

**NATIONAL DEPARTMENT
OF AGRICULTURE (MAE)
THE REPUBLIC OF GUINEA**

**THE DEVELOPMENT STUDY ON
THE PROJECT OF MECHANIZATION OF IRRIGATED
AGRICULTURE AND WATER MANAGEMENT
IN THE PLAIN OF SONFONIA
IN
THE REPUBLIC OF GUINEA**

FINAL REPORT

September 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

TAIYO CONSULTANTS CO., LTD.

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PREFACE

In response to a request from the Government of the Republic of Guinea, the Government of Japan decided to conduct the Development Study on the Project of Mechanization of Irrigated Agriculture and Water Management in the Plain of Sonfonia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team, headed by Mr. Shiro Hirata of Taiyo Consultants Co., Ltd., to the Republic of Guinea between April 2004 and September 2007.

The team held discussions with the officials concerned of the Government of Guinea and conducted a series of field surveys in the studied area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the sustainable agricultural development in the Republic of Guinea and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials of Government and those concerned in the Republic of Guinea for the close cooperation they had to the study.

September 2007

Ariyuki Matsumoto
Vice President
Japan International Cooperation Agency

September 2007

Mr. Ariyuki Matsumoto
Vice President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

Dear Sir,

We are pleased to submit to you the report on the Development Study on the Mechanization of Irrigated Agriculture and Water Management in the Plain of Sonfonia in the Republic of Guinea. This report presents the results of all the works performed in both Guinea and Japan during a total period of 41 months from April 2004 to September 2007.

In line with the objectives of the study, namely “Agricultural Farming and Crop Improvement”, “Human Resources Training”, “Agricultural Production Infrastructure Development/ Water Management” and “Environmental Preservation”, various projects of each component are broadly proposed. These projects are expected to contribute to the socio-economic development of the area by stabilizing and increasing agricultural production and preservation of environment. By implementing the projects, increase in farmers’ income and improvement in living conditions will be achieved and this will promote poverty alleviation in the area.

It is worthwhile to mention that all the local officials and farmers in the project area actively participated in the formation of the development plan and they are eager to implement the projects. Therefore, it is recommended to the Guinean Government that the projects be carried out as soon as possible.

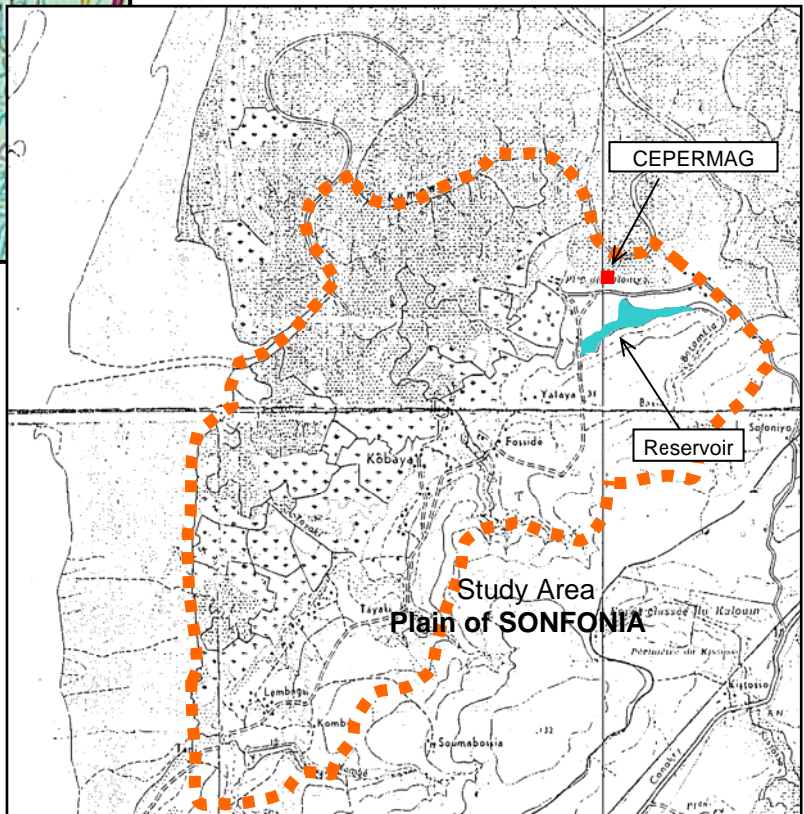
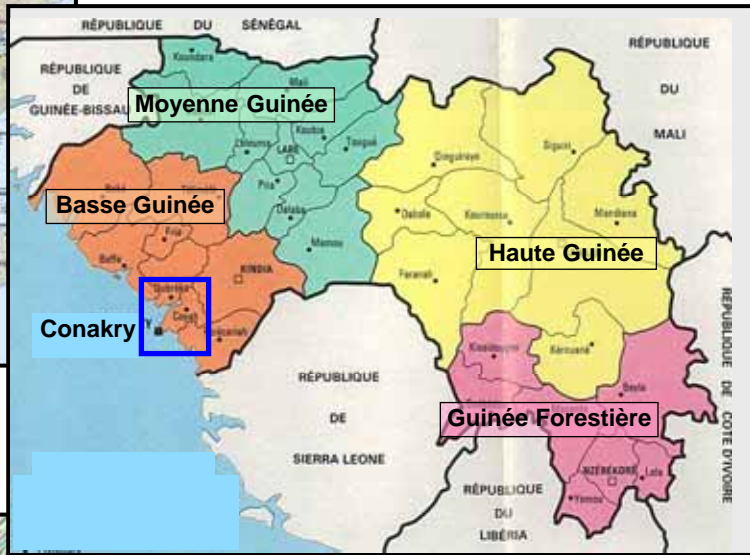
We wish to express our deep appreciation and sincere gratitude to the officials concerned of your Agency, the Ministry of Foreign Affairs, the Ministry of Agriculture, Forestry and Fishery of the Government of Japan for the courtesies and cooperation kindly extended to our team.

We also wish to express our deep appreciation and sincere gratitude to the Senegal Office of your Agency, the Embassy of Japan in Guinea, the Ministry of Agriculture and Livestock of Guinea, the Ministry of Cooperation, Ratoma Commune and other authorities concerned for their close cooperation and assistance extended to our team during our field investigation and studies in the Republic of Guinea.

Very truly yours,

Shiro Hirata
Team Leader
The Development Study on the Project
of Mechanization of Irrigated
Agriculture and Water Management in
the Plain of Sonfonia

Location Map





Study Area in the Rainy Season



Rice Transplanting on Line



Rice Transplanting on Ridge



Rice Sampling



Traditional Threshing



Small-scale Thresher



Irrigated Vegetable Farming



Group Leaders' Training



**Pipe Installation
(Small-scale Irrigation)**



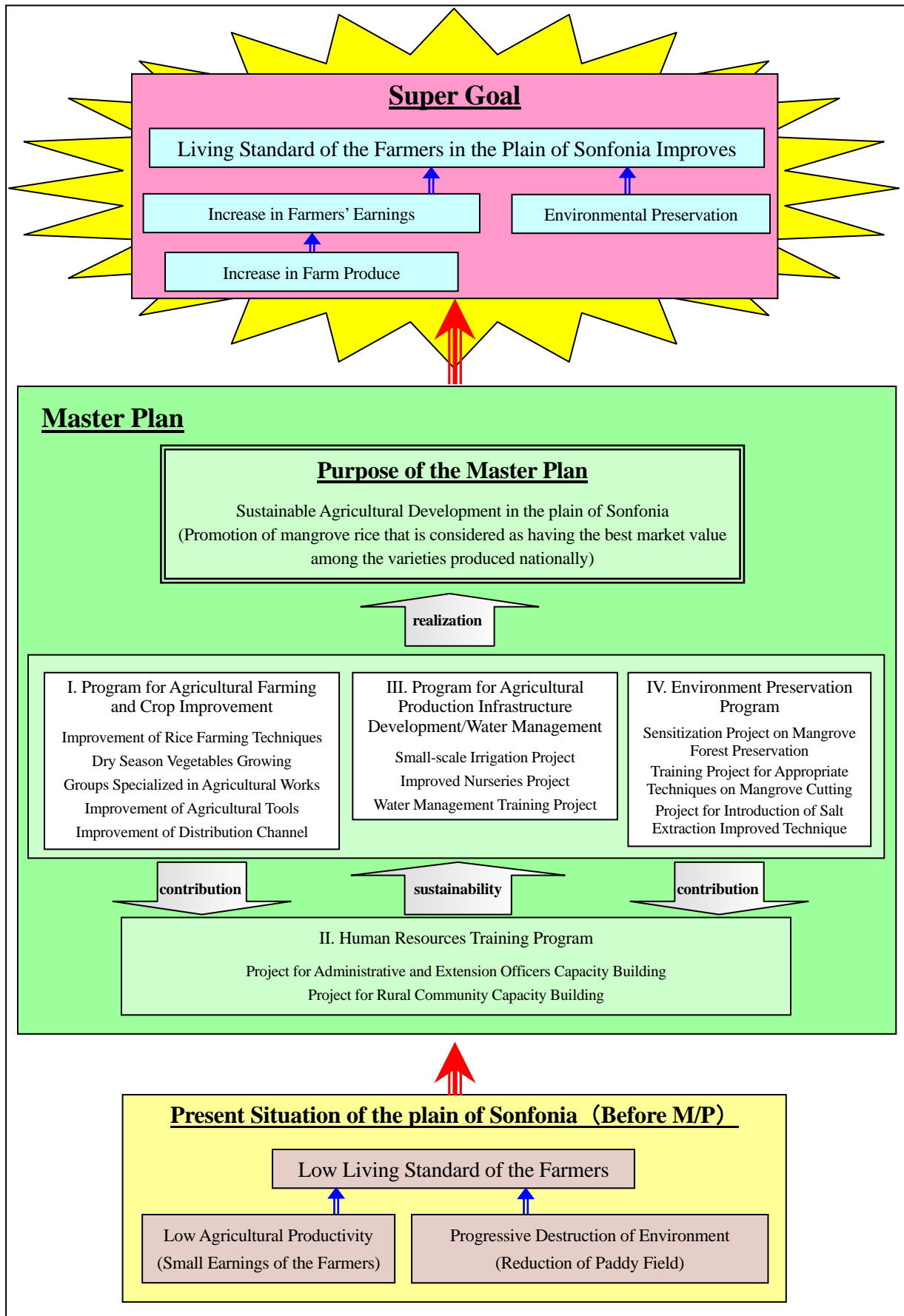
**Basin with Triangular Weir
(Small-scale Irrigation)**



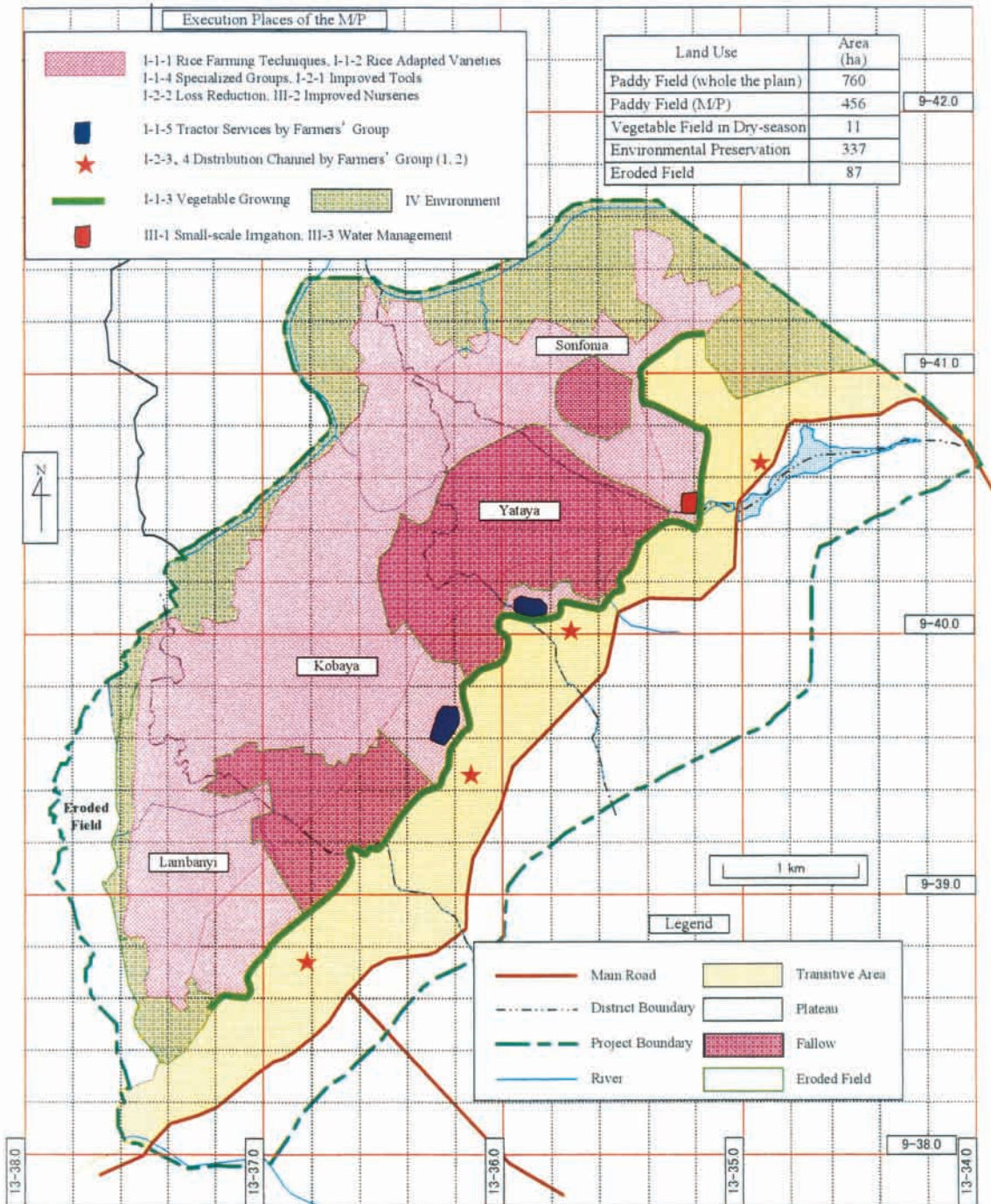
Small-scale Mangrove Reforestation



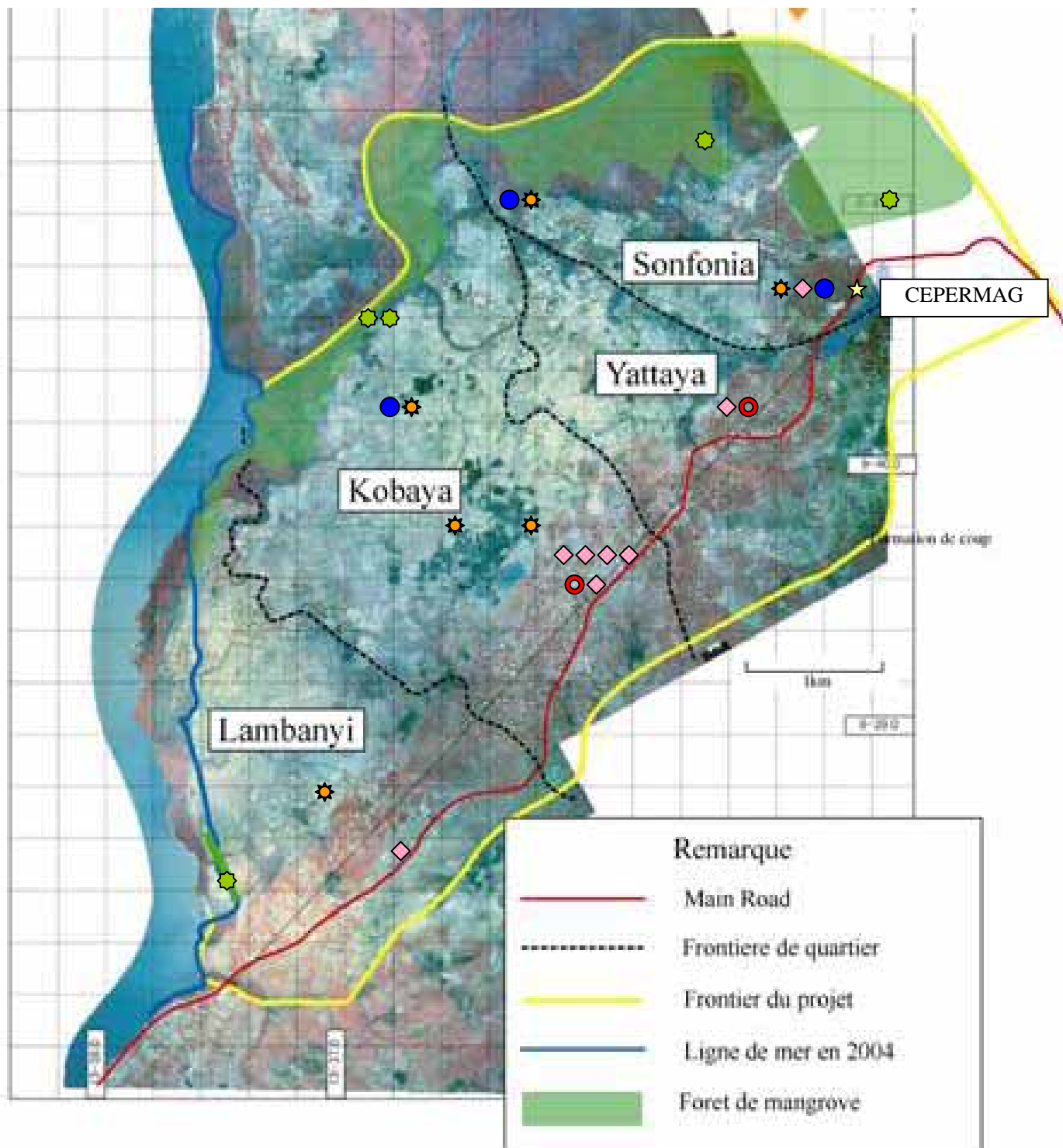
Sun-dried Salt Extraction



Conceptual Plan of the Master Plan



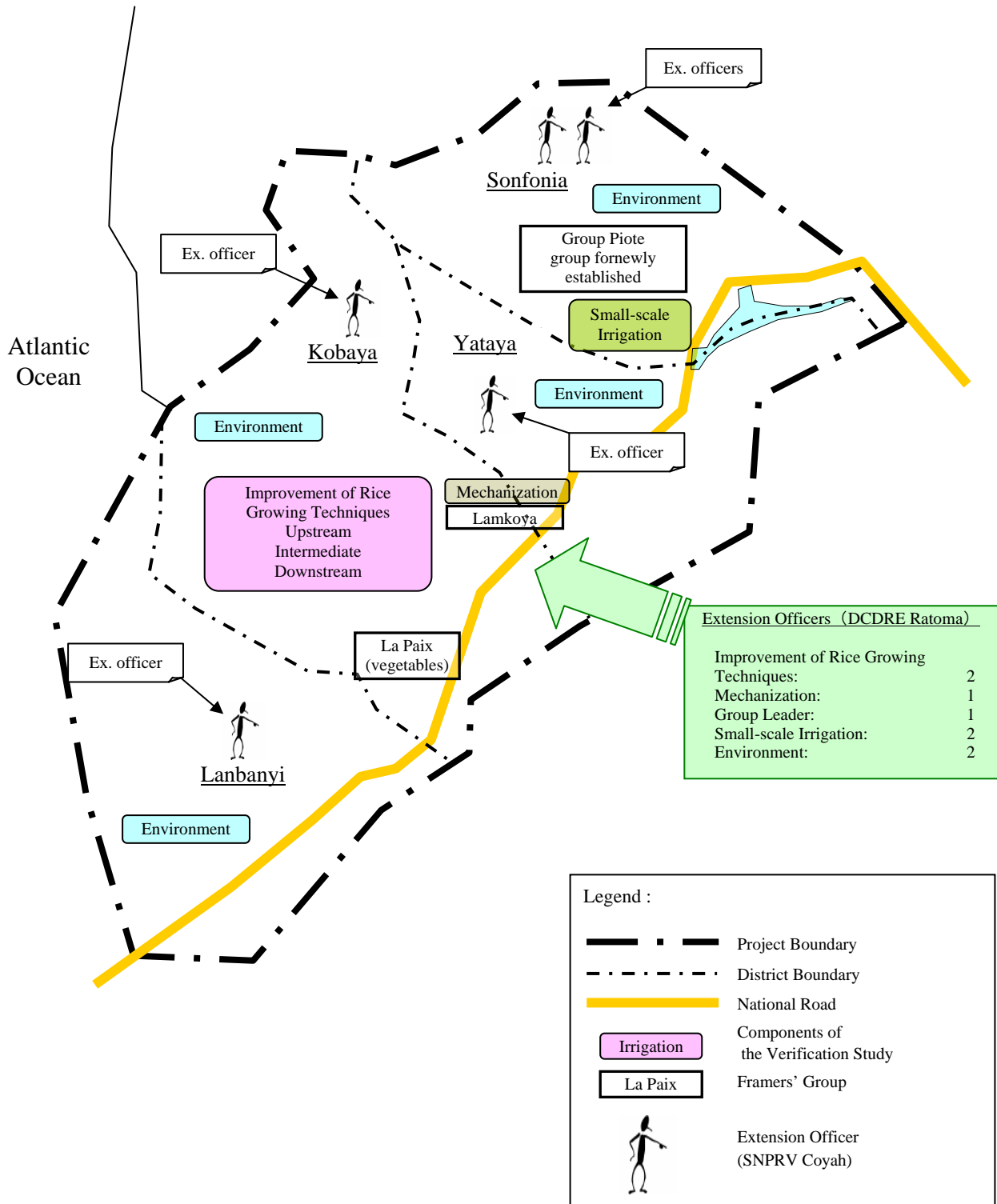
Execution Places of the Master Plan



Places of the Verification Study Components

- Sites of the Components carried out in the Verification Study :
- ☀ Improvement of Rice Growing Techniques
 - ◆ Training of Farmers' Group Leaders
 - 🌿 Environment Preservation and Sensitization
 - ⊙ Agricultural Mechanization
 - Small-scale Irrigation

Places of the Verification Study Components



List of Abbreviations

AFD	: Agence Francaise de Développement (French Development Agency)
BCEPA	: Bureau Central des Etudes et de la Planificaiton Agricole
CAP	: Centre Agricole Préfectorale
CCS	: Centre de Conditionnement de Semences
CEPERMAG	: Centre d'Expérimentation et de Préfectionnement au Machinisme Agricole
CFD	: Code Foncier et Domanial
C.GAMAR	: Coordination de Groupements d'Agriculteurs Maraîchers de Ratoma
PCEMP	: Promotion Committee for the Execution of the Master Plan
PCDMPP	: Promotion Committee for the Diffusion of the Master Plan Projects
CRD	: Communauté Rurale de Développement (Rural Development Community)
DCDRE	: Direction Communale du Développement Rural et de l'Environnement (Local Government of Rural Development and Environment)
DIMA	: Division Intrants, Mécanisation Agricole
DPDRE	: Direction Préfectorale du Développement Rural et de l'Environnement (Prefectural Government of Rural Development and Environment)
DSRP	: Document Stratégique de Réduction de la Pauvreté
ECOWAS	: Communauté Economique des Pays Ouest-Africains
EIA	: Environment Impact Assessment
EU	: Union Européenne (European Union)
FAO	: Food and Agriculture Organization
FIDA	: Fonds International au Développement Agricole
GDP	: Gross Domestic Production
GF	: Guinean Franc
GNP	: Gross National Production
IEE	: Initial Environmental Examination
IMF	: International Monetary Fund
IRAE	: Inspection Régionale de l'Agriculture et l'Elevage
IRAG	: Institut de Recherche Agronomique de Guinee (Guinean Institute of Agricultural Reserch)
JICA	: Japan International Cooperation Agency
2KR	: Kennedy Round 2
LPDA	: Lettre de Politique de Développement Agricole
MAL	: Ministry of Agriculture and Livestock
M/P	: Master Plan
NDA	: National Department of Agriculture
NDAE	: National Department of Agricultural Engineering
NDE	: National Department of Livestock
NDWF	: National Department of Water and Forests
NERICA	: New Rice for Africa
NGO	: Non Governmental Organization
OP	: Organisation Paysanne (Farmers' Organization)
PAPR	: Plan d'Aménagement des Plaines Rizicoles
PDRI-GM	: Projet de Développement de la Riziculture Irriguée en Guinée Maritime
PDRK	: Projet de Développement Rizicole de Kamsar

PNUD	:	Programme des Nations Unies pour le Développement
PNVA	:	Projet National de Vulgarisation Agricole (National Project of Agricultural Extension)
PPVA	:	Projet Pilote de Vulgarisation Agricole (Pilot Project of Agricultural Extension)
PREF	:	Programme de Réforme Economique et Financière
SE	:	Section Environnement (Environmental Section)
SEF	:	Section Eaux et Forêts (Water and Forests Section)
SG2000	:	Sasakawa Global 2000
SIPAG	:	Système d'Information sur le Produit Agricole en Guinée
SNPRV	:	Service National de la Promotion Rurale et de la Vulgarisation (National Service of Rural Promotion and Extension)
SNSA	:	Service National des Statistiques Agricoles (National Service of Agricultural Statistics)
SOGuiB	:	Section Office Guinéen du Bois
SPA	:	Section Promotion Agricole (Agricultural Promotion Section)
SPRA	:	Section Promotion Ressources Animales (Livestock Resources Promotion Section)
SV	:	Supervisor
UNESCO	:	Organisation des Nations Unies pour l'Education, la Science et la Culture (United Nations Educational, Scientific and Cultural Organization)
UNFPA	:	Fonds des Nations Unies pour pour les Activités de la Population (United Nations Fund for Population Activities)

Currency Exchange Rate:	F.GN. 1.00	≡	0.0188 yen	(November 2006)
	US\$ 1.00	≡	6,250 F.GN	(November 2006)
	US\$ 1.00	≡	117.45 yen	(November 2006)

SUMMARY

Chapter 1 Introduction

1.1 Background

The production of rice, which is the staple food of Guinea is limited, and not able to satisfy the ever increasing national demand. Therefore, one third of the demand of rice (about 300,000 tons) is imported.

