

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 various 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 should be put into practice, which is realizable and durable by examining the contents of the draft Master Plan taking into account the lessons learnt and experiences acquired from the Verification Study.

The process of the Verification Study, the lessons learnt and the items reflected in the Master Plan are mentioned in detail in “Chapter 5: Verification Study”.

4.2 Basic Policy for the Development

The aim of the present development plan (Master Plan) consists in proposing an effective route for an 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, which are conceived so as to be realizable by the Guinean part itself and which can promote the development of the agricultural activities in the plain.

Feasible and durable projects will be formulated taking into account the potentials of development described before and taking advantage of the actual situation of the area. Moreover, the Master Plan is to be 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. As for the measures to attain the above-mentioned, 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.

Moreover, the projects proposed in the Master Plan is to be formulated taking into account the adequate services and facilities allowing the beneficiaries to invest themselves into management and maintenance, and the creation of the consciousness that the projects belong to them. For the creation of such consciousness, the extension of the traditional agricultural techniques with small betterment shall be set in the center of the projects which can be acceptable for many farmers in order to promote the active participation of the farmers and beneficiaries. In addition, it is necessary to involve the transfer of the outcome of the research institutions, 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).

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. Rice is a staple food in Guinea and the mangrove rice is widely appreciated by the nation thanks to its taste compared to other imported or highland rice, and its price is the highest in market, while the promotion of the mangrove rice is valued as an important policy of the country.

The plain of Sonfonia has a wider continuous area with mangrove forest. This area also has the advantage of mangrove soil while introducing sea water with organic materials and minerals, which can bring sustainable production of rice without fertilizer and to be a main mangrove rice production area. Some progressive farmers with advanced technologies produce 3 ton/ha of rice without fertilizer. In the Master Plan, advanced technologies used in the plain are collected and the extension officers and/or farmers groups extend them to farmers with the purpose of increasing the yield to the advanced farmers' level without fertilizer. The advanced technologies mean the rice cultivation technologies making strong young plants and tufts with wise utilization of the vitality of mangrove rice, which are against the severe circumstance with sea water intrusion and flood condition.

The mangrove forest protects farmland by preventing erosion of the seashore. At the same time it brings fertile soil, and the sea water introduced to paddy field through the mangrove forest brings more organic materials. The promotion of mangrove rice cannot be achieved without protection of mangrove forest, and it is extremely important to aim at the sustainable agriculture by the promotion of the mangrove rice together with the preservation of the mangrove forest. The mangrove forest also supplies sea resources such as crabs and shrimps, which contribute to the livelihood of farmers in various fields.

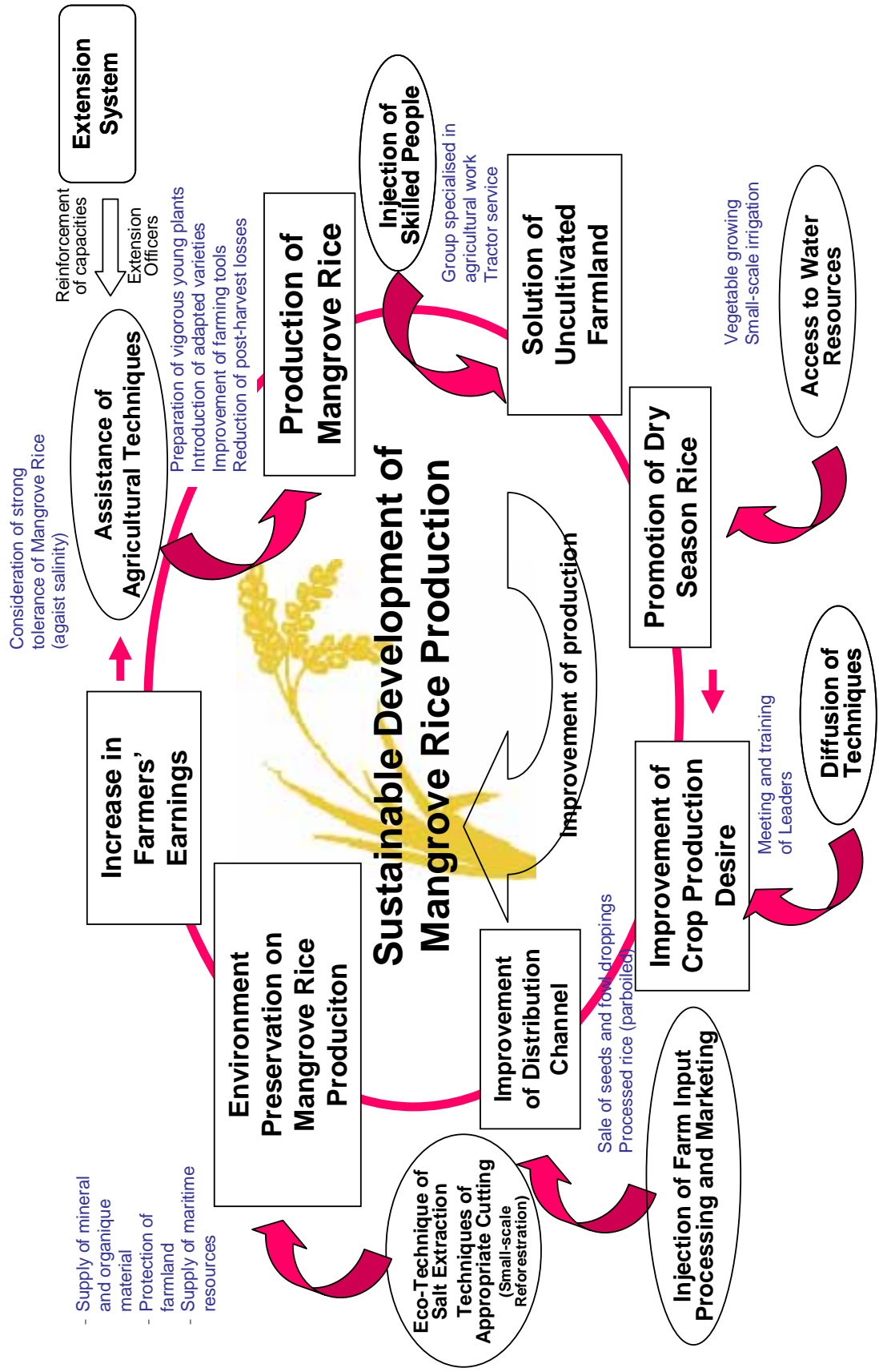
The promotion of mangrove rice stands in the center position of the Master Plan, and in order to realize the Plan, the establishment of a support system for extension services and the development of private enterprises in the area (small agricultural equipment, agricultural tools and distribution system) is 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.

The development of large scale agricultural production infrastructures is indispensable to remove the different constraints indicated in details in the previous chapter, and to increase the produce of the mangrove rice. However, it is difficult to realize this development in the near future, since there is no prospect to get funds, and a lot of time may be needed to solve land problems and the implementation ability of the organization is not fully sufficient. Consequently, as a phased development process, it is necessary to improve the cultivation techniques that are realizable to increase the yields without large scale development. By the realization of this project the mangrove rice is promoted, and the sustainable agricultural development is maintained. Moreover, "Improvement of Living Standard of the Farmers in

the Plain of Sonfonia” is anticipated as the super goal of the Master Plan, by means of the increase in farmers’ earnings which will be realized by the increase in farm produce to be made by the promotion of mangrove rice with the affect of the environmental preservation.

The Government of Guinea with the assistance of other donors has mainly invested in the agricultural production infrastructure projects for the promotion of mangrove rice cultivation. If effective techniques selected in the plain of Sonfonia are utilized in the area where the agricultural production infrastructure project has already been implemented, the promotion of mangrove rice in the whole Guinea will be accelerated. In addition, the plans proposed in the Master Plan such as environmental protection plan, water management training plan, and plan of introduction of tractor service by farmers’ group etc., shall be expanded to the other farming areas since they are all-purpose.

Modele of Agricultural Development in the Plain of Sonfonia «Maritime Guinea»



4.2.2 Sustainability of the Projects

Many integrated rural development projects were undertaken in 1980s, but it is difficult to say that their effects truly improved the social conditions of the farmers. Indeed, the majority of these projects were carried out in the past with the so-called “top down” approach or vertical approach where the administration (or donors) carried out the projects unilaterally by his (their) ideas, and which did not include the elements truly necessary to the beneficiary farmers; making their participation in the projects not significant. The farmers were not consequently aware that the projects were intended to them and had thus not shown a positive attitude for a responsible management of its activities. Indeed, the farmers ceased, in many cases, to take charge of the management of these activities, as soon as the support from the donors ended. For this reason, results that were far from satisfactory were obtained in very many cases, which did not support project sustainability. Based on the lessons learnt from these experiences, 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 showing interest only for the activities and the areas which concern them directly, it is difficult to know with precision, 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, we have introduced the positive elements of the “top down” approach as well as those of the “bottom up” one, and we draw up a durable plan by taking account of the participatory development approach.

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

As shown in the previous chapter, the plain of Sonfonia has potentials as well as various development constraints. It is necessary to transform the current agriculture known as self-sustaining into a sustainable agriculture introducing farming techniques depending on the developing stages. During progress of the stepwise development, there would be a lot of technical problems, namely, control of the sea water intrusion, counter-measures for drainage during flood, and so forth which cannot be solved without infrastructure development, problems of farming techniques, problems of capacity buildings for administration, and so forth. In order to overcome such various constraints, a lot of time and costs would be required. Therefore, the duration of the Master Plan is set for 10 years, and the approach and target values of each stage are to be decided. Then, the realistic development process to achieve the target values shall be given.

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

Study (3 years)

Basic study (1 year)

Identification of the current situation, analysis and study, broad outline of the Master Plan, selection of the sites for the Verification Study, establishment of a proposal for the Verification Study

Experimental period (2 years)

Execution, follow-up and evaluation of the Verification Study, establishment of the Master Plan

Master Plan (10 years)

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

- 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 variety
- 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

While implementing the Master Plan, the impact on the environment and society in Guinea should be reduced and impartiality should be maintained. Since this Plan aims at the sustainable agricultural development, 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 Plan shall be also formulated in such way that its implementation will have more positive environmental and social impact while the negative impact will be eliminated. Some points shall be considered, and the following two items are stressed to be taken into consideration.

(1) Projects Considering Social Aspects (Gender)

In Guinea the policy prohibiting discrimination between the sexes bore fruits under the Administration of Sékou Touré, and the proportion of women who occupy high positions of responsibility is one of the highest among the countries of the West African sub-region. But in the family, the weight of the housework and other heavy tasks weigh on women shoulders.

The women of the Study Area deal not only with the totality of the domestic tasks of the family, but also of the drawing up of water and collection of firewood. These tasks are very varied and play a particularly important part in the family life. In addition, the role of women in agriculture is extremely important. As regards rice growing, the principal cereal in the plain of Sonfonia, the women are charged, except for heavy works such as the clearing of the fields and the construction of dykes, with the

preparation of the nurseries, weeding, winnowing, milling and storage of rice. The vegetable growing is principally done by the women.

During project planning, the following points will be taken into account: one can expect, for example, that because of the proximity of the Sonfonia region to the Capital city and the progression of urbanization, the chances for the women to undertake small distribution activities in the dry season would increase. The milling of the 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 the housework in general. It will be however necessary to not only make the women take an active part in the project, but also to take into account the opinion of the men; this means that a good balance between the men and the women should be considered.

(2) Technical Application Considering Environment Preservation

When elaborating the Master Plan, the following three points should be taken into consideration as regards environmental preservation.

1) Mangrove Forests Preservation

Mangrove forests are classified in “Habitats with important ecological value” as one example of “Illustrative list of sensitive areas” in JICA’s “Guidelines for Environmental and Social Consideration”. The mangrove forests help in protecting the soils against sea erosion and the dykes against the tides. At the same time it brings fertile soil, and the sea water introduced to paddy field through the mangrove forest brings more organic materials making the area an ecologically precious habitat. As a result, preserving these forests would be extremely important to ensure a sustainable development of the mangrove rice. The sustainability of the agricultural production cycle will only depend on the preservation and efficient use of the natural resources, which are not inexhaustible. To this effect, it would be necessary to promote an appropriate development; putting 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 rice fields abandonment.

2) Preservation of Irrigation Water Quality

With the progression of urbanization in the Study Area, the pollution of irrigation water is to be worried. This problem should be properly dealt with in involving the populations of the neighboring areas and planning for the future.

As regards the quality of the water presently used for agriculture, the analyses have shown that there is no problem related to pollution, partly because a lot of rainfall is available. Hence, as water quality preservation is not an immediate problem, it is not considered in this Master Plan.

3) Appropriate Water Management

The hydrological environment of the area concerned with the study shows differences between the rainy and dry seasons due to the influences of sea water intrusions and rain water runoff from the

upstream areas. In addition, farmers of the area concerned carry out a traditional management of the water; using this natural hydrological environment. If the development of drainage and irrigation facilities and of dikes was to destroy the traditional system of water management, the influence on river water and groundwater levels, the change in the scale of sea water intrusion and size of flood damages are to be expected. As a result, the influence on the ecosystem would be equally important; necessitating, hence, the elaboration of a development plan which would enable not to disturb the traditional system of water management.

The duration of the Master Plan is set for 10 years, and the situations of environment and society will vary every moment during the duration. Therefore, the Government of Guinea shall review the Plan periodically at appropriate time and monitor the impact on the environment and society brought about through its implementation.

4.2.5 Consideration on Traditional Mangrove Rice Growing

Chapter 3 of the report deals with traditional mangrove rice growing in Sonfonia where yields of 2 to 3 ton/ha can be obtained without any fertilizer application in some good sites; taking advantage of the sea water rich in organic and mineral matter. One can also cite the beneficial action of sea water on weeds.

Consequently, the aforementioned program aims to increase production through the introduction of improved techniques considering the traditional mangrove rice growing without the facilities of agricultural production infrastructure.

4.2.6 High Regard on the Training of Human Resources

In order to support the modernization of agriculture in the plain of Sonfonia where a traditional agriculture is currently practiced, various forms of external contributions are essential. These contributions are essential for the introduction and the practical application of various kinds of knowledge and techniques for the community of the plain of Sonfonia. They include services of the local government, the development results from research institute, the sophisticated techniques having been adopted by the farmers of the advanced areas, the information (or the companies) dealing with the supply and repairs of equipment and materials. They include, among other things, the improved agricultural tools and small machines, the capacities of establishing and facilitating farmers' organizations. Civil servants, in particular extension officers, who play a part in the linkage between these external contributions and the community thus 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.

Two types of programs exist to promote the modernization of agriculture. The first type stresses the individual activities and the second the groups' activities. For example, the program for the improved

cropping techniques will mainly involve individual capacities, whereas the program for water management; using the facilities of irrigation/drainage, requires activities necessarily carried out by the groups. Also, the program concerning the purchase of materials necessary for production or the sale of harvests to the market will function better with the groups than with individuals. Based on these considerations, the training of the human resources of the community, which constitute the base of the development, the sensitization and reinforcement of the capacities of the individual farmers as well as of the farmers 'groups which make the rural community, are taken into account.

4.3 Development Policy for the Different Constituents

4.3.1 Farming and Crops

The agricultural development in the Study Area will be based on the strengthening of the main potentials of the plain of Sonfonia; namely, rice growing in the mangrove area, and rice growing and vegetables farming in the fresh water area. Concerning the vegetable farming, notwithstanding the advantageous situation of the area near the capital, several constraints exist on the physical or farming conditions and with respect to the limitation of good soils. Thus, one cannot foresee its great success. However, a small-scale urban vegetable growing for urban customers would be better adapted to the area.

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.

The agricultural development suggested in this Master Plan will be based on a scenario by phase, as indicated in paragraph 4.2. Concerning the farming technique, the process of its development will be conceived in 3 periods: period of demonstration of the techniques to be improved, period of introduction and popularization (extension), and period of autonomy. In this study, a verification study (small pilot projects) will take place at the stage of establishment of the Master Plan, and these pilot projects will be evaluated at the period of demonstration and developed at the period of introduction and popularization.

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 because it is estimated that the duration of the Master Plan is only 10 years. It is planned to introduce machines at the beginning by taking account of the conditions of the Study Area such as the difficulty in introducing plowing by animals, the promotion of the importation of tractors by the Guinean government and the great need for machines by the farmers. In addition, with regard to the

rice mills, their development will be promoted through private vitality because their introduction into the plain is already made on this basis.

The mechanization of agriculture makes it possible to be free from the heavy work, to carry out the activities at the appropriate time, to improve the effectiveness of the activities, to extend acreage etc, to improve the productivity and to increase the income of the farmers. In the event of the introduction of mechanization into the Study Area, and in particular the tractor service for plowing, the surface to be ploughed will increase and work will be carried out conveniently; and all that could lead to an increase in yields considering the current shortage of manpower. And if the labor surplus created by the mechanization could allow the development of the currently not cultivated surfaces, this would increase significantly the production of the area. There is also the possibility of decreasing the expenditure of the farmers because of the reduction of the expenses of labor and the possibility of assigning the surplus of this labor to new activities of production. In fact, it will be necessary to adequately study the introduction of the tractor service which has the possibilities of improving the productivity and increasing the income of the farmers in the area. In Sonfonia lowland, road network is not well prepared; therefore, hand-tractors may be the major mechanization system for working inside the paddy fields. The service cost will be set in such a way that it will also include the renewal cost of the machines. It is to be noted that the results of the Verification Study have shown that this cost is almost as same as the manual cost. However, tractor services have some other merits like saving time of price negotiation, shortening working days and need no extra cost on serving meal to laborers, therefore, it may be better than the manual labors from economical viewpoint.

With 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. One will consider their introduction 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 would 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 could guarantee a sustainable management. At the same time, a system ensuring the supply of spare parts must be established through governmental support.

The management of the machines by private farmers would be technically and economically difficult since experience has shown that such a management is destined to failure considering the conflicts it generated in the past. Consequently, one will aim to the management of the machines by the farmers' groups by training these groups to the task in the first phase of promotion of mechanization.

(3) Basic Policy for the Mechanization:

- The development of mechanization is closely related to training, agricultural techniques and development of farm roads. A mechanization adapted to these elements is necessary. If one considers the current situation in the area concerned with the study, one should not at the

beginning introduce big machines, but small ones based on the areas developed by the small number of farmers' groups, then to progress little by little. From these considerations, the farmers groups must not only use the machine in the group, but also gradually extend its activities, to collect management and maintenance costs and to provide paid service to other farmers for the local development.

- The Guinean government will ensure the initial investment for the introduction of agricultural machinery after setting the price for the service and clarifying the profitability related matter. In the event of mechanization, one would suppose a common use by the groups of farmers and study the problems of turn in the groups. The objective would be that the farmers' groups themselves should take charge of the maintenance.
- In this Master Plan, the intervention of the Guinean government in the agricultural mechanization is not directly related to the tractor service itself, but to mainly secure the necessary support to farmers' groups through the supply of a training place and technical support, etc.
- At the initial stage, the agricultural mechanization will involve a small number of farmers' groups to measure the conditions and effects of the use. If the contribution in the increase in farmers' income and agricultural area is confirmed, the number of groups will be gradually increased.

4.3.3 Post-harvest/Distribution

Acquiring agricultural inputs such as good seeds, fertilizers, etc. is very difficult in the plain of Sonfonia, which constitutes a development constraint. Many farmers have problems in getting good rice seeds though a few advanced farmers living near the seaside are selling them. Unfortunately, they cannot be easily reached because of the access, and they are only a few dealers. Vegetable seeds are also difficult to get in spite of the high demands in the area. However, there is a certain number of poultry farms where one can get droppings. The poultry farmers do not sell them to individuals, but to middle men who need big quantities which they can sell back to vegetable growers in Central Guinea.

Since there is an important demand for rice seeds and fertilizers, the improvement in the distribution will have to be programmed for the farmers 'groups which will have to ensure a central role. For that, some assistance will be necessary 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. Rice seeds shall be procured by progressive farmers near the sea coast. During the dry season, seeds can be procured by the "Pilot" farmers' group, which carried out the small scale irrigation in the Verification Study and by "Limaniya" that produces and sells rice seeds in the Study Area. Vegetable seeds shall be procured by an agricultural center in Kindia or by SPIA (an agricultural material shop) in Conakry. Chicken drops shall be procured by poultry farmers in Sonfonia and Kobaya. As the farmers' group "La Paix" carried out procurement and sale of rice and vegetable seeds and chicken drops even in the verification period, it is expected to grow as a group contributing to a more stable farming through the procurement and sale of agricultural materials.

In addition, it is expected a certain increase in the number of farmers selling rice seeds through the improved cropping conditions foreseen in the Master Plan. With regard to the 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 facilities.

4.3.4 Human Resources Training

From the viewpoint of sustainability and projects development adopted within the framework of the Master Plan, it would be important to guarantee the availability of the people who will be in charge of the execution. The projects will be supervised in principle by the human resources currently in place; therefore a program strengthening their capacities will be greatly necessary. The role played by the personnel of the central and local administrative departments, especially by the extension officers, is very important during projects implementation. In addition the key to success in the development of the projects will depend on the success of the sensitization of the rural Community, which consists of individual farmers and farmers' groups that will take charge of executing the projects.

