck	1 truck	2 trucks	20,000	40,000	20,000
Labor					59,000	29,500
Cutting of eucalyptus	4 man/day	4 man/day	8 man/day	500	4,000	2,000
Application of waste oil	2 man/day	2 man/day	4 man/day	500	2,000	1,000
Collection of stones	17 man/day	27 man/day	44 man/day	500	22,000	11,000
Construction of frame dam	32 man/day	30 man/day	62 man/day	500	31,000	15,500
Tools (hatchets and hoes owned by villagers were used)						
(2) Contribution of project					150,000	75,000
Technical advice, trainer*1					150,000	75,000
Trainers	4 man/day	4 man/day	8 man/day	15,000	120,000	60,000
Animators	5 man/day	5 man/day	10 man/day	3,000	30,000	15,000
Tools and consumables amounting 145,000 CFA were provided through other training sessions						

Note1) Management cost of forestry department officials and Japanese consultants are excluded.

(8) Inputs and Outputs of Vegetable Growing and Compost Making Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	67,500	Participants 75 people	1) Profits one season after training Group: 119,805 CFA per village
Materials (b)	145,032	Profits from sales of vegetable	Individual: 2,506,850 CFA by 32 people in 10 villages
Logistical support (c)	60,327	1) 2005 Training 223,862 CFA 2) 2006 Training 208,008 CFA	2) Intra-village credit scheme using profits 2006: 475 people in 8 villages, 1,383,675 CFA in total 2007: 418 people in 7 villages, 1,030,925 CFA in total
Management (d)	781,661		
Total	1,054,520		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	1) October-November 2005	2) October-November 2006
Target	1) 12 New villages	2) 8 New villages[22]
Duration	3 days	
Training Content	Techniques on dry-season vegetable growing and compost making were taught. Villagers learned how to set up vegetable garden and how to grow tomatoes, okra, lettuces, eggplants, chillies, carrots, cabbages, onions and others.	
Preparation	Villagers prepared fence to enclose vegetable garden.	
Follow-up	Trainers visited villages at least once a week for twelve weeks. Trainers gave advice on transplanting, pest control and disease control. Exchange visits between villages to observe activities of each other were organized.	

2. Inputs by Project

(1) Training

Trainer	45,000 CFA (15,000 CFA x 3 days)
Materials	145,032 CFA (Tools: 77,700CFA, Consumables: 67,332CFA)
Driver	15,732 CFA (5,244 CFA x 3 days)

[22] Keur Babou Diop was excluded due to insufficient water supply.

Fuel	7,776 CFA (2,592 CFA x 3 round trips)
Animator	9,231 CFA (3,077 CFA x 3 days)
Management	781,661 CFA

(2) Follow-up[23]

Trainer	22,500 CFA (7,500 CFA x 36 days in total / 12 villages)
Driver	15,732 CFA (5,244 CFA x 36 days in total / 12 villages)
Fuel	11,856 CFA (3,952 CFA x 36 days in total / 12 villages)

3. Outputs of Training

Participants 75 people (women: 20, men: 55)

1) Results of 2005-2006 season (average of 12 villages trained in 2005)

Additional inputs by villagers[24]	29,877 CFA
Sales revenue of vegetables	253,739 CFA
Net profit	223,862 CFA

2) Results of 2006-2007 season (average of 8 villages trained in 2006)

Additional inputs by villagers[25]	27,632 CFA
Sales revenue of vegetables	235,640 CFA
Net profit	208,008 CFA

4. Impacts of Training[26]

(1) Activities carried out by villagers after training (actual)

1) Results of one season after the training

A. Achievement of 2006-2007 season by groups of 12 villages trained in 2005

	Average of 12 villages	Average of 10 villages excluding 2 failed villages
Cost of production and sales	46,156 CFA	49,870 CFA
Sales revenue of vegetables	165,961 CFA	193,636 CFA
Net profit	119,805 CFA	143,766 CFA

B. Achievement by individuals

Number of producers 32 people in 10 villages

[23] Represented by data of 12 villages trained in 2005.
[24] Cost of production inputs such as water and pesticides, and sales costs such as for transporting of produces to market.
[25] Cost of production inputs such as water and pesticides, and sales costs such as for transporting of produces to market.
[26] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

Total profit made 2,506,850 CFA

* Half the producers have been practicing vegetable growing before training.