1.2 Objectives of the Study

- (1) To formulate an agricultural development plan consisting of agricultural infrastructure, farming plans and so forth to realize sustainable agricultural development;
- (2) To carry out technology transfer to the Guinean counterparts and the local people in the Study Area to build their capacity.

1.3 Study Area

The Study Area extends over four districts of Lambanyi, Kobaya, Yataya and Sonfonia, which belongs to Ratoma Commune of Conakry Special Region, and has an area of 2,450 ha expanding in the plain of Sonfonia.

1.4 Counterpart Organizations

The National Department of Agriculture (DNA) in the Ministry of Agriculture and Livestock (MAE) is the counterpart organization of this Study.

1.5 Scope of the Study

The Study is carried out in accordance with the Scope of Work and the Minutes of Meeting on the Scope of Work agreed and signed on the 11th September 2003 by the two governments of Guinea and Japan. The Study has been conducted for 36 months in three fiscal years from March 2004 till March 2007, and has been carried out in two phases.

Chapter 2 Present Situation of Guinea and its Agricultural Sector

2.1 Present Situation of Guinea

Administration: The administrative organization of Guinea consists of the central government and the local governments that are in charge of carrying out local administrations.

Economic and Social Situation: The mineral sector contributes to the national finance earning a certain amount of foreign currency with the abundant natural resources. There are various ethnic groups in Guinea such as Peul, Malinke, Soussou and so forth.

2.2 Present Situation of Agricultural Sector

National Economy and Agriculture: The primary industries in Guinea are agriculture and mines.

Administrative Regions and Natural Zones: Guinea is divided into eight administrative regions.

The national land area is divided into four zones.

Agricultural Policy: There are LPDA 1 (1991) and LPDA 2 (1997) as Agricultural Policy Documents.

Farm Produce: Rice cultivation is active in Maritime Guinea, Highland Guinea and Forest Guinea. Middle Guinea is famous for vegetable farming, where various kinds of vegetables are grown.

Irrigation Development and Promotion of Rice Cultivation: The water-use development was to make rice cultivation possible by protecting against the floods from Niger River at the first stage.

Chapter 3 Study Area

3.1 Social Conditions

Administrative Organization: The district is the smallest administrative body, and is placed under the commune.

Social Economic Conditions: The Study Area includes a booming town of residential areas of the capital Conakry.

Land Tenure: The farmers who own farmlands are about 20%, and the remaining 80% borrow or rent land.

Gender: Females occupy various professional domains nowadays. With this tendency, the sex distinction in the traditional custom has been fading year by year.

3.2 Natural Conditions

Location and Topography: The Study Area includes the cultivable lowland area along the seacoast with an altitude of around 2 m at the highest spot.

Climate: The mean annual rainfall in Conakry is about 3,800 mm.

Rivers: Four rivers flow in the Sonfonia plain. The up-river basins form the residential area.

Tide Level and Height of Wave:

High Water Level (HWL): + 1.66

It is stated that 85% of the wave height from December till March reaches a level of less than 0.75 m, and 44% of wave height from July till August reaches 0.75 to 1.5 m.

3.3 Agriculture

Outline of Agricultural Farming: There are various kinds of agricultural activities in the plain of Sonfonia including rice growing, vegetable cultivation, fishery, salt extraction, paid agricultural labor, and petty trade of products.

Agricultural Production: The rice growing is practiced without using fertilizers, agricultural chemicals and improved seeds. All the agricultural works are carried out manually. Vegetables are also cultivated, but not in abundance.

Rice Growing and Soil in the Zone of Mangrove: The zone is composed of mud and sand deposited alluvia, and is regularly fed in nutritive components formed by a deposit rich in organic matter transported during the dry season by sea water, which simultaneously eliminates bad grasses.

Basic Development for Agricultural Production and Water Management: The irrigation facilities are practically non-existent in the plain of Sonfonia except for the lake reservoir. Drainage facilities are practically non-existent, and, in fact, the natural rivers act as the drainage canals. But the majority of them are not being appropriately maintained, and the thick mud blocks the water flow. The entry and exit of water are both operated by opening of the dykes.

Machines and Agricultural Mechanization: Almost all the agricultural works are carried out by human power, and the rice fields cannot be cultivated if there is no paid labor. No breeding of bovines or horses is undertaken in the Study Area, and the use of cattle to replace the manpower can not thus be considered. The agricultural roads are not developed, and only the rice fields close to the villages can profit from tractor services. The Government aggressively promotes mechanization for the purpose of agricultural modernization. However, there are still many problems to be solved.

Post-harvest, Processing and Distribution: The process from the harvest of rice to its sale is divided into 8 stages: drying, threshing, transport, sorting, storage, parboiling, milling - polishing and sale. The following reasons were stated for parboiled rice: 1) the taste is better; 2) the losses during polishing are reduced; 3) the rice is better preserved; 4) it is easy to digest and 5) Its quantity increases by dilation. Farmers' food self-sufficiency in the area is about 60%. There are four public markets in the Study Area, which are located at Lambanyi, Kobaya, Yataya and Sonfonia. Mangrove rice is highly more appreciated than imported rice, and is sold at a high price.

Farmers' Groups: In the plain of Sonfonia, there are many farmers' groups; aiming at the production, processing of agricultural products and promotion of social activities. 14 groups are included in C. GAMAR (Coordination of Ratoma Vegetables Producing Farmers Groups) under the supervision of SNPRV.

Agricultural Support Services: Governmental organizations of agricultural support services are Communal Directorate of Rural Development and Environment (DCDRE) and National Service for Rural Promotion and Extension (SNPRV) that have responsibility of rural development and agricultural extension services. The Guinean Agronomic Research Institute (IRAG) is a central experimentation and research organization, and Koba Agronomic Research Center is one of IRAG special centers which deals mainly with mangrove and fresh water rice research. The official credit exists for fishermen, but not for farmers.

3.4 Environment

Administrative Organizations in charge of Environment: The Code for the Protection and Use of the Environment (N045/PRG/87) was formulated in 1987. The code makes it mandatory to undertake an IEE for any big scale development project before its implementation. The Directorate of

Environment in the Ministry of Mines, Geology and Environment was formed in 1986; it became independent and was set up as the Environment Ministry in 2004.

Method and Procedure of the Environmental Study: In this Study, an IEE (Initial Environment Examination) was conducted based on the Guidelines of Social and Environmental Considerations of Japan International Cooperation Agency (JICA).

Study Results: Following the examination of the present plan, it was concluded that it would not be necessary to carry out an EIA (Environmental Impact Assessment). However, the implementation of some parts of the selected projects would require certain precautions.

Mangrove of the Study Area: In Guinea, the cutting of the varieties classified in article 78 of the forest Code (Law L99/013/AN of June 1999) is prohibited. However, the cutting of the mangroves for obtaining firewood is followed currently in the Study Area. The area occupied by the mangroves in December 2004 was 292 ha. In comparison to the area calculated in 1985 based on the aerial photographs of the time, a reduction of 76 ha was observed during the 19 years period.

3.5 Development Constraints and Potentials

3.5.1 Consideration of the Development Constraints and Potentials

The constraints and potentials of realizable and durable agricultural development in the Plain of Sonfonia are examined on the basis of the results obtained during the field work.

3.5.2 Constraints

- (1) Weak Productivity
 - 1) Inundation by heavy rainfall and sea water intrusion
 - 2) Lack of water during the dry season
 - 3) Low level of agricultural techniques and lack of information
 - 4) Proliferation of weeds
 - 5) Lack of developed agricultural infrastructure
 - 6) Post-harvest losses
 - 7) Deterioration of environment by cutting down of mangroves
- (2) Lack of Labor Force
- (3) Absence of Input Supplying System
- (4) Insufficiency of Agricultural Support Service
- (5) Lack of Sensitization of the Rural Community
- (6) Traditional Land Tenure System
- (7) Lack of Agricultural Statistics

3.5.3 Development Potentials

- (1) Zone of Mangrove Forest Bringing Various Benefits (Rice Growing, Fishery, etc.)
- (2) Vast Area of Plains
- (3) Broad Acceptance of Local Rice by the Population and the Importance Attached to its Policy of

Promotion

(4) Women Having a Strong Will to Take Part in the Production Groups

(5) Proximity of the Capital Conakry

Chapter 4 Master Plan

4.1 Formulation of the Master Plan

In this Study, the final Master Plan was formulated in accordance with the following stages: 1) formulation of the draft Master Plan defined through the basic studies and the analysis of their results, 2) implementation of small projects (execution of the Verification Study) selected among the components proposed in the Master Plan to verify their feasibility, 3) formulation of the final Master Plan that can be implemented.

4.2 Basic Policy of the Development

The aim of the present development plan (Master Plan) consists of proposing an effective direction for the agricultural development that can be realized through feasible and durable projects, contributing to the modernization of agriculture in the plain of Sonfonia. Consequently, in the Master Plan, a certain number of projects are formulated such that these projects can be realized by the Guinean themselves, and can promote for the development of the agricultural activities in the plain.

Feasible and durable projects are formulated taking into account of the potentials of development described before, and taking advantage of the actual situation of the area. Moreover, the Master Plan is formulated to make the farmers and the farmers' groups attain the practical knowledge and techniques of cultivation by themselves, and to prompt the agricultural development through the promotion of mangrove rice, making good use of such knowledge and techniques. In order to attain the above-mentioned development, the measures including an extension system is to be established through the reinforcement of the capacity of administration in order to expand the knowledge and techniques from extension officers to farmers and farmers to farmers through farmers groups.

4.2.1 Purpose of the Master Plan

The purpose of sustainable agricultural development in the plain of Sonfonia is the promotion of mangrove rice that is considered as having the best market value among the varieties produced nationally due to its good taste.

The promotion of mangrove rice stands in the center position of the Master Plan, and in order to realize the Plan, the establishment of a support system for extension services and the development of private enterprises in the area (small agricultural equipment, agricultural tools and distribution system) are necessary. In addition, the following subjects will be included in the plan: the methods to solve the problem of uncultivated farmlands due to lack of labor, and to reduce post harvest loss of grains. In order to realize the Plan, the reinforcement of the capacities of promoters such as personnel of the National Department of Agriculture and extension officers is essential, and therefore, the reinforcement of the capacities of the personnel will be carried out in the Plan. At the same time, the National Department of

Agriculture, as the implementation organization of the Plan, shall carry out the activities including organizing a Promotion Committee for the Execution of the Master Plan, preparing suitable personnel at the suitable positions, securing and managing the budget, preparing an annual action plan, monitoring and evaluation of the projects and executing the Master Plan.

4.2.2 Sustainability of the Projects

An approach known as the “bottom up” approach, integrating on the one hand, the opinions of the farmers and reflecting them in the design of the project and, on the other hand, a participatory development approach; associating farmers in the realization of the project from their design stage up to their execution, were recently noticed, and efforts were deployed in order to put them into real practice.

However, the farmers show interest only for the activities and the areas which concern them directly, and it is difficult to understand exactly, even by taking account of their opinions according to the “bottom up” approach, the necessary elements that make it possible to solve the problems common to several villages or the long term objectives to be realized in the agricultural sector. In order to avoid these problems during this study, the positive elements of the “top down” approach as well as those of the “bottom up” approach were introduced, and a durable plan was prepared by taking account of the participatory development approach.

4.2.3 Phases of the Master Plan and Stepwise Development (Development per Stage)

The duration of the Master Plan which is 10 years is divided into initial stage, intermediate stage and final stage; the objectives of each stage or phase is clarified; an evaluation will be made at the end of each phase, and the subsequent contents of the study will be re-examined.

Master Plan (10 years)

Initial phase (4 years): Diffusion of techniques especially concerning rice farming

- Continuous expansion of the Verification Study
- Training for farmers’ groups and extension officers

Intermediate phase (3 years): Expansion of projects based on the rice cultivation techniques

- Introduction of adapted varieties
- Promotion of vegetable cultivation in the dry season
- Improvement of marketing
- Technology transfer from extension officers to farmers and from farmers to farmers

Final phase (3 years): Improvement of extension techniques through monitoring, and further expansion of the techniques

4.2.4 Consideration on Environment and Society

The impact on the environment and society in the Study Area has been carefully considered according to JICA’s “Guidelines for Environmental and Social Consideration” in the formulation of the Master Plan. The following two items are considered.

(1) Projects Considering Social Aspects (Gender)

The following points are taken into consideration: one can expect, for example that the chances for the women to undertake small distribution activities in the dry season would increase, because of the proximity of the Sonfonia region to the Capital city and the progress of urbanization. The milling of rice would make it possible for the women to be freed from part of the hard work load, and thus be enabled to devote themselves to other economic activities such as the housework in general.

(2) Technical Application Considering Environment Preservation

The mangrove forests help in protecting the soils against sea erosion and the dykes against the tides. As a result, preserving these forests is extremely important to ensure sustainable development in the Study Area. The sustainability of agricultural production cycle depends only on the preservation and efficient use of the natural resources, which are not inexhaustible. To this effect, it is necessary to promote appropriate development placing emphasis on sensitizing farmers not to transform wooded lands into rice fields, and on increasing the effects of deterrence on mangrove forests clearing in order to improve land productivity and reduce abandoning of rice fields.

4.2.5 Consideration on Traditional Mangrove Rice Growing

This program aims to increase production through the introduction of improved techniques considering the traditional mangrove rice growing without the installation of agricultural production infrastructure.

4.2.6 High Consideration on the Training of Human Resources

The civil servants, in particular the extension officers, who are the linkage between these external contributions and the community, assume a particularly important role. In addition, the community to whom these contributions are intended is also important. However, the capacities of civil servants and community are insufficient to deal with the problems related to the constraints which hinder the modernization of agriculture in the plain of Sonfonia. It is then important to establish programs putting emphasis on sensitization and reinforcement of capacities.

4.3 Development Policy for the Different Constituents

4.3.1 Farming and Crops

The self-sufficiency ensured by the production of local rice is 60% with imported rice currently ensuring 40% of the needs of the Study Area. This Master Plan will lead to the increase in autarky and will establish a sustainable farming program taking account of the traditional mangrove rice growing. The farming techniques will be centered on the improvement of the individual techniques, and will target yields increase for the rice produced in the plain of Sonfonia.

4.3.2 Tools and Agricultural Machines Service

(1) Significance of the Mechanization

There are tools and agricultural machinery which are introduced in the development phase of the farming techniques, but it will be difficult to introduce tools and machines in each phase of the

prospective developments, since it is estimated that the duration of the Master Plan is only 10 years. Therefore, it is planned to introduce plowing machines at the beginning.

In regard to the agricultural tools, the needs are related to improved tools in order to ensure the increases in yields and to improve the effectiveness and the precision of the traditional practices currently used in the area. The introduction of these tools should be considered with the improvement of the farming techniques.

(2) Conditions for the Promotion of Mechanization

The conditions for the promotion of mechanization are the development of farm roads and the guarantee of profitability. If machines are introduced and the access to the fields is impossible, the machines will not be used effectively. It is therefore necessary to study a program based on the development of farms roads. As for profitability, it can be improved through the establishment of costs related services which can guarantee a sustainable management. At the same time, a system ensuring the supply of spare parts must be established through governmental support.

4.3.3 Post-harvest/Distribution

Since there is an important demand for rice seeds and fertilizers, the improvement in the distribution shall be programmed for the farmers' groups who play its role. Some assistance shall be needed for this purpose to reinforce the capacities of these groups and give them a sense of responsibility in the stabilization of farming in the rural community through obtaining and supplying the inputs.

In addition, an increase in the number of farmers selling rice seeds is expected through the improved cropping conditions foreseen in the Master Plan. In regard to production surplus, it is important to improve the distribution systems where farmers' groups would channel the products and play central roles.

With regard to the conversion of subsistence agriculture to a durable agriculture through the introduction of modern techniques, post-harvest handling is expected to improve with the reduction of the losses incurred between the harvest to the sale of the products with better agricultural tools and new agricultural installations.

4.3.4 Human Resources Training

The human resources training is conceived as follows. First stage: strengthening the capacities of the personnel of administrative departments including the counterparts of this Study so that they can assist individual farmers and farmers' groups which make the rural community; second stage: strengthening the capacities of individual farmers and farmers' groups so that they can implement the projects by themselves; third stage: sensitizing not only the rural community concerned, but also the rural community outside of the Study Area to spread the projects based on a plan elaborated by the community itself.

4.3.5 Agricultural Production Infrastructure Development/Water Management

In the Study, it was noted that poor drainage prevents the development of rice growing depending on rainfall, which is the principal form of agriculture in this area. To solve this drainage problem

completely, the establishment of appropriate basic infrastructure is necessary. In order to conceive such production infrastructure within the framework of this project, it would be necessary to take into account of the scale of technical and financial measures which can be dealt with by the Guinean side. Consequently, the projects on a small scale are adopted for this Master Plan. However, alternative basic production infrastructure is indicated considering a large scale as wished by the Guinean government at the end of this chapter.

4.3.6 Environment

In the framework of the Master Plan, measures for conserving the environment underlining the preservation of the mangroves are taken in order to protect the favorable potentialities of the plain of Sonfonia. There are measures such as sensitization, judicial regulation of the cutting and carrying out appropriate cutting techniques of the mangrove. Therefore, in the Master Plan, emphasis is placed notably on the populations' sensitization with concrete measures like the training for appropriate techniques of the mangrove cutting and the introduction of improved technique of salt extraction.

Since the environmental preservation is the matter of general concern, the sensitization actions concern not only the populations of the Study Area, but also all the populations of the surrounding areas.

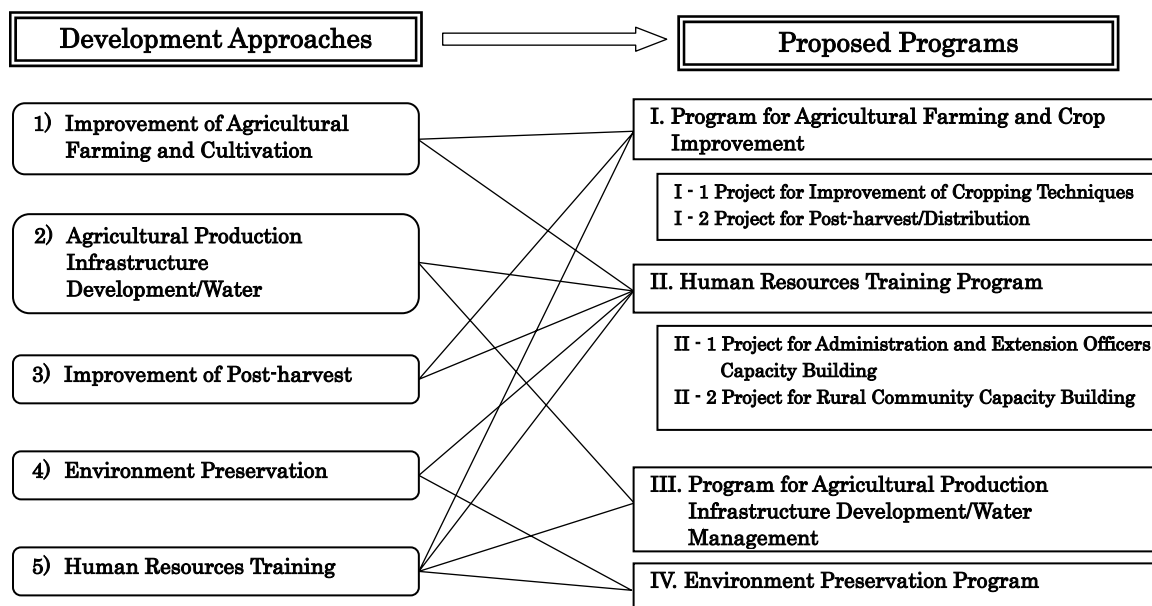
4.4 Framework of the Master Plan

4.4.1 Development Approach

- 1) Approach: Improvement of Agricultural Farming and Cultivation
(Introduction of adapted varieties, seedling preparation improvement, improvement of agricultural works, etc.)
- 2) Approach: Agricultural Production Infrastructure Development/Water Management
(Development of water evacuation canals, dykes against tides, and farm roads, availability of the water resources to be secured, etc.)
- 3) Approach: Improvement of Post-harvest
(Introduction of improved agricultural tools, reduction of post-harvest losses, improvement of distribution by group, etc.)
- 4) Approach: Environment Preservation
(Sensitization on the environment preservation, etc.)
- 5) Approach: Human Resources Training
(Capacity building of administrative and extension officers, training of leaders of agricultural groups, sensitization of the rural community, etc.)

4.4.2 Selection of the Programs

The correlation between the approaches and the proposed programs are illustrated in the following figure:



4.5 Master Plan Projects

4.5.1 Summary of the Projects

As the components in the Master Plan, 19 projects and the option: Development of infrastructure of agricultural production has been selected. The summary of the proposed projects is indicated in the following table.