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 themselves the projects; 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. Instead of going from one stage to the other, these stages will have to be considered in parallel so as to combine the experiences gained in each of these levels.

4.3.5 Agricultural Production Infrastructure Development/Water Management

The Study noted that a bad drainage prevents the development of a rice growing dependant on rains, which is the principal form of agriculture in this area. To solve this drainage problem completely, the establishment of appropriate basic infrastructure would be necessary. In order to conceive such production infrastructure within the framework of this project, it would be necessary to take into account the scale of technical and financial measures which can be dealt with by the Guinean side.

Consequently, one will adopt projects on a small scale for this Master Plan. However, it will be indicated alternative basic production infrastructure considered on a large scale as wished by the Guinean government at the end of this chapter.

By taking into account not only the current situation relating to rain-fed rice growing and the practice of irrigated agriculture in the Study Area, but also the socio-economic development and natural environment constraints, the fundamental policy relating to the basic production infrastructure aimed by this project can be stated as follows.

- In the plain of Sonfonia, a rain-fed agriculture is practiced during the rain season. In the plan also, a rain-fed rice growing will be carried out during the rain season.
- During the dry season, irrigated rice growing using residual waters of the rivers is practised on a small scale. Since the water resources for irrigated rice growing in the plain of Sonfonia are, in addition to these residual waters, only the dead water of the Sonfonia reservoir, which was affected by the construction of the road, and considering that a new development of the water resources proves to be impossible, this type of agriculture remains constrained. Consequently, the irrigation development will be carried out taking into account the currently available water resources in the dry season.
- With regard to the irrigation facilities, modern equipment requiring complicated management and maintenance costs, and expensive irrigation material will not be used. Hence, for the facilities to bring water to the plots, a structure of gravity flow by siphon, which is economical will be adopted.
- During the dry season, the irrigated vegetable growing using residual waters of the rivers is practiced along the banks of these rivers on a small scale. Another small scale vegetable growing; using watering from rudimentary wells located in the residential area on top of the plain, is also practiced. In both cases farmers use watering cans. With regard to the measures for water economy, the method of surface irrigation (method of irrigation between the bunds, method of flood irrigation) cannot be recommended. Consequently, the currently practiced methods of irrigation, (the use of watering can), will be used.
- Since it is impossible for farmers to take completely the initial investments for the basic infrastructure, they will be required to take care of only a part of these investments to give them a sense of responsibility that the facilities belong to them. Based on these considerations, farmers will themselves carry out the management and maintenance of the facilities, and the plan will thus be significant in term of durability. Judging from the result of the Verification Study, farmers can pay a share of one percentage of total project cost. Therefore, farmers' share shall be set at this amount.
- As mentioned above, farmers themselves will manage and maintain the facilities. The facilities should be collectively maintained through an organization established for them. The creation of such a farmers' organization is particularly important; which will be the premise of the construction of the facilities.

4.3.6 Environment

(1) Direction of Development

In the Study Area, environment preservation concerns particularly the mangrove forest. In Guinea mangroves are classified by the forest Code as species for which cutting is forbidden. However, in spite of that, 10,948 hectares of mangroves have disappeared between the year 1985 and 2000. According to a survey carried out in the present Study, 87 hectares of Lambanyi littoral were destroyed by the erosion

between 1988 and 2004. It is considered that that is due to the excessive cutting of the mangrove.

The mangroves of the Study Area serve to protect the plain of Sonfonia against waves as if they were being some kind of natural dykes, and to render the plain appropriate for the cultivation by bringing nutritive elements to the grounds.

If the mangroves clearing or cutting for use as firewood, continues as it is at this moment, their surface will not stop decreasing to disappear completely. If they were being destroyed this way, the damages caused by the free intrusion of seawater or by the soil losses would be enormous.

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.

The environmental preservation being 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.

(2) Basic Policy for the Environmental Preservation

- Mangroves are classified by the forest Code as species for which cutting is forbidden. The populations must be informed. Then the idea of a reasonable use so as to perpetuate the mangroves forest is presented and is accompanied by sensitization activities or appropriate technique of mangrove cutting.
- The mangrove cutting is practiced by the populations of the Study Area to procure firewood or for the clearing, and by the populations of the surrounding areas for construction material and combustible for making salt and bricks. The sensitization is also extended to them.
- The populations of the Sonfonia Plains are not or are fairly aware of the environment preservation of the mangroves. Consequently, practical activities such as carrying out appropriate techniques for mangrove cutting etc. which favour the environmental improvement are taken into account to better grasp the importance of environmental preservation.
- In order to avoid that the sensitization be performed unilaterally in the project, demonstrative and participative activities are scheduled.
- A team is formed, which is essentially constituted of the DCDRE sections, diffusion or extension staff. The team carries out sensitization campaigns in places like meeting rooms, elementary schools etc., in each division.
- Sensitization actions carried out by groups are more efficient than individual actions. It is asked to existing groups in each division to intervene on behalf of the project to better implicate the populations in the project's actions.
- Guidance is given to the population on the Training Project for Appropriate Techniques on Mangrove Firewood Cutting and Introduction of Salt Extraction Improved Technique so that they will have a clear understanding of the long term benefits that would give them incentives for future

environmental preservation .

4.4 Framework of the Master Plan

4.4.1 Development Approach

Taking into account the constraints on development identified through the field reconnaissance, socio-economical studies, interview surveys with the people concerned, workshops, the Verification Study (the Verification), etc., a problem tree has been elaborated (Ref. Figure 4.4.1). In accordance with this tree, the development of a sustainable agriculture in the Study Area was found to be difficult, given that the irrigated agriculture has not been developed, the productivity of rain-fed cultivation is weak due to the low level of agricultural technique, the non-developed agricultural infrastructure, the deteriorated environment by abusive cutting of the mangroves, etc. In addition, the necessity to create human resources of extension officers and farmers has been found. Consequently, taking into account the potentials for development highlighted by the above-mentioned studies, the following development approaches have been formulated. They specify the needs to be fulfilled by the development and show at the same time the policies to follow in order to solve the constraints.

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

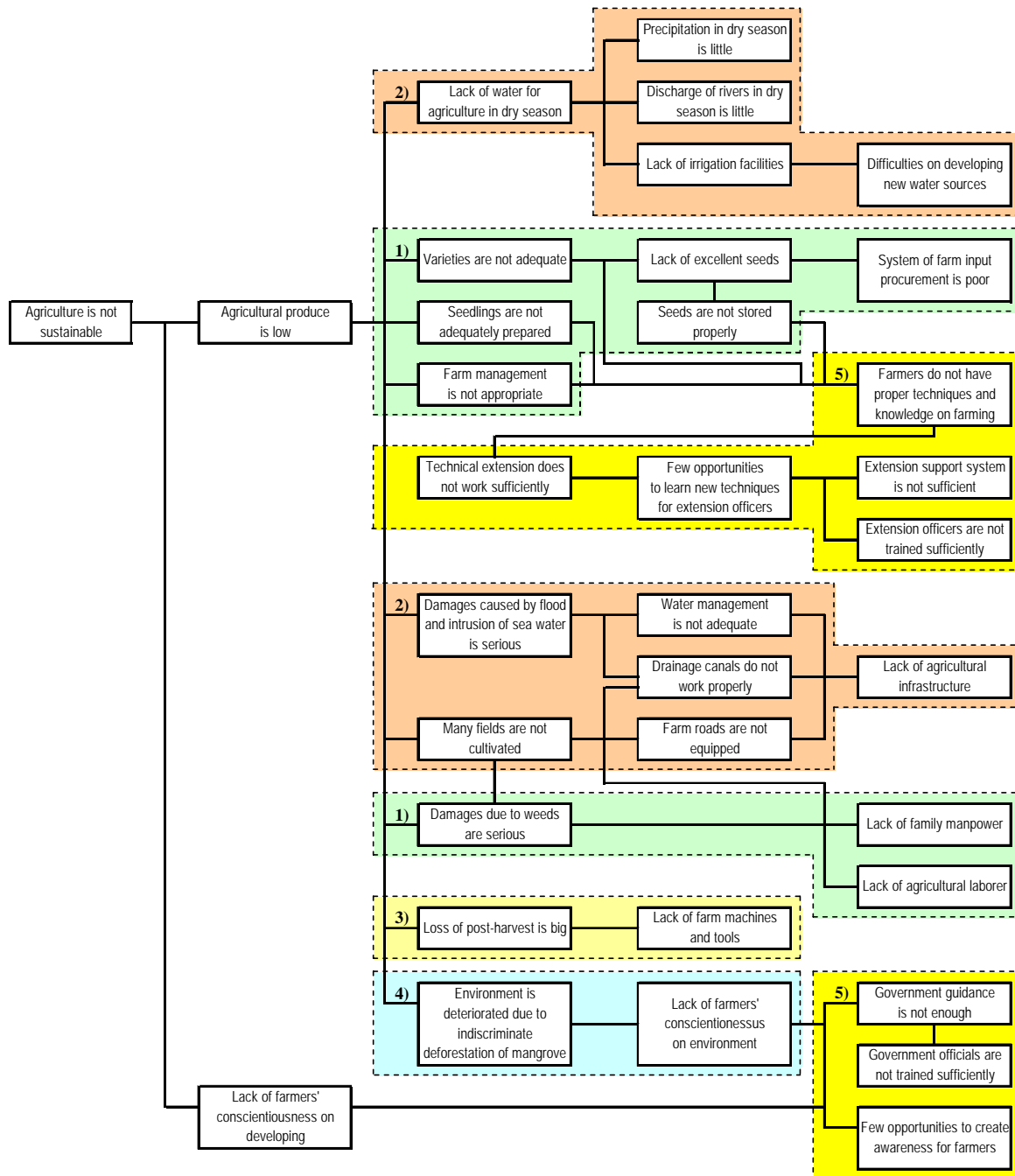
(Sensitization on the environment preservation, etc.)

5) Approach: Human Resources Training

(Capacity building of administrative and extension officers, training of leaders of agricultural groups, sensitization of the rural community, etc.)

These approaches are in conformity not only with the national priority program constituted by actions like the increase of the rice production, the promotion of agricultural produce commercialization, the introduction of improved seeds, the diversification of agricultural activities, the improvement of the agricultural infrastructure and the strengthening of local administrative capacities, but also with the needs of the farmers of the Study Area, such as the development of the production base, the access to agricultural tools, the mastering of agricultural techniques, the agricultural tools and the training by

extension officers, etc.



Development Approach

- 1) Approach: Improvement of Agricultural Farming and Cultivation
- 2) Approach: Agricultural Production Infrastructure Development/Water Management
- 3) Approach: Improvement of Post-harvest
- 4) Approach: Environment Preservation
- 5) Approach: Human Resources Training

Figure 4.4.1 Constraints and Approaches of Agricultural Development for the Plain of Sonfonia

4.4.2 Selection of the Programs

The programs hereunder presented have been established by the combination of the “approaches” between them. Otherwise, in the program entitled “III. Program for Agricultural Production Infrastructure Development/Water Management”, the large scale infrastructure development program has been established as an alternative and it is indicated at the end of this chapter, and small scale programs are proposed here.

Most of the projects are not only limited to the plain pf Sonfonia, but are applicable to other regions. Consequently, each project has been formulated as it can be carried out in other regions of the country.

I. Program for Agricultural Farming and Crop Improvement

I-1 Project for Improvement of Cropping Techniques

I-2 Project for Post-harvest/Distribution

This program has been established by the combination of the three approaches: 1) Approach: Improvement of Agricultural Farming and Cultivation; 3) Approach: Improvement of Post-harvest; 5) Approach: Human Resource Training, taking into account the improvement of agriculture of the plain of Sonfonia on the technical and management viewpoint.

It is composed of components which bring a technical support to the target farmers such as; for the rice-growing: improvement of seedlings, diffusion of adapted varieties, etc.; for the vegetable growing: promotion of vegetable cultivation in dry season; for the post-harvest: improvement of agricultural tools, improvement of distribution channel by farmers’ group, etc.

II. Human Resources Training Program

II-1 Project of capacity strengthening for administrative and extension services personnel

II-2 Project of capacity strengthening for rural community

The program entitled “II. Human Resources Training Program” is proposed in correlation with the approach entitled 5) Approach: Human Resources Training. It comprises the two projects above which are proposed to create the management capacity of the staff in charge of their execution. Through this program, the reinforcement of human resources needed for other programs is executed and the capacity to manage other projects is assured.

III. Program for Agricultural Production Infrastructure Development/Water Management

The approach entitled 2) Approach: Agricultural Production Infrastructure Development/Water Management, is in correlation with the program “III. Program for Agricultural Production Infrastructure Development/Water Management”. The execution of this program contributes to realization of the human resources training.

IV. Environment Preservation Program

Approach 4) Approach: Environment Preservation is in correlation with program “IV. Environment Preservation Program”. The execution of this program contributes to realization of the human resources training.

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

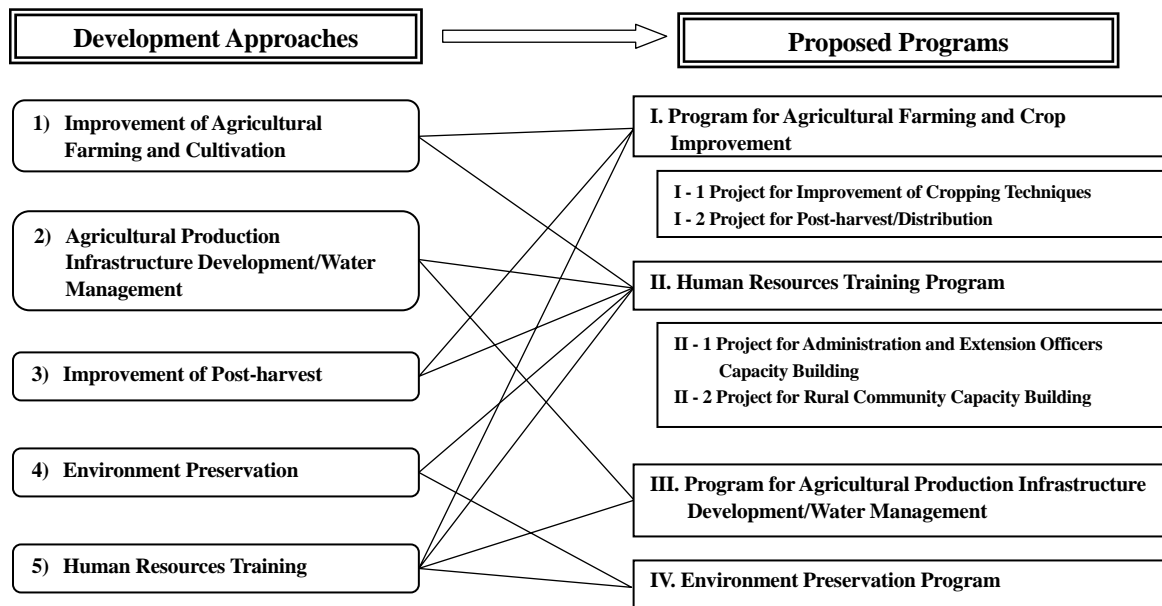


Figure 4.4.2 Correlation between Approaches and Proposed Programs

In other words, the three programs “I. Program for Agricultural Farming and Crop Improvement”, “III. Program for Agricultural Production Infrastructure Development/Water Management” and “IV. Environment Preservation Program” contribute to the realization of the main objective of the Master Plan: the promotion of agricultural activities in the plain of Sonfonia. With the “II. Human Resources Training Program”, the availability of the staffs that have the overall execution capacities as well as the sustainability of the project are ensured. In addition, the execution of the programs I, III, and IV significantly contribute to the realization of program II.

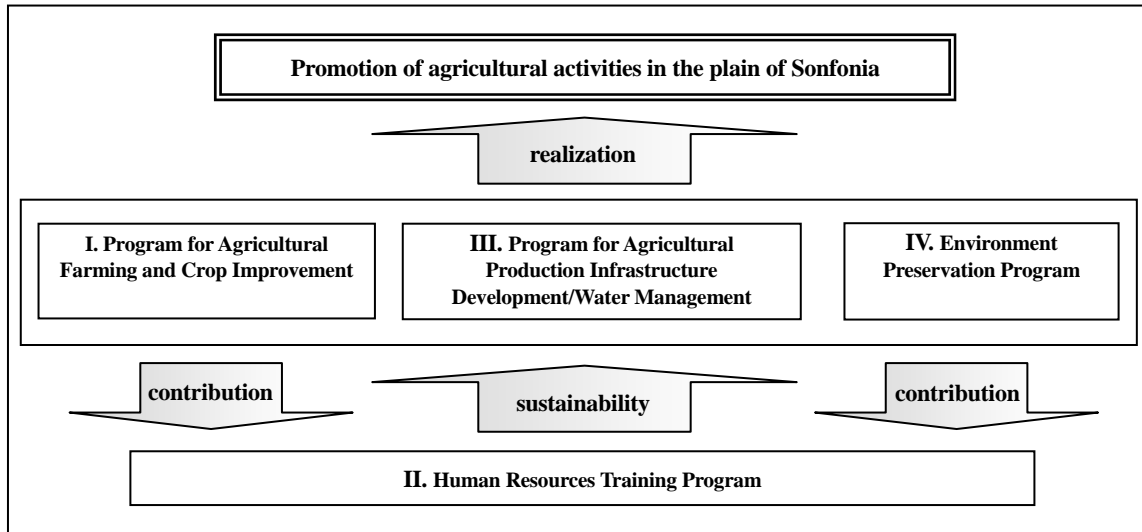


Figure 4.4.3 Correlations of Programs within Framework of the Master Plan

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. Their summary is indicated in the following table.

Table 4.5.1 Summary of the Proposed Projects

Program	Content
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, the diffusion of these techniques to farmers
I-1-2 Diffusion of Rice Adapted Varieties	augmentation of the rice yield by diffusing the adapted varieties in the area
I-1-3 Promotion of Dry Season Vegetables Growing	the 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	the service of agricultural works by specialized groups
I-1-5 Introduction of Tractor Service by Farmers' Group	the promotion of agricultural mechanization by introduction of the tractor service
I - 2 Project for Post-harvest/Distribution	
I-2-1 Improvement of Agricultural Tools	the manufacture 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	the strengthening of the administrative service operation capacities, like the establishment of plan, the 'acquisition of budgets, execution of the established plan, the maintenance, the follow up and evaluation, etc.
II - 2 Project for Rural Community Capacity Building	
II-2-1 Group Leaders Training/Organization of Meetings	the training of leaders that 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 the water evacuation, the agricultural roads, the dykes refilling, the irrigation, and the water management, etc.

The Master Plan contains the human resources training programs assisting all the other programs of the Plan. In other words, without the human resources training, no project can be managed and continued, therefore it is an important element for the project. The target persons by the training are the farmers, the extension officers and the government officials. In the course of the Verification Study, the Team has been trying to strengthen the human resources thorough OJT. The techniques and experiences acquired in

the Study will be useful to carry out the Master Plan by the government of Guinea.

4.5.2 I. Program for Agricultural Farming and Crop Improvement

I-1 Project for Improvement of Cropping Techniques.

The agricultural farms in the plain of Sonfonia are mainly the mangrove rice and the rain fed rice farms. Small scale vegetable cultivation is also practiced in the surroundings of backyards. The improvement of farming techniques taking into account the current situation and the constraints in the plain of Sonfonia is important to target the realizable and sustainable agricultural development in the plain in the future.

Regarding agricultural mechanization, since the introduction of agricultural machineries to each phase of the agricultural work being difficult in the immediate future, many works are carried out manually.

This program includes the following components, and the details of which are presented in the table.

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

Rice cultivation in the plain of Sonfonia, where there is lack of agricultural infrastructures is always threatened directly by the floods generated from strong rains. The undeveloped rice farms as those in the plain require the improvement of the local cropping techniques against the damages to the seedlings and transplanted rice. Traditional rice growing is practiced in the plain, and differences in the agricultural technical levels are observed among the farmers. However the technical levels are not high as a whole and these techniques have many points to improve. In this situation, there are advanced farmers living in the plain who have excellent techniques which allow them a high yield. These advanced techniques coincide with those recommended by research data or by the didactic manuals. Mastered advanced techniques are found consequently in the farming practice. That is to say that the advanced farmer knowing the conditions of his plot, his own economic conditions and the workforce, can then choose the techniques adapted to his conditions. Such techniques can be called “durable techniques” in the plain of Sonfonia.

The objective of this component is to make the collection and dissemination of these advanced techniques and the means of problems resolution by the extension officers, and that generates an unquestionable development of the plain. The behavior of the advanced farmers plays a very important role in the improvement and the extension of the techniques. More advanced farmers are trained by adopting the durable techniques. In addition, as indicated above, the rice farms of the plain of Sonfonia are not developed and most of them are submerged during rice growing because of the floods. The farmers have difficulty of accesses to their plots, and it is noted that the farmers almost do not work after the transplanting until the harvest. Consequently, the techniques to be improved for the development of the seedlings and the transplanting which are made at the beginning of the cultivation are important factors, because they allow an increase in yield. Therefore, the improved techniques to be introduced are

targeted.