* In addition, there are approximately 200 people who practice vegetable growing but with no data.

2) Intra-village credit scheme using profit from vegetable growing

A. Results of 2006

Total amount financed 1,383,657 CFA Total number of borrowers 475 people in 8 villages

B. Results of 2007

Total amount financed 1,030,925 CFA Total number of borrowers 418 people in 7 villages

3) Other impacts

- ✧ Several villages started combining vegetable growing with fruit tree cultivation.
- ✧ Several villages are saving money from vegetable sales to purchase machineries and equipments such as mill.

(2) Future activities by villagers (projection)

1) Vegetable growing by groups

The activity is expected to continue at a similar pace to that of one season after training.

Net profit approximately 120,000 CFA per village

2) Vegetable growing by individuals

The activity is expected to continue at a similar pace to that of one season after training.

Net profit approximately 125,000 CFA per village

(3) Social impacts: voices of villagers

- ✧ Sense of solidarity enhanced among villagers and members of women groups. Before, villagers would only get together on ceremonial occasions. Now, thanks to the vegetable growing activity, villagers regularly get together at the vegetable garden and have a chance to exchange opinions on village issues.

(9) Inputs and Outputs of Fruit Tree Cultivation Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	60,000	Participants 56 people	
Materials (b)	86,538	Trees planted Mango 20 Lemon 24	
Logistical support (c)	51,131		
Management (d)	781,661		
Total	979,330		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	July-August 2006
Target	20 New villages[27]
Duration	3 days
Training Content	One-day lecture and two-day practice on fruit tree growing using lemon and mango were held. Planting, fertilizing, maintenance and grafting were covered.
Preparation	Villagers prepared site for orchard.
Follow-up	Trainers visited villages once a week for eight weeks to give advice on maintenance. Extra sessions for grafting were organized.

2. Inputs by Project

(1) Training

Trainer	45,000 CFA (15,000 CFA x 3 days)
Materials	86,538 CFA (Tools: 27,400 CFA, Consumables: 59,138 CFA)
Driver	15,732 CFA (5,244 CFA x 3 days)
Fuel	7,776 CFA (2,592 CFA x 3 round trips)
Animator	9,231 CFA (3,077 CFA x 3 days)

[27] No training in Médina Nguèyene.

Management	781,661 CFA

(2) Follow-up

Trainer	15,000 CFA (7,500CFA x 40 days / 20 villages)
Driver	10,488 CFA (5,244CFA x 40 days / 20 villages)
Fuel	7,904 CFA (3,952CFA x 40 days / 20 villages)

3. Outputs of Training

Participants	56 people (women: 39, men: 17)
Trees planted	20 mangos, 24 lemons

4. Impacts of Training[28]

No impacts have been recorded as insufficient time has passed for the planted trees to develop.

[28] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(10) Inputs and Outputs of Livestock Fattening Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	45,000	Participants 58 people	Practice during one year after training 42 individuals and groups in 17 villages Profit: 69,408 CFA per operation
Materials (b)	32,733		
Logistical support (c)	34,232		
Management (d)	781,661		
Total	893,626		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	January-February 2006
Target	21 New villages
Duration	3 days
Training Content	Technique to fatten cows and sheep in short period of time and method to sell at high price by capitalizing on market price fluctuations were taught. Idea to buy livestock when prices are low and to sell when prices increase during festive occasions was taught. Establishment of livestock cage, preparation of feed, disease control, fattening schedule and access to credit for purchasing of animal were covered.
Preparation	Volunteers were asked to provide their livestock as training material. Volunteers prepared pegs and roofing material for cage. Trainers examined site for cage.
Follow-up	None

2. Inputs by Project

(1) Training

Trainer	45,000 CFA (15,000 CFA x 3 days)
Materials	32,733 CFA (Tools: 10,429, Consumables: 22,304 CFA)
Driver	15,732 CFA (5,244 CFA x 3 days)