Table 4.5.1 Summary of the Proposed Projects

Program	Contents
I. Program for Agricultural Farming and Crop Improvement	
I - 1 Project for Improvement of Cropping Techniques	
I-1-1 Improvement of Rice Farming and Cropping Techniques	Identification of advanced agricultural techniques, diffusion of these techniques to farmers
I-1-2 Diffusion of Rice Adapted Varieties	Augmentation of rice yield by diffusing the adapted varieties in the area
I-1-3 Promotion of Dry Season Vegetables Growing	Promotion of vegetable growing in the dry season including the utilization of chicken droppings and the marketing
I-1-4 Introduction of Groups Specialized in Agricultural Works	Service of agricultural works by specialized groups
I-1-5 Introduction of Tractor Service by Farmers' Group	Promotion of agricultural mechanization by introduction of the tractor service
I - 2 Project for Post-harvest/Distribution	
I-2-1 Improvement of Agricultural Tools	Manufacturing and diffusion of improved agricultural equipments
I-2-2 Reduction of Post-harvest Losses	Introduction of a work system to decrease the losses of grains falling during the drying works, beating or threshing, etc. and to reduce the hard work of farmers.
I-2-3 Improvement of Distribution Channel by Farmers' Group (1)	The group of farmers will be given a sense of responsibility in the supply and the sale of the inputs (seeds, droppings, etc.) which would be available in the area
I-2-4 Improvement of Distribution Channel by Farmers' Group (2)	The groups which have become the basic organization of production by selling the inputs will supply and sell the agricultural products of the area's farmers

II. Human Resources Training Program	
II - 1 Project for Administrative and Extension Officers Capacity Building	
II-1-1 Technical Training for Diffusion of Cropping Techniques	Implementation of the trainings based upon extended and concrete knowledge which are necessary to realize the project, especially the knowledge of rice and vegetable cultivation techniques
II-1-2 Operational Capacities Building of Administrative Department	Strengthening of the administrative service operation capacities including establishment of plan, acquisition of budgets, execution of the established plan, maintenance, follow up and evaluation, etc.
II - 2 Project for Rural Community Capacity Building	
II-2-1 Group Leaders Training/Organization of Meetings	Training of leaders who have the capacities to manage the groups
II-2-2 Setting up of Farmers' Groups	Implementation of the activity concerning the creation of new groups of farmers
III. Program for Agricultural Production Infrastructure Development/Water Management	
III - 1 Small-scale Irrigation Project	Realization of off-season cultivation with the small scale irrigation by using a siphon structure to convey water by gravity
III - 2 Improved Nurseries Project	The rice cultivations are threatened by nurseries flooding damages caused by abundant rain water in the area, and it is necessary to prepare the nurseries so that they can survive the flooding.
III - 3 Water Management Training Project	The training on irrigation water management for the farmers of other areas through good use of small scale irrigation in the area
IV. Environment Preservation Program	
IV - 1 Sensitization Project on Mangrove Forest Preservation	The implementation of sensitization campaign with the aim of raising the awareness level of the populations on the preservation of the mangrove forests
IV - 2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting	Training on appropriate cutting techniques for good and permanent utilization of mangrove firewood
IV - 3 Project for Introduction of Salt Extraction Improved Technique	These methods are based on the natural evaporation of salt by using plastic sheets and they aim at reducing the mangroves cutting
Option : Agricultural Production Infrastructure Development	The development program of the infrastructures comprises of drainage improvement, agricultural roads, dykes refilling, irrigation, and water management, etc.

4.5.2 I. Program for Agricultural Farming and Crop Improvement

I-1 Project for Improvement of Cropping Techniques.

I-1-1 Improvement of Rice Farming and Cropping Techniques

During the Verification, the effectiveness of a part of the advanced techniques basis was examined, and the confirmed effective techniques were presented in the seminars in order to be diffused to the other farmers. The advanced techniques which were collected and examined during the follow-up are: the effect of bedding (early notching), duration from lifting to transplanting, selection and incubation of good seeds, management of deep water against the weeds, etc. The objective of the component in the Master Plan is to make the collection and the diffusion of these advanced techniques and the improved techniques through the extension officers.

I-1-2 Diffusion of Rice Adapted Varieties

The adapted variety is defined as a variety which is spontaneously diffused locally by the farmers themselves. In fact, these varieties are adapted to the conditions of the flooded zone, with the characteristics of resistance to iron and salt and having yields which can be foreseeable to some extent. Consequently, the objectives of this component are the development of the inventories on the varieties adapted in the Study Area, the verification of characteristics of these varieties, the production and sale of these seeds for the extension of the adapted varieties.

I-1-3 Promotion of Dry Season Vegetables Growing

Within the framework of the promotion program of vegetables growing, the objective is to set up the use of organic matter (local chicken droppings in cooperation with local poultry farms, compost of solid refuse etc) and that within a program of improvement of the production's commercialization techniques (the study of the demand and the condition of the offer) in dry season. From the view point of the formation of a farmers group aiming at marketing cooperative, an appropriate system permitting sustainable management is aimed to be set up.

I-1-4 Introduction of Groups Specialized in Agricultural Works

The agriculture in the Study Area depends on paid labor. However, to have a salaried manpower becomes a problem because of the lack in labor. One solution to this problem is to set up a group specialized in agricultural works. This group is composed of youths, which takes in charge of the maintenance of canals, repair works of parcels or plots, transplantation, harvest, etc. By carrying out these activities, the agricultural technical knowledge accumulates up inside the group.

I-1-5 Introduction of Tractor Service by Farmers' Group

Taking into account of the situation of the plain where the tillage is done by remunerated work, this project introduces the tractor service to the farms of other groups and other farmers outside the group for the promotion of agricultural mechanization by enlarging the individual parcels of the group members. The viable management of the tractor service is made by the group of farmers through a program that takes into account of the fees for purchasing spare parts and for renewing the cultivator. The network of this tractor service is made practical to improve the operation and maintenance of the tractors which are assigned to all over the country.

I-2 Project for Post-harvest/Distribution

I-2-1 Improvement of Agricultural Tools

The agricultural tools verified in the Verification Study shall be diffused, such as 1) three on farm tools of "the bladed hoe, the pitchfork, and the hoe ", 2) small silo for the seeds conservation using empty oil can, 3) introduction of the leveling tool, the rope for transplanting and the weeding tool which were ingeniously manufactured by the farmers and 4) small scale manual threshing-machine.

I-2-2 Reduction of Post-harvest Losses

The reduction of the loss shall be achieved through the following works.

- 1) Utilization of fabric (cloth) to wrap the rice before threshing during transportation is introduced.
- 2) The general beating (hitting the rice with a stick,) generates the loss by spreading, and the introduction of vinyl sheets is programmed. Otherwise, the introduction of small scale manual threshing-machine manufactured in the Verification is scheduled for the farmers who are practicing large scale farming. As such, the method that permits the threshing in the rice farm is diffused.
- 3) The rice after the beating is stored in the small silo for the conservation of the seeds fabricated

in the Verification.

I-2-3 Improvement of Distribution Channel by Farmers' Group (1)

With regard to the distribution, it is essential to develop a system where the group of farmers plays a central role in the distribution. In the first phase, it is estimated that the groups of farmers develop an organization that plays an important role in the distribution through setting up the sale of good seeds, fertilizers, and the other lacking materials in the plain.

I-2-4 Improvement of Distribution Channel by Farmers' Group (2)

This project is a continuous one of Improvement of Distribution Channel by Farmers' Group (1). The group increases the sales of products coming from other groups or other individual producers. Storage installations are developed to collect the rice to be commercialized in the Study Area, and the rice is parboiled before it is sold.

4.5.3 II. Human Resources Training Program

II-1 Project for Administrative and Extension Officers Capacity Building

II-1-1 Technical Training for Diffusion of Cropping Techniques

In a technical training for diffusion of cropping techniques, priority is given to training the personnel on rice and vegetable growing, elaboration of agricultural calendar, etc. A regular follow-up of the cropping is carried out, and the results of improved techniques are extended to the other farmers of the plain of Sonfonia through workshops. The extension or diffusion staffs elaborate a manual of improved agricultural techniques with the assistance of the trainer in the framework of the support to be given to the farmers.

II-1-2 Operational Capacities Building of Administrative Department

Staffs are trained to have abundant experience on problem analysis following the participative approach on the formulation of plans through the project. Since the lack in administrative departments and the non circulation of the information constitute the principal barriers between the farmers and the administration, the database of the information is prepared. The confirmed techniques, the improvement rice-farming and cropping techniques, the information from National Agronomical Institute, etc. are comprised in the database. The elaboration of database generates high efficiency similar to OJT.

II-2 Project for Rural Community Capacity Building

II-2-1 Group Leaders Training/Organization of Meetings

The efficiency of group activities depends on leader who has project operating capacities. Therefore, trainings on the group's activities management, the sensitization, and the communication between farmers and administration are programmed. The leaders not only take training, but also schedule meetings to exchange opinions and solve problems to generate the consciousness of the leaders.

II-2-2 Setting up of Farmers' Groups

Many projects that must be executed by groups of farmers have been programmed in the Master Plan. The creation of new groups requires the following set of procedures: members' recruitment,

leaders' election, elaboration of regulations, and activities operation to achieve the objective. Officials who have practically taken part in the creation of the group within the Verification supervise and assist this procedure for realization.

4.5.4 III. Program for Agricultural Production Infrastructure Development/Water Management

III-1 Small-scale Irrigation Project

Small-scale irrigation facilities using the dead waters of the Sonfonia reservoir is planned. It aims at paddy cultivation including a small part of vegetable growing. The irrigable area calculated on the basis of water source volume is 6 ha. The gravity irrigation is adopted using a structure of siphon, and the water is conveyed by pipeline to the plots.

III-2 Improved Nurseries Project

It is very important to prepare seedlings for the rainy season rice-growing. However, the preparation of seedlings is very difficult because of the ravages due to nurseries flooding by the rains. Therefore, it is necessary to prepare nurseries that can survive against the ravage of the flooding. It is possible to assist by the component "Improvement of the rice farming and cropping techniques" through the confection of improved nurseries where the water level has reached 30 cm over 3% of the space reserved for rice-growing.

III-3 Water Management Training Project

It is important to include the operation and maintenance problems of the irrigation facilities in the water management. This project realizes that both the farmers and the government officers will learn on the operation and the maintenance of the facilities and on the water management. Training programs on water management intended for the farmers from other areas on the small scale irrigated cropping is carried out by the groups of farmers trained in this project. Therefore, it is estimated that this project is extended to the other areas.

4.5.5 IV. Environmental Preservation Program

IV-1 Sensitization Project on Mangrove Forest Preservation

In order to raise the awareness level of the population, it is necessary to conceive continuous measures and to put into operation attractive activities (opened to everyone). In this project, the extension officers, as principal actors, operate the program of sensitization to the population. Furthermore, the target group does not only comprise the residents of the area but also all those who are concerned by the exploitation of the plain. The contents of the sensitization themes is conceived according to the stage of the project operation, the target group (agricultural groups, woodcutters or lumberjack groups, women groups, etc.).

IV-2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting

The concrete countermeasures of the preservation of mangrove have been examined during the Verification. Consequently, the training on appropriate mangrove firewood cutting has been judged as appropriate. The good and permanent utilization of the mangrove firewood and the creation of awareness

on the environmental preservation by the populations concerned are expected in carrying out this project. Since it is not easy to stop the decrease of the mangrove area by only this training, the small scale reforestation is recommended and becomes part of this project.

IV-3 Project for Introduction of Salt Extraction Improved Technique

The improved techniques of salt extraction are executed in Dubreka, an area beside Sonfonia. Those techniques consist of proceeding with sun-dried method with the plastic sheets. Through this procedure, it is aimed to reduce the cutting of the mangroves which are being used as firewood for boiling brine. It is not difficult to diffuse this technique which is very economic, since the only new materials, which are introduced, are the black plastic sheet and the bucket which the local population can easily obtain.

4.6 Implementation Plan of the Master Plan

4.6.1 Target Values of the Master Plan

The target rice yield value obtained by the execution of the component “Improvement of Rice Farming and Cropping Techniques” is estimated to be 2.5 ton/ha that is the average yield of the advanced farmers in the plain of Sonfonia. The average yield of rice by the rice cultivation made with the existing channels in the plain of Sonfonia is 1.8 ton/ha. Consequently, an increase of 0.7 ton/ha is anticipated.

4.6.2 Cost and Benefit of the Master Plan

The total project cost and benefit during the project period of ten years of the Master Plan is 474,318 US\$ including the expenses of the Promotion Committee for the Execution of the Master Plan and 963,404 US\$ respectively, and the benefit/cost (B/C) ratio is 2.0.

The costs and benefit are estimated totally in whole Master Plan. However, the project with highest benefit is the “Improvement of Rice Farming and Cropping Techniques” that has the deepest relationship with the promotion of mangrove rice. It shares 40 % of total benefit and its B/C ratio is five.

4.6.3 Number of Beneficiary Farm Families in Projects

About 60 % of the farmers will attain benefit by the “Improvement of Rice Farming and Cropping Techniques”.

4.6.4 Implementation Schedule of the Master Plan

The implementation schedule of the Master Plan was prepared, and in accordance with the schedule, considerable number of the nineteen projects are to be carried out simultaneously, even though there are some independent projects which can be implemented solely. The plan was formulated taking into consideration of the capacity of the limited extension officers as they concern themselves in most of the projects and keeping the “Improvement of Rice Farming and Cropping Techniques” as the center to accelerate mutual effects of each project.

4.6.5 Effect of Projects

The effects of the implementation of the Master Plan are 1) effect of the increase of yield by the extension of advanced technologies, 2) effect of the increase of cultivation area due to reduction non-cultivation area, 3) effect of increase of cultivation area due to access to water source, and 4) effect

of preservation of environment. The implementation of the Master Plan is supposed to bring a total 1,750 ton of rice in the plain of Sonfonia, which is 55 % increase in comparison to without the Master Plan.

4.6.6 Organization and Procedure of the Master Plan

To execute the Master Plan, a Promotion Committee for the Execution of the Master Plan (PCEMP) is established at the National Department of Agriculture (NDA). This committee is composed of administration personnel of the NDA, especially those who assisted this Study as counterparts. The tasks of the PCEMP that are considered as a routine work of the NDA are 1) Set up of the annual action plan, 2) Obtaining the budgets, 3) Selection of the target farmers, 4) Approach by the farmers, 5) Execution of the projects and 6) Follow-up/evaluation and revision of the working program of the Master Plan.

4.6.7 Expansion to Other Areas

The projects that can contribute to sustainable agricultural development in the plain of Sonfonia are presented in the Master Plan. Among them, some can be developed in particular in the plain of Sonfonia (or in similar places), and the others can be developed to other area. In addition, it is possible to develop techniques for some and methods for others. This is presented in the following table.

Areas where expansion is possible	Projects that are possible to be expanded	Contents
Farming areas of mangrove rice in the maritime Guinea	Improvement of Rice Farming and Cropping Techniques	Techniques and methods
	Diffusion of Rice Adapted Varieties	Techniques and methods
	Improved Nurseries Project	Techniques and methods
Areas of in the maritime Guinea	All the projects of Environment Preservation Program	Techniques and methods
Areas with irrigation facilities	Small-scale Irrigation Project	Techniques and methods
	Water Management Training Project	Techniques and methods
All the country	Methods (extraction of improved techniques, their verification, their diffusion) in "Improvement of Rice Farming and Cropping Techniques"	Methods
	All the projects of Human Resources Training Program	Methods
	Introduction of Groups Specialized in Agricultural Works	Methods
	Introduction of Tractor Service by Farmers' Group	Methods
	Improvement of Agricultural Tools	Techniques and methods
	Reduction of Post-harvest Losses	Techniques and methods

4.7 Option: Agricultural Production Infrastructure Development

Development Orientation: The development is related to the lands which are cultivated inside the plain of Sonfonia and also on the exploitable part of the abandoned lands, and no clearing will be carried out by a new deforestation of the mangroves which is forbidden in the Commune of Ratoma.

Contents of the Development: The contents of the development are shown as follows.

Development Area

- Mangrove rice growing area	865 ha
- Fresh water rice growing area	217 ha
- Irrigated rice growing area	5 ha
- Irrigated vegetables growing area	1 ha

(1) Drainage Plan

Canal Length: 23.9 km (Main Canal: 9.6 km, Secondary Canal: 14.3 km), Gate: 20

(2) Sea Dike

Dike Length to be Refilled: 11.8 km, Average Refilling Height: 30 cm

(3) Farm Road

Road Length: 7.6 km, Total Width: 3.0 m, Effective Width: 2.5 m, Gravel Pavement, Bridge: 7

(4) Irrigation Facilities

Pipeline Length: 585 m, Water Basin: 3

(5) Water Management Plan

The water management plan using these irrigation facilities is prepared taking into account of the simplicity and the farmers' ability of handling them.

(6) Facilities Management Plan

The maintenance and management fees are at the expense of the farmers, and will be perceived during the harvest.

(7) Phases of the Master Plan and Stepwise Development

Adding to the necessity of huge time and costs for development of agricultural production infrastructure, it is necessary to take into account of a considerable number of elements. Therefore, the execution of the program will be divided into 3 phases.

(8) Costs and Benefits of Infrastructures of Agricultural Production Development

Costs of the Development: about 1,833,000 US\$

Total Costs (20 years): 2,422,000 US\$ (Farm Input and O&M Costs: 589,000 US\$)

Benefits (20 years): 5,567,000 US\$

B/C: 2.3

Provided that the farmlands uncultivated will be cultivable, the annual rice produce at the plain of Sonfonia will increase from 1,136 ton to 2,699 ton, and the rice import of 1,563 ton will not be needed

(9) Organization and Management of the Master Plan

The National Department of Agriculture is the owner of the project. An executive bureau of the project, which is in charge of the promotion of the project, will be established. An association of promotion of the project will be created by the beneficiary farmers. It is constituted of the whole groupings of farmers, in charge of the management of each gate.

Environment and Social Consideration: Initial Environment Examination (IEE) is necessary for the Plan of Agricultural Production Infrastructure Development in accordance with the “Code for the Protection and Use of the Environment” in Guinea. Therefore, before the commencement of the project, IEE must be carried out to conclude whether Environment Impact Assessment (EIA) is necessary or not.

Chapter 5 Verification Study

5.1 Summary of the Verification Study and its Feed-back on the Master Plan

5.1.1 Objectives of the Verification Study

The objectives of the Verification Study are: realizing an investigation in the framework of the Master Plan, confirming the feasibility of its components, drawing lessons and experiences from it so that these are reflected in the framework of a feed-back type action, and formulating a final Master Plan that is realizable and sustainable.

5.1.2 Feed-back on the Master Plan

The final Master Plan has been formulated by drawing the lessons and the experiences learnt from the Verification Study.

5.1.3 Selection of the Verification Study

The components of the Verification Study were selected taking into consideration of the following elements on the basis of the provisionally defined Master Plan:

- (1) Some results obtained during the period of the Verification (2 years),
- (2) The relevance of the realizations in the Verification,
- (3) The inclusion of topics and questions requiring the verification or confirmation, etc.

5.1.4 Programs and Components of the Verification Study

The relation between the basis of the provisionally defined Master Plan and the components of the Verification are as follows:

The components		1	2	3	4	5
Programs (provisionally defined)		Improvement of Rice Growing Techniques	Agricultural Mechanization	Training of Farmers' Group Leaders	Small-scale Irrigation	Environment Preservation and Sensitization
I. Program for Agricultural Farming and Crop Improvement						
I - 1	Project for Improvement of Cropping Techniques	○	○	△	○	
I - 2	Project for Post-harvest/Distribution		○	△	△	
II. Human Resources Training Program						
II - 1	Project for Administrative and Extension Officers Capacity Building	○	○	○	○	○
II - 2	Project for Training of Farmers' Groups	○	○	○	○	
II - 3	Project for Sensitization of Rural Community	○	○	△	○	△
III. Program for Agricultural Production Infrastructure Development/Water Management					△	○
IV. Environment Preservation Program					△	

○: direct relation

△: indirect relation

5.1.5 Components of the Verification Study

Hypotheses were developed to verify the realizations and to acquire effective lessons that are to be reflected in the formulation of the final Master Plan, as they are implemented in a specified time.

5.1.6 Organization of the Operation Structure of the Verification Study

All the activities of the Verification being supported or framed by the personnel of the DCDRE or the extension staffs, a committee of the farmers' groups has been created, and its management at the community level was ensured by the DCDRE section. Besides, a consultation committee was created at the level of the DNA. A steering committee, constituted by the representatives of the National Directions concerned and the DNA, was appointed as the supreme organ of decision.

5.2 Feed-back of Lessons Learnt

Feed-backs of the lessons learnt from the Verification Study are shown as follows.

Improvement of Rice Growing Techniques

Lessons learnt	Feedback to the Master Plan () component concerned
<ul style="list-style-type: none"> • The development of the drainage installations by farmers themselves seems to be a fundamental problem that is difficult to solve. One will first examine how to extend the techniques related to the bunds making and how to manage the water depth. • The rice cultivation practiced in the Study Area barely uses any labor just after transplanting up to harvesting. Based on such a practice, the preparation of solid nurseries is fundamental for the success of other techniques to follow that are to be implemented. • Needs for training on the application of improved techniques are evident with the farmers. The workshops that were organized answered well to such needs. • The component related to the seeds production for the community has not been mastered by the farmers' groups due to the insufficient number of trainings and workshops answering to their needs. • The sites selection and the number of nurseries were not well programmed. As a result, farmers mixed varieties in the same plot following the effects of the flood. • The lack of supervision by the extension officers has been one of the causes for the mixing of varieties transplanted in the same plot by farmers. • The first seminar has been announced only by the chiefs of the divisions, that has limited the participants to only 32 farmers. • The demonstration sites have been represented by 3 areas for the Verification of 2005, but the identification of the intermediate area was now evident for the farmers. 	<ul style="list-style-type: none"> ⇒ In regard to the development of the drainage installations, the Master Plan considers the basic agricultural development plan that the Guinean government will undertake with its own budget. (I-1-1) ⇒ Advanced techniques will be collected and developed during the establishment of the nurseries and transplanting; namely the preparation of solid plants is important for the techniques to follow later. (I-1-1) ⇒ Organization of workshops in the four divisions by extension staff/facilitators; aiming to convey the obtained results to the local farmers. (I-1-1) ⇒ Drawing up of an inventory of local needs through the frequent organization of workshops and trainings at the beginning of the program implementation. (I-1-2) ⇒ Consideration of the flood effects in the selection of the plots. (sites where there is a pouring-out of rainwater will be avoided) (I-1-2) ⇒ Continuation of the experiment on the seeds production plot. (at least three years) (I-1-2) ⇒ The advertisements of seminar must be published by postings in the public places, and to consider the most farmers of the zone, putting the images and the photographs. (I-1-1) ⇒ The definition of the zones was reformulated by the farming technical topics relating to the zone of the rice of mangrove (Downstream) and the zone of the rain fed rice (Upstream) in the plain of Sonfonia. (I-1-1)

Agricultural Mechanization

Lessons learnt	Feedback to the Master Plan () component concerned
<ul style="list-style-type: none"> • The capacity of the cultivator depends on rainfall. The price of the service should take into consideration of the risks related to rainfall at the next growing season. • In order to ensure a good financial management, some measures to collect the non paid bills of the tractor service are necessary. • A solution to reduce the workload of the operators is necessary. • When transporting the harvests, big losses are observed. • The provision of spare parts is difficult. • In the framework of agricultural mechanization, the organization of a training workshop for all owners of agricultural machines is necessary. 	<ul style="list-style-type: none"> ⇒ The annual number of working days is changed from 40 to 30days, considering the risk related to rainfall. Service price is decided based on 6ha that is possible to give service continuously under the condition such as: difficulty on getting spare parts, excluding too much workload on operators, and selecting a suitable customer excluding non collection fund (I-1-5) ⇒ As measures taken to collect the non paid bills of the tractor service, the selection of customers who pay cash is opted. (I-1-5) ⇒ Measures to reduce the workload of the operators are introduced that they can work on their own farms some time during farming season under suitable rotation of operation, hence that operators can get higher fee.(I-1-5) ⇒ The methods consisting of: 1) threshing in the field; 2) bagging of grains; 3) transporting the bales tied up with a piece of cloth, are introduced. (I-2-1, I-2-2) ⇒ The recommendation is to be made in the Chapter 6. ⇒ Ditto

Training of Farmers' Group Leaders

Lessons learnt	Feedback to the Master Plan () component concerned
<ul style="list-style-type: none"> • The evaluation made before the training has shown that more than half of the leaders who participated did not know how to read or write and were not appropriate for the role of leaders. • Even if the trainees learnt the contents of the training to a certain extent, it was revealed that they had problems to put it into practice. Hence, a continuous training is necessary. • The execution of the leaders' meeting brought about the revitalization of the group activities, such as making other groups' activities a good guide. • Lack of the agricultural infrastructures in the plain of Sonfonia was raised as the problem that the farmers confront in the leaders' meetings. • Awareness creation of the leaders' independency takes a long time. • The leaders came to prepare the account books to a certain level in the group activities, but the ability to understand the assets and liabilities was not sufficient. 	<ul style="list-style-type: none"> ⇒ During the leaders training, it shall be ascertained that an observation on the trainees' capacity is undertaken. (II-2-1) ⇒ Continuous training must be stressed in the creation of the program. (II-1-1, II-1-2, II-2-1, II-2-2) ⇒ The program must emphasize that the participants can positively present their activities in the meetings. (II-2-1) ⇒ The improvement of the agricultural infrastructures is a fundamental issue in this development, and it shall be stressed in the Recommendation. (Chapter 6) ⇒ The program must emphasize that the extension officers make proper advices in the leaders' meetings. (II-2-1) ⇒ Even the extension officers do not have enough sense of assets and liabilities, and the trainings must stress on this point as well. (II-1-1, II-2-1, II-2-2)