During the Verification, the effectiveness of a part of the advanced techniques basis was examined, and what proved to be effective was presented in the seminars in order to be diffused to the other farmers. The selection of seeds using salted water, the density of the seedbed, the age of the seedling to be transplanted, the number of seedlings per tuft, etc were tested there. 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 the incubation of the good seeds, the management of deep water against the weeds, etc. The objective of the component in the Master Plan would be to make the collection and the diffusion of these advanced techniques and the improved techniques through the extension officers.

The table below shows the useful techniques which were verified and whose effectiveness was agreed upon in the Verification. The manuals for these techniques were completed, and their diffusions are carried out through the execution of the Master Plan. In addition, because these techniques did not provide an additional value, that contributes to the farmers who do not have farm ownership.

Table 4.5.2 Verified Useful Techniques

Technique of the nursery	Background	Method
① Selection of good seeds (entire plain)	Winnowing is a traditional method selecting seeds, the use of which does not allow the elimination of immature and unhealthy grains. According to the surveys, 70% of the farmers proceed to the germination with the grains from the bag, where selection has not been done with this traditional method. With the selected seeds it is possible to prepare uniform seedlings, and this will bring success in achieving good yield.	<ul style="list-style-type: none"> ① Put 30 liter water in the bucket, and check the density with an egg (raw) which is immersed in the bucket, this indicates a density of 1.0. ② Add 6.6 kg (220 g/l) salt and stir up until it is completely dissolve. ③ Return the egg in the bucket to confirm the density of the salted water, this time the egg will float and will show a surface like a coin. ④ Put the seeds in the salted water and remove the floating ones. The floating seeds are the immature and unhealthy grains. ⑤ The seeds which remain at the bottom are the good ones. Remove the water properly. (the incubation method is to be carried out together with this method)
② Germination (entire plain)	The germination of seeds generally carried out in the Study Area. This zone does not have a risk of drought because the rains are abundant.	<ul style="list-style-type: none"> ① Dip the seeds in the water for 24 h, (if the selection of seeds has not been made by the salt, the empty seeds floating in the water shall be removed. ② Remove the seeds from the water and sprinkle for 2 to 3 days, the growth will be progressive with 3 to 5 mm of roots. <p>If the sowing is performed on a dry land surface, it is not advised to proceed to the germination because the climatic conditions can change drastically and present risks for the nursery.</p>
③ Improved nursery (downstream)	During the period of nursery, the ground is flooded by rains; therefore it is difficult to cultivate good seedlings. Especially in the plots located at the downstream, the nurseries are submerged and the cultivable spaces are very limited. Nevertheless the nurseries prepared in the plots have remarkable advantages, the farmers proceed to the seedbed several times even in at the time of floods damage. It is necessary to prepare the improved nurseries which are not submerged.	<ul style="list-style-type: none"> ① Choice of the surface of nursery, by a visit to the field; consideration of the places by avoiding the low surfaces and the water currents way. The surface of a nursery represents 3% of that of the large plot. ② Considering the maximum water film through the interview survey of the farmers. (In the Verification the height was 45 cm) ③ The seedlings can grow up to 15 cm during the 2 weeks after sowing and before the period of maximum depth of water. Consequently, if the height of the nursery bed is 40 cm, the seedlings could survive the flood. ④ The unit of a nursery bed should be 1 m x 5 m or 1 m x 10 m to ease the work and level the surface well.

Technique of transplanting	Background	Method
④ Density of the seedlings on the nursery bed (entire plain)	The farmers practice the seedling in various ways. With the Verification, according to techniques followed by the extension officers, the density of sowing varies between 0.77 to 2.2 kg/10 m ² . The density of seedling is an important element for obtaining robust seedlings. The demonstration of Kobaya succeeded with a density of 1 kg/10 m ² , these robust seedlings make it possible to save 1/3 rd of grain in the nursery from what the farmer used to consume in seedling.	The goblet of 1 liter (1ℓ) capacity which is available in the zone can be used to prepare 500 g of seeds by the method of incubation. This goblet is also used to adjust the density. ① After preparing a nursery bed of 1 m x 5 m or 1 m x 10 m, one can sow 1 to 2 goblets of seeds according to surfaces. ② The seedlings should be covered with a little ground. The leaves grow 3 to 7 days, and it is advisable to get a supervisor watch after them at the beginning of the growth.
⑤ lifting (entire plain)	The farmers of Sonfonia proceed to transplanting after 3 to 5 days of the lifting in particular for the nurseries prepared outside the transplanted plot. The lifted seedlings gathered in the transplanted plot and left for drying as the method appears to have better resumption. But the team observed that the seedlings transplanted just after lifting have good resumption compared to the others.	After the lifting of the seedlings, it is preceded to transplanting on the same day. There are problems on the lack of workforce, but the seedlings have better resumption if it is possible to proceed on the same day.
⑥ The age of the transplanted seedlings (entire plain)	According to the follow-up, 60% farmers transplanted old seedlings, exceeding 55 days old in the downstream zone. If the age of the seedling exceeds more than 30 days, tillering starts in the nursery. Whereas the growth of the seedlings is limited, tillering does not develop such as in the young seedlings.	The age of the transplanted seedling should be 30 to 40 days; this will depend on the variety. These seedlings make the resumption possible after transplanting, they give more productive size.
⑦ Spacing of the seedlings and number of stems per tuft (entire plain)	Numbers of bits in farming practice is 10 to 15 bits per tuft, and the spacing between the farm seedlings is of 15x20 cm. If the density is strong the transplanted seedlings will turn yellow, the productive tillerings will diminish in this case. Spacing together with the transplanting technique improved the yield.	The improved spacing is 25 x 30 cm, the number of bits in the improved technique is 2 to 3 bits per tuft. According to the follow-up result of the Verification, the influence of difference in technique on the number of bits was not found at the level of Yield. But if the numbers of bit augment it is necessary to take enough space between the seedlings. In addition the decrease in the number of bit will also be advantageous as an economy of the seedlings.

I-1-2 Diffusion of Rice Adapted Varieties

The seeds for the rice growing in the plain of Sonfonia are generally produced at home by the farmers themselves. The farmers use seeds from the previous year's harvest. The seeds prepared at home are often mixed with the other varieties; it is difficult to discuss the quality of the seeds. Moreover, the improved varieties recommended by the research centers (Koba Agronomic Research Center, etc.) (cf. [Chapter 3, Table 3.3.11](#)) are relatively limited from the view point of their accessibility and availability to certain groups of farmers who took part in the projects carried out by the international aid organizations, and most of the farmers have difficulties in obtaining these seeds.

The local varieties cultivated by the farmers of the plain, are numerous and the yields are varied. These local varieties are well adapted to the condition of the Mangrove zone. In spite of these varieties being numerous, there is not yet precise information on their characteristics. In accordance with these circumstances, the objective of this component aims at giving the farmers the opportunity to provide seeds by themselves. Therefore, they must master the methods of renewal of the seeds. In this case, an 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 to some extent foreseeable. Consequently the objectives of this component would be 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.

During the Verification, the training on the production of seeds within the objective of the adapted varieties extension was carried out by a group of farmers. In the application of this program, the extension officers visited and investigated the sites of the seed production groups in Kaback which have succeeded the production of the seeds at the level of the farmers themselves in the prefecture of Forecariah, considering the methods and the difficulties. However, since the choice of the plot was made in the backyard and around the settlement considering only the accessibility factor, the nurseries and the transplanted seedlings had big damage caused by flood, and a lot of rice transplanted clumps to be observed were washed away. Moreover, the farmers refilled the seedlings using a wrong method, and several varieties were mixed in the same plot. Consequently, taking into account these failures, it is needed to clearly mention the following technical advices in the Master Plan; 1) taking into consideration the flood damages, it is needed to choose the appropriated seeds production plots; 2) it is needed to prepare sufficient seedlings for refilling. The sale of the seeds will be carried out at the end of the fourth year, after three years period of the introduction for the collection of problems of plots and the locality, their solutions and knowledge concerning the seeds.

I-1-3 Promotion of Dry Season Vegetables Growing

The plain of Sonfonia brings great hopes in terms of the vegetables supplier in the urban area taking advantage of mixed habitants with urbanites. However the vegetable growing in the plain of Sonfonia is done in a small way and is little diversified. Appropriate lands for vegetables growing are limited there, but they still have continuous hope as a site of vegetable farming in the urban area. Therefore, this area shall continuously keep the role of small scale vegetable production in urban area. In addition, the inhabitants have great hopes for the vegetables growing, since it opens working opportunities to the women during the dry season. Taking into account these internal and external needs, it is in great demand to promote the urban agriculture by training the model individual or group farmers as vegetables growers, and by offering the opportunities of vegetables growing to the urbanites and their groups. 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 and it takes in charge the maintenance of canals, the parcels or plots repair works, the transplanted, the harvest, etc. In so doing, the agricultural technique knowledge accumulates up inside the group.

The most important work is the maintenance of canals. The knowledge of water circulation such as the intrusion of seawater and the drainage is necessary. This knowledge is essential for mangrove rice cultivation. Only some farmers coming from outside and a small number of local farmers keep this knowledge and the techniques that must be transferred to the specialized group for agricultural works.

The paid workers have the power of decision on wages owing to the lack of labor. That is why there are cases where asked wages are high, which generates the abandon of cropping. According to the verification results, the efficiency of paying the service with fixed wage depending on a unit surface has been noticed. In this project, the service is paid by fixed wage by grasping the capacity of the farmer to pay through market study. Therefore, fixed wage on contract works is recommended in the Master Plan. Price shall be decided according to the marketing research of farmers' needs, payment capacity, number of labor days for a contract based job and person-day fee. The same price should be given for every farmer.

The specialized group is made of an existing and organized group of farmers composed by the young persons living in the division.

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

It is difficult to introduce machineries for all agricultural works by taking into account the present situation of Guinea. On the other hand, the promotion of tractor import by Guinean government is taken into account. It is envisaged to introduce cropping machines at the beginning by taking into account the conditions of the Study Area such as the difficulty in introducing tillage by cattle and the high need in machineries by the farmers.

The group LAMKOYA possesses a cultivator or tiller received in the framework of KR2. Yet the group has not enough technical knowledge and spare parts to maintain it. Consequently, the farmers use it only in the collective farm by fear it breaks down.

In Guinea, the government encourages the use of agricultural machines to increase the cultivated surface area and the import of tractors is promoted in the framework of the presidential project and the bilateral cooperation. Then, the public tractors services are executed by the PAC (Prefecture Agricultural Centre). However, the tractors which are deployed in all the country are still not optimally managed. The management of the cultivator of LAMKOYA represents the incarnation of the tractors problem in all the country.

Taking into account 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 by the group of farmers through a program that takes into account 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 the country.

Since the Study Area is not equipped with farm roads, which is subject to deep flooding following rains, the tractor service covers a limited service area within the fields located near the village. Therefore, the expansion of the tractor service to the whole Study Area would be difficult unless farm roads are provided in this area. Accordingly, the application of the results of the verification study should put emphasis on the expansion of the tractor service, which is presently poorly managed, nationwide rather than in the Study Area alone. "Improvement Plan for the Operation and Maintenance of Tractors" attached in the end note of Chapter 4 describes the nationwide expansion plan of the tractor service.

I-2 Project for Post-harvest/Distribution

The introduction of a working system for reducing the losses of the harvest phase during storage is studied and the improvement of agricultural tools such as decorticating machines or millers is foreseen.

With regard to the distribution, it is essential to prepare a system where farmers' groups play the central role in the distribution. In the first phase, it is estimated that groups of farmers promote an organization which plays an important role in the distribution through setting up the sell of good seeds, fertilizers, and equipments which are lacking in the area.

The post-harvests/distribution project comprises the following components, which are detailed in the table.

I-2-1 Improvement of Agricultural Tools

In Guinea, not only in the plain of Sonfonia but also in the other parts, most of the rice-growing works are performed manually. Because the agricultural tools are important, their manufacturing and diffusion are promoted in this project. Concerning the improved agricultural tools, by accepting the requests of farmers to introduce practical tools, their manufacturing and their diffusion are executed in the Verification study. Accordingly, the tools of which efficiencies have been noticed and are presented as such are diffused, and new improved tools are also found in this project.

Improve agricultural tools which were designed by the CEPERMAG but were not manufactured by this centre have been presented to the farmers, and the three tools " the bladed hoe, the pitchfork, and the hoe " among others, which have been identified as the most in demand have been manufactured and the system for their diffusion has been prepared in the Verification. Furthermore, the small silo for the seeds conservation by using empty oil can has been tried to promote its use. The diffusion of those tools is efficient.

In the irrigated rice-growing of the dry season executed during the verification, the introduction of the leveling survey, the rope for transplanting, and the weed killer, which were ingeniously manufactured by the farmers has been tested, and its efficiency has been established. Those tools are diffused with the improved techniques for the rice-growing.

Apart from this, the efficiency of the small scale manual threshing-machine manufactured in the Verification has been noticed as follows.

- The traditional method requires additional activities for the grains collect in order to obtain a clean work, such a work can be unnecessary with this threshing-machine ;
- The solution of the grain loss
- The solution of the grain loss due to the harvest transportation; it is portable (can be moved) for a work in the plain. On the other hand, the farmers' negative opinion is that the machine is not resistant to the humidity and mice because it has been manufactured from wood-block.

Otherwise, the materials used for the construction of the threshing-machine can be obtained in the vicinity and the manufacturing work has been done by the carpenter and the coppersmith who inhabited the plain. Consequently, the manufacturing price is not high and it is affordable by advanced farmers. In consequence of that, its diffusion is programmed in the viewpoint of the reduction of hard work and grain losses.

I-2-2 Reduction of Post-harvest Losses

The harvesting grain losses during the storage represent considerable damages for the farmers. These grain losses are caused by grain falling during the drying works, the transportation, and the beating. According to the Verification results, in case of transport over 10 km distance from the rice-growing farm in the village, it has been noticed that the loss has been minimum 10% in weight. The rice transport before threshing constitutes a toilsome work for farmers, and the introduction of threshing-machine by which the threshing can be done in the farm is efficient to reduce the hard work and the loss. The threshed rice must be stored in the silo to avoid damage by mice.

For that reason, the reduction of the loss can 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 doing 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. It is better to reserve all the rice in the silo, but only in the first phase the seeds must be stored.

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

The acquisition of seeds, fertilizers, and materials is difficult in the plain of Sonfonia, which limits the development. There are many farmers that experience difficulties of acquisition of good seeds despite their availability from some big farmers who inhabit beside the sea and sell these seeds. Unfortunately, those big farmers are difficult to reach and their number is limited.

Otherwise, the vegetable-growing fertilizer is also difficult to access in spite of the high needs of the plain. Consequently, the groups of farmers must be made responsible in the supply and the sale of seeds and fertilizers.

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, the fertilizers, and the lacking materials in the plain.

On the other side, during the execution of the Verification, a group (la Paix) which has participated in the component "Training of farmers groups leaders" has begun the selling of droppings and it has been able to sell all the droppings. Their sale is continued and sale of vegetable and rice seeds has started at small scale. The system where the group of farmers plays a central role in the distribution is developing progressively with the results of this component. Consequently, the improvement of the channel of distribution by the group of farmers is presented by taking into account the experience of the Verification.

The groups of existing farmers in principle carry out this project, but new groups to be created can participate. If the creation of new groups is necessary it will be done in the component "Creation of groups of farmers" described hereafter. Otherwise, the groups participate in the component "Training of organizations/meeting organization leaders" described hereafter, and the staffs in charge carry out the follow up to maintain sound activities (transparent account, appropriate document management, etc.).

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

The project has a great potential because of the urban population of Conakry, the Capital, which shelters the project in its neighborhood. It is not possible to sell the rice production given that the self-sufficiency levels are not yet reached. Otherwise, the nationally produced rice is a product which can compete with the imported rice because of its praised taste, and an increase in the number of farmers who sell the rice while improving the rice-growing conditions through the realization of the Master Plan is expected. Therefore, the group that has become the basic organization of production through the selling of agricultural tools will supply the agricultural products of the plain of Sonfonia.

This component is programmed as a series of the farmers' groups project mentioned above and they begin to sell the agricultural products after they put their activities on track. At first, the group sells solely the foodstuff produced by its own group. Gradually, the turnover increases owing to the sales of products coming from the 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.

The groups participate continuously to the component "Training of groups leaders/ organization of meetings", and the staffs in charge make the follow up to maintain sound activities (transparent account, appropriate document management, etc.).

4.5.3 II. Human Resources Training Program

Human resources training program is composed of the project targeting administrative services staff and the project targeting the rural community including individual farmers and groups of farmers. The realization of both projects permits to strengthen human resources for the others projects of the Master Plan, and their strengthened management and execution capacities permit to assure the sustainability of

the projects which are realized in the framework of the Master Plan. According to the Verification results, even if the trainers have learnt the contents of the training in some way, it has been revealed that they have had some problems to put them into practice. Therefore, the continuous training is underlined for the creation of this program, since the essential point of the projects includes the theme of training.

This program is carried out in compliance with the following three steps; 1) the capacity building of the personnel of administrative services who are the key persons for the execution of the M/P shall be reinforced by the special staff in the NDA, 2) the capacity building of the extension officers shall be increased by the capacity built personnel of administrative services or the exterior experts depending on the subjects, 3) the capacity built extension officers shall reinforce the capacities of the rural community through the execution of the projects of the M/P.

II-1 Project for Administrative and Extension Officers Capacity Building

The personnel of administrative services have general knowledge in public service. But to take the initiative in the Master Plan projects realization, broader and more concrete knowledge is required as well as administrative capacities. Particularly, the role of extension service personnel is very important because they are in direct contact with the rural Community. If the liaison between the administration and the Community is not good, the results are not good either despite the excellence of the administrative service.

To assure the strengthening of those capacities, the components hereafter are accounted for, the details of which are presented in the table.

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

According to the Verification results, it was revealed that the extension officers had not enough technical knowledge of rice and vegetables growing. For example, at the time when they prepared the agricultural calendar which was necessary for starting the farming, they spent a lot of time but the prepared calendar was not enough. They prepared the calendar with the knowledge acquired from the books but the knowledge was not sufficiently assimilated and they could not think over the items comprehensively, so that the calendar made had a lot of contradictions. Consequently, taking into consideration that the Team would leave after the Verification, the Team gave not only the direct advice but also the advice to complete the calendar making inquires to other divisions in the NDA. As a result, the calendar became sufficient to a certain extent, but it is still difficult to say that their abilities are perfect.

Concerning the agricultural development, the acquisition of agricultural technique is indispensable for the extension or diffusion personnel. Therefore, 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. Otherwise, in the process of agricultural farming and cropping improvement, it is programmed to carry out training on soil testing, yield calculation, etc., which are bases of diffusion. 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. During the elaboration of agricultural calendars and manuals, the extension or diffusion staff must learn many things by themselves, what generates lot of efficiency as the training continues.

The followings are necessary for the execution of this project, 1) to employ the exterior expert who was engaged in the Verification, 2) collaboration of the other divisions of the NDA (Agricultural Produce Division, Seeds and Agricultural Input Division, etc.) for the lecturer of the farming, 3) collaboration of the personnel of the National Service of Rural Promotion and Extension and the National Department of Water and Forests who was engaged in the Verification as the lecturers of the group leaders' training and the environmental sensitization.

II-1-2 Operational Capacities Building of Administrative Department

At the beginning of this Study, the Team's counterparts, who were the personnel of the NDA, scarcely had the practical knowledge concerning the subjects which they should have had acquired as the personnel of administrative services for execution of the projects, such as planning, budgeting, projects operation and management, maintenance, follow-up and evaluation, since they had never carried out the entire project before. Some small-scale projects were carried out in the Verification, and such experience was the first time for them. For example, they did not make a note properly when they made a field survey but just listening. Though the Study started in such conditions, however, their capacities progressed remarkably during the execution of the Study. Especially, concerning the preparation of the reports, the Team asked them to make and submit monthly reports every month, and they came to make proper reports with the benefit from the personal computers introduced by the Verification, even though they had never conducted the computers before. However, the experience in two years is not enough, and it is indispensable to build up their experience through the execution of the M/P.

It is necessary to reinforce their knowledge about the aforementioned subjects needed for the execution of the projects in the M/P urgently. Therefore, a menu including the aforementioned rubrics is prepared for the trainings. Otherwise, the lack in administrative departments and the non circulation of the information constitute the principal barriers between the farmers and the administration. It is then important to re-establish the trust of the farmers toward the administration. Staffs are trained to be them with abundant experience on problem analysis following the participative approach on the formulation of plans through the project. Furthermore, although the agricultural data would be necessary to circulate the information, the data accumulation has not systematically been prepared, and the elaboration of the database is immediately necessary. The confirmed techniques, the improvement rice-farming and cropping techniques; the information from National Agronomical Institute, etc. are comprised in the data base, and information such as the location where the agricultural tools are available are also included. The elaboration of data base generates big efficiency similar to OJT.

For the execution of this project, the high officials of NDA, such as vice-Director, shall play the role as a lecturer in the training.