Fuel	7,776 CFA (2,592 CFA x 3 round trips)
Animator	9,231 CFA (3,077 CFA x 3 days)
Management	781,661 CFA

(2) Follow-up

Trainer	0 CFA
Driver	999 CFA (5,244 CFA x 4 days / 21 villages)
Fuel	494 CFA (2,592 CFA x 4 round trips / 21 villages)

3. Outputs of Training

Participants 58 people (women: 33, men: 25)

4. Impacts of Training[29]

(1) Activities carried out by villagers after training (actual)

Achievements during March 2006 to April 2007

1) Number of practitioners

41 individuals (women: 3, men 38) and 1group in 17 villages

2) Profits (in 29 cases which records on revenue and expenditure were disclosed)

29 operations have been carried out by 26 individuals (cows: 27, sheep: 2)

Net profit: 2,012,850 CFA (69,408 CFA per operation)

- ✧ Of the 26 individuals, 17 had prior experience in livestock fattening. However, those with experience have benefited from the training as well as they learned proper livestock raising techniques, tips on selecting the right animal to fatten and methods to fight diseases.

(2) Future activities by villagers (projection)

Due to the following reasons, the activity is unlikely to expand rapidly.

- ✧ Villagers lack capital to purchase livestock and feed.
- ✧ As villagers are always in short of cash, they cannot observe the proper fattening schedule. For example, villagers cannot purchase the recommended feed; and/ or villagers are forced to sell the animal before the right time.
- ✧ Access to veterinary service is difficult.

[29] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(3) Social and economic impacts: voices of villagers

✧ Many villagers believe that as they can reduce the risk of losing their livestock and efficiently do the feeding, the profitability of fattening operation has improved.

(11) Inputs and Outputs Fruit and Vegetable Processing of Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	73,636	Participants 92 people	Profit from sales of products up to April 2007 per village
Materials (b)	179,786	Profit from sales of products 26,021 CFA	Villages trained in 2005 31,682 CFA Villages trained in 2006 4,358 CFA
Logistical support (c)	32,739		
Management (d)	781,661		
Total	1,067,822		

a Trainer
b Tools and consumables
c Animator, driver and fuel

1. Outline of Training

Training Period	1) September-October 2005	2) September-October 2006
Target	1) 9 New villages	2) 12 New villages
Duration	3 days	
Training Content	Techniques to make tomato puree, tomato jam, tomato syrup, pumpkin jam, tamarind syrup, hibiscus juice powder and baobab fruit juice powder were taught. Full process including bottle sterilization, stewing, sugaring and bottling was covered.	
Preparation	None	
Follow-up	None	

2. Inputs by Project

(1) Training[30]

Trainer	73,636 CFA (15,000 CFA x 3 days, 2 trainers were allocated for large villages)
Materials	179,786 CFA (Tools: 42,483 CFA, Consumables: 137,303 CFA)
Driver	15,732 CFA (5,244 CFA x 3 days)
Fuel	7,776 CFA (2,592 CFA x 3 round trips)
Animator	9,231 CFA (3,077 CFA x 3 days)

[30] Costs are calculated using 2006 figures.

Management 781,661 CFA

3. Outputs of Training

Participants	92 people (women: 76, men: 16)
Additional inputs by villagers[31]	228 CFA
Sales revenue of products[32]	26,249 CFA

4. Impacts of Training[33]

(1) Activities carried out by villagers after training (actual)

*A. Achievements of 9 villages trained in 2005 from October 2005 to April 2007

*B. Achievements of 12 villages trained in 2006 from October 2006 to April 2007

1) Number of operation

*A 66 times (group: 58, individual: 8)

*B 7 times (group only)

2) Costs of inputs and sales per village

*A 22,494 CFA (Total: 202,445 CFA)

*B 4,763 CFA (Total: 57,150 CFA)

3) Sales revenue of products per village

*A 54,176 CFA (Total: 487,585 CFA)

*B 9,121 CFA (Total: 109,450 CFA)

4) Profits per village

*A 31,682 CFA (Total: 285,140 CFA) 4,320 CFA per operation

*B 4,358 CFA (Total: 52,300 CFA) 7,471 CFA per operation

[31] Figure is from 2005.
[32] Figure is from 2005.
[33] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(2) Future activities by villagers (projection)

- ✧ Due to low profitability, the activity is unlikely to expand widely.
- ✧ Tomato puree making may become popular if the price of tomato slumps.
- ✧ Jam making is likely to continue in villages that consume bread.
- ✧ Syrup making and juice making are likely to continue in villages close to the Gambian border as price of sugar is cheaper.