Small-scale Irrigation

Lessons learnt	Feedback to the Master Plan () component concerned
<ul style="list-style-type: none"> • At the first water intake, the bunds broke due to their weakness or the excess of water. As it was the first experience of the kind for the group members who did not know anything yet about irrigation water management, it is necessary to ensure a training in this field prior to implementing the irrigation program. • When the extension staffs/facilitators prepared the cropping calendar, they experienced difficulties as it was the first time. Hence, it is necessary to give some training in that field. • Knowledge on vegetable farming techniques is not enough for the extension officers. • When new groups are formed, it is important to secure the persons with talent as the capacity of leaders affect success of group activities. 	<ul style="list-style-type: none"> ⇒ It is necessary to improve the content of the training. (III-3) ⇒ It is necessary to give a training on farming techniques to the extension officers. (II-1-1) ⇒ It is indispensable to give a training on vegetable farming techniques to the extension officers. (II-1-1) ⇒ The criteria for selection of the leaders shall be indicated at the time of forming the new groups. (II-2-3)

Environment Preservation and Sensitization

Lessons learnt	Feedback to the Master Plan () Component concerned
<ul style="list-style-type: none"> • The execution of the seminars of sensitization on the environment preservation with the training and demonstration of appropriate mangrove cutting was found effective for the habitants concerned to regenerate the mangrove forests and protect disappearance of the farm land. • It is important for the habitants to know the laws concerning the preservation of mangrove. • The training of the appropriate techniques on cutting brings about good results in short term. • Reforestation was found effective for regeneration of the mangrove forests in the plain of Sonfonia. • The place of the training shall be considered nearby the participants residential areas so that not only the sustainability of its effectiveness is secured but also the costs of the training are kept low. • Training on new techniques aiming to save firewood is necessary. • It is important to diffuse the techniques on appropriate cutting, reforestation and firewood saving. • Salt extraction improved technique is more efficient than the traditional technique. It brings about the increase of revenue and does not consume mangrove as fuel at all. 	<ul style="list-style-type: none"> ⇒ Environment Preservation Program is effective. (IV) ⇒ The laws concerning the preservation of mangrove shall be clearly mentioned in the documents for the sensitization. (IV-1) ⇒ The training of the appropriate techniques on cutting is effective. (IV-2) ⇒ The necessity of reforestation after mangrove cutting shall be included in the Training Project for Appropriate Techniques on Mangrove Firewood Cutting. (IV-2) ⇒ It shall be mentioned in the technical advice of M/P that the place of the training shall be considered nearby the participants residential areas. (IV-2) ⇒ The introduction of an improved technique of salt extraction shall be added. (IV-3) ⇒ It shall be written in M/P on how to diffuse these three techniques. (IV-2, IV-3) ⇒ It shall be well mentioned in the Project for Introduction of Salt Extraction Improved Technique. (IV-3)

Chapter 6 Conclusions and Recommendations

6.1 Conclusions

Improvement of Rice Cultivation Techniques: Under the present situation of lack of water management, it is impossible to attain a drastic improvement in the field of agriculture that needs basic infrastructure improvement, and with this condition, the improvement of rice cultivation techniques were sought.

Agricultural Mechanization: Contract work of mechanical cultivation by groups, agricultural tools to the farmers which could be made by themselves, reduction of rice grain loss after harvest, etc. were carried out.

Training for Group Leaders: The trainings for group leaders were carried out for three times.

Small-scale Irrigation: The Team formulated this master plan aiming at projects that can be undertaken through the farmers' own efforts.

Environment Preservation and Sensitization: The environment preservation sensitization seminars were carried out for three times in each of the four Districts, totaling 12 times. In the seminars, they studied a better mangrove cutting down method, planting method, new salt making method which did not need fire woods.

Strengthening of Counterpart Personnel Capacities: The counterparts have improved remarkably in techniques and administration management in the three years of the Study.

6.2 Recommendations

Promotion of the Master Plan Projects: The Team conducted the M/P, verified most of the plan in the V/S and proposed 19 projects to be carried out. Most of the projects were found to be useful in the project area, and some of them are suitable even in other areas. Therefore, the government should promote these projects as proper government projects.

Strengthening of Agricultural Extension: The strengthening of agricultural extension service is essential to solve the structural poverty. Therefore, further strengthening of extension service is necessary.

Acquisition of Financial Resources: The government should obtain budget to carry out the Master Plan as much as possible. The financial sources should be basically from the government, and the counterpart funds of the Japanese 2KR may be the best source of these projects.

Preparation of Agricultural Statistics Data: Conakry Special Region is not an agricultural district, and therefore, no agricultural statistical data has been collected for this area. The data on agriculture must be collected and agricultural statistics must be prepared without exclusion.

Promotion and Extension of Techniques Developed in the Study: Many useful techniques were found in the Verification Study. The Team proposes the government to push these ideas more to

accelerate the progress of the extension.

Practical Use of Manuals: The Team presented manuals on rice cultivation, water management, suitable cutting method of mangrove and improved salt manufacturing. These should be utilized by anybody related to the projects.

Procurement of Spare parts of Agricultural Machines: It was realized that the difficulty of procuring spare parts was a bottleneck of the agricultural mechanization project. The Government should provide support to strengthen the system.

Promotion of Agricultural Land Preparation Project: The Team prepared an agricultural land preparation plan of 1,200 hectares in Sonfonia lowland. This plan is essential to improve agricultural condition of this area completely. It is recommended that the government shall continue its search to find the donors for the implementation of the plan.

**The Development Study on
the Project of Mechanization of Irrigated
Agriculture and Water Management in the Plain of Sonfonia
in the Republic of Guinea**

Final Report

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Chapter 1 Introduction

1.1 Background

The Republic of Guinea is located in West Africa where the weather is generally hot and humid except in Middle Guinea, which is normally referred to as Fouta. The national land covers an area of about 245,857 km², which is equal to 2/3 of the area of Japan. Facing the Atlantic Ocean, Guinea is located between 7 and 12.5 degrees north latitude and 7.5 and 15 degrees west longitude, and borders on Guinea-Bissau, Senegal and Mali on the north, Sierra Leone and Liberia on the south and Ivory Coast on the east. The total population was about 9.50 millions in 2005 (IBRD).

The Government of Guinea drew up the Development Vision 2010 as the long-term national development plan in 1996 and has carried out the improvement of national financial systems, social development and infrastructures in accordance with the plan. The official documents of agricultural policy consist of the LPDA 1 in 1991 and LPDA 2 in 1997, and the Poverty Reduction Strategy Paper (PRSP, 2002) was drawn up in accordance with these documents. The PRSP stipulates that the poverty reduction in rural areas cannot be achieved without agricultural and rural development that shall be durable and consistent. In Guinea, agriculture is the key industry; employing 80% of the laboring population and contributing about 25% of the GNP. The productivity is very low even with the favorable natural conditions and the production of rice, the staple food, and is limited; not able to satisfy the ever increasing national demand. Therefore, one third of the demand of rice (about 300,000 tons) is imported.

Owing to such circumstances, the Government of Guinea requested the Government of Japan a study on rural development project; aiming at durable agriculture development in the rural areas in March 2000. In response to the request, the Government of Japan dispatched a project formulation mission in March 2002 and examined the contents and the areas of the study. After that, Japan again dispatched a S/W mission in September 2003, and the governments of both countries agreed to implement a master plan study in the plain of Sonfonia (broad swamp land located in the suburbs of Conakry) and signed the scope of work (S/W).

1.2 Objectives of the Study

The objectives of the Study are as follows:

- (1) To formulate an agricultural development plan consisting of agricultural infrastructure, farming plans and so forth to realize sustainable agricultural development;
- (2) To carry out technology transfer to the Guinean counterparts and the local people in the study area to build their capacity.

In other words, the objectives of the Study are to formulate a master plan in the plain of Sonfonia for a durable agricultural development that contributes to agricultural modernization in the study area; introducing agricultural infrastructure and farming technologies that are manageable by the local farmers.

On the other hand, the education and sensitization of the counterparts and local people, who are the animators for promoting the projects, are to be carried out in the Study for their capacity building.

1.3 Study Area

The Study Area belongs to Conakry Special Region, a metropolis with 5 communes, and is located about 30 km northeast of its center. Ratoma Commune is one of the 5 communes, which has 20 districts. The Study Area extends over 4 of these 20 districts, which are Lambanyi, Kobaya, Yataya and Sonfonia, and has an area of 2,450 ha; expanding in the plain of Sonfonia.

1.4 Counterpart Organizations

There are four (4) technical directorates (the National Department of Agriculture: NDA, the National Department of Livestock: NDL, the National Department of Water and Forestry: NDWF, the National Department of Agricultural Engineering: NDAE) in the Ministry of Agriculture and Livestock (MAL). The National Department of Agriculture (NDA), one of the 4 directorates, is the counterpart organization for this Study. It is the government organization in charge of carrying out the agricultural policies; promoting food security and the exportation of crops (cf. Attachment 5, 6).

The Communal Department of Rural Development and Environment (DCDRE), in Ratoma Commune, represents the local agency of MAE and is the counterpart organization at the site, since the Study Area belongs to that commune (cf. Attachment 7).

In addition, since the National Service of Rural Promotion and Extension (SNPRV), which is in charge of agricultural promotion and extension of the country, has not its local agency in DCDRE, the extension officers of SNPRV from the Prefectural Department of Rural Development and Environment (DPDRE) of Coyah, the neighboring prefecture, are deployed in the plain of Sonfonia.

1.5 Scope of the Study

The Study is carried out in accordance with the Scope of Work and the Minutes of Meeting on the Scope of Work agreed and signed on the 11th September 2003 by the two governments of Guinea and Japan. In order to formulate the Master Plan, the Verification Study is carried out concerning the project components selected from the draft Master Plan drawn up; taking into consideration the results of the basic studies and their analyses on the Study Area. The lessons learnt taken from the Verification Study are to be reflected in the finalization of the Master Plan, and the durable development plan shall be formulated. The Study has been conducted for 36 months in three fiscal years from March 2004 till March 2007 and divided into two phases.

The study on the analyses of the conditions of the Study Area, the formulation of the draft Master Plan and the preparation of the Verification Study (hereinafter referred to as “the Verification”) were focused on in Phase I. The implementation of the Verification, its monitoring and evaluation and the finalization of the Master Plan have been carried out in Phase II.

Phase I consists of

- ① Defining the framework of the Study;
- ② Apprehending the present conditions of the Study Area, collecting and analyzing the data and information needed;
- ③ Sorting out the constraints of the development, evaluating the development potentials of the Area and examining the solutions of the constraints;
- ④ Drawing up the draft Master Plan;
- ⑤ Preparing the implementation of the Verification (selection of the sites and components).

Phase II consists of

- ① Implementing the components of the Verification;
- ② Conducting the midterm evaluation through the progress (monitoring and evaluation) of the Verification, and making modifications when needed;
- ③ Organizing seminars on the contents of the Master Plan for the organizations concerned and the communities in the Study Area;
- ④ Formulating the final Master Plan reflecting the results of the Verification.

The following figure shows the contents of each phase of the Study.

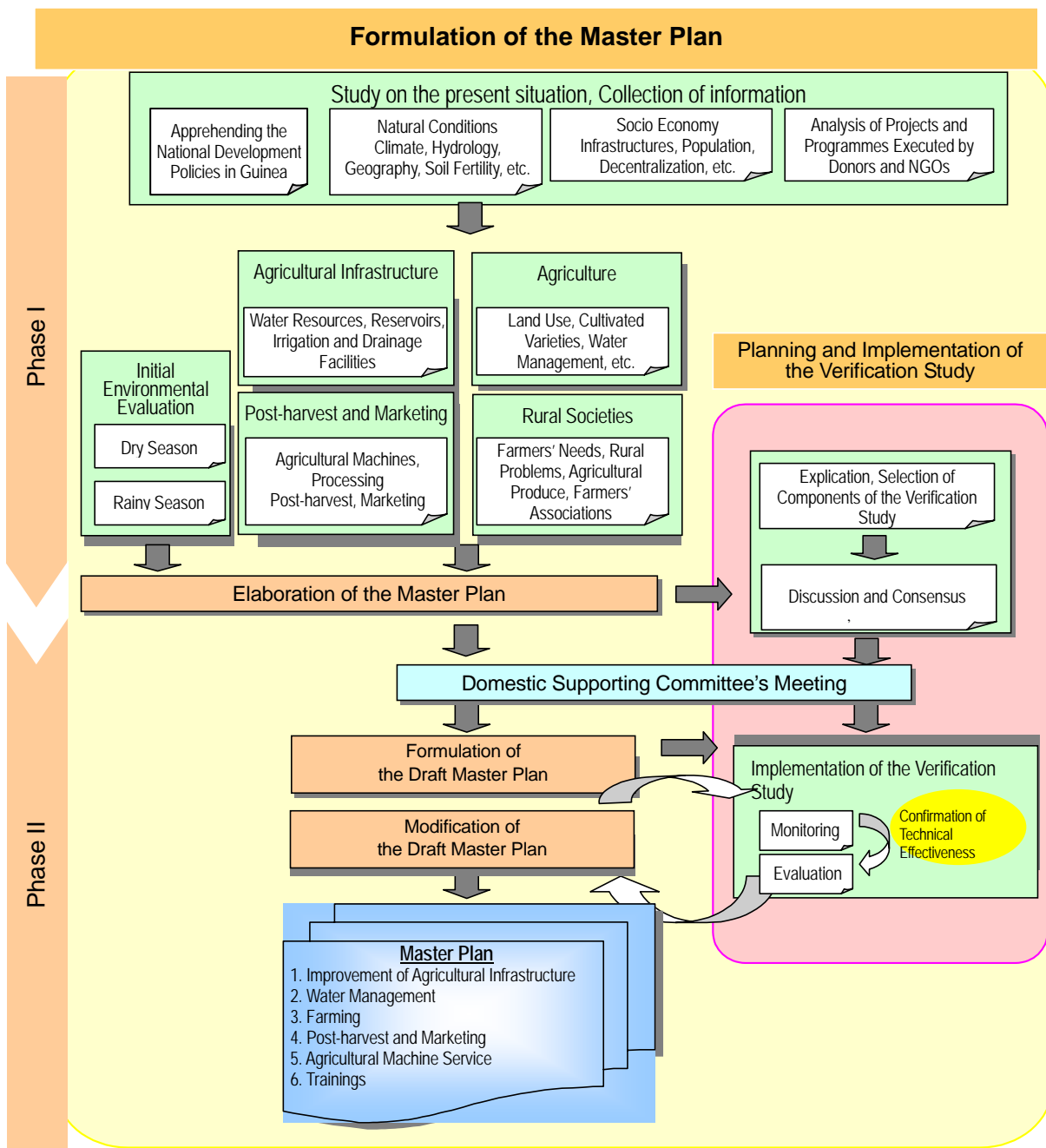


Figure 1.5.1 Framework of the Study

Chapter 2 Present Situation of Guinea and its Agricultural Sector

2.1 Present Situation of Guinea

2.1.1 Administration

After its independence in 1958, Guinea ruptured ties with France and brought about strained relations with neighboring countries; seeking assistance from the Soviet Union and adopting a communist regime and a policy of nonalignment. The political shift started at the end of the first Republic as a result of joining the Economic Community of West African States (ECOWAS) and improving relations with France. The second Republic, founded in 1984 by Colonel Lansana Conté, started to drastically change the policy towards liberalization with the assistance of international organizations (IMF, World Bank, etc.).

The administrative organization of Guinea consists of the central government led by the President and the local governments that include the regional, prefectural and district administrations. The decentralization promoted and supported by the government has not progressed very fast.

The administrative units are regions (special region for the capital), prefectures, communes (for the capital and prefectural capitals) and districts. In the process of the decentralization that has been promoted for more than ten years, a administrative subdivision called CRD (Rural Development Community) has been established in each district and constitutes the smallest administrative unit of the local government. The number of CRD reaches 303 in the whole country. The CRD, which does not exist in the special region of Conakry, has the function of collecting farmers' ideas so that villages demands reach the local government. However, the decentralization has not achieved the expected results, since budget allocation and authority transfer from the central government have not yet been realized, and the capacities of each local government have not reached the level to perform the necessary tasks.

2.1.2 Present Economic and Social Situation

The economic activities of Guinea were stagnant in the socialist regime of the first Republic, despite abundant underground resources; for example, bauxite with one third of World estimated deposits. With the start of the second Republic, the political shift towards liberalization was taken, but the delay in infrastructure improvement has not provided the country with economic development.

It is the mineral sector that contributes to the national finance; earning a certain amount of foreign currency with the abundant natural resources. On the other hand, the sector that has recorded the best rate of growth recently is the service sector such as transport, trade and so forth. Concerning the agricultural sector where 80% of the work force is engaged, self-sufficiency has not yet been achieved, but farm produce is increasing.

Conakry is a big capital with 1,800,000 habitants that is 19% of national population (about 9,500,000 habitants). Guinea contains various ethnic groups such as Peul, Malinke, Soussou and so forth.

The official language is French, but Soussou language is also widely used. The main religion is Islam with Muslims accounting for about 85% of the total population.

2.2 Present Situation of Agricultural Sector

2.2.1 National Economy and Agriculture

Guinea is a country with primary industries such as agriculture and mines. In the past decade, the economic structure has not given signs of big changes. The statistical data of the World Bank, as shown in Table 2.2.1 below, indicates that the share of the agricultural sector occupies about 24% of GDP (from 1990 to 2000). The annual growth rate of the agricultural sector is 4.3% and is equal to that of GDP.

Table 2.2.1 Share of GDP par Sector (%)

Sector	1990	1999	2000
Agriculture	23.8	24.3	36.6
Industry	33.3	37.9	36.6
Manufacture	4.6	4.2	4.1
Services	42.9	37.8	39.7

Source: World Bank

70% of the total population lives in the rural area, and 80% of the active population is engaged in the agricultural sector, which is said to be a basic industry of Guinea due to its contribution to GDP and employment.

2.2.2 Administrative Regions and Natural Zones

Guinea is divided into eight administrative regions, and an inspection office of the Ministry of Agriculture and Livestock (MAE) is placed in each region and supervised by a regional inspector. The agricultural statistics have been collected for seven regions except Conakry Special Region.

The national land is divided into four zones in compliance with geographic aspects and climatic differences, and these are Maritime Guinea, Middle Guinea, Highland Guinea and Forest Guinea.

Table 2.2.2 Administrative Regions and Natural Zones

Natural Zones	Administrative Zones
Maritime Guinea	1. Conakry Special Region 2. Kindia 3. Boké
Middle Guinea	4. Mamou 5. Labé
Highland Guinea	6. Kankan 7. Faranah
Forest Guinea	8. N'zérékoré

Maritime Guinea has eight prefectures; including Coyah, Boké, Boffa, Fria, Téliimélé, Dubréka, Kindia and Forécarria with Conakry Special Region. It occupies 15% of the national land and has 24% of the population; consisting of lowland areas which face the Atlantic Ocean with a climate of high temperature and high humidity. The temperature does not change sensibly throughout the year. The annual precipitation reaches about 3,000 mm in the northern area while it exceeds 4,000 mm sometimes around Conakry. Maritime Guinea has 181,000 ha of rice fields. This area puts it in third place after Forest Guinea and Highland Guinea.

The plain of Sonfonia of the Study Area belongs to Conakry Special Region and has the character of agricultural area in the suburbs.

2.2.3 Agricultural Policy

(1) Guinean Vision 2010

The Government of Guinea prepared and adopted the Guinean Vision 2010 in 1996 as a national development plan, which provides the development strategy of social economy; setting 2010 as a target year. It is anticipated in the Vision that if appropriate measures in line with the regional situations are adopted, an agriculture geared toward the best use of the natural conditions and resources has best prospect of success; ensuring not only food self-sufficiency but also food export, as Guinea has abundant water resources.

Concerning agriculture and its infrastructure, 1) insufficient road improvement, 2) insufficient number of storerooms, 3) primitive farm tools, 4) lack of farmers' associations, 5) slow progress of agricultural research, and so forth are raised as problems in Vision 2010.

As regards the growth of the agricultural sector in the mid and long term strategy, 1) promotion of commercialization, use of improved seeds and improvement of productivity by mechanization and so forth, 2) diversification of agricultural activities to create employment opportunities in rural areas, improvement of conditions for farmers' credit and agricultural infrastructure and procurement of assistance from private sectors are stated as necessary means.

(2) Agricultural Policy Documents (LPDA)

The Agricultural Policy Document (LPDA) is a strategic document for the agricultural sector, and LPDA 1 was drawn up in 1991 and LPDA 2 in 1997. LPDA 1 puts emphasis on the: 1) promotion of food security; 2) encouragement of an agriculture geared towards exportation; and 3) reinforcement of agricultural infrastructure as priority strategies. Concerning the conditions vitalizing agriculture, the government withdrawal from production and marketing and the creation of conditions for private sectors to easily participate in the process are stressed. The application of LPDA 1 revealed the following weak points of the document.

- 1) Lack of clear strategic view in reinforcing the private sectors in the declaration of the government withdrawal.
- 2) Lack of institutional framework for making the reinforcement of agricultural administrative

function possible.

- 3) Extremely bureaucratic administration.

Taking into consideration the basic concept of Vision 2010 and the lessons learned from the application of LPDA 1, LPDA 2 has set forth major objectives for achieving food self-sufficiency, reducing food (mainly rice) importation, and promoting the exportation of agricultural produce (coffee, fruit, cotton) along with the rational management of the natural resources. In order to realize these objectives, the plan proposes the following strategies: 1) improvement of macro-economy and implementation of the program for the adjustment of sectors reinforcing market economy; 2) promotion of privatization; 3) improvement of business conditions for promoting investment by private sectors; 4) improvement of agricultural research; 5) promotion of seed industries; 6) improvement of agricultural infrastructure; and 7) capacity building of the local governments.

2.2.4 Farm Produce

(1) Farm Produce

The agricultural statistics of the country (SNSA) for the past ten years show a certain increase in rice produce (from 500,000 tons in 1991/1992 to 790,000 tons in 2001/2002: cf. Attachment 1). A rapid increase is also observed in cassava and yam produce. The area devoted to rice cultivation has been extending constantly; showing in 2001/2002 (498,000 ha) about 1.6 times bigger than in 1991/1992 (364,000 ha). The unit yield (1.4 t/ha - 1.6 t/ha) has been gradually increasing.

Vision 2010 sets up the target amount of rice produce as 1,280,000 tons in 2005, and the Government of Guinea has the determined endeavor to increase this produce. Meanwhile, fruit produce such as orange, mango, pineapple, and so forth has been low except banana. Cotton, which is one of the other cash crops, has been showing some recovery, though its produce decreased in the middle '90s; complying with the international fall in price. The humid climatic conditions make coffee cultivation possible, but the level of production is small.

(2) Regional Farm Produce

Rice cultivation is active in Maritime Guinea (pluvial paddy), Highland Guinea and Forest Guinea (pluvial upland rice). Fonio, one of the other important cereals, is grown in the rainy season mainly in Middle Guinea and Highland Guinea. Peanut is cultivated in all the areas except Forest Guinea. It is fair to say that Middle Guinea (Pita, Labé, Dalaba et Mamou) is famous for vegetable farming where various vegetables are grown such as potato, tomato, eggplant, okra, cabbage and so forth. These are shipped to Conakry and neighboring countries.