II-2 Project for Rural Community Capacity Building

In most cases, projects operators within the framework of the Master Plan are farmers and the groups of farmers comprising the rural Community. To carry out the projects of the Master Plan, strengthening of the capacities of the administrative and the diffusion or extension department personnel who assist the project operation is not enough, but it is indispensable to strengthen their capacities and to sensitize them on the projects management of the rural community which receives the assistance. For that purpose, this project targets their strengthening. Though, concerning the capacity strengthening of individual farmers, this project does not include this point in particular, but the individual farmers would learn necessary knowledge during the operation of each project.

This project comprises following components, the details of which are presented in the table.

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

The group activities efficiency depends on the capacity of the leader. In the Study Area, the head of the group is appointed by the authority of this area, then it is not certain whether he possesses good capacities. It is necessary to have a leader who has projects operating capacities.

The general conditions for sustainable organization of the groups can be summarized as follows: 1) Exclusiveness of the objective targeted by the group, 2) presence of a competent and fervent leader good at commanding 3) fair and transparent management. Therefore, trainings on the group's activities management, the sensitization, and the communication between farmers and administration will be programmed. Otherwise, according to the Verification results, it is necessary to confirm whether the trainees have reading and writing knowledge, being the basic capacity of a leader. Furthermore, because the trainees still have problems to apply alone the knowledge acquired in classrooms, the follow-up of the group activities including the arrangement of accounting by administrative personnel is programmed.

Otherwise, the leaders are not only trained, but they also schedule meetings to exchange opinions and solve problems. These meetings 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. To operate these projects, existing groups are in principle the operators, but new groups would be necessarily created sometimes. The new group has been created for the operation of the component "Small scale irrigation" in the Verification. There are different difficulties to create new groups, and it is not easy to put these activities on track. The creation of groups of farmers is herein presented by taking into account the experience of the Verification.

The creation of new groups requires the following set of procedures: the members' recruitment, the 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. According to the Verification results, it is noticed that the capacity of the leaders has great influence on the continuation of groups. Therefore, during the election of leaders, the

condition whereby they have reading and writing knowledge is indispensably imposed, and on top of that, the conditions that they are competent to lead the members and fervent to achieve the objective are also imposed.

To manage democratically the groups, it is necessary to elaborate the rules of procedures to which all the group would consent. The fact to regroup and to study together the previous cases of success and participate to the establishment of the regulations is itself a good training; contributing to the creation of awareness and the strengthening of capacities. The roles and responsibilities of each of the members are explain and inscribed in the rules of procedures.

The newly created groups target the strong behavior by participating to the training of the leaders and by being followed by officers.

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

Taking into account the results obtained by the studies carried out in the Study Area, a program for agricultural production and water management infrastructure development in the plain of Sonfonia has been elaborated as follows.

III-1 Small-scale Irrigation Project

Small-scale irrigation facilities using the dead waters of the Sonfonia reservoir is planed. It aims at paddy cultivation, for which the tillage works are executed in December, the transplanting in mid-January and the harvesting in April. The water quantity for irrigation is calculated for the rice-growing by considering the possibility of watering on the surface, there included part of the vegetable cropping.

Water requirements are calculated taking into account the crop evapotranspiration (ETc), the net water requirements (NWR) and gross water requirements (GWR).

The parameters for the water requirements are shown in the following table.

Table 4.5.3 Parameters for Water Requirements

	Jan		Feb		Mar		Apr		May	
	1 st half	2 nd half	1 st half	2 nd half	1 st half	2 nd half	1 st half	2 nd half	1 st half	2 nd half
ETo (mm/day)	5.2	5.9	6.4	6.5	6.0	4.8	3.8	3.6	4.4	4.8
kc		Lands preparation	1.10	1.10	1.10	1.10	1.10	1.10	1.05	0.95
NWR (mm)		200	119	119	136	145	137	137	125	123
GWR (mm)		211	125	125	143	152	144	144	131	130
GWR (l/s/ha)		1.52	1.03	1.03	1.10	1.10	1.11	1.11	1.01	0.94

Water Balance

Adding up the dead water volume of Sonfonia reservoir and the water volume supplied by the rivers, as one hand, and subtraction of the evapotranspiration from the surface and irrigation water consumption, as the other hand, the irrigable area has been obtained. The water balance sheet is calculated on the basis of the water volume fed by gravity and taking into account the water-level of the lake and the altitude of

the parcels or plots. The irrigable area calculated on the basis of the dead water volume is 6 ha.

Irrigation Facilities

The water uptake of the lake of Sonfonia is performed by a structure of siphon, placed on the overflow structure. The water is conveyed by pipeline from the basin of discharge to the plots by gravity. The discharge basin is placed at the downstream extremity of the pipeline, and the water is transferred from the basin to the plots through earth canals. The canals shall be dug by the beneficiaries.

The total length of the PVC and steel pipeline is 585 m.

III-2 Improved Nurseries Project

It is very important to prepare the seedlings for the rainy season rice-growing. However, the preparation of the small plants 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 estimated that the maximum water depth of rice farms will be 45 cm in average (depending on the areas) during the period of nurseries preparation following the Verification results. If one supposes that the maximum depth of water attained 2 weeks after sowing, the plants reach 15 cm height at this moment. Therefore, if water level in the nurseries is increased to 30 cm, the plants can survive the flooding. It is possible to assist 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.

According to the results of the Verification, the efficiency of the improved nurseries is unveiled. Therefore, this project is perhaps applicable to the rice-growing during rainy season in the lowlands of mountain areas where the ravage due to flooding are important. The detail is described at the end of this chapter.

III-3 Water Management Training Project

The small scale irrigation facilities have been constructed and the irrigated cultivation has been realized in the component "Small Scale Irrigation" of the Verification. It is important to include in the water management the operation and maintenance problems of the irrigation facilities. Meanwhile, since the irrigated agriculture is not yet practiced in the plain of Sonfonia, the farmers have no experiences on the irrigation water management. The DNA and the extension/diffusion staffs have no experiences either on the irrigation facilities. This project realize that both the farmers and the government officers will learn on the operation and the maintenance of the facilities and on the water management.

On the other hand, there are areas where the irrigation facilities do not work well because of the inadequate operation and maintenance of the irrigation and water management, despite the introduction of irrigation in these areas. 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 extends to the other areas. Otherwise, the manual of waters management has been elaborated during the operation of the Verification. It will be revised during the training for the other areas in compliance with the characteristics of these areas. The detail is described at

the end of this chapter.

4.5.5 IV. Environmental Preservation Program

With the current status of mangrove forests deterioration in the plain of Sonfonia, and in the surrounding areas, it is necessary to sensitize the populations on the importance of environmental preservation. In the plain of Sonfonia, the relationships between populations, those who cut the mangroves, and the landowners are rather delicate, and the sensitization ought to reach these different levels. Otherwise, it is not possible to argue that the populations of the plain have a high level of consciousness with respect to the environmental conservation since, to present, they still continue cutting the firewood, clearing for new plots, etc., which are actions with negative impact on the environment. At this pace, the environmental situation will all but worsen, it is then necessary to take appropriate measures urgently.

This program comprises the following projects, the details of which are hereunder presented.

IV-1 Sensitization Project on Mangrove Forest Preservation

To raise the awareness level of the populations, it is then necessary to conceive continuous measures and to put into operation attractive activities (opened to everyone). In this project, the extension/diffusion personnel, as principal actors, operate the program of sensitization next to the populations. 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 content 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.). The sensitization sessions take place in meeting-rooms or elementary schools at hours where large audience can be expected. Since the efficiency of this activity has been noticed according to the Verification results, this project is carried out taking into account the connection used. Otherwise, it has been learnt that the population must have good knowledge of laws relative to the preservation of the mangrove forests. Therefore, the following accompanying components are proposed.

- 1) Role of the mangrove forests
protection against erosion, rice farms preservation, air purification, etc.
- 2) Current situation and problems
excessive and anarchic cutting of mangrove wood: reclamation of new land for rice-growing, construction material, firewood (heating for domestic works, salt manufacture), etc.
- 3) Anticipated outcome
land erosion, diminution of rice farm, etc.
- 4) Necessities for the protection of mangrove
preservation of rice farms, creation of the conditions of a sustainable agricultural development
- 5) The proposed solutions
offering the information, introduction of the improved salt extraction technique, training for appropriate cutting technique of mangrove wood, etc.

6) Laws concerning the mangrove preservation

basis of the laws, laws and national regulations, International treaties and conventions ratified by Guinea, infractions and sanctions

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

The mangrove surface areas of the Study Area lessen year by year because of the mangrove firewood or tree cutting and the clearing for new plots. Meanwhile, even if the mangrove cutting is forbidden by the laws, it is difficult to forbid systematically the cutting of mangrove firewood because of the necessity of firewood for the daily life of the residents. Otherwise, the necessity of the preservation of mangrove has been preached in the workshops on its sensitization during the Verification, and its concrete countermeasure has also been examined. Consequently, the training on appropriate mangrove firewood cutting which has been discussed each time in workshops has been judged appropriate and it has been verified. Following that, the training on the mangrove firewood cutting turned to be efficient, so that 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. Otherwise, because it is not easy to stop the decrease in the mangrove surfaces by only this training, the small scale reforestation has been recommended and its execution has been performed in the Verification. Its result has permitted to notice its efficiency and the small scale reforestation has become part of this project.

The training for appropriate technique of mangrove firewood cutting targets the woodcutters, the riparian populations of the mangrove area and the traditional producers of salt who use the mangrove firewood with the objective of explaining the importance of the mangrove and of transferring the appropriate procedure of maintenance and use of mangrove.

The training is carried out on the mangrove site. The demonstration items are:

- 1) Do not cut the main trunk
- 2) Let the branches holding seeds, fruits, or blooms of mangrove for next year
- 3) One must cut off and to use as firewood the branches which do not grow so that the mangrove stays healthy and the light could penetrate deep inside the mangrove after cutting.
- 4) One must consider the renewal of the mangrove by calculating the distance between trees and those which are cut and recommend the cutting only in well garnished areas.
- 5) One must plant the propagules of the mangrove if the propagules are uncovered during the mangrove cutting work from June to September.

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 material which is

introduced is the black plastic sheet and the bucket which the populations can easily obtain. This technique has been carried out in the Verification from the viewpoint of the mangrove preservation. Consequently, its efficiency has been established as indicated hereafter, so that the diminution of the mangrove surface is expected in fact by carrying out this project.

1) Traditional method	production: 15 kg/day	mangrove consumption: 44 kg/day
2) Improved technique	production: 80 kg/day	mangrove consumption: 0 kg/day

4.6 Implementation Plan of the Master Plan

4.6.1 Target Values of the Master Plan

The objective of the Master Plan is the realization of sustainable agricultural development in the plain of Sonfonia. The above mentioned projects have been set up to achieve this objective.

The values and effectiveness of the projects are explained below.

(1) I. Program for Agricultural Farming and Crop Improvement

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. This has been confirmed in the workshop during the interim evaluation through surveys. In addition this value is nearly the same as that of the average yield drawn from the rice cultivation applying the improved techniques and this is reasonable. On the other hand, the result of the demonstration carried out in 2006 in the division of Sonfonia has shown a yield of about 4.0 ton/ha. The natural conditions of the demonstration farm in the Sonfonia division are better than those of the other parts of the plain of Sonfonia and are not representative of the natural conditions of all the plain of Sonfonia. Even if it is taken into account the deduction of this advantage, the value of 2.5 ton/ha is still considered as realizable.

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 after the introduction of the component “Improvement of the rice farming and the cropping techniques”. However, by taking into account the limited number of extension officers that are assigned to the plain of Sonfonia, it is not realizable that all the farmers (about 1,000 persons), that is to say all the rice farms (about 760 ha) of the plain of Sonfonia introduce the improved techniques during the 10 years of the Master Plan. However, it is estimated that 60% of all the farmers will introduce the technique during the 10 years.

The component “Diffusion of Rice Adapted Varieties” is considered as the project that assists the component “Improvement of the rice farming and cropping techniques”. The target value of the rice yield acquired by execution of this component is estimated to be 2.5 ton/ha same as the one above, and the target value of the adapted seeds quantity to produce is estimated to be the quantity that will be sufficient after 10 years for the above indicated surface where the improved techniques have been introduced.

Concerning the component “Promotion of Dry Season Vegetables Growing”, the vegetable cultivation is supposed to be possible in an area of about 22 ha that is located along the boundary of the plain of Sonfonia beside the hill with a width of 50 m where fresh water from the aquifer is available. However, taking into account the limited number of the extension officers as indicated above and owing to the fact that the few farmers that have vegetable growing experience, it is not realizable that vegetable cultivation be made on all area during 10 years, and it is estimated that the 50% of the area will be cultivated.

Concerning the component “Introduction of Groups Specialized in Agricultural Works”, provided that 20% of the farmland uncultivated (383 ha) is abandoned due to lack of labor, this area will be cultivable in 10 years.

Concerning the component “Introduction of Tractor Service by Farmers' Group” this has started during the Verification Study and continues. In the frame of this component, it is possible to plough 6 ha of land a year.

Concerning the components “Improvement of Agricultural Tools” and “Reduction of Post-harvest Losses”, it is supposed that the farmers that execute the component “Improvement of Rice Farming and Cropping Techniques” also participate in these components. A yield of 10% is planned as the target value of effectiveness acquired by the execution of these components.

Concerning the component “Improvement of Distribution Channel by Farmers' Group (1) and (2)”, they almost don't have any quantitative effectiveness, but they have lot of indirect effectiveness since they assist the “Project for Improvement of Cropping Techniques”. Then, these components contribute to the revitalization of the rural community at large scale.

(2) II. Human Resources Training Program

The effectiveness acquired by the execution of this program is that each component advance regularly and contribute indirectly to the accomplishment of the goal of Master Plan. Consequently, the target values are the same as those of the “Program for Agricultural Farming and Crop Improvement” indicated above.

(3) III. Program for Agricultural Production Infrastructure Development/Water Management

The effectiveness acquired by the execution of this program is the yield acquired by the irrigated cultivation in the dry season through execution of the “Small-scale Irrigation Project”. Consequently, the target value of the yield is the same as that of the “Program for Agricultural Farming and Crop Improvement” indicated above.

The “Improved Nurseries Project” is considered as the project that assists indirectly the “Program for Agricultural Farming and Crop Improvement”.

The “Water Management Training Project” is considered as the project that assists the “Small-scale Irrigation Project”. In these terms, there is no benefit, but in the future the good use of the irrigation facilities that are not functioning well in Guinea will bring some benefit.

(4) IV. Environment Preservation Program

This program contributes to the sustainable mangrove rice cultivation in the plain of Sonfonia. In addition, the “Project for Introduction of Salt Extraction Improved Technique” can produce an increase in farmers’ revenue by increasing the salt production. The target value is the number of farmers that introduce this technique after 10 years, and this target value is estimated to be 10% of all the farmers (about 1,000 persons) of the plain of Sonfonia.

4.6.2 Cost and Benefit of the Master Plan

The Master Plan consists of 19 projects, of which the benefits are expected directly for some projects, where as the benefits of some projects which contribute to the other projects, can not be estimated directly. The total project costs 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 (cf. Attachment 15), 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, which implies the appropriateness of the promotion of mangrove rice through the “Improvement of Rice Farming and Cropping Techniques”. At the same time, the promotion of mangrove rice influences on other projects contributing to increasing of total benefit of the Maser Plan. In conclusion, it is recommended to carry out all the projects proposed in the Master Plan. The details of cost and benefit of each project are shown in the tables at the end of this chapter.

Table 4.6.1 Cost and Benefit of Projects

Projects	Cost (US\$)	Total Benefit (US\$)	Net Benefit (US\$)	B/C
I-1-1 Improvement of Rice Farming and Cropping Techniques	65,130	340,887	275,757	5.2
I-1-2 Diffusion of Rice Adapted Varieties	31,208	21,600	△9,608	0.7
I-1-3 Promotion of Dry Season Vegetables Growing	19,152	33,040	13,888	1.7
I-1-4 Introduction of Groups Specialized in Agricultural Works	9,760	133,056	123,296	13.6
I-1-5 Introduction of Tractor Service by Farmers' Group	-	18,140	18,140	-
I-2-1 Improvement of Agricultural Tools	27,600	121,745	75,945	2.7
I-2-2 Reduction of Post-harvest Losses	18,200			
I-2-3 Improvement of Distribution Channel by Farmers' Group (1)	9,120	-	△9,120	-
I-2-4 Improvement of Distribution Channel by Farmers' Group (2)	6,920	-	△6,920	-
II-1-1 Technical Training for Diffusion of Cropping Techniques	41,780	-	△41,780	-
II-1-2 Operational Capacities Building of Administrative Department	57,500	-	△57,500	-
II-2-1 Group Leaders Training/Organization of Meetings	26,120	-	△26,120	-
II-2-2 Setting up of Farmers' Groups	23,400	-	△23,400	-
III - 1 Small-scale Irrigation Project	-	3,778	3,778	-
III - 2 Improved Nurseries Project	2,300	-	△2,300	-
III - 3 Water Management Training Project	9,600	-	△9,600	-
IV - 1 Sensitization Project on Mangrove Forest Preservation	19,800	2,718	△35,282	0.1
IV - 2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting	18,200			
IV - 3 Project for Introduction of Salt Extraction Improved Technique	15,200	288,440	273,240	19.0
Total Costs of 19 Projects	400,990	963,404	562,414	2.4
Expenses of PCEMP	73,328	-	-	-
Total	474,318	963,404	489,086	2.0

4.6.3 Number of Beneficiary Farm Families in Projects

The number of farm families to be benefited by the implementation of the projects is shown in the following table. There are about 1,000 farm families in the plain of Sonfonia and about 60 % of them will attain benefit by the “Improvement of Rice Farming and Cropping Techniques”.

Table 4.6.2 Number of Beneficiary Farm Families of Projects in M/P (10 years)

Projects	Direct Benefit (Farm Family)	Indirect Benefit (Farm Family)	Total (Farm Family)
I-1-1 Improvement of Rice Farming and Cropping Techniques	300	309	609
I-1-2 Diffusion of Rice Adapted Varieties	10 groups × 10 families = 100	609	709*
I-1-3 Promotion of Dry Season Vegetables Growing	14 groups × 10 families = 140	-	140
I-1-4 Introduction of Groups Specialized in Agricultural Works	4 groups × 10 families = 40	100	140
I-1-5 Introduction of Tractor Service by Farmers' Group	1 group × 10 families = 10	80	90
I-2-1 Improvement of Agricultural Tools	300	309	609
I-2-2 Reduction of Post-harvest Losses	300	309	609
I-2-3 Improvement of Distribution Channel by Farmers' Group (1)	4 groups × 10 families = 40	709+200=909	949*
I-2-4 Improvement of Distribution Channel by Farmers' Group (2)	2 groups × 10 families = 20	709+200=909	929*
II-1-1 Technical Training for Diffusion of Cropping Techniques	(16 persons × 10 years)	709+200+140=1,049	1,049*
II-1-2 Operational Capacities Building of Administrative Department	(16 persons x 10 years)	709+200+140=1,049	1,049*
II-2-1 Group Leaders Training/Organization of Meetings	-	500	500
II-2-2 Setting up of Farmers' Groups	-	500	500
III - 1 Small-scale Irrigation Project	14	-	14
III - 2 Improved Nurseries Project	300	309	609
III - 3 Water Management Training Project	3 groups/year x 10 families x 7 years = 210	4 groups/year × 10 families × 7 years = 280	490
IV - 1 Sensitization Project on Mangrove Forest Preservation	3,600 persons	1,000	4,600
IV - 2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting	1,800 persons	1,000	2,800
IV - 3 Project for Introduction of Salt Extraction Improved Technique	100	-	100

- Note) 1. Direct benefit means people who get benefit directly from the projects through extension officers, and indirect benefit means people getting benefit through the farmers who got direct benefit in the projects.
2. (*) included duplicated benefit farmers.
3. Beneficiary does not include urban people even though they also receive indirect benefit through environmental preservation and being the consumers.

4.6.4 Implementation Schedule of the Master Plan

The implementation schedule of the Master Plan was prepared as shown in Figure 4.6.2. In accordance with the schedule, considerable numbers of the nineteen projects are to be carried out simultaneously; even there are some independent projects which can be implemented solely. The plan was formulated taking into consideration 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.

Furthermore, priority of the implementation of the projects was considered for the selection in case not all the projects are to be carried out due to lack of budget. As for considering priority, attention was made on “Improvement of Rice Farming and Cropping Techniques” which shall give better effect even

with a small budget and contribute to the sustainable development of agriculture through promotion of mangrove rice. At the same time, the total benefit of the plan was considered for the purpose of keeping objectivity. The result is shown in the following table.