(12) Inputs and Outputs of Planning Training

(Figures shown are per village unless otherwise stated)

Summary

Inputs		Training Outputs	Training Impacts
Category	Amount CFA	Item	Item
Technical advice (a)	33,571	Participants 64 people	
Materials (b)	0		
Logistical support (c)	21,826		
Management (d)	781,661		
Total	837,058		

a Trainer
b Tools and consumables
c Animator, driver and fuel
d Training program manager

1. Outline of Training

Training Period	December 2006
Target	21 New villages
Duration	2 days
Training Content	Participants were offered chance to understand importance of and methods for planning. Workshops were held to practice planning, taking activities villagers were currently performing or themes of past training such as afforestation and vegetable growing as examples.
Preparation	Candidate trainers were asked to perform trial training session to demonstrate their qualification.
Follow-up	None

2. Inputs by Project

(1) Training

Trainer	33,571 CFA (15,000 CFA x 2 days + travelling expense[34])
Driver	10,488 CFA (5,244 CFA x 2 days)
Fuel	5,184 CFA (2,592 CFA x 2 round trips)

[34] Travelling expense was provided to trainers who came from cities outside the project area.

Animator 6,154 CFA (3,077 CFA x 2 days)
Management 781,661 CFA

(2) Preparation
Trainer 2,619 CFA (55,000 CFA / 21 villages)

3. Outputs of Training

Participants 64 people (women: 46, men: 18)

4. Impacts of Training[35]

No obvious impacts have been observed. The impacts of this training theme are difficult to measure and the impacts should probably be monitored over a long period. Few reasons for lack of obvious impacts are as follows.

1) Impacts are unlikely to appear due to the nature of the theme and because the training period was short.
2) The literacy level of villagers is very low.
3) Facilitation level of some trainers was low. Some training sessions did not consider illiteracy and employed a lot of exercises using letters.

[35] Activities carried out and achievements attained by villagers after training are summarized. Projection on future activities and achievements by villagers is also made. However, as data on past activities and achievements are lacking, it is not possible to precisely measure the impact of training.

(13) Unit Cost Table for Inputs and Outputs of Training

Table: Unit cost of project inputs

Category	Amount CFA	Notes
Trainer (Training)	15,000	Per day
Trainer (Follow-up)	7,500	Per day
Fuel	2,592	For one round trip from project office to village 16.2 km (average distance to village) x 2 / 6 km (mileage) x 480 CFA (unit price of diesel without tax)
Driver	5,244	Per day 95,000 CFA (salary) x 13 months (including one-month paid leave) x 1.07 (retirement allowance top-up) / 12 months (actual working period) / 21 days (working days per month)
Animator	3,077	Per day 80,000 CFA (salary) / 26 days (working days per month)
Management	781,661	Per training Cost of Japanese Consultant responsible for training management including salary, overhead, and travelling costs and allowances. Running cost of project office, cost of counterpart and investment cost are not included.

(14) Analysis of Synthetic Impacts of Forestry Related Trainings

Scenario 1: Cost of Japanese Consultants responsible for training management *accounted*