2.2.5 Irrigation Development and Promotion of Rice Cultivation

The water-use development was aiming at making rice cultivation possible by protecting against the floods from Niger River at the first stage. Irrigation projects were implemented mainly in the Niger

valley and Highland Guinea, where tributaries of the Niger River flow, and in the plains of Maritime Guinea.

Agricultural development projects and programs with irrigation development and rice cultivation have been carried out by the donors such as World Bank, FAO, IFAD, AFD, China and so forth with their own characteristics (Refer to Table 2.2.3 below).

Table 2.2.3 Activities of Donors

Organization	Outlines of Activities
World Bank	<p>The World Bank assists in the promotion of bottom-up approach; carrying out Rural Community Projects for the Rural Development Community (CRD) established in each district with the Government of Guinea in compliance with the decentralization policy.</p> <p>On the other hand, it assisted the reinforcement of SNPRV, which is in charge of agricultural promotion and extension in the country, for three phases from 1986 to 2002; realizing its present formation.</p> <p>1st phase: from 1986 to 1990 Pilot Project of Agricultural Extension (PRVA)</p> <p>2nd phase: from 1991 to 1994 National Project of Agricultural Extension (PNVA)</p> <p>3rd phase: from 1995 to 2002 National Service of Rural Promotion and Extension (SNPRV)</p> <p>As a result of the 2nd phase, the reinforcement of extension was found important, and the SNPRV was established in November 1994 combining the National Department of Rural Formation and Promotion and the PNVA.</p>
FAO	<p>FAO has elaborated the strategic paper for providing a guide to the small-scale irrigation project in each region taking into consideration the results of the analyses on small-scale irrigation projects carried out in Guinea. Subsequently, it has also studied the level of development and farmers shares in the project costs.</p>
IFAD	<p>IFAD started its activities in 1980 and executed many agricultural development projects in Guinea. It is now concentrating on the poverty alleviation projects.</p>
AFD	<p>With a long experience of cooperation in the mangrove rice cultivation, AFD has been carrying out the Irrigated Rice Cultivation Project in Maritime Guinea (PDRI-GM) in collaboration with the National Department of Agricultural Engineering (NDGR) of MAE. In the Project, the protection of sea water invasion, improvement of dikes, water management and so forth have been introduced through a consensus with villagers.</p> <p>Precious lessons in agricultural infrastructure, agricultural technologies, farmers' group formation and so forth as related to mangrove rice cultivation have been learned.</p>
China	<p>SIGUICODA of China has been executing a big-scale mechanized irrigation project near the Koba Agricultural Centre; introducing double-cropping.</p>
SG2000	<p>SG2000 has assisted the extension of NERICA with SNPRV and has also diffused threshers, improved steamers for parboiled rice, rice polishers, rice storehouse and so forth. However, it has already withdrawn from Guinea.</p>

Source : The Study Team

Chapter 3 Study Area

3.1 Social Conditions

3.1.1. Administrative Organization

The Study Area belongs to Conakry Special Region which consists of five communes. Each Ministry has a branch office in the commune where the Communal Directorate of Rural Development and Environment (DCDR) plays the role of the Ministry of Agriculture and Livestock (MAE). Ratoma Commune is one of the five communes. It has twenty districts. The Study Area extends over four of these districts; namely, Lambanyi, Kobaya, Yataya and Sonfonia. The district is the smallest administrative body and is placed under the commune. The branch offices of the Ministries have the role to give administrative guidance to the districts. The decisions are made through consensus with the council; consisting of seven councilors in the district. Budgets from the central government are not presently allocated to the districts. Therefore, the districts (Commune and district level) are not able to execute any development activities; the execution of the development and rural activities rely on the assistance of donors and NGOs.

3.1.2 Social Economic Conditions

A social economic survey was carried out in the framework of the Study, and the aggregations and analyses of the study results were performed and stated in its clause.

(1) Population and Households

The population, households and farmers' households in the four districts composing the Study Area are shown in the following table.

Tableau 3.1.1 Population, Households and Farmers' Households

District	Total Households (unit)	Farmers' Households (unit)	Population (habitants)		
			Total	Male	Female
Lambanyi	3,500	525	19,635	9,633	10,002
Kobaya	1,000	750	19,479	8,766	10,713
Yataya	2,230	558	17,862	8,752	9,110
Sonfonia	1,308	654	9,888	5,421	4,467
Total	8,038	2,487	66,864	32,572	34,292

Source: The Study Team (re-arranged the data from Ratoma Commune)

The population in the Study Area is 66,864, and the number of total households is 8,038; including 2,487 farmers' households. The Study Area includes a boomtown of residential areas for the capital Conakry, and the percentage of farmers' households is only 30% of the total households, see Table 3.1.1. The recent year's residential development brought more assimilation with urban population. Table 3.1.1 also shows that one household consists of 8.3 persons on average; a number which is somehow bigger than

the nation's average of 7.0 persons.

The said four districts are divided into 30 sections, and the agricultural activities are performed in 18 of these (Please refer to Table 3.1.2).

Tableau 3.1.2 Number of Sections and Sections with Agricultural Activities

District	Total Number of Sections	Sections with Agricultural Activities	
		Number of Sections	Designation of Sections
Lambanyi	8	6	Centres 1, 2, Waria, Khombe, Kinifi et Yembeya
Kobaya	8	6	Secteurs 1, 2, 3, 4, 5 et 8
Yataya	8	3	Secteurs 1, 2, 3
Sonfonia	6	3	Secteurs 1, 2, 3
Total	30	18	

Source: the Study Team

(2) Land Use

In accordance with the topographic maps (1/50,000), the analysis of the aero-photos taken in 1988 and the results of the reconnaissance site survey, the location of the Study Area and its 2,450 ha are confirmed and shown in the following tables and figure (cf. Attachment 10).

Table 3.1.3 Distribution of Area in the Study Area (ha)

District	Lowland Area	Transition Area	Plateau	Total
Lambanyi	350	161	99	610
Kobaya	612	117	80	809
Yataya	164	65	270	499
Sonfonia	396	97	39	532
Total	1.522	440	488	2.450

Source: the Study Team

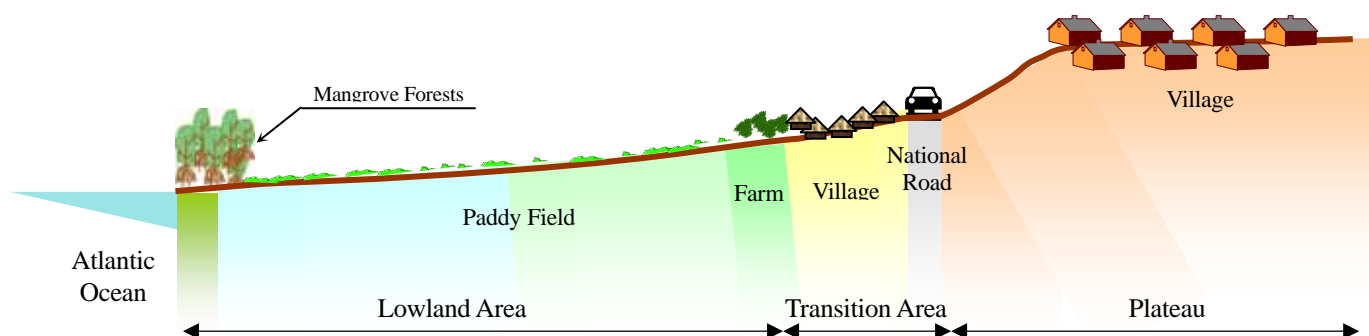


Figure 3.1.1 Sectional Sketch of the Plain

Table 3.1.4 Land Use in Lowland Area (ha)

Lowland Area	Area (ha)				
	Lambanyi	Kobaya	Yataya	Sonfonia	total
Lowland Area					
Farmland (developed)	252	523	164	204	1,143
Farmland cultivated	(175)	(385)	(31)	(169)	(760)
Farmland uncultivated	(77)	(138)	(133)	(35)	(383)
Mangroves	11	89		192	292
Eroded Land	87				87
Total	350	612	164	396	1,522

Source: the Study Team

() actual survey figures

The Study Area of 2,450 ha is divided into the lowland area of 1,533 ha, the transition area of 440 ha and the plateau of 488 ha. The farmland already developed in the lowland area is 1,143 ha, and most of which is paddy field. However, the results of the survey carried out by GPS revealed that around one third of the farmland (383 ha) was not cultivated (cf. Attachment 11). The reasons for this would be: 1) the existence of swamps created by the poor drainage of the rivers, which flow in the plain; 2) the damages caused by the invasion of seawater and weeds; and 3) the labor shortage. Consequently, the actual farmland presently cultivated is about 650 ha (640 ha of paddy, 10 ha of vegetables) and is less than 60% of the farmland developed. The paddy fields, which are located along the seacoast and in the northern part of the plain close to the mangrove forests, are the farming areas with relatively good yields. The vegetable farms extend along the upstream edge of the plain with widths ranging from 10 to 100 m and a total area reaching around 10 ha.

The mangrove forests stretch principally over Sonfonia and Kobaya located in the northern part of the plain and a little bit over the coastal area along Lambanyi. From the analysis of the aero-photos and the results of the reconnaissance site survey, the zone of mangrove covered a vast area along the coastal area of Lambanyi in 1988; however, its cutting has progressed rapidly afterwards. The disappearance of the zone of mangrove has brought about land erosion by sea waves; causing 87 ha of farmland loss.

The transition area is used by villages, and the plateau by residences of the boomtown. The farmlands scattered around the transition area and the plateaus are used for vegetable farming and are very small in size. Vegetable farming (partly paddy cultivation) is practiced in the small areas along the rivers; using river water.

(3) Size of Cultivated Area

The proportion of farms' households by size of cultivated area is shown in the following table.

Table 3.1.5 Proportion of Farmers' Households (%)

Size of Cultivated Area	Lambanyi	Kobaya	Yataya	Sonfonia	Average	
Less than 0.4 ha	36.4	25.0	33.3	36.4	32.8	54.9
0.4 – 0.8 ha	18.2	17.9	25.0	27.3	22.1	
0.8 – 1.6 ha	27.3	35.7	25.0	27.3	28.8	34.9
1.6 – 2.4 ha	13.6	10.7	0	0	6.1	
2.4 – 3.2 ha	0	0	8.3	0	2.1	10.2
3.2 – 4.0 ha	4.5	10.7	8.3	9.0	8.1	
Total	100	100	100	100	100	

Source: the Study Team

(4) Classification of Farmers' Households

The farmers' households related to the already developed 1,100 ha of paddy field in the Study Area have been classified according to three categories; small-scale farming, medium-scale farming and large-scale farming (Please refer to the table below). For the small-scale farmers' household, the area of paddy field is 0.40 ha per household. The number of households represents 55% of the total farmers' households, and the farming area occupies 20% of the total developed farmland. Most of the medium-scale and large-scale farmers' households are constituted by big families composed of heads of family and descendants of their brothers.

Consequently, the classification indicates that the number of farmers' households cultivating paddy is 1,000; the average farmland size is 1.1 ha per household and the farmers' population is 15,000.

Tableau 3.1.6 Classification of Farmers' Households

Category	Per Household		Concerned Households				Cultivated Area by Category	
	Size of Cultivated Area (ha) (1)	Average Size (ha) (2)	Number of Households (3)	Proportion (%) (4)	Number of Family Members (5)	Farmers' Population (6)=(3)*(5)	Area (ha) (7)=(2)*(3)	Proportion (%) (8)
Small-Scale Farming	Less than 0.8	0.4	550	55	8	4,400	220	20
Medium-Scale Farming	0.8 – 2.4	1.6	350	35	22	7,700	560	50
Large-Scale Farming	2.4 – 4.0	3.2	100	10	30	3,000	320	30
Total	—	—	1,000	100	—	15,100	1,100	100

NB) Here 1,000 farm households is computed as one unit of a large family (The household expense is assumed to be one) and is different from the number 2,487 households mentioned before. In 1,000 farm households, the average cultivated size for large, medium and small scale farm obtained from farm investigation is 3.2ha, 1.6 ha and 0.4 ha, respectively. Moreover, the Study Team computed using the ratio 10%, 35% and 55% as in Table 3.1.5 that the size of lowland area development for this large farm family is 1,100 ha.

Source: the Study Team

(5) Economic Activities

The main economic activities of the farmers' households in the Study Area are explained in the following table.

Table 3.1.7 Economic Activities of Farmers' Households

Main Economic Activities	Lambanyi (%)	Kobaya (%)	Yataya (%)	Sonfonia (%)	Total (%)
Agriculture	61.7	57.3	73.3	55.5	61.9
<i>Paddy</i>	<i>(60.3)</i>	<i>(56.6)</i>	<i>(70.6)</i>	<i>(55.5)</i>	<i>(60.8)</i>
<i>Vegetable</i>	<i>(1.4)</i>	<i>(0.7)</i>	<i>(2.7)</i>	<i>(0.0)</i>	<i>(1.1)</i>
Commerce	2.3	3.2	1.8	9.3	4.4
Handicraft	1.4	0.7	5.0	1.9	2.4
Others	10.4	5.7	3.7	12.1	8.1
Unemployed	24.2	33.1	16.2	21.2	23.2
Total	100.0	100.0	100.0	100.0	100.0

Source: the Study Team

() Actual survey figures

62% of the farmers' households devote themselves to agriculture as a main economic activity. Women are principally in charge of vegetable farming and retailing/marketing. The economic activities of women and youths are shown in the following table.

Table 3.1.8 Economic Activities of Women and Youths

Season	Women	Youths
Dry Season	- Vegetable Farming - Fishery - Commerce (retailing, etc.)	- Fishery - Sale/Manufacture - Rice Cultivation
Rainy Season	- Rice Cultivation - Fishery - Commerce (retailing, etc.)	- Rice Cultivation - Fishery

Source: the Study Team

The breakdown of household budget shows that expenditure for food (54%) stands first and is followed by expenditures for children educational fees (10%), clothing (8%), ceremonial occasions (8%), medical care (8%) and transportation (5%). The average annual expenditure per household is estimated at about GF 2,400,000. Concerning the farm produce, the expenditure for labor is the biggest and is followed by that for seeds (paddy and vegetables).

(6) Educational and Medical Treatment

There are 69 primary schools and 12 junior high schools in the 4 districts composing the Study Area with 14,414 and 8,266 pupils, respectively (Please refer to table below).

Table 3.1.9 Number of Schools and Pupils

District	Primary School		Junior High School	
	School	Pupil	School	Pupil
Lambanyi	36	6,874	8	4,696
Kobaya	4	1,298	1	60
Yataya	10	2,259	2	212
Sonfonia	19	3,983	1	3,298
Total	69	14,414	12	8,266

Source: the Study Team

The education level of the farmers is shown in the following table, and 60% of them have received a primary education.

Table 3.1.10 Education Level of Farmers (%)

District	Primary Education	Secondary Education	Uneducated
Lambanyi	65	18	35
Kobaya	58	13	42
Yataya	53	12	47
Sonfonia	64	16	36
Moyenne de la zone	60	15	40

Source: the Study Team

The medical facilities in the Study Area are presented in the following table. They are generally insufficient, with Lambanyi scoring better than other districts.

Table 3.1.11 Medical Facilities

District	Dispensaries	Clinics	Pharmacies
Lambanyi	2	2	3
Kobaya	1	0	0
Yataya	0	0	0
Sonfonia	1	0	0
Total	4	2	3

Source : the Study Team

3.1.3 Land Tenure

In compliance with the results of the social economic survey in the Study Area, the farmers who own farmlands are about 20%, and the remaining 80% borrow or rent land. The result of the survey on the land tenure is shown in the following table.

Table 3,1,12 Situation of Land Tenure (%)

District	Land Tenure		
	Owner	Borrower/Renter	Total
Lambanyi	16	84	100
Kobaya	13	87	100
Yataya	15	85	100
Sonfonia	23	77	100

Source: the Study Team

The freedom for individual land tenure in Guinea is guaranteed by the Code of Land and Domain (CFD) promulgated in March 1992. However, the application of CFD is far from reality, since the Code itself is not popular among the people concerned, and the principle and procedures of CFD are not adjustable to the actual rural conditions. Most rural people follow strictly the customary laws which do not conform to the regulations defined in CFD.

In compliance with the experiences derived from the past development projects, the importance of security for the right in land tenure has been recognized. In Guinea, two laws of land tenure with different concepts are found overlapping with each other; bringing about many land problems. In order to realize equity in land tenure, the Government of Guinea has started to take measures for the nation to widely accept CFD with the issuance of the Political Declaration on Land Tenure in Rural Area in May 2001. The declaration advocates the necessity to make the current law and the customary laws compatible and has set forth measures to protect the people concerned against the disadvantages that may occur in the land market opening.

3.1.4 Gender

In Guinea, there is an obvious distinction in profession and housework between the two sexes. This situation is said to be related to both the Islamic and traditional cultures. As a result of the earnest tackling of the gender issues in the first Republic, females occupy various professional domains nowadays. With this tendency, the sex distinction in the traditional custom has been fading year by year.

The Government of Guinea created the Ministry of Woman and Child Promotion in 1994 in order to improve women situation and started to reinforce the social welfare; promoting the situation of women and children.

There are four principal strategies in the national woman promotion policy formulated since 1996, which are defined as follows.

- Improvement of legal circumstances for women
- Economic Assistance to women
- Reinforcement of women roles in family, society and culture, and improvement of women situation in the general public
- Reinforcement of the structural aspect for women promotion

The proportion of women in the principal public offices is shown in the following table.

**Table 3.1.13 Proportion of Women in Principal Public Offices
(1997 and 2004)**

Public Office	Total in 2004	Women in 2004	Proportion of women (%)	
			2004	1997
Diet Member	114	22	19.3	9.0
Minister	32	5	15.6	8.7
National Director	120	6	5.0	2.5
Mayor	38	3	8.6	7.9
Vice-mayor	65	17	26.1	-
Councilman	604	118	19.5	-

Source: Ministry of Woman and Child Promotion

3.2 Natural Conditions

3.2.1 Location and Topography

The plain of Sonfonia, the Study Area, is located in Maritime Guinea along the Atlantic Ocean and extends around 9 degrees, 40 minutes north latitude and 13 degrees, 15 minutes west longitude. It belongs to Conakry Special Region and is located about 30 km to the northeast of Conakry metropolis.

The Study Area includes the cultivable lowland area along the seacoast with an altitude of around 2 m at the highest spot; covering 2,450 ha. The hinterland of the plain forms the hills on the other side of the national road and allows most rainfall to flow directly into the plain; causing flood damage in the rainy season. On the other hand, the phenomenon of seawater intrusion is recognized around places near the seacoast. The northern part of the plain is covered by the mangrove forest, which does not grow thick in the area along the seacoast from the middle to the south of the plain.

3.2.2 Climate

Maritime Guinea, where the plain of Sonfonia is located, has the strongest rainfall in the country, which sometimes reaches more than 4,000 mm annually in Conakry; making the area the strongest rainfall area in Africa. The main climatic elements are shown in the following table and figure (based on 13 years meteorological data from the Conakry observatory, 1991 to 2003).

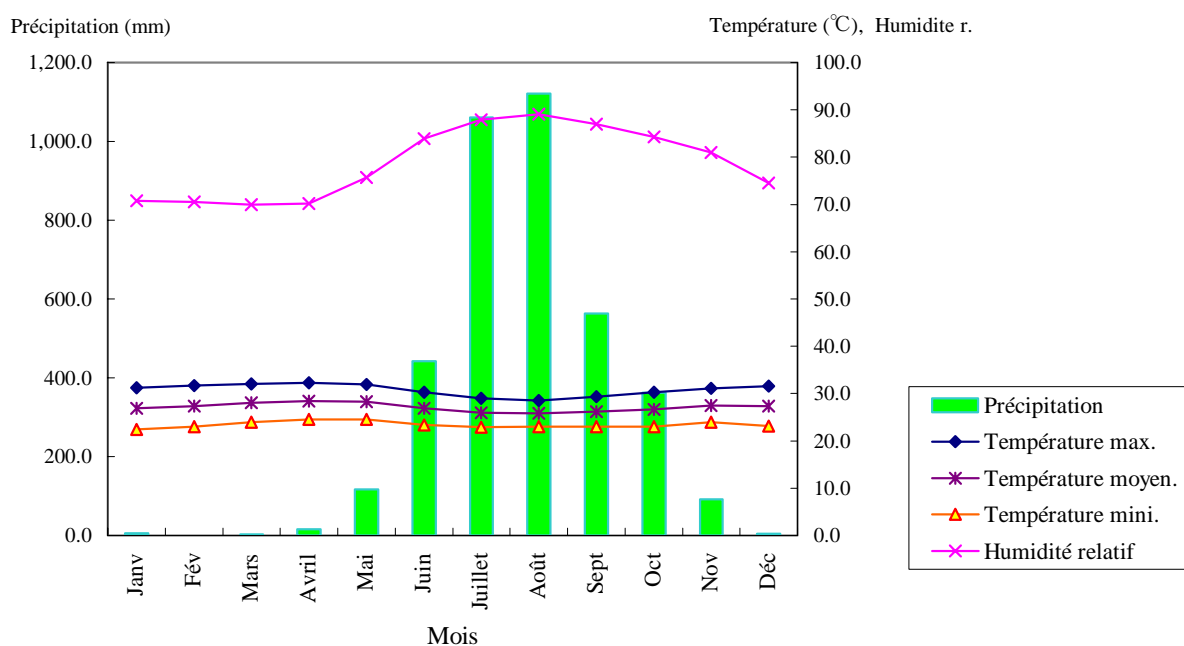


Figure 3.2.1 Precipitation, Temperature, Humidity

Table 3.2.1 Main Climatic Elements

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Precipitation	5.3	0.6	2.3	16.0	116.6	441.8	1060.7	1121.0	563.8	361.7	91.9	4.9	3,786.6
Temperature	26.9	27.4	28.0	28.4	28.2	26.9	25.9	25.8	26.2	26.6	27.5	27.4	-
Humidity	70.8	70.6	69.9	70.2	75.7	83.9	87.9	89.0	86.9	84.3	81.0	74.5	-
Hours of Sunlight	230.1	228.3	242.9	232.2	227.5	174.2	116.7	97.0	151.2	197.0	224.3	234.8	2,356.2
Wind Velocity	3.1	3.3	3.8	3.9	3.6	3.6	3.6	3.6	3.6	3.0	2.8	3.0	-
Wind Direction	W	W	W	W	W	W	W	W	W	S	W	W	-
ETo (daily)	5.2	5.9	6.4	6.5	6.0	4.8	3.8	3.6	4.4	4.8	5.0	5.0	-
ETo (monthly)	161	165	198	195	186	144	118	112	132	149	150	155	1,865

Source: Meteorological Observatory at Conakry

The annual rainfall is clearly divided into two seasons; a rainy season from the end of May till the beginning of November, and a dry season from the middle of November till the middle of May. Most of the total annual rainfall concentrates in the rainy season. Therefore, in the plain of Sonfonia where the drainage facilities are hardly installed, great damages caused by flooding occur in this period. On the other hand, there is barely any rainfall in the dry season. Consequently, crop growing is extremely limited in this season since the water sources for irrigation are scarcely available around the plain.

3.2.3 Rivers

The four rivers mentioned below flow into the Sonfonia plain.

Baguissénia River: It flows into the Sonfonia reservoir, and its downstream forms the boundary between Sonfonia and Yataya Districts.

Gbalan River: It flows into Yataya District.

Kamasondo River: It forms the boundary between Yataya and Kobaya Districts.

Kinifi River: It forms the boundary between Kobaya and Lambanyi Districts.

The up-river basins form the residential area. Vegetable growing in the dry season is carried out in the plain at inlet points of the rivers; using the river water. Around the upstream areas of Kamasondo and Kinifi rivers, paddy cultivation in the dry season is practiced at a limited scale; using the river water.

The daily runoff discharge of the rivers flowing in the plain was calculated based on the rainfall data and the areas of the river basins (cf. Attachment 12). The daily discharges are shown in the following table along with the drought discharges of the rivers considered.