Table 4.6.3 Selection of Priority Projects

Priority	Reason of Priority Decision	Project	Project Cost (US\$)	Total Benefit (US\$)
1	Essential projects for “Improvement of Rice Farming and Cropping Techniques” which stands in the center of the promotion of mangrove rice	I-1-1 Improvement of Rice Farming and Cropping Techniques II-1-1 Technical Training for Diffusion of Cropping Techniques II-1-2 Operational Capacities Building of Administrative Department	243,718	484,232
2	The techniques which are extended by “Improvement of Rice Farming and Cropping Techniques” are included as a component of the projects.	I-1-2 Diffusion of Rice Adapted Varieties III-2 Improved Nurseries Project I-2-1 Improvement of Agricultural Tools I-2-2 Reduction of Post-harvest Losses		
3	Projects with multiplier effect when implemented with “Improvement of Rice Farming and Cropping Techniques” as a set, or projects which bring sustainable agricultural development	II-2-1 Group Leaders Training/Organization of Meetings IV-1 Sensitization Project on Mangrove Forest Preservation IV-2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting IV-3 Project for Introduction of Salt Extraction Improved Technique	79,320	291,158
4	Projects which are necessary according to the development of mangrove rice, or projects to be implemented without relating the promotion of mangrove rice.	I-1-3 Promotion of Dry Season Vegetables Growing I-1-4 Introduction of Groups Specialized in Agricultural Works I-1-5 Introduction of Tractor Service by Farmers' Group I-2-3 Improvement of Distribution Channel by Farmers' Group (1) I-2-4 Improvement of Distribution Channel by Farmers' Group (2) II-2-2 Setting up of Farmers' Groups III-1 Small-scale Irrigation Project III-3 Water Management Training Project	77,952	188,014
Total			400,990	963,404

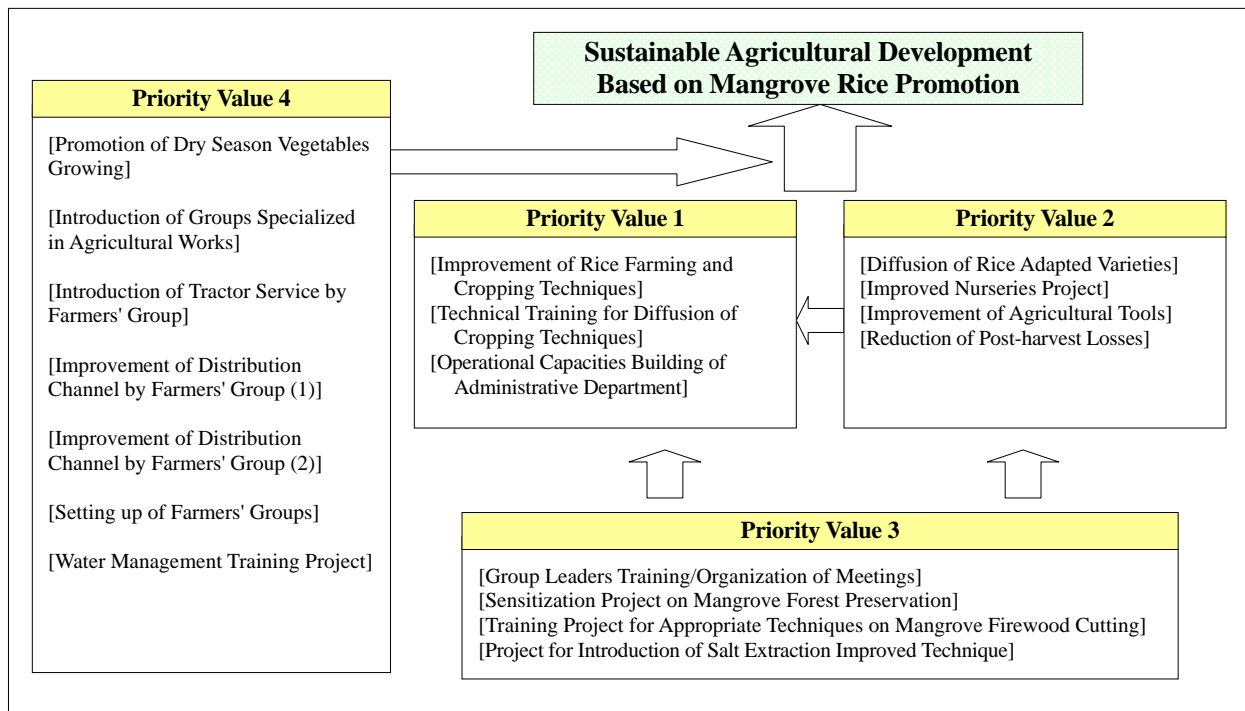


Figure 4.6.1 Correlations of Priority Projects

Agricultural Production Infrastructure Development that requires a high construction cost and a very long duration for the construction is considered as an option, and it will be implemented at the time the budget will be secured. The details are shown in “4.7 Option: Agricultural Production Infrastructure Development”.

Both “Introduction of Tractor Service by Farmers' Group” and “Small-scale Irrigation Project” were found to be effective in the Verification Study, and the results shall be extended in the surrounding area and even all over the country. However, there is no room for both the projects to be extended in the Study Area without implementing the infrastructure development, and therefore, they will be continued in the Master Plan with the same size as those of the Verification Study.

As for the “Introduction of Tractor Service by Farmers' Group”, the result of the Verification Study was concluded into “Improvement Plan for the Operation and Maintenance of Tractors” as mentioned in the end of this chapter. Apart from the Master Plan, the “Improvement Plan for the Operation and Maintenance of Tractors”, should also be carried out by the Government. As for “Small-scale Irrigation Project”, this project will provide the opportunity of training on water management for officials and farmers through “Water Management Training Project” in the Master Plan, and it is expected that its effect will be extended to the other areas.

Indicators of each project in each phase of implementation schedule are shown in the following table.

Table 4.6.4 Indicators in Each Phase of Implementation Plan (1/2)

Program of Plan	Commencement of Plan	Indicators in Each Phase		
		Initial Phase: 3 years	Intermediate Phase: 3 years	Final Phase: 4 years (Target)
I-1-1 Improvement of Rice Farming and Cropping Techniques	This project mostly contributes to the promotion of mangrove rice and has the highest priority. It should begin at the beginning of the Plan and the area shall be expanded.	Target Area: 79 ha No. of Benefit Farmers: 104	Target Area: 200 ha Benefit Farmers: 263	Target Area: 463 ha Benefit Farmers: 609
I-1-2 Diffusion of Rice Adapted Varieties	In order to supply superior seeds to the farmers who master the techniques of I-1-1, groups shall be formed and seed production shall be started from the intermediate phase.	Prepare to produce seeds after 4 years	Produce and marketing of seeds: 9 ton No. of Groups: 6	Produce and marketing of seeds: 15 ton No. of Groups: 10
I-1-3 Promotion of Dry Season Vegetables Growing	In the initial phase, group formation and training for extension officers shall be carried out and the implementation of the project shall be carried out from the intermediate phase.		Target Area: 3.6 ha No. of Groups: 6	Target Area: 8.4 ha No. of Groups: 14
I-1-4 Introduction of Groups Specialized in Agricultural Works	In the initial phase, group formation shall be carried out, one group in one District, and in the intermediate phase, implementation of the project shall be carried out.		Target Area: 40 ha No. of Groups: 2	Target Area: 80 ha No. of Groups: 4
I-1-4 Introduction of Groups Specialized in Agricultural Works	As the plain of Sonfonia is not apt for tractor cultivation, the project shall be continued within the limit of the size shown in the Verification Study.	Target Area: 6 ha No. of Groups: 1	Target Area: 6 ha No. of Groups: 1	Target Area: 6ha No. of Groups: 1
I-2-1 Improvement of Agricultural Tools	This project is introduced as one component of I-1-1.	Same as I-1-1	Same as left block	Same as left block
I-2-2 Reduction of Post-harvest Losses	This project is introduced as one component of I-1-1.	Same as I-1-1	Same as left block	Same as left block
I-2-3 Improvement of Distribution Channel by Farmers' Group (1)	This project shall be carried out working together with project I-1-2 and I-1-3 and procurement of seeds and fowl droppings.		No. of Groups: 4	No. of Groups: 4
I-2-4 Improvement of Distribution Channel by Farmers' Group (2)	This project shall be introduced after the project of I-1-1 is carried out and at the stage when marketing is enlarged.			No. of Groups: 2

Table 4.6.4 Indicators in Each Phase of Implementation Plan (2/2)

Program of Plan	Commencement of Plan	Indicators in Each Phase		
		Initial Phase: 3 years	Intermediate Phase: 3 years	Final Phase: 4 years (Target)
II-1-1 Technical Training for Diffusion of Cropping Techniques	As extension officers are promoters of project of I-1-1 and as techniques are renewed, training for extension officers shall be carried out all through the phases.	Extension officer: 16 persons	Same as left block	Same as left block
II-1-2 Operational Capacities Building of Administrative Department	Trainings shall be carried out all through the phases for the smoother promotion of the Plan and easier feedback of the result of the projects under monitoring and evaluation.	Extension officer: 16 persons	Same as left block	Same as left block
II-2-1 Group Leaders Training/Organization of Meetings	As many projects of the Master Plan shall be implemented by groups, this project shall be carried out according to the progress of the related projects.	All the groups	Same as left block	Same as left block
II-2-2 Setting up of Farmers' Groups	This project shall be carried out according to the progress of the related projects.	All the groups	Same as left block	Same as left block
III - 1 Small-scale Irrigation Project	Using the small scale irrigation facility that was prepared in the Verification Study, double cropping shall be put into practice.	Dry season target area: 1 ha	Same as left block	Same as left block
III-2 Improved Nurseries Project	This project is introduced as one component of the project of I-1-1.	Same as I-1-1	Same as left block	Same as left block
III - 3 Water Management Training Project	This project is to give training for related farmers using the small scale irrigation facility. After the project is well under way, farmers of other area and officials shall be targets of the training.	Farmers' groups	Farmers in other area, Official	Farmers in other area, Official
IV - 1 Sensitization Project on Mangrove Forest Preservation	Succeeding to the Verification Study, this project shall be carried out from the beginning of the Plan. Targets: all the residence in the project area	No. of Seminar : Total 36 Attendants: 1,080 persons	No. of Seminar : Total 72 Attendants: 2,160 persons	No. of Seminar : Total 120 Attendants: 3,600 persons
IV - 2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting	Succeeding to the Verification Study, this project shall be carried out from the beginning of the Plan. Targets: wood cutters, residents who cut woods for fire	No. of Seminar : Total 36 Attendants: 540 persons	No. of Seminar : Total 72 Attendants: 1,080 persons	No. of Seminar : Total 120 Attendants: 1,800 persons
IV - 3 Project for Introduction of Salt Extraction Improved Technique	Succeeding to the Verification Study, this project shall be carried out from the beginning of the Plan.	No. of farmers: 30 Manufacturing of salt: 252 ton	No. of farmers: 60 Manufacturing of salt: 504 ton	No. of farmers: 100 Manufacturing of salt: 840 ton

4.6.5 Effect of Project

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 (effect of preservation of farmland and/or effect of manufacturing salt). The total benefit during ten years shall be 963,404 US\$ (cf. Table 4.6.6). Within this, the effect of increase of unit yield by the extension of advanced technologies is the highest of 484,233 US\$, sharing 50 % of total effects. If the projects are implemented according to the schedule shown in Figure 4.6.2, the benefit shall surpass the cost after four years, and B/C ratio shall be increased according to the progress of projects.

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 with without the Master Plan. In this case, the demand in the Study Area of 1,800 ton (cf. p. 3-26) will be almost satisfied and many farmers who bought rice before will attain self-sufficiency, and numbers of farmers who sell their excess rice will be appeared.

Tableau 4.6.5 Rice Production in the Plain of Sonfonia (without Project, with Project)

Without Project				
Item	Area (ha)	Yield (ton/ha)	Production (ton)	Remarks
Existing Cultivation	640	1.8	1,152	
Land Reduction	△9	1.8	△16	Land Reduction due to Coastal Erosion
Total	631	1.8	1,136	
With Project				
Item	Area (ha)	Yield (ton/ha)	Production (ton)	Remarks
Improvement of Techniques	463	2.5	1,158	
Reduction of Loss			116	10% of Improvement of Techniques
Normal Techniques	177	1.8	319	A = 640 - 463
Cultivation in non cultivated land	86	1.8	155	
Dry Season Cultivation	1	2.5	3	
Total	727		1,751	Increase of 615 ton (55%)

Table 4.6.6 Cost and Benefit of Projects

Programs	Categories	Year										Total	B/C	Remarks
		First Phase			Intermediate Phase				Final Phase					
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
I-1-1	Improvement of Rice Farming and Cropping Techniques	3,830	8,235	13,301	19,127	25,826	33,530	42,390	52,579	64,296	77,771	65,130	5.2	
I-1-2	Diffusion of Rice Adapted Varieties	3,901	3,901	3,901	3,901	3,901	3,901	3,901	3,901	3,901	3,901	31,208	0.7	
I-1-3	Promotion of Dry Season Vegetables Growing	0	0	0	864	1,728	2,592	3,456	4,320	5,184	6,048	21,600		
I-1-4	Introduction of Groups Specialized in Agricultural Works	0	0	0	1,180	2,360	3,540	4,720	5,900	7,080	8,260	33,040	1.7	
I-1-5	Introduction of Tractor Service by Farmers' Group	1,814	1,814	1,814	1,814	1,814	1,814	1,814	1,814	1,814	1,814	18,140		already prepared in the Verification Study
I-2-1	Improvement of Agricultural Tools	4,580	4,580	4,580	4,580	4,580	4,580	4,580	4,580	4,580	4,580	45,800	2.7	
I-2-2	Reduction of Post-harvest Losses	1,368	2,941	4,750	6,831	9,224	11,975	15,139	18,778	22,963	27,775	121,745		
I-2-3	Improvement of Distribution Channel by Farmer's Group (1)	0	0	0	2,280	2,280	2,280	2,280	2,280	2,280	2,280	9,120		benefit contributes to other projects
I-2-4	Improvement of Distribution Channel by Farmer's Group (2)	0	0	0	0	0	0	3,460	3,460	0	0	6,920		
II-1-1	Technical Training for Diffusion of Cropping Techniques	4,178	4,178	4,178	4,178	4,178	4,178	4,178	4,178	4,178	4,178	41,780		
II-1-2	Operational Capacities Building of Administrative Department	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	5,750	57,500		benefit contributes to other projects
II-2-1	Group Leaders Training/Organization of Meetings	2,612	2,612	2,612	2,612	2,612	2,612	2,612	2,612	2,612	2,612	26,120		
II-2-2	Seating up of Farmers' Groups	2,340	2,340	2,340	2,340	2,340	2,340	2,340	2,340	2,340	2,340	23,400		
III-1	Small-scale Irrigation Project	210	273	355	420	420	420	420	420	420	420	3,778		already prepared in the Verification Study
III-2	Improved Nurseries Project	230	230	230	230	230	230	230	230	230	230	2,300		benefit contributes to the component "I-1-1"
III-3	Water Management Training Project	960	960	960	960	960	960	960	960	960	960	9,600		benefit contributes to the project "III-1"
VI-1	Sensitization Project on Mangrove Forest Preservation	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	38,000	0.1	
VI-2	Training Project for Appropriate Techniques on Mangrove Firewood Cutting	0	302	302	302	302	302	302	302	302	302	2,718		
VI-3	Project for Introduction of Salt Extraction Improved Technique	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	15,200	19.0	
Total Costs of 19 Projects		36,384	91,146	147,744	204,402	266,030	316,658	372,886	429,914	485,542	541,170	2,888,440		
Expenses of PCEMP		2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	21,800		
Total Costs		38,584	93,346	149,944	206,602	268,230	318,858	375,086	432,114	487,742	543,370	2,900,240		
Total Benefit		10,740	22,712	35,296	56,988	79,800	103,975	129,720	151,219	173,930	199,025	963,404	2.0	(27) = (25) + (26)
B/C		0.3	0.6	0.5	1.2	1.7	2.3	2.6	2.1	4.6	5.3	2.0		
Effect of the increase of yield by the extension of advanced technologies		5,198	11,177	18,051	26,822	36,778	48,097	60,986	75,677	91,580	109,867	484,233		(30) = (2) + (4) + (11)
Effect of the increase of cultivation area due to reduction non-cultivation area		1,814	1,814	1,814	1,814	1,814	1,814	1,814	1,814	1,814	1,814	18,140		(31) = (8) + (9)
Effect of increase of cultivation area due to access to water source		210	273	355	420	420	420	420	420	420	420	3,778		(32) = (6) + (18)
Effect of preservation of environment (effect of preservation of farmland and/or effect of manufacturing salt)		3,518	9,448	15,076	20,704	26,332	31,960	37,588	43,216	48,844	54,472	291,158		(33) = (22) + (24)

4.6.6 Organization and Procedure of the Master Plan

In conformity with the Implementation Schedule of the Master Plan (Ref. Figure 4.6.2), 19 projects presented in the Master Plan are executed. Among these projects, some should be executed by individual farmers and the others by the activities of the farmers' groups. In any case, all the projects necessarily require the participation of the administrative personnel, especially the collaboration of the extension officers. Taking this into account, the organization of the procedures of the Master Plan is programmed as follows.

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 have assisted to this study as counterparts. Most of them have attended training in Japan and have an in-depth knowledge on the participatory method. The tasks of the PCEMP that are considered as a routine work of the NDA are described hereunder. (Ref. Figure 4.6.3)

- Set up of the annual action plan:

The annual action plan is set up according to the working program of the Master Plan. In the action plan, the contents of the projects to carry out in each year, the locations of the execution, the selection of the number of projects, the budgets, the selection of the service of extension officers, etc. are programmed. To set up the action plan, the budget of the project should be prepared. The action plan is executed after approbation by the National director of Agriculture.

- Obtaining the budgets:

To set up the action plan, the budgets for the projects execution should be secured. If the cost of the project is not expensive, the NDA might cover it. If the cost is higher than the capacity of the NDA, the cooperation of the donors like the international organizations, NGO, etc. should be acquired. Consequently, the use of the counterpart funds of the KR2 of Japan shall be taken into account for the execution of the M/P. On the other hand, the Minister of Agriculture and Livestock has the intention to use these funds to realize all the projects of the M/P. Since the M/P was formulated directory by the Japanese Government and the Minister has such intention, the good use of the counterpart funds of the KR2 of Japan is in available condition.

For each independent project, it is necessary to have recourse separately to the cooperation limiting the amount of the budget to make its availability easier. In order to do so, it is effective that each responsible person in the PCEMP appeals to the cooperation of each donor directly by explaining the usefulness of the project. Concerning the affluent fund of the KR2 of Japan, it is necessary to request the project by fashioning a package of projects at a certain scale. The NDA even took up the trial to diffuse the tractor services to farmers in other areas during the Verification Study and the Ministry of Agriculture and Livestock officially submitted its request letter to the Embassy of Japan. The good use of the counterpart funds of the 2KR is expected.

- Selection of the target farmers:

The selection of the target farmers or the target groups of farmers is made in collaboration with

the proposed extension officers. To make the selection, the collaborations of the chiefs of the divisions and C.GAMAR are required and the advertisement on the content of each project to the target persons is necessary. It should be explained the usefulness of the projects in such a way as to make people interested. The explanation on their usefulness is made through workshops, and the summary of the projects in local language are prepared during the workshop. The manuals of the improved techniques are attached to the summaries. The summaries must always be available not only for the workshops but also for the farmers through the chief of each district.

- Approach by the farmers:

In the workshops indicated above, the projects should be explained to the farmers or the groups of farmers. Through listening to the explanations in the workshops and by reading the summaries of the projects, they select the projects they want to execute, and appeal to the extension officers for their execution. The extension officers propose their opinion to the PCEMP in a way that their opinions could reflect on the action plan of the next year.

In addition, if donors like NGOs approach them, they should be able to explain the projects they want to execute or should themselves approach donors for the necessary funds.

In addition, they should be advised, if there is an improved technique they want to try in the manual of improved techniques; they can execute these techniques with the assistance of the extension officers.

- Execution of the projects:

The projects are to be executed according to the content of each project by bringing the extension officers to play a central role. However, the “Human Resources Training Program” and the “Environment Preservation Program” are to be executed by the persons in charge of the PCEMP.

- Follow-up/evaluation and revision of the working program of the Master Plan:

The PCEMP will follow-up and evaluate the activities of each project during execution, and will revise the working program of the Master Plan and add to the contents of the projects, if it proves necessary. This is to be examined by the steering committee.

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 additions, it is possible to develop techniques for some and methods for others. This is presented in the following table.

Tableau 4.6.7 Projects Possible to Expand to Other Areas

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

The Verification Study was carried out in the plain of Sonfonia on some of the above-mentioned projects to verify their realization and problems, and the results were reflected to the final Master Plan. Therefore, they should be principally carried out in the Study Area. However, they include common techniques that are able to be applied in the neighboring prefectures or all the country. The Team desires that the Guinean side will apply the Master Plan in other areas as broadly as possible without encaging it in the plain of Sonfonia.