- Per village costs and benefits of forestry activities for 2005 to 2024 -

Discount rate 0.035 CFA

Category	Item	Year	Expense	Revenue	Net profit	Discounted net profit	Cumulated discounted net profit	Note
Project	Afforestation training	2005	1,018,899		-1,018,899	-1,018,899	-1,018,899	Including management expense
Villagers	Seedling transportation	2005	10,163		-10,163	-10,163	-1,029,062	Fuel for truck
Villagers	Planting	2005	0		0	0	-1,029,062	Labour for planting 2088 trees
Project	Seedling production training & follow-up	2006	1,071,473		-1,071,473	-1,035,240	-2,064,302	Including management expense
Villagers	Seedling production	2006	0		0	0	-2,064,302	Labour
Villagers	Seedling sales	2006		4,310	4,310	4,164	-2,060,137	
Villagers	Seedling transportation	2006	5,052		-5,052	-4,881	-2,065,019	Fuel for truck
Villagers	Planting	2006	0		0	0	-2,065,019	Labour for planting 2917 trees
Project	Plantation management training	2006	868,668		-868,668	-839,293	-2,904,311	Including management expense
Villagers	Seedling production materials	2007	5,196		-5,196	-4,851	-2,909,162	30 % of the training material cost
Villagers	Seedling production	2007	0		0	0	-2,909,162	Labour
Villagers	Seedling sales	2007		3,323	3,323	3,102	-2,906,060	
Villagers	Seedling transportation	2007	4,222		-4,222	-3,941	-2,910,001	Fuel for truck
Villagers	Planting	2007	0		0	0	-2,910,001	Labour for planting 3165 trees
Villagers	Seedling production materials	2008	5,196		-5,196	-4,686	-2,914,688	30 % of the training material cost
Villagers	Seedling production	2008	0		0	0	-2,914,688	Labour
Villagers	Seedling transportation	2008	4,222		-4,222	-3,808	-2,918,496	Same as 2007
Villagers	Planting	2008	0		0	0	-2,918,496	Labour for planting 2795 trees
Villagers	Seedling production materials	2009	5,196		-5,196	-4,528	-2,923,024	30 % of the training material cost
Villagers	Seedling production	2009	0		0	0	-2,923,024	Labour
Villagers	Seedling transportation	2009	4,222		-4,222	-3,679	-2,926,703	Same as 2007
Villagers	Planting	2009	0		0	0	-2,926,703	Labour for planting 2795 trees
Villagers	Eucalyptus timber sales	2010	4,500	338,256	333,756	281,014	-2,645,689	2005 plantation 1*
Villagers	Eucalyptus timber sales	2011	4,500	388,544	384,044	312,420	-2,333,269	2006 plantation 1*
Villagers	Eucalyptus timber sales	2012	4,500	489,942	485,442	381,553	-1,951,716	2007 plantation 1*
Villagers	Eucalyptus timber sales	2013	4,500	406,816	402,316	305,523	-1,646,193	2008 plantation 1*
Villagers	Eucalyptus timber sales	2014	4,500	406,816	402,316	295,192	-1,351,001	2009 plantation 1*
Villagers	Eucalyptus timber sales	2015	4,500	338,256	333,756	236,606	-1,114,395	2005 plantation 2*
Villagers	Eucalyptus timber sales	2016	4,500	388,544	384,044	263,049	-851,346	2006 plantation 2*
Villagers	Eucalyptus timber sales	2017	4,500	489,942	485,442	321,257	-530,088	2007 plantation 2*
Villagers	Eucalyptus timber sales	2018	4,500	406,816	402,316	257,243	-272,846	2008 plantation 2*
Villagers	Eucalyptus timber sales	2019	4,500	406,816	402,316	248,543	-24,302	2009 plantation 2*
Villagers	Eucalyptus timber sales	2020	4,500	338,256	333,756	199,216	174,913	2005 plantation 2*
Villagers	Eucalyptus timber sales	2021	4,500	388,544	384,044	221,480	396,394	2006 plantation 2*
Villagers	Eucalyptus timber sales	2022	4,500	489,942	485,442	270,490	666,884	2007 plantation 2*
Villagers	Eucalyptus timber sales	2023	4,500	406,816	402,316	216,591	883,475	2008 plantation 2*
Villagers	Eucalyptus timber sales	2024	4,500	406,816	402,316	209,267	1,092,742	2009 plantation 2*
Current price (2005)						1,092,742		

1* Revenue = total planted x proportion of eucalyptus x survival rate x unit price of timber