Table 3.2.2 Areas, River Discharges

River	Area of the basin (ha)	Intake discharge (ton/day)	Drought discharge (m ³ /sec.)
Baguissénia	688	769,324	0.60
Gbalan	150	167,700	0.06
Kamasondo	231	258,188	0.36
Kinifi	667	745,566	0.10
Total	1,720	1,922,960	1.12

Source: the Study Team

3.2.4 Tide Level and Height of Wave

The mean sea level is a reference value for the altitude of Guinea and is determined in accordance with the long time observation.

Concerning the tide level, the values measured, analyzed and determined in the Basic Design Study Report on the Fourth Project of the Small-scale Fishery Development made by JICA in 1998 are as follows;

High Water Level (HWL): + 1.66

Mean Sea Level (reference value for the country) (MSL): ± 0.00

Low Water Level (LWL): - 1.66

Periodical observations on the height of the waves have not been carried out in Guinea. In accordance with the technical report on the design of the breakwater for the commercial port in 1991, it is stated that 85% of the wave height from December till March marks less than 0.75 m and 44% of it from July till August reaches 0.75 to 1.5 m.

3.3 Agriculture

3.3.1 Outline of Agricultural Farming

The agricultural activities in the plain of Sonfonia are multiple. They consist of rice growing, vegetable cultivation, and fishery, salt extraction, paid agricultural labor, and petty trade of products

made mainly by women. Compared to other regions of Maritime Guinea, economic activities found in this area are more diversified due to the proximity of the city. The particularity of agriculture is mainly the growing of mangrove rice, which is often seen in the plain of Maritime Guinea.

The actors involved in agriculture in the plain of Sonfonia can be roughly divided into agricultural owners and «agricultural farmers». The conditions of lending the lands are diverse. Due to the proximity of the city, there are many agricultural lands whose owners are absent; making the use of paid labor in the execution of certain agricultural tasks fairly common. For rice, the main crop of the area, self consumption is the rule except for a small number of big scale farms.

Looking at the characteristics of the plain of Sonfonia, one can bear in mind the following salient points:

- Located in an urban area, it is not a purely agricultural region.
- The existence of absent land owners and a small number of land-clearers heirs show a complex land owners-users relationship
- The absence of farm roads for the agricultural activities makes the transport of farm produce difficult.
- The plain provides other sources of cash income such as salt making and sand collection apart from rice growing.
- Many rice fields are facing the coast, where there are risks of salt intrusion.
- Most parts of the central area are constituted by non cultivated lands due to poor drainage and damages due to weeds.

3.3.2 Agricultural Production

(1) Production System

In Maritime Guinea, production systems are of two types; rice cultivation on the littoral plain, and diversification on the plateau.

1) Rice cultivation in the plain

a) Mangrove rice area

This area runs risks of salt damages due to the influence of sea water. In the dry season, sea water runs back up to the rivers into the plots; making rice cultivation impossible even if there are enough water sources. *Baga* have been practicing traditional rice cultivation in the area for a long time; managing water through constructed small bunds and fills. Rice varieties resistant to salt damages are cultivated with fewer weeds seen because of the salty water. This type of area is widely spread in the plain of Sonfonia.

b) Rice cultivation between the mangrove area and the plateau

Rice is cultivated in fresh water with no influence of sea water. Risks of damages are observed during dry spells (sudden stop of rains) at harvest or with the weeds. In the plain of

Sonfonia, this type of area is found near the dwellings.

c) Alluvial plain in the plateau

There are no such areas in the plain of Sonfonia, but these are sites devoted to rice, banana and palm oil production in the other regions of Maritime Guinea.

2) Crop diversification in the plateau

There is a thick fertile layer in the swampy areas located at the foot of the hills, where rice, banana and other fruits, vegetable, peanut, etc., can be cultivated. There is no area of this type in the plain of Sonfonia.

(2) Rice Cultivated Area and Yield

Fundamentally, there are no systematic data concerning agricultural production in the plain of Sonfonia. The field reconnaissance and the study of the topographic maps have made it possible to estimate the rice area at 1,100 ha and the existing fields at 10 ha as previously mentioned. About 40% of existing rice fields are not cultivated due to the poorly drained water, damages caused by weeds or the lack of labor. Concerning rice yields, most farmers give estimates based on their experience; namely, a rainy season yield ranging from 1 to 1.5 ton/ha, and a dry season yield of about 1.5 ton/ha with the risks damages by birds more important in that season.

IRAG has undertaken trials introducing fresh water rice varieties (*Balante*, CQ15, BA8A, Sanakoko8) in the plain of Sonfonia until 1988. Yields of 2 to 3 ton/ha without development could be obtained at the time. These trials have been stopped afterward following the change of orientation of IRAG in the rural area.

Project documents on irrigated rice in the region of Maritime Guinea (PDRI-GM) that have records of mangrove rice developed by AFD together with DNGR show a yield comparison in mangrove developed plots and non-developed plots (Please refer to table below). The yield is 0.9 ton/ha in the latter plots, which is a little bit lower than in the plain of Sonfonia.

Table 3.3.1 Yield Comparison in Mangrove Developed Plots and Non-Developed Plots

Plots	Area (ha)	Number	Yield (kg/ha)		
			average	max.	min.
Developed plots	2.280	14	2.489	4.174	2.182
Non-developed plots	429	5	907	1.285	526

Source: PDRI-GM Documents

A study on paddy sampled in 8 fields selected in 4 areas of the plain; namely, the northern part, the part near the villages, the transition part and the littoral, has been undertaken to calculate rice yields. The results of the study are shown on the table below.

Table 3.3.2 Study Results on Paddy Samples

Number of the field	Number of feet (/m ²)	Number of ears (/m ²)	Paddy weight (g/m ²)	yield (ton/ha)	Description
1	11	233	385	3,1	• Sonfonia north (centre) ; zone of mangrove • flat ground, transplanted, variety : Kaolak
2	25	199	249	2,0	• Sonfonia north (near land); zone of mangrove • flat ground, transplanted, variety : Malsa
3	28	199	204	1,6	• CEPERMAG site ; zone of fresh water • flat ground, transplanted, variety : Malsa,
4	28	153	184	1,5	• Kobaya (near dwellings) ; zone of fresh water • flat ground, transplanted, variety : Kalaya
5	32	137	156	1,2	• Kobaya (near dwellings) ; zone of fresh water • flat ground, transplanted, variety: Wonsonggonron
6	18	147	235	1,9	• Kobaya (zone of transition) ; zone of mangrove • flat ground, transplanted, variety: Wonsonggonron
7	23	202	274	2,2	• Lambanyi (near littoral) ; zone of mangrove • flat ground, transplanted, variety: Wonsonggonron
8	11	138	219	1,8	• Lambanyi (zone of transition) ; zone of mangrove • balks (ridges), transplanted, variety : Kaorine

NB) The weight of paddy represents the average value of 3 samples taken in the same field. Calculations of the yields were carried out by conversion into tons per hectare of the weights of paddy expressed in g/m², and reducing by 20% the weights of paddy which corresponds to the percentage of the surface of the edges of fields. The rice of field 4 was harvested earlier than the others.

Source: the Study Team

Among these 8 fields, field 1 gave the best record with 3.1 tons of rice per hectare. In field 1, the number of feet per m² was 11, the smallest value compared with the others, and the number of ears was the most important. Among the fields of the littoral part, there were many which presented a good growth even while being limited to the visual observation. The yield of the field located at a distance of 300 m in the direction of the plain from the littoral of the district of Lambanyi was of 2.2 t/ha., whereas that of the fields of the fresh water zone lies between 1.2 and 1.6 t/ha, the lowest values of all the calculated yields. Based on this study, the average yields are estimated at 2.0 t/ha for mangrove rice, 1.5 t/ha for fresh water rice and 1.8 t/ha for the whole of the area.

The type of rice growing practiced in all the parts of Sonfonia being that without contributions of agricultural chemical fertilizers, and improved seeds (introduced partially), one can affirm that rice growing in the zone of mangrove is more advantageous than that in the other zones.

(3) Rice Growing

All the agricultural work is carried out manually, and as labor is insufficient at the time of transplanting and of harvest, one calls upon workers outside of the family. It often happens that the periods of completion of the agricultural work and the care taken to work vary considerably between several neighboring farmers.

1) Varieties

The farmers cultivate much the variety Kaolack in the zone of mangrove, and Koti Condor for fresh water. The varieties of fresh water CK4 and CK21 recently developed with the Kilisi Research

Center were introduced by the personnel of the SNPRV. The varieties vary according to families of farmers, but early (maturing) and late varieties are combined. The number of varieties planted in the zone is relatively important.

- Late Varieties: They are planted varieties of fresh water on the side of the villages far from the sea. Wonsonggonron, Koti Condor (improved variety), Yegety Marsand etc are largely cultivated.
- Early Varieties: These varieties are planted downstream from the rivers, it is what is called generally rice of mangrove. The varieties Barakamadina, El Haji Khadéba, Marsa, Koty, Kaolack, Rok5 etc are also cultivated.

2) Seeds

The farmers use practically all their own seeds. It also happens that one exchanges varieties with good yield between farmers. However, it proved that the problems of seed, not only of accessibility, but also of quality because of mixture, conditioning and conservation, are a general situation all over the Study Area.

3) Agricultural work

Transplanting is practiced on almost the whole of the plain of Sonfonia. The sites of the nurseries are varied: in the rice fields, around the dwellings, between palm trees etc. It often happens that the density of sowing is high. There are cases where the growing of the seedlings is done over approximately 50 days.

In the plain, there are two varieties of bad grasses (weeds) resisting salt; Wonwonyi and Soufé (both in Soussou language) are largely widespread. There is no weeding after transplanting; however, one mixes the crop residues and bad grasses in the soil when plowing. Wonwonyi, with not very deep roots, is easy to handle, and mixed in the soil when plowing, it can be used as manure; the farmers thus wish to increase this Wonwonyi. However, Soufé obstructs the billonnage and transplanting; it is not welcome by farmers.

The period of transplanting varies also considerably on the plain of Sonfonia, and goes from July to September. There are two methods of transplanting, according to the farmer and the height of the rice field: transplanting on flat ground (high rice fields) and transplanting on balks (ridges) (low rice fields). The density of transplanting (spacing) is variable: on flat ground, it is 15 cm X 20 cm, and there are cases of tighter and broader spacing. On balks, one transplant on the two faces of the balk, and spacings are variable. After transplanting, there is not practically more work on the rice fields until harvest apart from managing water.

(4) Vegetables Growing

In the plain of Sonfonia, the vegetables that one can relatively cultivate without too many difficulties are: okra, eggplant, local eggplant (*jahatou*), pepper, sweet potato (use of potato and the leaves) and chive etc. It would be difficult to increase the productions considerably, since there exists in

the area few grounds appropriate to vegetables growing, and that irrigation is difficult during the dry season. Certain chemical fertilizers as well as the feces of the small domesticated animals are used for the vegetables growing.

(5) Collaboration of Animal Breeding with Agricultural Production

Animal breeding is not flourishing in the plain of Sonfonia. Only small ruminants are bred in some farms. One practically does not see large cattle like the bovines. For this reason, there is practically no collaboration of animal breeding with agricultural production. There are 8 poultry centers (collection of eggs, broiler chickens) in this area, and the chicken dung is sold to the farms by the poultry man. For vegetables growing, the contribution of the neighboring poultry man in organic manures relates to only very small quantities.

The extension of compost making; using the molasses and the vinegar with the assistance of FAO, was also partially tested in this area, but not widely diffused yet because of the difficulties of obtaining/transport of materials and their high cost.

3.3.3 Rice Growing and Soil in the Zone of Mangrove

(1) Development of Mangrove Rice Growing

Rice growing in the zone of mangrove presents one of the great characteristics of the agriculture of Sonfonia. It appears that mangrove rice growing was introduced in Guinea more than 200 years ago. But as it was within the framework of projects executed on a large scale, and little attention was given to the fragile balance of the mangroves, the excess of drainage involved a significant deterioration of the soils. Taking into account the lessons drawn from the past, the Guinean Government (National Department of Agricultural Engineering) realizes since the years 1990 the sustainable development of rice growing in the zone of mangrove; benefiting from the co-operation of Russia and France (AFD) through the Kamsar Rice Development Project in Monchon region (PDRK) and the Maritime Guinea Irrigated Rice Development Project (PDRI-GM)).

(2) Rice Growing and the Soil

The plain of Sonfonia concerned with the study is composed of mud and sand deposited alluvia transported by the water running from the hills, which are lands located in the background. Also composed of alluvia of the sea, the plain is generally fertile, argillaceous and suitable for agriculture. Moreover, the soil of the plain of Sonfonia presents the following characteristics which are commonly related to the zone of mangrove.

- The zone of mangrove is very fertile, the soils are rich in organic matter and minerals, but it constitutes a complex and fragile zone.
- The zone is regularly fed in nutritive components formed by a deposit rich in organic matter transported during the dry season by sea water which at the same time eliminates bad grasses.

Thus the zone of mangrove holds an economic importance from the financial point of view and labor by the use of sea water as fertilizer and herbicide. Consequently, rice development in this zone has a great potential compared with the other zones. However, when this zone is used for rice growing, there will be problems of strong acidity due to sulphates.

This phenomenon is created by sulphate coming from sea water, and which is reduced into sulphide, an insoluble element in water, under the action of the bacteria of the mangrove, and which then accumulates on the spot. The sulphide combines with the iron, contained in the laterite brought by the rivers, and becomes iron disulphide or pyrite, also an insoluble element. In the dry season, with the lack of water and the excess of oxygen, the pyrite oxidizes and produced ferrous sulphate which causes a strong acidity. In the same way, although the mangrove soil is protected from oxidation by the abundant water introduced from the sea into maintaining fertility, oxidation occurs once the soil becomes dry.

Thus, the concentration of increasing salt coupled with the inorganic phenomenon will make that the soil loses its fertility considerably. In addition, the rice fields in the flooded areas are exposed to the risk of a sensible reduction in production due to the intrusion of sea water.

This is why, when one cultivates rice in the zone of mangrove, the soil must be made dry at the beginning of the dry season to oxidize the pyrite, which is insoluble, and convert it into ferrous sulphate, which is soluble. While benefiting from the alternation of the tides and the opening of the dykes, the ferrous sulphate and the acids can be washed by sea water, which will leave on the spot strongly salinized soils. Salts can be washed in their turn on the arrival of the strong rains to confer on the soils their basic fertility.

(3) Soil pH

A study of the soils pH was carried out in the mangrove rice area located at the north of the plain of Sonfonia. The main results can be summarized as follows:

- The values of the pH vary from 4.2 to 6.4 in the surface layers and from 4.4 to 6.4 in the subsequent layers.
- The rice fields whose pH is lower than 5.5 in the surface layers are either covered with poorly drained water, or invaded by bad grasses, or abandoned.
- The majority of the rice fields whose pH is lower than 5.0 are abandoned.
- For the highly performing rice fields, the pH of the subsequent layers is higher than 6.2.

3.3.4 Basic Development for Agricultural Production and Water Management

(1) Situation of Irrigation and Drainage Water

1) Irrigation

The irrigation facilities are practically non-existent in the plain of Sonfonia except for the lake reservoir. However, the water stored in the lake is not currently used for irrigation as described further. Concerning the current state of irrigation, rice growing in the dry season is carried out on a

small scale; using water of the rivers Kamasondo and Kinifi which flow in the area. The cropping area is approximately 6 hectares. Earth and wooden dykes are installed in these rivers to intake water by raising its level.

In addition, in the area facing the dwellings in the plain, watering of vegetables crops during the dry season is carried out by means of small simple wells; using watering-cans.

2) Drainage

Drainage facilities are practically non-existent in the cultivable area of the plain of Sonfonia. In fact, the natural rivers act as drainage canals, but the majority of them; not being appropriately maintained, the thick mud blocks the water flow. This is why, in the center of the plain, there are vast marshy areas which occupy a third of the surface. In addition, with regard to the facilities designed to improve the drainage in the event of floods or intrusion of sea water, farmers themselves have already set up small facilities, and some water management is being carried out right now. Consequently, basic infrastructure improvement of a certain scale will be necessary to properly manage the drainage with more important effects than those obtained at the present time and to transform these marshy areas into cultivable lands.

(2) Farms

The rice growing areas in the plain of Sonfonia have mostly a surface of approximately 0.4 ha per plot, without any given form (cf. Attachment 14). There are no irrigation canals because one is dealing with a rain-fed agriculture. The drainage canals are also not practically developed, and the lay-out of canals and plots is not regular. In the areas practicing irrigated rice growing, irrigation is simply made by natural intake and flow, without almost any facilities worthy of this name.

There are no farm roads for the agricultural activities and farmers must move on the banks or in the rice fields; transporting their products with difficulty. Also, they must pass through the rice fields by putting the thighs in water during the floods period of the rainy season.

There are some other disseminated agricultural lands on the side of the dwellings in the higher part of the plain and at the entry point with only a very small area allowing for vegetables growing.

(3) The Sonfonia Reservoir

The Sonfonia reservoir was built in the year 1940 as an irrigation infrastructure for a fruit growing area located in the immediate upstream stretch of the plain at the entry point where Baguissénia River, located in the northern part of the Study Area, runs into the plain. The reservoir is currently decayed. The flood regulating valve, which is installed at the outlet of the reservoir, ceased functioning at the end of the year 1980 and remained currently as such, without being repaired. The water level not having increased since nearly 20 years, the inhabitants have built residences around the reservoir down to levels lower than the planned storage water level. Before the beginning of this study, one had considered the possibility of a repair plan to use the water of the reservoir as a source of water for dry season crops. However, the Ministry for Town planning and Habitat cut off a part of the reservoir crest and extended it

to create a ten (10) meters wide asphalt road. The mouth of the intake was also raised of one (1) meter and was restored as a mouth for the overflow. After the construction of the trunk road on the dike, which is probably justified by the presence of dwellings in the neighborhoods, it was judged that it is practically impossible to still restore it as facilities to store water.

According to measurements carried out on the water depth of the reservoir with the aim of determining the volume of dead water in the dry season, the water surface was 15.1 ha and the volume of dead water, 180,000 m³. The flood discharge level was at 3.486 m altitude (cf. Attachment 13).

(4) New Water Source

One observes that the dwellings have invaded most of the immediate proximities of the rivers crossing the Study Area that it would be very difficult to dig a reservoir. Consequently, there is little hope to count on that as a source of water during the dry season.

(5) Situation of Water Management

In the mangrove rice growing area, dykes are built in height in order to prevent the penetration of sea water. During the dry season, sea water penetration brings not only nutritive elements, like minerals, to the soils of the mangrove forest but it also makes it possible to wash away the acid soils. Then salt is washed away by draining rainwater during the low tide, which floods the fields in the rainy season. During the growth of rice after transplanting, water which accumulates during the rains is drained during the low tide, and the level of water is thus adjusted. The entry and exit of water are both operated by opening the dykes.

In the fresh water rain-fed rice area, dykes are also built in height to prevent the currents of the rivers floods from directly damaging the small seedlings. In July, the level of water obtained through rains in the fields increases in proportion to the growth of the seedlings. In August, the level of water is higher than that of the banks at the time of the floods, but the current of the flood water from rivers extends in the plain, and rice is not damaged.

Certain farmers just leave the rice field as it is during the rains. In October, when water withdraws, transplanting starts. Thereafter, the level of water will be adjusted by precipitations. In December, when the rains stop, residual waters are left just as they are, and rice continues to grow with this remaining water until the end of March.

These procedures of water management are the same as that practiced in the mangrove rice fields.

In the area of fresh water rain-fed rice, dry rice growing using the river water is also practiced. Water intake is managed as previously described with the simple earth and wooden dykes, which are installed in the rivers. It seems that no particular management of drainage is carried out.

3.3.5 Agricultural Work, Tools and Machinery

(1) Current Situation of the Agricultural Work

In the Study Area, almost all the agricultural work is carried out with simple tools, and by man power. The tools used are several kinds, among which the *cofi* and the *kheri*, mainly used for plowing, the *deguema*, employed to extract weeds and wastes, and the *fine* and the *worte*, used for harvest.

The household study shows that most of the agricultural work is carried out by families and farm laborers. The work carried out by a family alone accounts for only approximately 20%. Plowing of the fields and installation of the canals being particularly difficult tasks, there are specialized groups taking care of this work; requiring knowledge and a certain experience in the prevention of sea water invasion as well as in water circulation.

Some tribes (mainly Baga tribe) with specialty in the field of plowing and canal maintenance come to Sonfonia lowland from outside as seasonal laborers. Not only specialized laborers but common ones also come from other area at the time of plowing and harvesting. Farmers of miscellaneous management sizes, big or small, broadly hire laborers.

Moreover, the recourse to remunerated laborers often takes place during harvests, in particular owing to the fact that some farmers residing in suburban area are also involved in other profession than agriculture.

As for allotted task of agricultural works between men and women, plowing and canal maintenance are tasks accomplished by men. Income management is mainly the responsibility of men as well. Drying, milling and processing of parboiled rice after harvest are tasks left mainly for women. Other works are done by both men and women.

(2) Plowing of the Rice Fields and Installation of the Canals

The preparatory work of the rice fields before planting comprises two phases, which are plowing and installation of canals. Plowing is carried out by manpower, and as regards the methods of plowing, ridges making can be or not be carried out. Ridge making has many advantages among which one can cite 1) the improvement of the drainage conditions (in particular allows to immediately avoid the floods after transplanting), 2) improvement of the effects of fertilization by the plowing of grasses and residues and 3) the reduction of the number of seedlings to be transplanted.

The installation work of the canals consists in digging the canals inside the banks and reinforcing them by embankment. There are several reasons for excavating canals among which one can cite among other things, the management of the banks and facilitation of the drainage and the penetration of sea water.

The plowing of the rice fields and installation of the canals are in most cases carried out by paid laborers. The necessary manpower for this work is 14 to 21 men-day per field (0.4 ha: cf. Attachment 14), which is generally carried out with several (2 people approximately). There are subcontractors specialized in their execution, but their number is insufficient and the surface requiring a work in consignment currently exceeds the capacities of the subcontractors available. Consequently, the demand

exceeding the offer, the prices of work tend to increase, and that, among other reasons, involves sometimes the abandonment of rice growing.

(3) Harvests

During harvests, the cut of straws is practiced while cutting plant starting from the middle part (approximately 50 cm starting from the higher end of ear). Because harvesting work cannot be completely carried out by the family, many farmers have recourse to paid labor. The payment of the work is not carried out in cash but in kind with the products of the harvest, in general 10% of the harvest. The labor necessary during harvests is between 6 to 8 person-day per 0.4 ha

(4) Remunerated Labor

Many farmers involved in rice growing in the Study Area are unable to carry out the necessary work with their family alone. They depend, therefore, on a remunerated labor for plowing, installing canals, transplanting and harvest.

Assuming that the production of milled rice is approximately 500 kg per plot (0.4 ha), which at the price of imported rice would amount to 450.000 GF. In addition, if this rice is produced hiring a remunerated labor for the main work; such a labor would approximately cost 260.000 GF per plot. In other words, it would be certainly more economic to produce rice with remunerated labor than to buy imported rice, even if the difference is not very sensible. In a context of general lack of labor, one of the reasons to hire remunerated labor is that mangrove rice, which has a better taste, is preferred to imported rice.

Table 3.3.3 Cost of Remunerated Labor in Rice Growing

Work	Labor Cost (GF/0.4 ha)
Plowing	80.000
Installation of canals	80.000
Transplanting	40.000
Harvest	40.000
Milling, and others	20.000
Total	260.000

- Milled production per plot: 0.4 ha X 1.80 tons ha X 0,68 = 500 kg
 - Amount “converted” into imported rice: 500 kg X 900 GF/kg = 450.000 GF (ref. price of imported Asian rice in May 2004).
 Source : the Study Team (Estimated in May 2004)

(5) Tractor Service

On the outskirts of Kobaya village in the Study Area, there is a tractor service, even though it only involves a small scale operation. This service is provided according to the three following methods:

1) Service by an agricultural enterprise

At Kobaya in the Study Area, one private enterprise practiced commercial agriculture following business management methods; renting several dozens of plots to farmers, where one used tractors in the exploitation. Thus, the enterprise took care of the plowing work for the farmers; using tractors.