To realize the expansion of the projects to other areas, it is important to establish a system of dissemination. To expand different knowledge and techniques such as the improved techniques, the introduction of simple agricultural tools, the water management, the establishment of farmers groups, the capacity of coordination, etc. The projects in the Master Plan extend to different kinds like the agricultural techniques, the strengthening of the human capacities, the preservation of the mangrove, etc. Consequently, it is necessary to acquire the collaborations of other directions in the Ministry of Agriculture and Livestock (MAL) like the National Service of the Rural Promotion and the Diffusion (NSRPD), the National Department of Agricultural Engineering (NDAE), etc. To promote the expansion of the projects to other areas, the Promotion Committee for the Diffusion of the Master Plan Projects (PCDMPP) is established in the National Department of Agriculture (NDA). This committee is composed of the administrative officers of the NDA in particular those who assisted in this study as counterparts because they have good knowledge on the projects. That is to say that the members of the Promotion Committee for the Execution of the Master Plan (PEMP) keep two offices simultaneously.

The PCDMPP set up the annual action plan in collaboration with other National Departments. In the action plan, the contents of the projects to be made in the year, the locations of the executions, the

selection of number of projects, the budgets, the other National Departments that will collaborate, etc. are programmed. The budgets of the MAL are allocated to the action plan to execute it after approbation by the National Director of Agriculture. The action plan is carried out by the concerned National Departments. The obtaining of budgets and the procedures of the projects follows that in the procedure of the Master Plan.

Programs	Phase Year	Verification Study 2005-2006	First Phase 2007-2009	Intermediate Phase 2010-2012	Final Phase 2013-2016	Remarks
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		↔	↔	↔	↔	
I-1-2 Diffusion of Rice Adapted Varieties		↔	↔	↔	↔	Supply of the seeds of "adapted varieties" to the farmers acquiring the rice farming techniques
I-1-3 Promotion of Dry Season Vegetables Growing			↔	↔	↔	Execution after setting up of the farmers' group and acquisition of the techniques by the extension officers
I-1-4 Introduction of Groups Specialized in Agricultural Works			↔	↔	↔	Execution after setting up of the farmers' group
I-1-5 Introduction of Tractor Service by Farmers' Group		↔	↔	↔	↔	Started in the Verification Study and being carried out continuously
I-2 Project for Post-harvest/Distribution						
I-2-1 Improvement of Agricultural Tools		↔	↔	↔	↔	Introduced as one of extension items of rice farming techniques
I-2-2 Reduction of Post-harvest Losses			↔	↔	↔	Introduced as one of extension items of rice farming techniques
I-2-3 Improvement of Distribution Channel by Farmers' Group (1)			↔	↔	↔	Correlation with dry season vegetables growing and rice adapted varieties
I-2-4 Improvement of Distribution Channel by Farmers' Group (2)			↔	↔	↔	Execution after realization of increase of market quantity
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		↔	↔	↔	↔	Extension officers play main role of rice farming techniques diffusion
II-1-2 Operational Capacities Building of Administrative Department			↔	↔	↔	Execution of projects and feedback by monitoring
II-2 Project for Rural Community Capacity Building			↔	↔	↔	Execution in accordance with progress of other projects
II-2-1 Group Leaders Training/Organization of Meetings		↔	↔	↔	↔	Execution in accordance with progress of other projects
II-2-2 Setting up of Farmers' Groups			↔	↔	↔	
III. Program for Agricultural Production Infrastructure Development/Water Management						
III-1 Small-scale Irrigation Project		↔	↔	↔	↔	Started in the Verification Study and being carried out continuously
III-2 Improved Nurseries Project			↔	↔	↔	Introduced as one of extension items of rice farming techniques
III-3 Water Management Training Project			↔	↔	↔	Aiming at the target group in the first phase and at the other farmers in the second phase
IV. Environment Preservation Program						
IV-1 Sensitization Project on Mangrove Forest Preservation			↔	↔	↔	Started in the Verification Study and being carried out continuously
IV-2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting			↔	↔	↔	Started in the Verification Study and being carried out continuously
IV-3 Project for Introduction of Salt-Extraction Improved Technique			↔	↔	↔	Started in the Verification Study and being carried out continuously

Figure 4.6.2 Implementation Schedule of the Master Plan

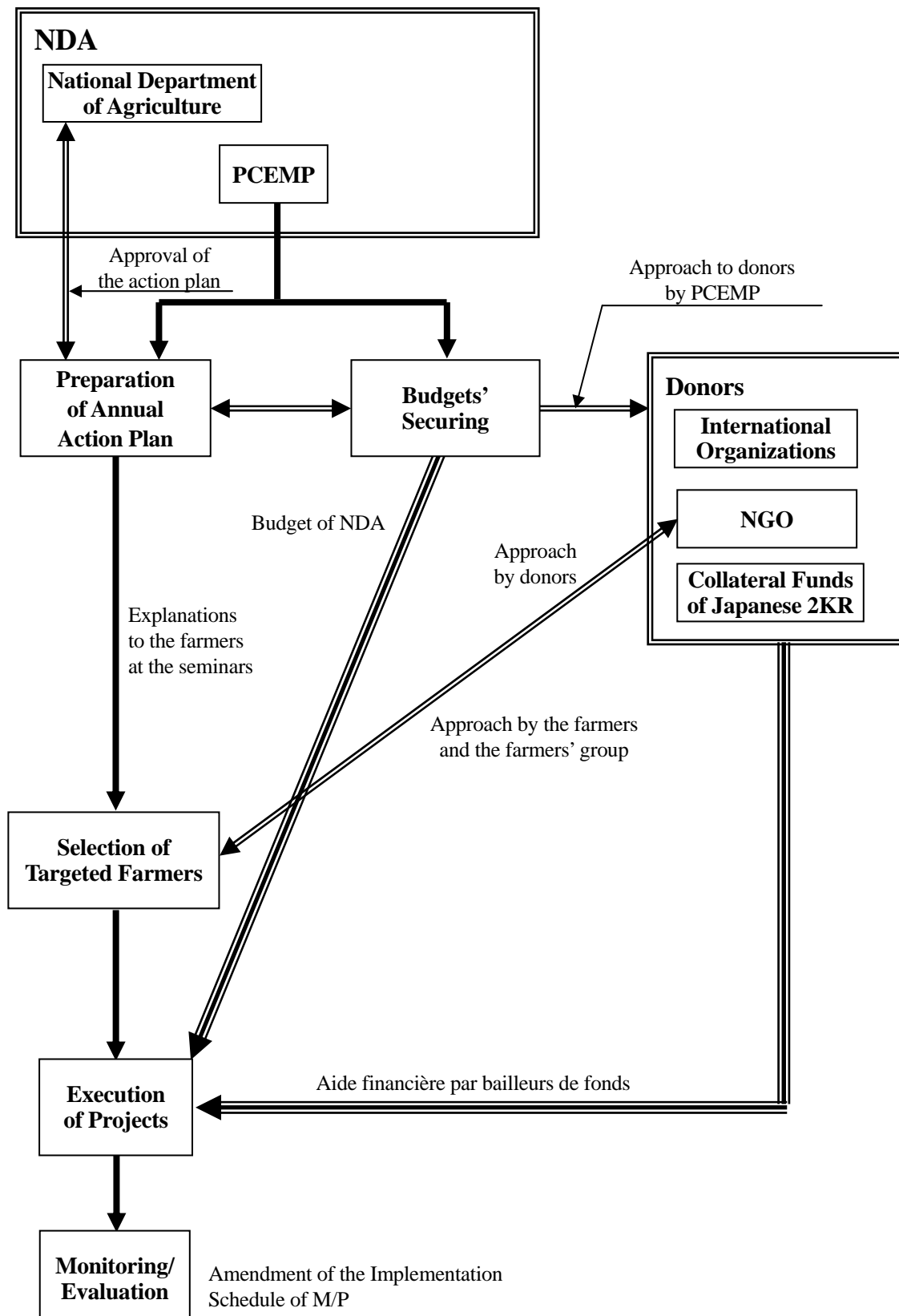


Figure 4.6.3 Organization and Procedure of the Master Plan

4.7 Option: Agricultural Production Infrastructure Development

4.7.1 Development Policy

Taking into account not only the current situation concerning the rain-fed rice cultivation and the practice of irrigated agriculture in the Study area, but also the constraints to development at the socio-economic level and the natural environment, fundamental orientations concerning the development of the base of agricultural production which are aimed by this project can be stated in the following way.

- The development will relate 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.
- In the plain of Sonfonia, the rain-fed rice cultivation is practiced during the rainy season. In the plan also only the rain-fed rice cultivation will be carried out during the rainy season.
- The cultivation of mangrove rice practiced particularly in the plain of Sonfonia is significant because it benefits from the advantages (supplement in nutritive elements, transformation of the acidity and effects of weeding) brought to the mangroves owing to the fluctuations of the tides. The penetration of sea water is initially permitted during the tides of the dry season and the plots are permanently maintained in the state of marshes. On the contrary, the penetration of saline water is avoided at the time of rice cultivation in rainy season, and it is necessary to eliminate the flood waters due to the rains. Consequently, the essential facilities for the development of mangrove rice cultivation are the flood control dikes to avoid the penetration of saline water, the canals to evacuate excess water in the plots, and the regulating gates for the control of water. In addition, the development of agricultural roads will be programmed.
- Concerning the development of the mangrove rice cultivation, it was carried out on a surface area of more than 4,000 hectares within the framework of the development Project of the irrigated rice cultivation in Maritime Guinea (PDRI-GM). Within the framework of this study, and by learning lessons from passed failures, emphasis will not be placed on large unit surfaces for the development of the cultivation but it will be recommended to limit to surface areas approximately within the range between 100 and 300 hectares. The target surface for the development of the mangrove rice cultivation in the plain of Sonfonia being 865 hectares, its development in the form of a unit plot seems difficult to consider by taking into account the failure of project PDRI-GM mentioned above as well as the difficulty in forming an organization of farmers gathering a large number of members. Consequently, it will be envisaged, in the present study, to consider a controllable cultivation surface of about 100 hectares per intake gate.
- During the dry season, irrigated rice growing using residual waters of the rivers is practiced on a small scale. Since the water resources for the irrigated rice growing in the plain of Sonfonia are, in addition to these residual waters of the rivers, only dead water of the storage reservoir of Sonfonia which was deteriorated by the construction of a road, and that a new development of the water resources proves to be impossible, this rice growing remains limited. Consequently, the

development of irrigation will be carried out by taking into account the currently available water resources in the dry season.

- Concerning the irrigation facilities, modern equipments requiring important fees for management and maintenance, and also high cost irrigation materials will not be installed. So, for the facilities which convey water to the plots it is adopted a structure of gravity flow by siphon, which is economic.
- During the dry season, the irrigated vegetables growing using residual river water is practiced along the banks of these rivers at small scale, as well as sprinkled cultivation of vegetables by using water from simple wells located in residential area at the top of the plain. Concerning the measures for water economy, the surface irrigation method (irrigation method between balks or ridges, basin type irrigation method) cannot in principle be recommended. Consequently, the irrigation methods which are currently practiced will be used.
- However, as shown in chapter 3, the number of land owners within the plain of Sonfonia is limited. In the lessons learnt from previous projects, it is reported some cases of conflicts about lands which are revalorized after development, which had serious consequences on the fate of the project itself. Thus it will be necessary to devote sufficient time to the preparation and to setting up conditions which allow the active participation of farmers. In other words, it is extremely important to clarify the relationship property/usage right (contract agreement) for the use of the lands. Consequently, if the property of the lands and their use remain ambiguous, the development of the parcel in question will not be regarded any more as priority. As for the execution of the development of the base of production, a study of the lands will take place as a preliminary, the contractual elements concerning the owners and the users will be identified. The solutions of the land problems are premises for the development.
- Since it is impossible that the farmers bear completely the initial investments for basic facilities, a part only of the assumption of responsibility will be mandatory, so that the farmers are aware that the facilities belong to them. According to that, the farmers will be able to carry out management and maintenance by themselves and the plan will thus be significant in terms of durability.
- For the project of maintenance and management of the development, the farmers themselves will ensure the management and the maintenance of the facilities. Those will have to be managed collectively and an organization of farmers will be set up, the creation of this organization being particularly important. Consequently, the establishment of the organization shall be the premise of the construction of the facilities.

4.7.2 Contents of the Development

Taking into account the results obtained by the previous studies carried out in the Study area, a program of development of infrastructures for agricultural production in the plain of Sonfonia was elaborated. In the center of the plain of Sonfonia, there is an abandoned marshy land extent, as vast as the third of the total surface of the plain. The development of the drainage canals was programmed in order

to drain these wetlands. The main parts of the work to be realized are: improvement of the drainage canals; raising the height of the dykes; development of the regulating gates for water and sea water evacuation; development of agricultural roads and the crossing works. In addition the development of a small-scale irrigation agriculture using dead water of the reservoir is required.

Development Area

The surfaces of the various cultivations for each development within the concerned area are presented hereafter. The area of fresh water rice growing is understood as the lands located at a level where the sea water can not reach even after the installation of the drainage canals. Concerning the irrigable area, it was determined from the water requirements and the usable volume of dead water of Sonfonia reservoir.

- 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

A development plan of the infrastructures of agricultural production is presented hereafter.

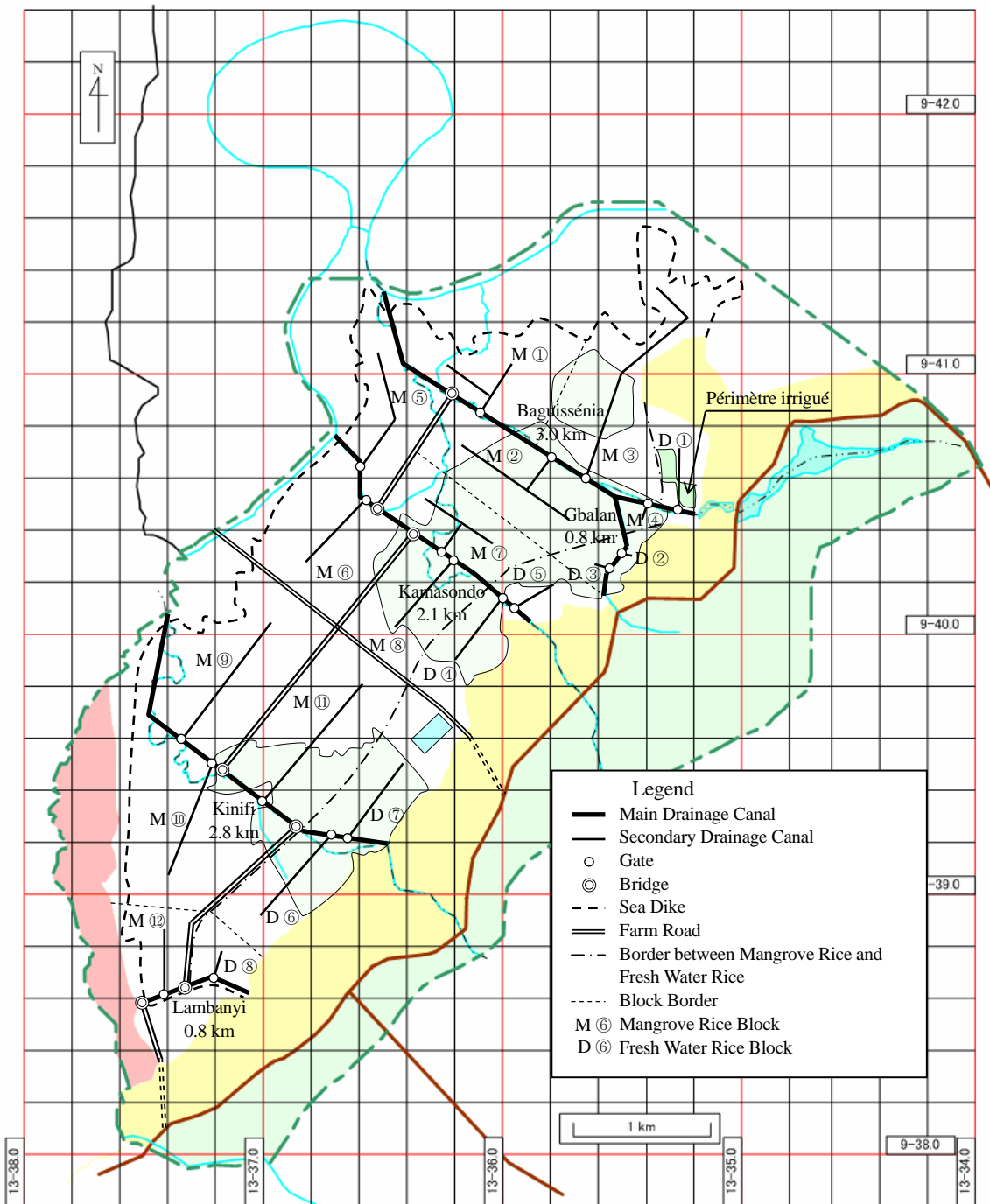


Figure 4.7.1 General Plan of the Plain of Sonfonia

(1) Drainage Plan

The drainage plan consists in regulating the water run-off of the tributary rivers in the zone with a flow which can be drained daily towards the sea during rains. The average altitude of the parcels of the plain of Sonfonia being 1.5 m, the works will be conceived so that the rise of the water level is fixed to 1,5 m above the altitude of the parcels. The canal will be made of earth and the slope of the side parts will be 1:1.5. On a river bank concerned, an agricultural road acting also as management road (of the development) will be arranged. The unit flow rate of the rains, calculated according to the rainfall records, is of 12.9 l/s/ha. The cross-section of stream discharge of water was determined by hydrological calculations. For the lateral canals, the width of the bed is of 0.5 m. The canals on the extremity side will be arranged by the beneficiary farmers.

To control the drainage in the plots and the intrusion of sea water, the unit flow rate of the rivers, the overall length of the canals, the width of the bed, the overall length of the secondary canals and the number of regulating gates are presented in the table below:

Table 4.7.1 Discharge and Canal Dimension

River	Discharge (m ³ /s)	Canal Length (m)	Bed Width (m)	Secondary Drainage Canals (m)	Gates
Sonfonia	15.043	3,000	6.0, 5.0	4,370	5
	2.374	800	1.0	200	2
Do	7.169	2,100	4.0	3,950	6
	12.798	2,800	5.0	4,530	5
	3.963	900	1.0	1,260	2
Total	41.347	9,500	—	14,310	20

(2) Sea Dike

According to the in-situ study results, at littoral plots level, the sea-water would not directly reach the plots, once the drainage canals are developed, but the water would rather come from the rivers. However, the existing wave control dykes being not strong, a development which consists in refilling them up to the same height as the rivers banks is required. The average refilling height will be about 30 cm. The length of the dikes to be refilled will be 11.8 km.

(3) Farm Road

On one of the two rivers banks, management (control) roads will be set up as well as agricultural roads equally on the north-south axis. An agricultural road will be constructed between Kobaya and Tayaki. The total width and the effective width are 3.0 m and 2.5 m respectively. The road will be coated by gravel, what will allow the tractors to roll even during the rains season. At each crossing of agricultural roads and rivers, a bridge will be constructed.

The total length of the agricultural road will be 7.6 km, and the numbers of bridges will be seven.

(4) Irrigation Facilities

A development of small size irrigation using the dead water of Sonfonia reservoir will be set up. It will serve for the cultivation of freshwater crops, of which tillage works will be executed in December, the transplanting in middle January and the harvesting in April. The quantity of water for irrigation is calculated for the rice-growing by considering the possibility of surface watering, including part of the vegetables cultivation.

The irrigable surface area has been obtained by adding up the water available in Sonfonia reservoir fed by the rivers, as one hand, and subtraction the evapotranspiration at surface waters and irrigation water, as the other hand. The water balance is calculated based upon the volume of water which is conveyed by gravity and taking into account the water level in the lake and the altitude of the plots. The irrigable surface area which is calculated on the basis of dead water volume is 6 ha.

The water uptake of Sonfonia reservoir will be made of Siphon structure placed in the overflow structure. The water is transferred by pipeline from the overflow basin to the plots by gravity. The discharge basin will be placed at the downstream extremity of the pipeline and the water will be transferred from the basin to the plots by means of a canal. This canal must be dug by the beneficiaries.

(5) Water Management Plan

The water management plan using these irrigation facilities is prepared taking into account the simplicity and the farmers' ability of handling them. With regard to the waters management for the mangrove rice-growing, the periods of low and high tides are very important and it will be necessary to know at any time the situation of the tides. The procedure of water management for mangrove rice growing is presented below:

- The gates will be opened during the dry season to allow seawater to penetrate in the plots by using the tide effect, the plot being permanently in the state of swamp.
- At the beginning of the raining season and during the low tide the gates are opened and the water is evacuated.
- The penetration of seawater during high tide shall be avoided by proper operation of the gates.
- In order to lessen the salinity of the plots, residual rainwater shall be evacuated during low tide by opening the gates.
- When salinity is reduced, the rice transplanting shall proceed when rainwater reaches sufficient depth.
- After transplanting the rice, in order to avoid damages caused by crabs, a sufficient water depth shall be ascertained while respecting the length of the plant.
- During the flooding time, the gates are closed to avoid the penetration of river waters in the plots, which will have to be evacuated to the sea. To evacuate the waters from the plots, it is necessary to open the gates during low tide. At this moment the rice can bear for about 3 days a large volume of seawater and the management of water evacuation can be performed taking this as reference.