2* Revenue = total planted x proportion of eucalyptus x survival rate at year 5 x proportion of sellable sprouts x unit price of timber

Scenario 2: Cost of Japanese Consultants responsible for training management *excluded*

- Per village costs and benefits of forestry activities for 2005 to 2024 -

Discount rate 0.035 CFA

Category	Item	Year	Expense	Revenue	Net profit	Discounted net profit	Cumulated discounted net profit	Note
Project	Afforestation training	2005	121,992		-121,992	-121,992	-121,992	Excluding management expense
Villagers	Seedling transportation	2005	10,163		-10,163	-10,163	-132,155	Fuel for truck
Villagers	Planting	2005	0		0	0	-132,155	Labour for planting 2088 trees
Project	Seedling production training & follow-up	2006	289,812		-289,812	-280,012	-412,167	Excluding management expense
Villagers	Seedling production	2006	0		0	0	-412,167	Labour
Villagers	Seedling sales	2006		4,310	4,310	4,164	-408,002	
Villagers	Seedling transportation	2006	5,052		-5,052	-4,881	-412,884	Fuel for truck
Villagers	Planting	2006	0		0	0	-412,884	Labour for planting 2917 trees
Project	Plantation management training	2006	87,007		-87,007	-84,065	-496,948	Excluding management expense
Villagers	Seedling production materials	2007	5,196		-5,196	-4,851	-501,799	30 % of the training material cost
Villagers	Seedling production	2007	0		0	0	-501,799	Labour
Villagers	Seedling sales	2007		3,323	3,323	3,102	-498,697	
Villagers	Seedling transportation	2007	4,222		-4,222	-3,941	-502,638	Fuel for truck
Villagers	Planting	2007	0		0	0	-502,638	Labour for planting 3165 trees
Villagers	Seedling production materials	2008	5,196		-5,196	-4,686	-507,324	30 % of the training material cost
Villagers	Seedling production	2008	0		0	0	-507,324	Labour
Villagers	Seedling transportation	2008	4,222		-4,222	-3,808	-511,132	Same as 2007
Villagers	Planting	2008	0		0	0	-511,132	Labour for planting 2795 trees
Villagers	Seedling production materials	2009	5,196		-5,196	-4,528	-515,660	30 % of the training material cost
Villagers	Seedling production	2009	0		0	0	-515,660	Labour
Villagers	Seedling transportation	2009	4,222		-4,222	-3,679	-519,340	Same as 2007
Villagers	Planting	2009	0		0	0	-519,340	Labour for planting 2795 trees
Villagers	Eucalyptus timber sales	2010	4,500	338,256	333,756	281,014	-238,326	2005 plantation 1*
Villagers	Eucalyptus timber sales	2011	4,500	388,544	384,044	312,420	74,094	2006 plantation 1*
Villagers	Eucalyptus timber sales	2012	4,500	489,942	485,442	381,553	455,647	2007 plantation 1*
Villagers	Eucalyptus timber sales	2013	4,500	406,816	402,316	305,523	761,170	2008 plantation 1*
Villagers	Eucalyptus timber sales	2014	4,500	406,816	402,316	295,192	1,056,362	2009 plantation 1*
Villagers	Eucalyptus timber sales	2015	4,500	338,256	333,756	236,606	1,292,968	2005 plantation 2*
Villagers	Eucalyptus timber sales	2016	4,500	388,544	384,044	263,049	1,556,017	2006 plantation 2*
Villagers	Eucalyptus timber sales	2017	4,500	489,942	485,442	321,257	1,877,275	2007 plantation 2*
Villagers	Eucalyptus timber sales	2018	4,500	406,816	402,316	257,243	2,134,517	2008 plantation 2*
Villagers	Eucalyptus timber sales	2019	4,500	406,816	402,316	248,543	2,383,061	2009 plantation 2*
Villagers	Eucalyptus timber sales	2020	4,500	338,256	333,756	199,216	2,582,277	2005 plantation 2*
Villagers	Eucalyptus timber sales	2021	4,500	388,544	384,044	221,480	2,803,757	2006 plantation 2*
Villagers	Eucalyptus timber sales	2022	4,500	489,942	485,442	270,490	3,074,247	2007 plantation 2*
Villagers	Eucalyptus timber sales	2023	4,500	406,816	402,316	216,591	3,290,838	2008 plantation 2*
Villagers	Eucalyptus timber sales	2024	4,500	406,816	402,316	209,267	3,500,105	2009 plantation 2*
Current price (2005)						3,500,105		