The costs were slightly lower than when the same work was carried out through a remunerated labor, which would approximately cost 75,000 GF for a 0.4 ha average size plot, for instance.

2) LAMKOYA

After receiving a cultivator, a gift from KR2 which was placed free at the disposal of LAMKOYA in 2004, SNPRV gave the instructions necessary to the operation of the known cultivator. In the current context, this service is provided only in the communal land of LAMKOYA. Apart from this land, the land of the members of LAMKOYA and other agricultural groups profit from the service, and only the recurring expenses, such as fuel expenses, are perceived. The serious problems currently existing are the lack of spare parts and the techniques for maintenance.

3) Centre for Experimentation and for Improvement of Agricultural Mechanization (CEPERMAG)

The CEPERMAG, which is located on top of a hill on the right bank of Sonfonia reservoir and constitutes a service attached to the National Directorate of Agriculture, cannot officially provide the tractor services to the farmers, but it carries out these services only in the event of grouped requests of approximately 10 farmers per annum demanding the actual fuel expenses.

As the demand for commissioned-plowing by the farmers is beyond the capacity of the contractors, farmers request CEPERMAG for tractor services. CEPERMAG gives tractor services to farmers with actual expenses of fuel covered by them.

Guinea started providing public tractor services through the provincial agricultural office (CAP, Centre Agricole Préfectorale), however, there is no CAP in Conakry Special Region. Therefore, public tractor services cannot be carried out in the Study Area.

(6) Current Problems Concerning the Machines and Agricultural Mechanization

The problems concerning the machines and agricultural mechanization in the Study Area are explained below.

- Almost all of the agricultural works being carried out by human power, it is difficult to proceed to all of the operations only with the family, and the rice fields cannot be cultivated if there is no paid labor. Harvests are used for family consumption and for labor remuneration, and real incomes obtained from the sale of rice do not exist in many families.
- The canals development works are very often carried out by a specialized group. In addition, the number of people which can deal with these canals works is limited. It is sometimes difficult to find labor for the plowing of the rice fields, and there are consequently certain lands which are not cultivated.
- No breeding of bovines or horses is undertaken in the Study Area, and the use of cattle to replace the manpower cannot thus be considered

The tractor services carried out in part of the Study Area make it possible to compensate for the insufficiency of labor necessary for the plowing of the rice fields, and it would be desirable that they are more widespread, in a durable and stable way. At the present time, however, these services present the

following problems.

- The agricultural roads not being developed, only the rice fields close to the villages can profit from these services. However, it should be noted that the passage of the machines damages the canals and the banks. The introduction of machines for the rice fields located inside the plain and on the littoral is very difficult.
- With the tractor services, the traditional methods of canals development and bunds making cannot take place, and only plowing services on flat ground can be provided.
- As regards the tractor services provided by the private enterprises, they cannot always be provided at the appropriate time at the request of the farmers since they do not constitute the principal activity of the company.
- At LAMKOYA, the tractor services are very limited.

In spite of the above mentioned problems, farmers' who are dependent on hired labor, desperately need a stable and continuous tractor services for plowing works.

(7) Governmental Policy of Agricultural Mechanization

The government of Guinea aggressively promotes agricultural mechanization. It has a plan to import 1,000 tractors as Presidential Project; and 385 tractors of middle and big size (45~80 PS) were already imported since 1999 to December 2005. More than 50 tractors were imported from China as an aid in December 2005. The imported tractors were sold cheaply or given to farmers groups, private farmers and military. The Government set up agricultural centers (CAP : Centre Agricole Préfectorale) in seven DPDRE of seven Provinces; such as Boké, Kindia, Mamou, Labé, Faranah, Kankan and Nzérékoré, to which the government gave three to four tractors. CAP began official tractor services for farmers in May 2003. Officials of DIMA, which constitutes a section of the National Department of Agriculture, were sent to CAP. In 2006 the President decided to carry out the official tractor services in all the Provinces but Conakry Special Region, accordingly the jurisdiction of official tractor services has been shifted from DIMA to CEPERMAG. Now officials in charge of CAP receive training on management and operation under CEPERMAG. The result of "tractor services by agricultural groups" investigated in the Verification Study made good use of this training.

The Study Team visited CAP in Kindia Province and watched the actual tractor services. The Team realized that the tractor services contributed to the expansion of cultivation area as it found extensive rain-fed paddy cultivation fields in many places. However, there are still many such problems in the planning of tractor services like that the Government has not conducted an overall plan in the importation of tractors and that there is no monitoring activities. Also in the official tractor services, there is no procurement of spare-parts and insufficient collection of fund.

(8) Agricultural Machinery Available

The agricultural machinery sold and/or produced in the neighborhoods of Conakry (including the nearby prefectures) is indicated in the table below.

Table 3.3.4 List of Agricultural Machines and Tools Available in the Study Area

	Agricultural machines and tools	Country of Origin	Acquisitions	Capacity	Power	Price	Observations
1	Thresher	China	SOAGRIMA (Conakry)	1,500 kg/h	20 CV	6,000,000 GF	
2	Thresher	Guinea	AFAMAPOR (Kindia) SOMATA (Kindia)	1,000 kg/h	8 CV	3,200,000 GF	Under the cooperation of SG2000; including the price of the motor
3	Milling Machine	China	SOAGRIMA (Conakry)	700 kg/h 400 kg/h	20 CV 14 CV	3,925,000 GF 3,125,000 GF	including the price of the motor
4	Milling Machine	China	DYNAMIC (Conakry)	900 kg/h 700 kg/h	18 CV 12 CV	3,850,000 GF 2,750,000 GF	including the price of the motor
5	Milling Machine	Guinea	AFAMAPOR (Kindia) SOMATA (Kindia)	300 kg/h	12 CV	2,800,000 GF	Under the cooperation of SG2000; including the price of the motor
6	Steam Parboiler	Guinea	AFAMAPOR (Kindia)	100 kg 200 kg	Firewood	250,000 GF 500,000 GF	Under the cooperation of SG2000
7	Metallic Silo	Guinea	AFAMAPOR (Kindia) SOMATA (Kindia)	100 kg ~ 1,800 kg		60,000 GF~ 700,000 GF	Under the cooperation of FAO
8	Cultivator	China	SOAGRIMA (Conakry)		14 CV	9,500,000 GF	price included for all accessories
9	Manual sprayer	China	SOAGRIMA (Conakry)		Manual	100,000 GF	
10	Diesel pump	China	SOAGRIMA (Conakry)	H=45 m Q=18 m ³ /h	8 CV	3,000,000 GF	
11	Diesel Motor	China	SOAGRIMA (Conakry)	2,200 rpm	8 CV	1,500,000 GF	
12	Plough	China	SOAGRIMA (Conakry)	Animal draught		65,000 GF	

Source: the Study Team (Prices in January 2005)

FAO seeks to popularize the use of the metallic silos. These silos were developed to preserve the rice grains and are used in countries of Africa like Senegal, Mali and Burkina Faso. Chemicals containing phosphorus are used in order to avoid the damage with the foodstuffs. They allow approximately a 6 months conservation. FAO trained 20 people, who already manufactured 51 silos. It aimed mainly at popularization of the silos with the groups of farmers and not on a private basis due to its weight, (which is of 120 to 1,800 kg) and high price, and also hardness of gas control after injected chemical gas into it.

3.3.6 Post-harvest, Processing and Distribution

(1) Current Situation of the Post Harvest Processing

The process going from the harvest of rice to its sale is divided into 8 stages: drying, threshing, transport, sorting, storage, parboiling, milling - polishing and sale.

1) Drying

Drying is carried out either in the rice field itself, or in the courtyard of the farms and, according to the results of the socio-economic study, drying in the plots generally seems to be practised. When drying is carried out this way, harvests are left there in the fields just as they are in the majority of the cases. In the Study Area, the relative humidity is over 70% during the dry season after harvests and rice being left in the wet fields close to the marsh, drying takes a considerable time.

2) Threshing, transport, sorting and storage

Threshing is generally carried out by striking the rice with a stick. In certain cases, rice is also trampled underfoot. A variety lending itself easily to threshing being cultivated, this operation is carried out relatively easily but important damage takes place because of the considerable losses incurred during the processes of drying, threshing and transport. After threshing, rice is transported by man power to the farms and it is sorted either with the hand or by using local tools. After the sorting, the not milled paddy is placed in vinyl bags of 50 kg, and it is stored by dividing it in several places inside the farm. Rice is stored; still containing high moisture, because of the fact that the relative humidity is very high in the Study Area during the dry season and that rice cannot thus dry completely by natural conditions. Consequently, when rice is stored without being milled, it is eaten by the rats or it rots easily. Consequently, the seeds that will be used for the following year are generally preserved in metallic cans (oil cans) in order to avoid being devoured and are kept separately from the rice reserved for consumption. However, since the cap is not sealed firmly, protection from animals is not effective.

3) Parboiled rice

Except for the rice paid as a labor cost, most of the harvested rice is parboiled in each family. According to the verbal investigation carried out with the farmers, the following reasons, among others, were stated for parboiled rice: 1) the taste is better; 2) the losses during polishing are reduced; 3) the rice is better preserved; 4) it is easy to digest and is more appropriate for children and elderly people who fall easily sick and 5) being diluted, its quantity increases and becomes well suited to nourish big families. Since, in the Study Area, drying after harvest is insufficient and that the water content remains important, the stored not milled rice can suffer damage and its shelf life is short. The processing through parboiling constitutes consequently an effective measure to compensate for these disadvantages.

4) Milling and polishing

Milling and polishing are the most mechanized agricultural processes in the Study Area. According to the results of the agricultural economics study, these works are generally carried out; associating the use of machines and manual work, with only 20% of the farmers who use machines alone. More than 80% of the agricultural households use, in a form or another, polishers.

In the Study Area, there are 3 private rice mills and 5 polishers. Apart from these, some small enterprises possessing polishers come in the area at harvest time and carry out milling and polishing

activities.

Table 3.3.5 Milling Sites in the Study Area

Location	Number of machines	Milling machines	Milling price	Remarks
Lambanyi	1	Chinese made (run by a motor)	540 GF/15 kg	In service only at harvest time
Sonfonia	2	Chinese made (run by a electromotor) Chinese made (run by a motor)	500 GF/15 kg	Chinese made polishers were bought for 2,400,000 GF in 2003. They are electric and are operated in the evening from 18 :00 p.m.
Kobaya	2	Chinese made (run by a motor) Chinese made (run by a electromotor)	600 GF/15 kg	

Source: The Study Team (Price in January 2005)

5) Transport loss

In the plain of Sonfonia, since the cultivated varieties have the tendency to easily spread their grains, it is supposed that the losses during transport would be considerably great. This is why, these losses were examined. The results show losses of 0.9% and 0.4% in weight recorded, respectively for the varieties RC4 and Siguikoda, during a transport of 25 m distance. This means that if the same varieties are moved 1 km from the places of production to the village, the losses observed would be 16 to 36% in weight. However, RC4 was harvested 10 days before Siguikoda and was more dried. Even Siguikoda was harvested 10 days before this examination, and it is assumed that the mean loss shall be about 10% in weight.

Table 3.3.6 Transport Loss

Items	RC4	Siguikoda
(1) Weight Loss (during the 25 m distance)	109 g	44 g
(2) Wight after the transport	12 kg	10 kg
(3) Loss (1) / ((1) + (2))	0.9% /25 m	0.4% /25 m

Source: the Study Team

6) Sale

Case of agricultural households

In most of the agricultural households, the quantity of rice produced is not enough to feed the whole family, and sale does not practically take place. According to the results of the agricultural economics study, less than 20% of the rice harvest is sold for 80% of farmers. At any rate, sale is taking place, even if small quantities are involved. Rice sale takes place following three different forms in the Study Area: 1) case where the rice is directly brought to one of the four markets of the region; 2) case where the farmer himself sells the rice at the market, and 3) case where the sale takes place through a middle man who has directly bought the produce from farmers.

Farmers sell rice much cheaper than the actual price when they use middle man, if they do not have any information of actual price. However, most of the farmers normally sell their produce with a reasonable price according to the market price.

Among the reasons given as to why farmers are selling their rice, the need for cash to pay for the human labor necessary for plowing the fields, the need for cash to pay for the children school or to cover the medical bill of someone sick in the family are mostly cited. In most cases, the rice is sold not for accommodating the daily family expenses but to solve unexpected cash need. Most of the rice sold by farmers is parboiled rice; meanwhile, the non milled paddy is sold to firms in charge for distribution in the project area, which are affiliated to the Project for the development of Irrigated Rice in Maritime Guinea (PDRI-GM). In the Study Area, which has the characteristic of urban agriculture, the possibility to sell parboiled rice at a high price constitutes an excellent potential.

Case of farmers' groups

Among the farm produce harvested in the plots of farmers' groups, the rice is generally distributed to members of the groups, while the major part of the vegetables is sold. The vegetables are sold: 1) to middle men who come to buy them directly at the garden; 2) by wholesale or retail after transport to the markets; 3) by the groups' members themselves to consumers coming to the market. As mentioned above, in some cases, their selling prices are much cheaper than the actual prices when they use middle man, however, normally they can sell it with reasonable prices according to the market price.

(2) Situation of Food Self-Sufficiency

The situation of food self-sufficiency in rice has been studied based on the quantities of rice produced in the Study Area and also in relation to the number of farmers. As a result, it is estimated that farmers' food self-sufficiency in the area is about 60%, with the remaining 40% being covered through the purchase of imported rice. The farmers have many income sources such as agricultural produce, salt production, fish harvest, employed as a construction worker, as a driver, selling daily commodities, employed in different economic sector in Conakry, etc.

Rate of rice self-sufficiency in the area: $1,102 \text{ tons} / 1,800 \text{ tons} = 0.61 \text{ (61 \%)}$

* Quantities that can be supplied (weight of non milled paddy)

- Cropping area $750 \text{ ha} \times 85 \% = 640 \text{ ha}$
 $750 \text{ ha}: 760 \text{ ha (total area)} - 10 \text{ ha (area taken by fields)}$
 $85\%: \text{rate of cropping area}$
- Production $640 \text{ ha} \times 1.8 \text{ ton/ha} = 1,152 \text{ tons}$
 $1.8 \text{ ton/ha}: \text{Average yield of the paddy fields in the area (data taken from the results of a study)}$
- Quantity necessary for the grains $640 \text{ ha} \times 0.08 \text{ ton/ha} = 50 \text{ tons}$
- Quantity that can be supplied: $1,152 \text{ tons} - 50 \text{ tons} = 1,102 \text{ tons}$

* Quantity that is demanded (weight of non milled rice)

- Farmers' population 15,000 inhabitants (cf. Table 3.1.6)
- Rice demand 15,000 inhabitant. \times 120 kg/inhabitant = 1,800 tons
120 kg/inhabitant: Consumption per head (cf. Attachment 2)

(3) Markets

There are 4 public markets in the Study Area

There are four public markets in the Study Area, which are located at Lambanyi, Kobaya, Yataya and Sonfonia. The market of Lambanyi is the most important. In each of the markets, 30 to 50 small shops are lined up, which sell rice, vegetables and articles commonly used. Articles produced in the area can also be displayed on the stalls, but their quantity is very limited, and generally products bought from markets nearby the Conakry area are mainly sold. Most shop owners are women living in the area.

Opening a shop in the market would require in the case of Lambanyi, for example, would require being inspected by the disciplinary committee composed of members of the market and obtaining a permit delivered by the administration of Ratoma Commune. Anyone can open a shop if these conditions are met.

The big rice markets in Conakry and the nearby area are those of Boussoura, Tanene and Enta. Vegetables are mainly sold in the markets of Madina, Matoto and Enta. All these markets are located on a 15 km radius around the Study Area.

(4) Vegetables

As regards vegetables, they are not only consumed in the family, but also they are sold in the markets of the area. Many farmers who are involved in vegetable cultivation sell themselves their produce in the markets of their area. However, the quantity of vegetables provided through markets located close to the area is more important than the quantity coming from the area itself. Some vegetables such as potatoes, onions, egg plants, tomatoes, kidney beans, peppers, cabbages, etc. which are sold in the vicinity markets and in Conakry city are mainly produced in the Middle Guinea where the cool climate is found. In addition, some onions and potatoes are imported from Europe.

(5) Rice Distribution and Price

Rice is the main staple food of Guinea. To the difference of the consumers in neighboring countries, parboiled rice is mainly consumed nationwide. When rice produced nationally is distributed, it is categorized as plain rice, hill rice and mangrove rice. In all cases, the rice that is sold is parboiled rice. Mangrove rice has the highest market value among the rice varieties produced nationally, and it is sold at high price on the market¹.

In Guinea, due to the national taxes, the price of imported rice is higher than the international price, but the tendency is pointing toward the reduction of these taxes in the future. The price of the local rice is

¹ MANGROVE RICE SECTOR, PDRI-GM, Mamadou, Aliou Sy

influenced by the price of imported rice; the price of local rice decreases when the imported quantities increase. At any rate, in spite of these elements of instability, the local rice is highly more appreciated than imported rice and is sold at higher price, since the local rice especially parboiled rice is essential in Guinean food due to the high popularity in taste.

Table 3.3.7 Evolutions of Retail Sale Price of Parboiled Rice and Imported Rice (2003)

		(GF/ kg)												
Category	Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
Parboiled rice	2002	700	700	800	800	800	800	880	918	938	922	895	816	831
	2003	800	800	840	900	900	900	975	1.000	1.000	1.000	894	1.000	917
Imported Asian Rice	2002	499	499	499	500	500	500	500	510	507	509	510	510	504
	2003	500	500	500	596	600	640	617	675	600	600	600	735	597

Source: MARKET PRICE OF AGRICULTURAL PRODUCTS, SIPAG No. 16

Parboiled rice is sold at higher prices than the rice from other big cities on the Conakry market because of the distance of the production area and the high demand.

Table 3.3.8 Retail Sale Price of Parboiled Rice in Guinea (2003) (GF/ kg)

Study Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average
CONAKRY	800	800	840	900	900	900	975	1.000	1.000	1.000	894	1.000	917
KAMSAR	766	783	787	820	820	894	962	968	951	950	787	800	856
KANKAN	610	610	611	682	686	756	844	858	963	840	740	709	742
NZEREKORE	647	650	683	700	712	731	776	832	774	775	738	805	597

Source: MARKET PRICE OF AGRICULTURAL PRODUCTS, SIPAG No. 16

The comparison in prices for parboiled rice in the markets of the Study Area, Conakry and neighboring areas has shown that there are no significant differences in prices. Consequently, the markets of the Study Area are places in the country where parboiled rice is sold at highest prices. If today the quantities of rice sold in the Study Area are limited, this sale in the region represents bigger advantages with respect to other production areas because of: 1) the existence of a public near by; 2) the coming of city residents in this market for shopping; 3) the possibility for farmers to sell directly in the market, and: 4) the possibility to sell the rice at high prices considering that there is no significant differences between the prices applied in the region to those applied in Conakry.

Table 3.3.9 Retail Sale Price of Rice in the Study Area and Neighboring Markets (May 2004) (GF/kg)

Category	Study Area						Average
	Madina	Boussoura	Tanene	Anta	Lanbanyi	Sonfonia	
Parboiled rice	1,300	1,300	1,275	1,350	1,200	1,350	1,296
Asia Imported rice	1,100	-	925	950	900	950	965

Source: the Study Team

3.3.7 Farmers' Groups

In the plain of Sonfonia, in addition to traditional village associations, there are many village groups; aiming for the production, processing of agricultural products and promotion of social activities. These groups might have been formed in the mid 1990s when the government promoted the establishment of farmers' organizations. Activities of the main groups located inside Ratoma Commune are shown in the following table. Among the groups presented in the table, the ones working in the concerned Study Area are them of numbered from 1 to 9.

Table 3.3.10 Activities of Main Groups

Name	Main activities	Number of persons	Area of activity	Other
1. Lamkoya	Rice, vegetables, bananas	29	Yataya	Support of FAO, SG2000
2. Lymaneya Lambanyi	Rice, vegetables	30	Lambanyi	Renting of public land
3. La Paix	Rice, vegetables	32	Kobaya	vegetables sale
4. Donse Fangui	Processing (dried vegetable leaves, mango jam etc.)	18	Kobaya	Processing. Drying tools
5. Taabaty	Rice, vegetables	15	Kobaya	
6. Limaniya Kobaya	Vegetables	16	Kobaya	
7. Walifanyi Kobaya	Rice, vegetables	15	Kobaya	
8. Lanyifan	Rice	18	Kobaya	Male Group
9. Union des Jeunes pour le Développement de Kobaya	Vegetables	26	Kobaya	Male Group
10. Développement de Sonfonia Centre	Rice, vegetables	15	Outside the Study Area	
11. Progrès de Sonfonia	Vegetables	19	Id.	
12. Kakimbo	Rice, vegetables	20	Id.	
13. LimaniyaRatoma Centre	Vegetables	20	Id.	
14. Lanféma	Vegetables	20	Id.	
15. Petit Lac	Vegetables	20	Id.	
16. Mama Henriette Conté	Smoking fish	20	Id.	

- Groups 8 to 16 are not members of C.GAMAR

Source: the Study Team

(1) Coordination of the Ratoma Vegetables Groups (C.GAMAR)

14 other groups are gathered under the supervision of SNPRV in C. GAMAR (Coordination of Ratoma Vegetables producing Farmers Groups). Its seems that the coordination is organized not only in Ratoma Commune, but nationally so as to allow the exchange of information between groups and to promote the activities related to each group; including extension

C. GAMAR meets twice a year under SNPRV in order to decide on the exploitation policy to follow for the growing seasons of the year to come. Furthermore, the small market built at Kobaya under the financial support of FAO is allocated to C. GAMAR. Another project funded by UNESCO has also built at Kobaya 4 bakeries for C.GAMAR (not yet under use because the training has not taken place).

C. GAMAR has also communal lands (located outside of the Study Area) which are exploited by

the members of each group.

(2) Characteristics of the Farmers' Groups

The farmers' groups have their own lands to carry out their activities. Most of the members have also their own lands and participate to the group activities apart from the works they do on their own lands. They meet regularly 3 or 4 times a week and every day during the season of agricultural works. Many who are members of the groups are small-scale farmers. The land area they occupy is relatively small with difficult possibilities for expansion; therefore, they make up for the family expenses with what they produce in the group.

The area of the land occupied by the groups ranges between 1 and 5 ha and is divided into 3 categories: land inherited by the group chief (or by one member), land rented or belonging to the government. The land of the group is not distributed among members, but is collectively exploited. The work volume is distributed equitably between members, and the work plan is commonly agreed upon by the group.

Most of the groups' members are women with a proportion of 2 men for 8 women. A woman is the group chief in most of the cases, but there are groups with 2 chiefs (one male, one female). Some groups have been created only with women, but the need of men's hands to help in the particularly hard works has forced women to ask for men participation in the group.

3.3.8 Agricultural Support Services

(1) Actual Situation of Extension Activities in Guinea and the SNPRV

The agricultural extension activities in Guinea started in the Guéckédou Agricultural Project in 1980, and the extension of agricultural techniques, namely, the formation of farmers' organization and the extension system based on T & V (Training and Visit) method was carried out. This project made the farmers expect to sell their farm surpluses in markets.

On the basis of this experience, the Government of Guinea requested the World Bank to assist the execution of a study on the level of farm produce. In response to the request, the World Bank conducted a rural development master plan and a structure reformation of agricultural sector. Weakness of the extension sector was one of the various problems found in the study. In order to solve this problem, the Government of Guinea started, in cooperation with the World Bank, the extension projects according to the following steps from 1986 to 2002.

- 1st phase: from 1986 to 1990 Projet Pilote de Vulgarisation Agricole (PPVA)
(Pilot Project of Agricultural Extension)
- 2nd phase: from 1991 to 1994 Projet National de Vulgarisation Agricole (PNVA)
(National Project of Agricultural Extension)
- 3rd phase: from 1995 to 2002 Service National de la Promotion Rurale et de la Vulgarisation
(SNPRV) (National Service of Rural Promotion and Extension)

As a result of the second phase, the necessity of the organization for beneficiaries' participatory

extension which contributed to the food security was confirmed. The National Department of Training and Rural Promotion and PNVA were reunited, and SNPRV was created in November 1994 under the administrative supervision of the Ministry of Agriculture and Livestock with the mission to elaborate and implement the strategy of the agricultural policy in terms of rural promotion and extension. Its global objective is to provide a flux of advices and appropriate technology to farmers in order to increase the productivity of the farms and consequently improve incomes. At present, about 1,300 extension officers are carrying out their service to the farmers through the country.