- At the harvesting time, the gates shall be opened at low tide to discharge the water.

(6) Facilities Management Plan

The importance of the management and maintenance plan for the facilities lies in the necessity to carry out inspection tour of the flood control dykes in order to avoid the penetration of seawater, and carry out repairs in case dyke damaged parts are noticed. It will be necessary to proceed to the inspection of eventual problems of gates failures during their operations. In addition, the dredging and weeding of the evacuation canals should be a matter of importance.

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 an agricultural production infrastructure, it is necessary to take into account first hand a considerable number of elements. Therefore, the execution of the program will be divided into different scheduled phases indicated below.

1) Initial Phase

Farmers' Organization

The most important element in the execution of the basic facilities programs is the formation of farmers' organization having group consolidation and leading capabilities in order to proceed to the management of collective facilities. On the other hand, the infrastructure development brings about land problems and it is necessary to carry out beforehand the land ownership questionnaire in order to identify contractual and juridical elements between proprietors and land users, and to solve the land problems. It is particularly necessary that the land would be made available for the construction of evacuation canals and agricultural roads among others, in the case of a base development, and the farmers will have to solve the problems by themselves as an organization.

In addition, it will be necessary to foresee measures allowing farmers' sense of responsibility on the ownership of the facilities obtained through infrastructure development.

Therefore, the initial phase shall be devoted to setting up the farmers' organization, to the solution of the land ownership, and to the farmers' sense of responsibility on the ownership of the facilities. The accent will be particularly put on the awareness creation and the improvement of farmers capabilities in this period.

Administration

During the execution of the program of base development, setting up a system of reception for farmers, as indicated above, is important. In order to put this into execution, it is necessary to obtain the directives and the appropriate support of the administration. Therefore, the administrative side itself must have the necessary knowledge and experience. Furthermore, knowledge and technical experience are required for the study, the plan, the conception, the calculation, the tender, the

selection of the companies, and the management of the works during the execution of the project of base development. The National Department of Agriculture will be the executing organization of the present project.

Therefore, the initial phase will be reserved to the promotion of the administrative institutions support to farmers, and for the acquisition of knowledge and technical experience as well. The accent will be particularly placed on the sense of responsibility and the capacities improvement.

For that purpose, the collaboration of the National Department of Agricultural Engineering which possesses abundant knowledge and experience in the field of base development will be indispensable. When the commissioning of the developments is set up for the farmers, some development projects will be undertaken.

The execution of irrigation development and the redevelopment of the canals will be among the priorities.

2) Intermediate Phase

During this phase, confirming the success of the project partly carried out in the Initial Phase, the farmers' groups for the farmlands not yet executed shall be formed and the land reclamation shall be carried out.

3) Final Phase

After confirming the success of the project of the infrastructure development which is executed during the intermediate phase, the totality of the project will be put into execution.

In order to make success of this project, it is not enough to construct the infrastructures but the following components shall be executed; the formation of a farmers organization which will be in charge of facilities management and maintenance, the organization management, the extension or diffusion of agricultural techniques to the farmers and setting up a transversal liaison system as a program for improvement of the capacities of the extension staff in charge of these tasks.

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

1) Costs of the Development

The costs of the agricultural production infrastructure development have been estimated on the basis of average prices of the year 2004 and by referring to the development projects of irrigated rice growing - Maritime Guinea (PDRI-GM), Kakossa Rural Development project, FAO Project on the Policy and National Strategy Development of Small-Scale Irrigation and other similar projects.

The costs consist of the direct construction cost, the indirect construction cost, the management fees and the engineering fees. The direct construction cost consists of the drainage plan, see dike, farm road, irrigation and leveling. The costs of the agricultural production infrastructure development has been estimated at about 1,833,000 US\$, and the costs divided into phases are shown in the following table.

Table 4.7.2 Development Costs**(US\$)**

	Initial Phase (4 years)	Intermediate Phase (3 years)	Total
Direct Construction Cost			
Drainage Plan	238,910	748,656	987,566
Sea Dike	-	29,260	29,260
Farm Road	-	206,284	206,284
Irrigation	17,638	-	17,638
Leveling	-	125,120	125,120
Sub total	256,548	1,109,320	1,365,868
Indirect Construction Cost	5,131	22,186	27,317
Management Fees	51,310	221,864	273,174
Engineering Fees	31,299	135,337	166,636
Total	344,287	1,488,707	1,832,995

2) Benefits of the Development

The benefits of the agricultural production infrastructure development were calculated in accordance with the target values of the Master Plan as mentioned before.

The overheads consisting of the farm input, the labor fees, the maintenance fees, etc. for 20 years are estimated at 589,000 US\$, and the total costs of the project including the costs of the development are 2,422,000 US\$.

On the other hand, the benefits born in 20 years are estimated at 5,567,000 US\$. Consequently, B/C is calculated at 2.3. Additionally, 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. The details of cost and benefit are shown in Table M. 21 at the end of this chapter.

(9) Organization and Management of the Master Plan

The project owner is the National Department of Agriculture. At the executive level, a steering committee which is formed by representatives of Ministries will be created. The committee is in charge of the coordination of inter-ministerial relations.

An executive bureau of the project, which is in charge of the promotion of the project, will be established. The execution of the project will be placed under the direction of the chief of the project, and five sections will be created within the bureau. These are:

Finances and Management Section: in charge of general affairs and finances. The supporting staff (secretary, Driver etc.) is attached here.

Section of agricultural development: in charge with matters related with the medium in which the agriculture will be developed, and jointly promoting with the {SNPRV} and the {DCDRE} farmers training in the improvement of cultivation techniques.

- Rural community section: In charge of rising awareness of the community aiming at the active participation, the project realization, and the regular management of the facilities.
- Section of land construction: In charge, in relation with land development of the study, the planning, the conception and calculation, the adjudication, the control of the works, etc. Since the DNA has not performed any agricultural development, the participation of the DNGR, which has rich experiences in this matter, will be welcomed in the project. An staff of the {DNGR} will be dispatched to this section.
- Evaluation and followed up section: In charge of follow up and evaluation depending on the progress of the project. After completion of the project, it will perform the follow up and evaluation of the facilities' management carried out by the farmers.

An association of promotion of the project will be created by the beneficiary farmers under the direction of the rural community section. It is constituted of the whole groupings of farmers, in charge of the management of each gate. All beneficiary farmers will participate to the association. A head, a secretary, and an accountant will be chosen by election. As a diminution of lands following the construction of the banks and the agricultural roads is foreseeable, a land planning section will be placed within the association. As the management of the facilities after the completion of the project will be compulsorily performed by the association, a section will be created to this end. A part of the fees for the construction and management of the facilities will be at the expense of the farmers, which will necessitate contributions. For that purpose, an accountant will be appointed. The collaboration with the execution bureau during all the lasting of the project will allow the association to have knowledge about the facilities and learn to manage them or to maintain them. Consequently, the management and the maintenance of the facilities will be performed without significant problems. A full session of the regular assembly of the association will be convened twice a year, and extraordinary sessions will be opened according to the needs. Besides the association of farmers, the DNA, the SNPRV and the DCDRE will participate to the assembly. In parallel to the realization of the project, the groupings of farmers will be able to choose according to their needs among projects or accompanying components retained in the frame of the master plan. Everything will be carried out under the groupings initiative and then from bottom-up , with the support of the SNPRV and the DCDRE.

The grouping of farmers is an organization for the realization of the project and is composed of interested persons. A group leader, a secretary and an accountant are appointed after consultation. The group shall have internal rules of procedure and shall carry out the group activities. The group shall be registered so that its activities will be made official and it can open a bank account.

The training of the administrative and extension officers to reinforce their capacities will be carried out under the supervision of the DNA.

Items	2005			2006			2007			2008			2009			2010			2011			2012			2013			2014			2015			2016								
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
Option: Agricultural Production Infrastructure Development																																										
Master Plan							1	2	3	4																																
1 Group Formation																																										
2 Solution Problems (Land Ownership, Shares, Maintenance and Management)																																										
3 Study, Design, Estimate, Tender Documents, etc.																																										
4 Procurement																																										
5 Farming using Agricultural Infrastructure																																										
Period of the Verification Study																																										

Figure 4.7.2 Option: Implementation Schedule of Agricultural Production Infrastructure Development

4.7.3 Environmental 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 if Environment Impact Assessment (EIA) is necessary or not, and IEE was carried out in accordance with JICA’s “Guidelines for Environmental and Social Consideration” to formulate the M/P. Land problem may be the main component in the scoping of IEE of Environment and Social Consideration. In case that the project utilizes a land area where the landowners are not clear, there will be conflict of interests, and therefore, the project must be carried out with deep consideration of farmers’ interests. There is also some concern that the farmers shall not be able to cultivate due to the increase of land fee after Agricultural Production Infrastructure Development.

The items which may cause impact on the natural environment are “soil erosion” and “animals and plants”. The change of direction of canals due to the improvement of inflow canals and drainage canals may have a possibility of causing soil erosion. Therefore, careful consideration was taken into account for the planning of canal route. There are mangrove forests at the boundary of the sea and farmlands in the plain of Sonfonia. Therefore, it was taken into consideration that the existing canal systems were used as much as possible in the designing of irrigation and drainage canals so that there would not be any significant impact on the ecological system of mangrove forests.

Additionally, it is necessary to set up an environment division and a Community division in the Project Implementation Office to monitor the impacts of environment and social consideration during the implementation of the projects.

Table M. 2 «I. Program for Agricultural Farming and Crop Improvement» (2/9)

Project	I - 1 Project for Improvement of Cropping Techniques															
Component	1 - 1 - 2 Diffusion of Rice Adapted Varieties															
Target Group	Farmers group (existing or new group), extension officers															
Background Most of the cultivated rice varieties in the plains of Sonfonia have been disseminated by the farmers themselves. The farmers use seeds from part of the harvest of the previous year. The qualities of these seeds made at home are not really excellent, because they are frequently mixed with other varieties.					Objective The objective of the component aims at getting the farmers self supply their own seeds.											
Contents of Activities The inventory of the adapted varieties is made, and their characters are identified. The farmers' groups are set up in order to diffuse the seeds of such varieties, and the training is carried out for raising the groups. The farmers should master the methods of renewing and selling the seeds.																
Expansion to Other Areas Possible to carry out in the inundated rice cultivation areas, it is also possible in the mountain rice cultivation area, if the concept is modified.																
Activities					M	J	J	A	S	O	N	D	J	F	M	A
1	Inventory of the adapted varieties by the diffusion/extension officers				■											
2	Choice of the groups or creation of new groups				■											
3	Training on the production adapted seeds varieties					■										
4	verification of the characteristics of the adapted varieties'						■									
5	production and commercialization of the seeds (4 th year)						■						■			
Inputs					Benefit											
Item					Price (\$)											
External expert 1 month \$ 700/month × 1 month					700.00											
Person from another direction 5 months \$ 100/month × 5 months					500.00											
Personnel from DNA 9 months \$ 100/month × 9 months					900.00											
Diffusion/extension officers 2 × 9 months \$ 80/month × 18 months					1,440.00											
Provision of seeds/ other agricultural materials Seeds + agricultural material					145.00											
Workshop 2 times × \$ 100					200.00											
Compilation of the manual etc					16.00											
•Calculation of the benefits Yield by the improved techniques : 2.5 t/ha Number of the seeding groups in 10 years : 10 Area cultivated per group : 0.6 ha Production quantity in 10 years : 15 t local cost (1 kg of seeds) : 1,800 FG/6,250 = 0.288 \$ During the first 3 years period, the activities will be based on inventory of adapting varieties. From 4 th years, increasing of target group at 2 groups per year.					•Expected Benefit: The benefit will come from production selling of seeds «adapting varieties». •The sum of benefits in 10 years \$ 21,600											
Expected Output 1) realization of the inventory of the adapted varieties 2) the access to the adapted varieties will be easy at the level of the farmers, and will be extended to the farmers around the area. 3) the revenue of the groups will be increased 4) augmentation of the yield and revenue at the level of the farmers that have proceeded to the advanced techniques.					Technical Advice • Lack of inventory on the local information, pursuant to the frequent organizations of workshops and training at the beginning of program set up. • consideration of the flooding damage in the choice of the plot (rain water discharge location will be avoided) • pursuing the seeds production plot experimentation (at least three years)											
Related Agency	DNA, DCDRE, SNPRV															
Cost/Benefit	Total costs : \$ 3,901 × 8 years = \$ 31,208 ; Benefit : \$ 21,600 ; Cost and benefit balance rate : 0.7															
Period	The test period will be 3 years; at beginning of 4 th year, it must be sold seeds. Increasing of target group at 2 groups per year, and there will be 10 groups at 8 th years.															
Related Components	I - 1 - 1 Improvement of Rice Farming and Cropping Techniques II Human Resources Training Program															
References	Note on the Verification activities															

Table M. 3 «I. Program for Agricultural Farming and Crop Improvement» (3/9)

Project	I - 1 Project for Improvement of Cropping Techniques																	
Component	1 - 1 - 3 Production of Dry Season Vegetables Growing																	
Target Group	Vegetable growing group (already existing or new group), extension officers																	
Background In the plain area of Sonfonia, appropriate lands for vegetable cultivation are limited, but there is always the possibility as in the case of vegetable growing by the urban farmers. In addition, the activities of vegetable farming shall bring open opportunities for women during the dry season.						Objective Set up of organic matter utilization (chicken droppings, composts of solid wastes, etc.) and a program for improvement of the commercial production technique (the study of demand and supply) in the dry season. From the view point of farmers' group training, destined to the farmers group in charge of the sale, set up a transparent system and durable management.												
Contents of Activities Taking into account these internal and external needs, it is in great demand to promote the urban agriculture by training the model individual or group farmers as vegetables growers, and by offering the opportunities of vegetables growing to the urbanites and their groups.																		
Expansion to Other Areas Generally possible in all areas.																		
Activities						O	N	D	J	F	M	A	M	J	J	A	S	
1	Choice of the groups or the creation of new groups					-												
2	Training on the vegetable cultivations					-												
3	Marketing study in the advanced areas.					-	-											
4	Execution of the vegetable cultivations																	
5	Promotion of the sales, budget for the next production																	
Inputs						Benefit												
Item		Price (\$)				<ul style="list-style-type: none"> •Benefits calculation Expected groups after 10 years : 14 Surface area of the farm per each group : 0.6 ha Anticipated total surface area in 10 years : 8.4 ha (40% of the cultivable surface area for vegetable growing) revenue of each group : 590 \$ 2 targeted groups per year from 4th year •Expected Benefit: The benefit will come from Dry Season Vegetables Production selling. •The sum of the benefit in 10 years : \$ 33,040 												
Person from another direction 3 month \$ 100/month × 3 months		300.00																
Person from the DNA 6 months \$ 100/month × 6 months		600.00																
Diffusion/extension officers 2 × 5 months \$ 80/month × (10 months + 2 months)		960.00																
Provision of seeds/ other agricultural materials seeds + agricultural material		180.00																
Workgroup and workshop, visits of the advanced area 2 times × \$ 100, 40 per × 2 times × \$ 6		680.00																
Compilation of manual etc		16.00																
Expected Output						Technical Advice												
<ol style="list-style-type: none"> 1) Augmentation of work opportunities during the dry season. 2) Augmentation of the groups' revenue. 3) Promotion of the farmers' groups. 						<ul style="list-style-type: none"> • The training manuals will be simplified, considering the diffusion in the area, it is hoped that this will be carried out with the participants. • The main topics of the training will include the preparation and the maintenance of soil, because the fertility of the land is a big issue in the area. • Consideration of the screening of the participants to better diffuse to others. 												
Related Agency		DNA, DCDRE, SNPRV																
Cost/Benefit		Total cost : \$ 2,736.00 × 8 years = \$ 19,152.00, Benefit : \$ 33,040 Balance rate of cost and benefit : 1.7																
Period		Start from 4 th years																
Related Components		II Human Resources Training Program																
References		None																

Table M. 4 <<I. Program for Agricultural Farming and Crop Improvement>> (4/9)

Project	I - 1 Project for Improvement of Cropping Techniques																	
Component	I - 1 - 4 Introduction of Group Specialized in Agricultural Works																	
Target Group	Farmers' Group for Rice Growing , Young Generation Group																	
Background Since the agriculture in the study area mainly depends on hired laborers who are insufficient in number, it is difficult to secure them.						Objective Young persons compose groups of contract works. The contract works shall improve the condition of labor shortage and may expand the area of paddy lands.												
Contents of Activities This group is composed of youths and it takes in charge the maintenance of canals, the parcels or plots repair works, the transplantation, the harvest, etc. In so doing, the agricultural technique knowledge accumulates up inside the group.																		
Expansion to Other Areas This component shall expand only to the area of similar conditions to Sonfonia lowland where agricultural infrastructures for mangrove rice are not sufficient.																		
Activities						O	N	D	J	F	M	A	M	J	J	A	S	
1	Selection of target group and new group formation					■												
2	Execution of market research						■											
3	Setting the service charges and establishment of operating regulation							■										
4	Implementation of services								■	■	■	■	■	■	■	■	■	■
Inputs						Benefit												
Items			Costs (US\$)			<ul style="list-style-type: none"> • Calculation basis; Nos. of group after 10 years: 4 (each district 1) Cultivation area of each group: 20.0 ha Cultivation area after 10 years: 80.0 ha (about 20 % of uncultivated area) Cost of Production: 30 % of Production Yield: 1.8 ton/ha Farm gate price for rice: 0.240 US\$ One target group commence and implement the services every two years • Expected Benefit: • Total benefits of 10 years: 133,056 US\$ 												
Staff of DNA, 4 months \$ 100 / month × 4 months			400.00															
Extension officer, 8 months \$ 80 / months × 8 months			640.00															
Expenditure for training			800.00															
Agricultural tools/equipment, and others			600.00															
Expected Output 1) Farmers will be released from heavy works. 2) Supply and demand of hired laborers will be more popular and active. 3) Rice yields will increase due to the timely cultivation. 4) Cultivation area will be expanded conquering the shortage of workforce.						Technical Advice • Formation of a new group is shown in the item "II - 2 - 2 Farmers Group Formation". • The contract work includes not only land preparation but also other activities such as transplantation, harvesting and others. • Services charge shall be decided on the basis of market survey and it should be affordable by the farmers.												
Related Agency	DNA, DCDRE																	
Cost/Benefit	Total Cost (C): 2,440 × 4 times = 9,760 US\$, Total Benefits (B): 133,056 US\$, B/C: 13.6																	
Period	Add 1 target group at each year from 4 th year after commencement of the project																	
Related Components	I - 1 - 5 Introduction of Tractor Service by Farmers' Group II - 2 - 1 Training seminar for group leader and Leaders' Conferences II - 2 - 2 Farmers' Group Formation																	
References	None																	

Table M. 5 «I. Program for Agricultural Farming and Crop Improvement» (5/9)

Project	I - 1 Project for Improvement of Cropping Techniques															
Component	I - 1 - 5 Introduction of Tractor Service by Farmers' Group															
Target Group	Farmers' Group															
Background Agricultural mechanization for land preparation is introduced to the program for the following reasons. i) It is difficult to bring the agricultural mechanization to other agricultural activities in the existing condition of Guinea, ii) Introduction of animal draft is also difficult in the study area, and iii) The government is promoting a policy of agricultural mechanization importing a lot of tractors.					Objective Utilization of tiller is also used on other farmers' lands for effective use of the existing tiller.											
Contents of Activities Considering the actual situation of the study area where land preparation is carried out by human labors, utilization of tiller that was used only for the group lands is also used on other farmers' lands for effective use of the existing tiller.																
Expansion to Other Area It is possible to expand the method of tractor services including training seminar to other part of Guinea.																
Activities					O	N	D	J	F	M	A	M	J	J	A	S
1	Execution of training seminar and marketing survey (already executed in the verification study)				—											
2	Construction of warehouse (already constructed in the verification study)						—	—								
3	Setting services charge and preparation of operating regulation (already constructed in the verification study)						—									
4	Implementation of services (under the execution)								—	—	—	—	—			
Inputs					Benefit											
Items		Costs (US\$)			<ul style="list-style-type: none"> • Calculation basis; This component is under the execution based on the verification study. Annual cultivation area: 6.0 ha Yield: 1.8 ton/ha Cost of Production: 30 % of Production Farm gate price of rice: 0.240 US\$ • Expected Benefit: Annual increase in the cultivated area by the decrease of non-cultivated area. • Total benefits in 10 years: 18,140 US\$ 											
Staff of DNA, 3 months \$ 100 / month × 3 months		300.00														
Extension officer, 6 months \$ 80 / months × 6 months		480.00														
Expenditure for training seminar		1,700.00														
Fuel cost for initial operation 200 litter × 1.1 US\$		220.00														
Cost for construction of warehouse		3,000.00														
Expected Output 1) Farmers will get relief from heavy works. 2) Supply and demand of hired laborers will be more popular and active. 3) Rice yields will increase due to the timely cultivation. 4) Cultivation area will be expanded conquering the shortage of workforce. 5) The tiller will be utilized effectively.					Technical Advice <ul style="list-style-type: none"> • Deciding the services charge should consider the risk of rainfall, since the working capacity of tiller is influenced by rainfall • In order to secure a sound financial capability of the group, the uncollected money should be minimized. Therefore, suitable customers should be selected. • The heavy works on operators for tractor service must be alleviated. 											
Related Agency	DNA(DIMA, CEPERMAG), DCDRE															
Cost/Benefit	Total Cost (C): 0 US\$ (already prepared in the verification study), Total Benefits (B): 18,140 US\$, B/C: N/A															
Period	Target farmers' group (LANKOYA) performed in the verification study continues this component.															
Related Components	I - 1 - 4 Introduction of Entrusted Working Group II - 2 - 1 Training seminar for group leader and Leaders' Conferences															
References	The activities records in the verification study															