1* Revenue = total planted x proportion of eucalyptus x survival rate x unit price of timber

2* Revenue = total planted x proportion of eucalyptus x survival rate at year 5 x proportion of sellable sprouts x unit price of timber

- Assumptions -

1. Main Assumptions

- Forestry related trainings are afforestation, seedling production and plantation management.
- Analysis period is from 2005 to 2024. Investments during the five year period from 2005 to 2009 and subsequent revenue up to 20 years into the future are considered. Actual investments by the project and villagers during the project's three year lifespan, expected investments by villagers in the future and expected revenue are considered to calculate the cost and benefit of the forestry related trainings.
- For number of trees and proportion of eucalyptus trees planted, actual figures are used for 2005, 2006 and 2007. For 2008 and 2009, average figure of 2005, 2006 and 2007 is used.
- First felling is projected at year 5. Felling method is clear cutting. Regeneration is by natural sprouting and two cycles are expected. Second felling is projected at year 10. Third felling is projected at year 15.
- Proportion of sellable trees at first felling is projected at 40 % of initially planted trees.
- Number of sellable sprouts at second and third felling is assumed to be the same as first felling.

2. Costs

- For inputs by the project, actual figures are used. For personnel cost of training manager, the budget actually spent to station relevant Japanese Consultants is considered.
- For inputs by villagers, following assumptions are made.
  - Labour inputs by villagers such as nursing of seedlings and planting are not translated into monetary value as opportunity cost is extremely low in the area.
  - For transportation cost of seedlings, only the fuel cost borne by villagers to hire a vehicle to carry seedlings from Forest Department Nursery to village is considered. For 2005, 2006 and 2007, actual figures are used. For 2008 and 2009, the figure of 2007 is used.
  - For cost of seedling production, as villagers cut down on costs, the cost each year from 2007 is estimated to be 30 % of the consumables provided by the project during the seedling production training.
- The policy of free distribution of seedlings and pots is assumed to continue at least through to 2009.
- For cost of felling, the cost of obtaining permission to fell is accounted. Fuel cost for foresters to travel to the felling site for inspection is accounted.

3. Benefits

- Basically, sales revenue from eucalyptus timber sold as poles is only considered.
- Unit price of eucalyptus tree is estimated using records of recent sales.

Revenue from sales of species besides eucalyptus and timber other than for poles, and sales of fruits and seedlings can be projected. However, because such revenue is expected to be minimal, only

actual figures of 2006 and 2007 is taken into account.

4. Unit prices

Assumptions and factors used for analysis

Discount rate
Commercial bank savings rate (%) 3.5

Cost of training
See Inputs and Outputs of XXX Training

Cost of seedling transportation (CFA)

year	amount	note
2005	10163	
2006	5052	
2007	4222	
2008 projection	4222	same as 2007
2009 projection	4222	same as 2007

Cost of seedling production materials (CFA)

year	amount	note
2005	-	
2006 training	17320	
2007 projection	5196	30% of training
2008 projection	5196	30% of training
2009 projection	5196	30% of training

Tree planting

year	number	notes
2005	2088	
2006	2917	
2007	3165	
2008 projection	2723	average of 2005-2007
2009 projection	2723	average of 2005-2007

Proportion of eucalyptus

year	%	notes
2005	90	
2006	74	
2007	86	
2008 projection	83	average of 2005-2007
2009 projection	83	average of 2005-2007

Survival rate after 5 years (%) 40

Timing of felling

1) 5 years after planting
2) 10 years after planting
3) 15 years after planting

Regeneration and quality of sprouts
Number of sellable sprouts at second and third felling is assumed to be the same as first felling