What characterized the activities undertaken by SNPRV up to now can be summarized as follows:

- Participatory Community Diagnostic (DPC)

The Participatory Community Diagnostic (DPC) has been carried out in Guinea in 1977 by SNPRV with IRAG following a study on participatory approaches financed by the World Bank in 5 countries in the West Africa (Guinea, Benin, Ivory Coast, Mali, Burkina Faso), to identify problems on farm produce and seek their adequate solutions. Through this exercise, it has aimed to improve the capacity of extension officers, get common information and promote farmers' participation in the diagnostic.

- Research- Extension- Coordination between farmers

As representatives of the extension of NERICA rice, WARDA, SNPRV and farmers are maintaining a close collaboration among themselves

- Collaboration with partners

SNPRV is undertaking activities such as the collection of information, technical extension and training; doing all this in collaboration with the public services, development projects, NGOs, farmers organizations and CRD. This form of collaboration makes it possible to create a dialogue between extension officers and farmers and to further clarify the needs of the latter.

- Support to Farmers' Organizations (OP)

In order to rapidly transfer the projects dealing with agricultural production and distribution to the private sectors and joint ventures, the Guinean government gave support for the establishment of Farmers Organizations. These organizations are now 7,800 with 160,000 members spread out all over the country. In line with this policy, SNPRV gave support to the strengthening of these organizations.

- Support to rural women

In the rural area, SNPRV has locally established a service for women so as to help them take advantage of the extension activities. These activities involve: the taking into consideration of the particular needs of women, the establishment of women organizations, the promotion of farmers' autonomous management, the mastering of the processing and conservation techniques of agricultural products and the improvement of women social status.

- Approach CRD-OP-Extension

The participation of the representatives of the region in the extension activities not only contributes in diffusing the information and sensitising the role of the extension officers in the rural area, but also facilitates the communication between the promoters of development and villagers.

(2) Extension Organizations Intervening in the Study Area

1) Communal Directorate of Rural Development and Environment (DCDRE)

The governmental organization in charge of providing agricultural support in the plain of Sonfonia is the DCDRE, which is one of the 9 technical departments located in Ratoma Commune. Under the decentralization policy of 1993, the DCDRE which was the local agricultural office of the central government was finally integrated into the Commune.

The DCDRE which is headed by a director includes 5 sections as follows: Agricultural Promotion Section (SPA), Animal Resources Promotion Section (SPRA), Water and Forests Section (SEF), Environment Section (SE) and Timber Section (SOGuiB). Among these sections, SPA is in charge of agricultural extension. SPA is headed by a section chief who is assisted by the following staffs: representatives for training, extension and facilitation, representatives for land matters, representatives for mechanization and post harvest activities and representatives for seeds and farm inputs. SPA has 19 staffs among which 6 are in charge of sensitization/facilitation at the village level.

The DCDRE does not have transportation means such as motorcycles. Its activities consist in giving support to women groups involved in vegetables growing, which are often small groups. As a whole, the training and extension activities are today stagnant due to the lack of fund. According to the director, it is difficult to undertake these activities when they are not parts of programs and concrete projects.

2) SNPRV (DPDRE of Koya Prefecture)

In addition to the above mentioned DCDRE in the plain of Sonfonia, 5 extension officers and one in charge of the plain (supervisor: SV) from SNPRV are dispatched by Koya DPDRE to undertake extension activities with farmers. The plain of Sonfonia constitute one of the 5 areas under the active extension program of Koya Prefecture since the creation of SNPRV in 1995. 5 extension officers of SNPRV are already assigned one or two years in the four divisions of the present Study Area. They perform field activities five days a week, except Friday and Sunday. Friday is devoted to the meeting of the staffs and to training. None of the staffs has a transportation means such as motorcycle.

3) Organizations in charge of extension under dual government control

As mentioned above, the extension activities under the Ministry of Agriculture and Livestock are in a stationary stage; however, the plain of Sonfonia are under the supervision of SPA of DCDRE (Ratoma Commune) and the extension staffs of the DPDRE of Koya Prefecture under SNPRV. This

shows two types of extension organizations in Guinea. Except the Conakry Special Region, a SPA facilitator and an extension staff of SNPRV are dispatched in each prefecture. According to them, their roles are divided; one listens to the needs of the farmers during his/her daily activities and reports the problems to the department; the other tries to diffuse the improved production techniques. There is no official coordination between the two extension organizations.

(3) Agronomic Research

1) Outline of the agronomic research

The Guinean Agronomic Research Institute (IRAG) is a central experimentation and research organization which has been established under the principle of financial autonomy. It has four regional centers and two special centers as follows:

a) Regional Centers

- ① Maritime Guinea: located at Foulayah, experimentation and research related to cereals, fruits and cassava.
- ② Mean Guinea: located at Pita, experimentation and research related to cereals and environment management
- ③ High Guinea: located at Kankan, experimentation and research related to cereals, cotton, maize and groundnuts.
- ④ Forest Guinea: located at Sereidou, experimentation and research related to exported products such as coffee, rubber and others.

b) Special Centers

- ① Koba Agronomic Research Centre: located at Koba in Maritime Guinea, research related to mangrove rice cultivation.
- ② Kilisi Agronomic Research Centre: development of rice and maize varieties.

2) Koba Agronomic Research Centre

The Koba Agronomic Research Center is one of IRAG special centers. It deals mainly with mangrove and fresh water rice research, which constitute the main two commodities of the coastal plain. The centre has 13 staffs (permanent employees). It is said that its activities have started stagnating for the last 3 years due to the lack of funding. In the 1950s and 1960s, basic experimentation on mangrove rice cultivation (variety trials, fertilizer application, seeding time, direct seeding, transplanting and others) was undertaken, and today the centre has been conducting the classification of the characteristics for the rice varieties destined to the mangrove and fresh water areas

The center deals with four research topics on mangrove rice: 1) variety trials (research on harvest cycle and quantity); 2) plant protection (namely against crabs and weeds: application of chemicals and filling the furrows with water (3 to 5 cm height); 3) seeding density (25cm x 25cm recommended); 4) post-harvest processing (parboiled mangrove rice). As regards fresh water rice,

five research topics are considered: 1) variety trials; 2) iron toxicity; 3) morphological characteristic of fresh water varieties; 4) trials on organic and mineral fertilizer; 5) fight against weeds (herbicide trials).

(4) Koba Seeds Centre

Created in 1989, the center initially received the help of the World Bank. Later on, the French Development Agency (AFD) and the European Union took over, but due to the strengthening of its financial autonomy and the stop of donors support, its activities stagnated. The centre is demanding contracting farmers to cultivate production seeds, when in reality it could buy only parts of the good quality seeds. For the growing season 2002/2003, the distribution of the rice seeds presented in the following table was programmed.

Table 3.3.11 Characteristics of Rice Seeds Available at Koba Seeds Centre (2002 /2003)

Varieties	Mangrove ice		Fresh water or marsh rice			Rain-fed rice
	ROK5	Kaolack	Sukoko	CQ15	Balante	Sambakonkon
Cycle (days) semi-maturity	130	144	145	160-165	156	127
Growing ability	Mangrove Fresh water	Mangrove Fresh water	Fresh water	Fresh water	Fresh water	Rain water
Resistance to iron	Average	Resistance	Resistance	Average	Weak	Resistance
Resistance to salt	Resistance	Resistance	Weak	Weak	Weak	Weak
Lodging	Resistance	Resistance	Resistance	Weak	Average	Resistance
Height (cm)	95	98	100	130	100	112
Average yield (kg/ha)	2,317	2,000	2,500	3,500	3,500	1,000

Source: Rice seeds available at Koba Seeds Centre, Growing season 2002- 2003

(5) Credit

In the plain of Sonfonia, the official credit exists for fishermen but not for farmers. In Ratoma Commune, NGOs give micro-credits, but the plain of Sonfonia do not benefit from them.

3.4 Environment

3.4.1 Administrative Organizations in charge of Environment

The Code for the Protection and Use of the Environment (N045/PRG/87) has been formulated in 1987. A part of the code was revised in 1989. The code makes it mandatory to undertake an EIA for any big scale development project before its implementation and defines the EIA procedure.

In Guinea, it is the Ministry of Mines, Geology and Environment which, under the aegis of its Environment Directorate, represented the competent authorities in environment and was as well in charge of implementing the environmental policies. The Directorate of Environment was created in 1986; it became independent and was set up as the Environment Ministry on 2nd March 2004.

3.4.2 Environmental Evaluation

The environmental evaluation aims to examine whether the implementation of the development plan to be elaborated in this present study or the pilot projects planned in the framework of the verification study would have negative effects on the Environment. In this study, an IEE (Initial Environmental Examination) was conducted based on the Guidelines of Social and Environmental Considerations of the Japanese International Cooperation Agency (JICA) and on the analysis of Guinean laws related to environment.

(1) Method and Procedure of the Environmental Study

Below are described the method and content of the IEE

1) Collection of related information and site reconnaissance

- Collection of the information related to the norms and regulations set by the Guinean government and to the roles of different organizations related to society and environment
- Understanding the endangered fauna and flora
- Identification of national parks, reserves or cultural, archaeological and historical heritage
- Collection of information related to similar studies undertaken in the past

2) Classification (screening) by category

- To classify, according to the basic orientation of the plan elaboration, the projects plan into the three categories A, B, and C: A means projects whose implementation will have grave consequences; B means projects with lesser influence compared to A; and C means projects with minimum impact or almost no impact

3) Definition of scoping

- Examination of components likely to produce impacts and the study method related to the projects.

4) Implementation of the study taking into account natural and social aspects defined in the scoping

- Undertake the study based on the definition examined at the above mentioned point.

5) Analysis of the study results and reporting

- Discuss with the persons concerned and record the results of the discussions in the Report to be established.

(2) Study Results

Following the examination of the present plan (including that of the verification study), we came to the conclusion that it would not be necessary to carry out an EIA (Environmental Impact Assessment). However, the implementation of some parts of the selected projects would require certain precautions.

The main results of the scoping are presented below.

I. Social Environment

1) Social factors

There is no resettlement plan for the inhabitants. However, the rate of urbanization of the Study Area and the disorganized increase of residences in the plateau would eventually pollute the water and destroy the environment (dumping of household garbage, etc.)

2) Demographic factors

The population of the area is increasing following a growth rate of 8.7% per annum (according to a survey undertaken at Ratoma Commune)

3) Economic activities

The majority of the population is divided into two categories:

- Farmers
- Salary men or people working in Conakry

This trend will continue.

4) Customary and institutional factors

The cutting down of the mangrove is carried out customarily. It would be necessary to sensitize the population on the importance of preserving the mangrove and to carry out reforestation.

5) Health and hygiene factors

The dumping of household garbage and the pollution of the water subsequent to the population increase are to be expected mainly in the upstream stretches of the tributaries flowing in the Study Area.

The insecticides prohibited by FAO are used by farmers of the Study Area. It is therefore essential to inform the populations on the dangers and risks incurred as well as on a health standpoint than on the breaking of the law forbidding such use. It is important to conform to the security norms set by the government

6) Cultural factors

In the area concerned by the Study, there is no historical site or cultural heritage registered or protected under the Ramsar Convention, the World Cultural Heritage or the Guinean law.

II. Natural Environment

1) Biological and ecological factors

The mangrove of the Study Area is being cut down every day as firewood (used in cooking, salt making, fish smoking and bricks making). If the trend continues, the mangrove will disappear in 73 years. An important ecosystem depends on the mangrove forest whose preservation is urgently

needed.

2) Land and soil resources

In parts of the Study Area, soil erosion caused by the cutting down of the mangrove and the extraction of sand and clay (used in bricks making) can be observed. At Lambanyi, because of littoral erosion caused by the chopping of the mangrove, 87 ha of land have been destroyed between 1988 and 2004. In some areas, the sea water intrusion has caused damages.

In addition, if the infrastructure development is to be carried out mainly on the area of sulphuric soils, it would be necessary to examine the environmental impacts beforehand.

3) Hydrology, air and water quality

The pollution of the water due to the increasing urbanization around the Study Area is to be expected

Before undertaking the development planned in the Master Plan, it would be necessary to demarcate the area of sulphuric soils.

4) Landscape and mining resources

The extraction of sand used as a construction material in buildings is carried out in the Study Area; creating littoral erosion in some areas.

3.4.3 Mangrove of the Study Area

(1) Mangrove Varieties

In the Study Area, the following mangrove varieties are observed.

Table 3.4.1 Characteristics and Uses of Mangrove

Varieties	Characteristics	Uses
<i>Avicennia germinans</i>	Prevailing variety Salt resistant Can regenerate rapidly	Firewood
<i>Rhizophora mangle</i>	Long roots Grow on the moving peat, on the littoral as well as inland Form viviparous seeds	Construction Firewood, etc.
<i>Laguncularia racemosa</i>	Rare variety Grow on the moving peat	Firewood

Source: the Study Team

In the plain of Sonfonia, most of the forest of mangrove is colonized by the varieties Avicennia and Rhizophora, the first variety being dominant. In the muddy part, it is the Laguncularia variety which dominates.

(2) Condition of the Cut

In Guinea, the cut of the varieties classified in article 78 of the forest Code (Law L99/013/AN of June 1999) is prohibited. However, in the Study Area, the cut of the mangroves is a current practice, and

the cut varieties are used as firewood (household combustible, salt making, fish smoking, brick making). In the north-western forest of the Study Area, the clearing of the mangroves is carried out without monitoring by a forest agent.

The surface occupied by the mangroves in December 2004 was 292 ha. Compared with the surface calculated in 1985 according to the aerial photographs of the time, a reduction of 76 ha (annual average of 4 hectares) was observed in a 19 years interval.

In Kobaya, the surface of the forest of mangroves increased, but with the progression of the urbanization in the area, the demographic pressure will weigh on the wood cut.

Table 3.4.2 Evolution of Area of Mangrove in Each District

District	Area of the Mangrove (ha)		
	1988	2004	Difference
Lambanyi	47	11	-36
Kobaya	82	89	+7
Sonfonia	239	192	-47
Total	368	292	-76

Source: the Study Team

A natural regeneration is observable in part of the mangroves, but with the pace things are going, there will be no more mangroves in the area in 73 years time.

In the forest edges, one can observe paths just passable for a person between the mangroves. People who come to cut wood pass by these paths and go back there after the cut with their loading. Inside the forest, one can find many pockets where the mangroves are cut (see attached photograph). The real area of the mangroves is consequently smaller than the values presented in the table above.

It is urgent to take conservation measures in the Study Area. However no provision was taken in this direction.

3.5 Development Constraints and Potentials

3.5.1 Consideration of the Development Constraints and Potentials

The objective of the plan of development (Master Plan) which will be elaborated in this Study is to propose a realistic route for a realizable and durable agricultural development being able to contribute to the modernization of agriculture in the plain of Sonfonia. The constraints and potentials of development are examined on the basis of the results obtained during the field work. This work is composed of the review of the documents available, the socio-economic study, the observation by the Team in charge of the Study, a series of verbal investigations and workshops, the implementation of the Verification Study, etc.

The above-mentioned results were reported in the seminars and were shared with the populations concerned such as the farmers, the government staff and the personnel of the international organizations,

and the ideas on the possibility and the orientation of the durable agricultural development were exchanged.

3.5.2 Constraints

(1) Weak Productivity

1) Inundation by heavy rainfall and sea water intrusion

The plain of Sonfonia are located in an area where annual rainfall is strongest in the country. In addition the rice fields developed along the littoral are all the time exposed to the intrusion of sea water. These two aspects constitute at the same time advantages and disadvantages to mangrove rice growing, which is one of the characteristics of the area. As advantages in the dry season, the penetration of sea water in the plots improves the fertility of the soils, decreases the growth of weeds and reduces the oxidation of the soils. In the rainy season, the washing of the salts accumulated in the rice fields by strong rains makes rice growing possible. On the other hand there are disadvantages such as the reduction in yields due to the intrusion of sea water during the high tides of the growing season and the damage caused by the rivers floods. In particular the nursery and transplanted seedlings are washed away by water. Consequently, the current yield levels (1.5 to 2.0 t/ha) cannot be exceeded.

2) Lack of water during the dry season

It practically does not rain during the dry season which lasts approximately six months, and there are almost no other water resources supplying water to the plain. No cultivation would be possible during this season unless there is a new water resource and irrigation facilities are developed. With the above mentioned considerations, two annual rice harvests are practically impossible and the productivity of the soils is to remain low.

3) Low level of agricultural techniques and lack of information

The rice cultivation practiced in the plain of Sonfonia applies some special and traditional techniques, but the technical level of the farmers is not homogeneous and is still insufficient. The same can be said regarding vegetable cultivation; drawing keen demands of technical training. The extension activities carried out by the Government having a certain limit, the access of the farmers to agricultural technical information is extremely restricted. As explained in section 3.1.2, (Socio-economical Situation), the percentage of agricultural farmers in the Study Area is only 30 %. Among them only 62% are engaged in agricultural sector as their main economic activity. Therefore, the plain of Sonfonia not being an area with purely agricultural vocation, it would be difficult to draw the attention of NGO to intervene in the area.

4) Proliferation of weeds

In the upstream stretch of the plain, weeds easily invade the field plots because the influence of the tide does not reach the area. Farmers carry out weeding at the same time as plowing is taking

place during the land preparation of the large plots. Nevertheless, they are not so much accustomed to weeding during the nursery period and after transplantation. As a result, weeds invade the plots; compromising the growth of rice as well as the yields.

5) Lack of developed agricultural infrastructure

In the plain, the insufficiency of facilities such as dikes and drainage canals make the management of the damage due to the intrusion of sea water or the floods of the rivers not easily controllable. Moreover, the farm roads necessary for the transport of the agricultural tools or harvests are not developed, which makes difficult the timely execution of the agricultural work and the fast routing of harvests. Moreover, the water resources necessary to the promotion of agriculture during the dry season are limited.

6) Post-harvest losses

In the plain of Sonfonia, the agricultural implements are insufficient. The volume of lost rice grains recorded is too important and non negligible during transportation prior to threshing. These post-harvest losses are compounded by the damages caused by the rats or the rot.

7) Deterioration of the environment through the cutting down of the mangrove

Mangrove rice growing is carried out in the plain taking advantage of the mangrove forests. However, the area of these forests is being reduced by the cuts for firewood (combustible for households, salt making, brick making, etc) and by the clearing; gradually limiting the possibilities of rice growing. In addition, the erosion of the sites where the forest is destroyed combines with these effects and contributes to the abandonment of the field plots; raising the problem of progressive exhaustion of the natural resources available in the future.

(2) Lack of Labor Force

In the plain of Sonfonia, most of the agricultural work is carried out manually, but often this cannot be completed in time by the members of the agricultural household alone. Many farmers thus resort to paid labor. However the number of workers that can be entrusted the task being limited, there are plots that are left abandoned without being cultivated.

(3) Absence of Input Supplying System

To increase yields, it is necessary to invest in inputs such as improved seeds or fertilizer etc, whereas these inputs are generally insufficient in Guinea and are available only at some certain shops in Conakry, and they are always in lack of goods. Only KR2 of Japanese Government is the main source of fertilizer, in addition there is few circulation of fertilizer through private companies. The reason is considered to be that the Government of Guinea has not been aggressive in preparing marketing system, therefore, farmers have not had a chance to use agricultural inputs and the circulation through private companies has been stagnated.

(4) Insufficiency of Agricultural Support Service

The agricultural support service for the plain of Sonfonia is very limited; only six extension officers are assigned for 1,000 farmers; a great number of farmers cannot profit from it. The actions carried out by the DCDRE of Ratoma have not so far given significant results because of the insufficiency of the means. In addition, the micro-credits to support the purchase of agricultural inputs do not exist in the plain.

(5) Lack of Sensitization of the Rural Community

In Guinea, under the decentralization policy, the CRD (the Development Rural Community), a kind of rural organization representing the various farmers' organizations exists in each Sub-prefecture of the country except for the Conakry special Region and plays an important part in the coordination, reception and execution of development projects. The majority of the donors give active support to the CRD. However, as there is no organization equivalent to the CRD in the plain of Sonfonia, aid from donors has been very limited. Once there was a test of cultivation of NERICA carried out by Sasagawa Global 2000; vegetable cultivation using groundwater was also carried out by FAO for LAMKOYA farmers' group. However, all of them did not bring any good results. Recently there is only one active project funded by the Austrian Government related to compost making from garbage. Under such conditions, villagers can not show initiatives and willingness for development of their communities.

(6) Traditional Land Tenure System

The customary land tenure system is one of the restrictive factors of the durable agricultural development in the plain. The typical characteristics of such traditional landownership is that it does not depend on regulation and written contract but oral one (especially in the cases of rent or lease). Among the development projects of the past, one can observe many cases of failure due to the conflicts in relation to the value added to the property/land use after the development. As such kind of problems cannot be technically solved, it would be necessary that suitable measures be taken by the Government to find social solutions.

(7) Lack of Agricultural Statistics

The plain of Sonfonia belongs to the Conakry Special Region. According to the National Agricultural Statistics Department (SNSA) of the Ministry for Agriculture and Livestock, as the said region is not classified in the category of rural area, it was not the subject of an agricultural statistical study; consequently, the agricultural data of the plain are not available. The DCDRE of Ratoma Commune, which is a local office of the Ministry for Agriculture and Livestock, does not have any documentation on agricultural production or land use, etc

3.5.3 Development Potentials

(1) Zone of Mangrove Forest Bringing Various Benefits (Rice Growing, Fishery, etc)

The forest of mangroves and its surroundings bring many benefits to the ecosystem including the

human beings. In traditional mangrove rice cultivation, the plant receives plenty of benefits from mangrove soil and the yields can reach up to two to three ton/ha without using fertilizer after introducing sea water with fertile organic matters and minerals. Mangrove rice has the highest position in domestic rice due to its good taste. Mangrove forest also has other roles such as protection of soil, supply of marine resources (crabs, shrimps, etc.) and so forth. To ensure durability, it is of primary importance to promote the present agricultural activities without destroying the ecosystem of the zone of mangroves.

(2) Vast Area of Plains

The plain of Sonfonia are marshy lands where the flat grounds are spread out over a large area. Annual precipitations in the plain, ranging from 3,500 to 4,000 mm, make rain water sufficient to sustain rice growing in the rainy season. However, measures for the dry season are difficult to consider, except for the small possibility of using the dead water of Sonfonia reservoir, because almost no precipitation is recorded during the dry season, and the development of reservoirs in the basin upstream of the tributary rivers is difficult to implement because of the residential development observed in the area. If there were a general social consensus on resolving the land problem, obtaining the budget for land preparation, arrangement of agricultural inputs supply system, etc. and the hydraulic conditions and those of drainage as well as the influences exerted by the damage caused by salt were improved, yields would increase.

(3) Broad Acceptance of Local Rice by the Population and the Importance Attached to its Policy of Promotion

Currently in the plain of Sonfonia, rice is cultivated just for subsistence because no reserve is kept for sale. If the base of production is improved and production increases, and when the factors relating to the consumption of rice become favorable to the producers, one could expect important profits.

(4) Women Having a Strong Will to Take Part in the Production Groups

Since the women in this area are responsible for the whole housework, they have strong desire for increasing their living standards. Consequently, though women are busy at the domestic tasks and their children, they have a strong will to take part in the production groups. This presents an investment in labor for the production and also a contribution in the social activities undertaken inside the village.

(5) Proximity of the Capital Conakry

The proximity of the Capital Conakry is advantageous for the sale of products and the supply of materials and equipment. Moreover, the progressive transformation of part of the zone concerned with the Study into dormitory town for the Capital, offers market opportunity to the surplus rice. As for vegetable cultivation, even though natural condition and cultivation condition of the area are not always blessed, it has some possibility of expansion, at smaller scale due to the mixed living of urban people.