Price of eucalyptus timber per tree (CFA) 450

Cost of obtaining permission to fell per felling (CFA) 4500

Sales of seedlings
Only actual figures of 2006 and 2007 are considered

- How to make sense of the Scenarios -

Three economic concepts are introduced to help readers understand Scenarios 1 and 2 presented in Analysis of Synthetic Impacts of Forestry Related Trainings. In the analysis, economic returns on a scenario with Japanese Consultants' management services, and economic returns on a scenario without their services are presented and compared. The three economic concepts are recovery of investment, economic and financial analyses based on estimation of economic and financial rate of returns, and discounting. Particularly, the discounting of future monetary value is a key concept to understand the analysis, because the discounting makes it possible to compare and carry out arithmetic operations of monetary values at different points of time over project period.

Investment recovery

In the Scenarios, net profit is calculated by subtracting expense from revenue (when the value of the net profit is negative, it is a loss). Discounted net profits for every year are calculated by dividing net profits at the rates derived from the fixed annual discounting rate. Then the cumulated values of the discounted net values, which are shown in the column 'Cumulated discounted net profit' in the two scenario tables, are calculated. In the beginning years, the cumulated values are negative, because there are large investments, such as costs of seedling transportation, training and follow-up operations, etc. The cumulative values turn to be positive when profits from eucalyptus production become greater than investment costs. Investments are recovered when the cumulative value turns to a positive value. Thus, in case of Scenario 1, investment is recovered in 2020, and incase of Scenario 2, investment is recovered in 2012. Scenario 1 takes more time to recover investments than Scenario 2 does because of the higher cost of engaging the management services of Japanese administrators. If training and follow-up activities are conducted exclusively by local staff members, higher profitability is ensured.

Economic analysis and financial analysis

The Scenarios are constructed with assumption that the investment is carried out by the government, and the people benefit from eucalyptus timber production. Therefore, the Scenarios show results of *economic analysis* where output and input are captured within the framework of society, making it possible to estimate impact and efficiency of public investment. In case of *financial analysis*, input and output are captured within the framework of a financial entity such as a household, production or business group, etc. to see whether such a business entity is financially viable.

Discounting of the future value

In economic and financial analyses, discounting of economic values expressed in monetary unit is a necessary operation to compare economic values measured at the different points of time. Thus, future values have to be discounted to the present values in order to make the comparison meaningful. In the case of money that yields capital gain over time, for example, the value of 100 CFA of the present year

and 100 CFA of the next year are not the same.

The present value has to be calculated considering the fact that money yields capital gains over time. For example, comparison between Project A which gains a profit of 100 CFA in the present year and Project B with a profit of 120 CFA in the next year in the situation where a bank's interest is 30%, can be considered. The profit of Project A can be increased up to 130 CFA in the next year by depositing this year's profit of 100 CFA to a bank, while Project B makes profit of 120 CFA in the next year which, however, is less than the deposit of Project A. In this case, Project A is chosen due to its higher profit compared to the profit of Project B in the next year.

It is also possible to compare profits converted to the value of the present year. In this case, Project B's profit of 120 CFA in the next year is converted to the present year's value, and compared it to the Project A's present year profit of 100 CFA. Calculating a present value of 120 CFA in the next year is the same as determining the amount of current year deposit which yields 120 CFA in the next year. In this case, the 30 % interest rate is equal to 30 % discount rate, since the direction of calculation turns backward from the future to the present. The equation 1 represents relationship between monetary values of deposits in this year and next year.

This year's deposit * (1+ interest rate) = deposit of the next year (equation 1)

Dividing both sides of equation 1 by (1+interest rate) yields this year's amount of deposit as shown in equation 2.

This year's deposit = deposit of the next year / (1+ interest rate) (equation 2)

Assigning 120 CFA to the deposit of the next year and 30% to the interest (discount) rate in the right hand side of equation 2, this year's deposit is calculated to be approximately 92 CFA. Thus, the present value of Project A is 100 CFA whereas the present value of Project B is 92 CFA. According to this analysis, Project A is selected for implementation because of its higher profit expressed in the present value. In the two Scenarios, accumulated amounts expressed in the current values are calculated assuming the 3.5% discounting rate over the years concerned.