Table M. 6 «I. Program for Agricultural Farming and Crop Improvement» (6/9)

Project	I - 2 Project for Post-harvest/Distribution															
Component	I - 2 - 1 Improvement of Agricultural Tools and Equipments															
Target Group	Farmers, Farmers' Group and Extension Officer															
Background Most of the activities of rice cultivation depend on manual work in Guinea. Accordingly, the improvement of agricultural tools and equipments used for rice cultivation are urgently requested.					Objective Tools and equipments for rice cultivation are fabricated and the extension system of them is established and promoted.											
Contents of Activities Improve agricultural tools which are the bladed hoe, the pitchfork, the hoe, the small silo for the seeds conservation by using empty oil can, the rope for transplanting, and the weed killer and the small scale manual threshing-machine manufactured are presented to the farmers.																
Expansion to Other Area It is possible to expand to other part of Guinea.																
Activities					M	J	J	A	S	O	N	D	J	F	M	A
1	Extraction of improvement points and farmers' needs by extension office.					■										
2	Fabrication of tools and equipments						■	■	■	■	■	■				
3	Introduce the fabricated tools to farmers through seminar											■				
4	Selling of tools and equipments												■	■	■	■
Inputs					Benefit											
Items		Costs (US\$)			<ul style="list-style-type: none"> •Basis of Calculation; Benefits are calculated as a value brought from reduction in grain loss through activities from harvest to storage. Ten percent (10%) of yield (0.25ton/ha) would be saved by the technique of rice cultivation improvement proposed in this master plan. •Total benefits in 10 years (including in the benefit of I-2-2) are 121,745 US\$. 											
Staff of DNA, 1 months \$ 100 / month × 1 months		100.00														
Extension officer, 2 months \$ 80 / months × 2 months		160.00														
Fabrication of tools and equipments		2,000.00														
Expenditure for introduction seminar \$ 100 / time × 4 times		400.00														
Promotion expenditure		100.00														
Expected Output 1) Working efficiency is improved, and 2) Grain loss is reduced.					Technical Advice <ul style="list-style-type: none"> • In order to get ideas on reducing grain loss, a hearing survey from wide-rang of farmers is effective. • In order to expand the tools and equipments, it is necessary to get opinions of farmers who actually use them. 											
Related Agency	DNA(CEPERMAG), DCDRE															
Cost/Benefit	- Cost of 1-2-1: \$ 2,760 × 10 years = 27,600 US\$, and cost of 1-2-2: \$ 1,820 × 10 years = 18,200 US\$, Total Costs (C): \$ 27,600 + \$ 18,200 = 45,800 US\$ - Total Benefits of 1-2-1 and 1-2-2 (B): 121,745 US\$, - B/C: 2.7															
Period	10 years															
Related Components	I - 2 - 2 Loss reduction from harvest to storage II Capacity building															
References	Leaflet for extension of fabricated agricultural tools															

Table M. 7 <<I. Program for Agricultural Farming and Crop Improvement>> (7/9)

Project	I - 2 Project for Post-harvest/Distribution																	
Component	I - 2 - 2 Loss Reduction from Harvest to Storage																	
Target Group	Farmers, Farmers' Group and Extension Officer																	
Background Various types of grain losses such as shedding loss, conveyance loss, threshing loss and storage loss by rats occur in the process of harvest and storage.						Objective To introduce a loss reduction method in each process such as improvement of conveyance, method of threshing, and introduction of small silo, etc.												
Contents of Activities Utilization of fabric (cloth) to wrap the rice before threshing during transportation is introduced. The general beating (hitting the rice with a stick,) generates the loss by spreading, and the introduction of vinyl sheets is programmed. The rice after the beating is stored in the small silo for the conservation of the seeds fabricated in the Verification.																		
Expansion to Other Area It is possible to expand to whole Guinea.																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Extraction of improvement points by extension office																	
2	Selection of farmers who participate in the verification																	
3	Technology transfer to farmers through seminars																	
Inputs						Benefit												
Items			Costs (US\$)			<ul style="list-style-type: none"> • Calculation basis; Benefits are calculated using the value brought from grain loss reduction through the activities from harvest to storage. Ten percent (10%) of yield (0.25ton/ha) would be saved to the farmers with the improved technique of rice cultivation proposed by this master plan. • Total benefits in 10 years (including in the benefit of I-2-1) are 121,745 US\$. 												
Staff of DNA, 1 months \$ 100 / month × 1 months			100.00															
Extension officer, 4 months \$ 80 / months × 4 months			320.00															
Inputs for improvement			1,000.00															
Expenditure for introduction and extension seminar and workshop \$ 100 / time × 4 times			400.00															
Expected Output 1) Grain losses from harvest to storage is reduced, 2) Heavy works of conveyance is alleviated, 3) Income of farmer is increased owing to grain loss reduction.						Technical Advice <ul style="list-style-type: none"> • In order to get ideas on reducing grain loss, a hearing survey from wide-range of farmers is effective. • In order to expand the tools and equipments, it is necessary to get opinions of farmers who actually use them. 												
Related Agency	DNA(CEPERMAG), DCDRE																	
Cost/Benefit	- Cost of I-2-1: \$ 2,760 × 10 years = 27,600 US\$, and cost of I-2-2: \$ 1,820 × 10 years = 18,200 US\$, Total Costs (C): \$ 27,600 + \$ 18,200 = 45,800 US\$ - Total Benefits of I-2-1 and I-2-2 (B): 121,745 US\$, - B/C: 2.7																	
Period	10 years																	
Related Components	I - 2 - 1 Improvement of agricultural tools and equipments II Capacity building																	
References	None																	

Table M. 8 «I. Program for Agricultural Farming and Crop Improvement» (8/9)

Project	I - 2 Project for Post-harvest/Distribution																	
Component	I - 2 - 3 Improvement of Distribution by Farmers' Group (1)																	
Target Group	Farmers' Group (Existing Group and New Group)																	
Background It is difficult to obtain agricultural inputs such as high quality rice seeds and fertilizer, which is one of the constraints for development in the Sonfonia plain.						Objective Distribution system is improved through the procurement/sales of rice seeds and chicken manure which are available in the study area.												
Contents of Activities 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, the fertilizers, and the lacking materials in the plain.																		
Expansion to Other Area It is possible to expand to other part of the country.																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Selection of target group, formation of new group					■												
2	Training seminar for obtaining necessary knowledge					■												
3	Marketing survey for procurement and sales					■				■								
4	Execution of procurement and sales																	
5	Participation in "Training seminar for group leader and Leaders' Conferences"																	
Inputs						Benefit												
Items			Costs (US\$)			<ul style="list-style-type: none"> •Basis of Calculation; Selling of rice seeds and chicken droppings will be done for expansion of rice and vegetable cultivation. The time and manpower will be saved for easily procuring the seeds. Benefit cost is calculated by « Improvement of Rice Farming and Cropping Techniques » and « Production of Dry Season Vegetables Growing ». •Target group: 4 •Total benefits of 10 years: 0 US\$ 												
Extension officer, 2 person × 3 months \$ 80 / month × 6 months			480.00															
Initial procurement of agricultural inputs			1,000.00															
Expenditure for training seminar			800.00															
Expected Output 1) Agricultural input materials are supplied in the study area, 2) Farmers' group will expand to be an organization which is in charge of distribution in the project area.						Technical Advice <ul style="list-style-type: none"> • Formation of a new group is executed in the framework of "II-2-2 Group Formation", • Deciding a selling price shall considered the escalation price for next procurement, • Selection of selling items is determined from the results of marketing survey based on the farmers' needs. 												
Related Agency	DNA, DCDRE, SNPRV																	
Cost/Benefit	- Total Cost (C): \$ 2,280 × 4 times = 9,120 US\$ - Total Benefits (B): 0 - B/C: N/A																	
Period	Execute from 4 th year, add one group each year																	
Related Components	I - 1 - 2 Introduction of high-quality rice varieties I - 2 - 4 Improvement of distribution system of Farmers' Group (2) II - 2 - 1 Training seminar for group leader and Leaders' Conferences II - 2 - 2 Group formation																	
References	None																	

Table M. 9 <<I. Program for Agricultural Farming and Crop Improvement>> (9/9)

Project	I - 2 Project for Post-harvest/Distribution															
Component	I - 2 - 4 Improvement of Distribution by Farmers' Group (2)															
Target Group	Farmers' Group															
Background					Objective											
<p>Since urban residents are living in the study area, it would have been a big market potential for selling agricultural products. However, farmers in the study area do not achieve even self-sufficiency. Therefore, the market of agricultural products is not active in the study area.</p>					<p>This component succeeds the "1-2-2 Improvement of Distribution by Farmers' Group (1)". The farmers' groups shall expand to the organizations which take in charge of procurement and distribution of agricultural products in the study area.</p>											
Contents of Activities																
<p>At first, the group sells solely the foodstuff produced by its own group. Gradually, the turnover increases owing to the sales of products coming from the 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.</p>																
Expansion to Other Area																
It is possible to expand the new organizations to whole Guinea.																
Activities					M	J	J	A	S	O	N	D	J	F	M	A
1	Training seminar for obtaining skill and necessity knowledge				■											
2	Marketing survey for procurement and selling					■			■							
3	Procurement of agricultural input, processing (par-boiled rice), and Selling											■	■	■	■	■
4	Participation in "Training seminar for group leader and Leaders' Conferences"						■	■	■	■	■	■	■	■	■	■
Inputs					Benefit											
Items			Costs (US\$)		<ul style="list-style-type: none"> •Calculation basis; The local production will be sold in the Study zone. The transportation cost can be saved and estimated stable benefit, however benefit of 10 years is small, so the benefit can't be calculated in this Master Plan. •It is considered as support other component. •Target group: Selection 2 groups from groups of Improvement of Distribution by Farmers' Group (1) . •Total benefits in 10 years 0\$ 											
Extension officer, 2 person × 1 months \$ 80 / month × 2 months			160.00													
Storage facilities, parboiled rice steamer and others			2,500.00													
Expenditure for training seminar			800.00													
Expected Output					Technical Advice											
<p>1) Agricultural products harvested from the project are sold, 2) Farmers' group expanded to organizations which take the charge of distribution in the project.</p>					<ul style="list-style-type: none"> • Careful attention is necessary in the storage of rice. Sensitive management preventing the damages from insects, rats and pest is required. 											
Related Agency	DNA, DCDRE, SNPRV															
Cost/Benefit	<p>- Total Cost (C): \$ 3,460 × 2 times = 6,920 US\$ - Total Benefits (B): 0 - B/C: N/A</p>															
Period	7 years after farmers' group become the organization which takes in charge of distribution for products and input materials.															
Related Components	<p>I - 1 - 1 Improvement of rice cultivation technique I - 2 - 3 Improvement of Distribution by Farmers' Group (1) II - 2 - 1 Training seminar for group leader and Leaders' Conferences</p>															
References	None															

Table M. 10 <<II. Human Resources Training Program>> (1/4)

Project	II - 1 Project for Administrative and Extension Officers Capacity Building																	
Component	II - 1 - 1 Technical Training for Diffusion of Cropping Techniques																	
Target Group	Administrative Personnel, extension officers																	
Background The extension officers disseminate not only the agricultural technique but also advice on the improvement of the daily life. Concerning the agricultural development, the acquisition of the improved agricultural techniques is indispensable for them.						Objective Through this training, the extension officers learn the techniques on rice and vegetable cultivation, so that they disseminate to the farmers and as a result the agriculture of the area is promoted												
Contents of Activities 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. Otherwise, in the process of agricultural farming and cropping improvement, it is programmed to carry out training on soil testing, yield calculation, etc., which are bases of diffusion. 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.																		
Expansion to Other Areas It is possible to develop the techniques and field in the whole country.																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Assistance to the training					■	■	■	■	■	■	■	■	■	■	■	■	■
2	Preparation of manuals for the mastered techniques and their distribution														■			
Inputs						Benefit												
Item		Price (\$)				<ul style="list-style-type: none"> ▪ Basis of calculation There is almost no quantitative benefit. This component is considered as the project that assists other projects. ▪ The total benefit for 10 years is \$ 0 												
Expert 1.1 month \$ 700 /month × 1.1 month		770.00																
DNA Personnel 1.2 month \$ 100 /month × 1.2 month		120.00																
Diffusion/extension officers 16 Persons × 1 month + 0.1 month \$ 80 /month × 16 months + 0.1 month		1,288.00																
Workshop (20 days per year) 20 days × \$ 100		2,000.00																
Manuals of the mastered techniques (already counted in the project I-1)		0																
Expected Output						Technical Advice												
<ol style="list-style-type: none"> 1) The agricultural techniques of the extension officers increase. 2) The manuals for the mastered techniques are prepared for the farmers. 3) The agriculture of the Study area is promoted. 						<ul style="list-style-type: none"> • To prepare the training program, the first priority should be given to items such as rice cultivation and vegetable growing techniques and the set up of the cultivation plan that are useful immediately. • The execution of the project for the improvement of cropping techniques should be defined as the part of this training which corresponds to on the job training (OJT), in order to anticipate increase effectiveness. 												
Related Agency	DNA, DCDRE, SNPRV																	
Cost/Benefit	Cost of the project : \$ 4,178 × 10 years = \$ 41,780											Benefit of the project : \$ 0						
Cost and Benefit: impossible to count																		
Period	10 years																	
Related Components	I - 1 Project for Improvement of Cropping Techniques																	
References	Manuals of the mastered techniques																	

Table M. 11 «II. Human Resources Training Program» (2/4)

Project	II - 1 Project for Administrative and Extension Officers Capacity Building																	
Component	II - 1 - 2 Operational Capacities Building of Administrative Department																	
Target Group	Administrative Personnel, extension officers																	
Background The personnel in the administrative services have general knowledge on the public service. But to take initiatives in the realization of the projects in the Master Plan, it is required to have concrete knowledge and detailed administrative capacities.						Objective A project for the strengthening of the operational capacities of the administrative service is programmed to activate the execution of the Master Plan.												
Contents of Activities Staffs with abundant experience on problem analysis are trained following the participative approach on the formulation of plans through the training.																		
Expansion to Other Areas It is possible to develop their techniques and field in the whole country.																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Assistance to the training (5 times per year)					•	•	•	•	•	•	•	•	•	•	•	•	•
Logistic and Personnel						Benefit												
Item			Price (\$)			<ul style="list-style-type: none"> • Basis of calculation There is almost no quantitative benefit. This component is considered as the project that assists other projects. • The total benefit for 10 years is \$ 0 												
Expert 1.5 month \$ 700 /month × 1.5 month			1,050.00															
DNA Personnel (trainees) 10 Persons × 1.4 month \$ 100 /month × 14 months			1,400.00															
Diffusion/extension officers (trainees) 6 Persons × 1.25 month \$ 80 /month × 1.25 month			600.00															
Workshop (5 days/time. 5 times a year) 25 days × \$ 100			2,500.00															
Realization of the database			200.00															
Expected Output 1) The capacities of the central and local personnel for the administrative execution are strengthened. 2) Good relations of mutual aid between the central government the local administration and concerned services are established. 3) The projects from the Master Plan are regularly conducted.						Technical advice • Because there exist some distance between the farmers and the administration owing to insufficient administrative services and partial information advertisements, it is necessary to recover a mutual confidence in the relation between the two parties. • To achieve what is indicated above, it is effective to adopt the participatory method, and it is necessary to introduce a training on PCM. • The counterparts that have accomplished a training in Japan act as trainer in executing the training on PCM.												
Related Agency	DNA, DCDRE, SNPRV																	
Cost/Benefit	Cost of the project : \$ 5,750 × 10 years = \$ 57,500												Benefit of the project: \$ 0					
Period	10 years																	
Related Components	All the programs in the Master Plan																	
References	None																	

Table M. 12 <<II. Human Resources Training Program>> (3/4)

Project	II - 2 Project for Rural Community Capacity Building																	
Component	II - 2 - 1 Group Leaders Training/Organization of Meetings																	
Target group	Farmers groups' leaders																	
Background There are farmer groups that target vegetable cultivation or the food industry, but these activities are stagnate and are not operational. For the existing groups or the new ones, the leaders constitute an important element for the success or failure of the project.						Objective The awakening of the consciousness of the leaders and the acquisition of necessary basic knowledge to lead the group activities are assured through the trainings. Meeting of group leaders are also organized to discuss the problems, assure the exchange of views and develop the awareness.												
Contents of Activities Trainings on the group's activities management, the sensitization, and the communication between farmers and administration will be programmed. The leaders are not only trained, but they also schedule meetings to exchange opinions and solve problems.																		
Expansion to Other Areas It is possible to develop their techniques and field in the whole country.																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Assistance to the training (2 times a year, 7 days/time)							—							—			
2	Assistance to the leaders meeting (6 times a year)					—	—	—	—	—	—	—	—	—	—	—	—	—
Logistic and Personnel						Benefit • Basis of calculation There is almost no quantitative benefit. This component is considered as the project that assists other projects. • The total benefit for 10 years is \$ 0												
Item		Price (\$)																
DNA Personnel (trainer) 1 Person × 2 months \$ 100 /month × 2 months		200.00																
DNA Personnel (trainees) 2 Persons × 0.7 month \$ 100 /month × 1.4 month		140.00																
Diffusion/extension officers (trainees) 2 Persons × 0.7 month \$ 80 /month × 1.4 month		112.00																
Diffusion/extension officers (follow up) 1 Person × 2 months \$ 80 /month × 2 months		160.00																
Workshop (14 days and 6 days per year) 20 days × \$ 100		2,000.00																
Expected Output 1) The consciousness of the leaders is awakened. 2) Democratic operation of the group is realized. 3) The spontaneous rural development is realized. 4) The activities of the groups are revitalized						Technical advice • It is indispensable to choose the persons that can read and write when the trainees are selected • Even if the trainees learn the contents of the training in some way, most of the time they have problem to put in practice what they have learnt. Therefore, the reinforcement and the follow up of the group activities are indispensable. • It is important to let the leaders that have the knowledge held the meetings by themselves												
Related Agency	DNA, DCDRE, SNPRV																	
Cost/Benefit	Cost of the project : \$ 2,612 × 10 years = \$ 26,120 Cost and Benefit: impossible to count												Benefit of the project: \$ 0					
Period	10 years																	
Related Components	I - 1 - 2 Diffusion of Rice Adapted Varieties I - 1 - 3 Promotion of Dry Season Vegetables Growing I - 1 - 4 Introduction of Groups Specialized in Agricultural Works I - 1 - 5 Introduction of Tractor Service by Farmers' Group I - 2 - 3, 4 Improvement of Distribution Channel by Farmers' Group (1), (2) II - 2 - 2 Setting up of Farmers' Groups III - 1 Small-scale Irrigation Project III - 3 Water Management Training Project																	
References	Manuals of the leaders training																	

Table M. 14 <<III. Program for Agricultural Production Infrastructure Development/Water Management>> (1/3)

Project		III - 1 Small-scale Irrigation Project											
Component													
Target group		Farmers groups practicing the irrigated agriculture											
Background In the plains of Sonfonia, it hardly rains in the dry season, and the agriculture in this season is limited. To practice agriculture in the dry season, the irrigation installations are indispensable. As the water resources, it is possible to use the dead waters of the Sonfonia reservoir that has been altered by the construction of a road.						Objective Two annual cultivations are targeted by realizing the agriculture in the dry season in part of the plains of Sonfonia. Consequently, the small-scale irrigation facilities are constructed.							
Contents of Activities The small-scale irrigation facilities are constructed. During this construction, the concerned personnel grasp the knowledge on how to construct the facilities.. The farmers and the administrative personnel learn how to maintain the installations and manage water for realizing two annual cultivations. In addition, the installations are used efficiently as the part of the training for the project of training on water management.													
Expansion to Other Areas The development is limited only to the Sonfonia plains.													
Activities													
		M	J	J	A	S	O	N	D	J	F	M	A
1	Training on the construction of irrigation installations (Already carried out in the Verification study)		—	—									
2	Creation of the new group of farmers (Already carried out in the Verification study)		—	—									
3	Construction of the irrigation installations (Already carried out in the Verification study)			—	—			—	—	—	—		
4	Training on the water management (Already carried out in the Verification study)									—			
4	Execution of two annual cultivations	—	—	—	—	—	—	—	—	—	—	—	—
Logistic and Personnel						Benefit							
Item		Price (\$)											
Training on the construction of irrigation installations		40,000.00		<ul style="list-style-type: none"> • Basis of calculation The continuous execution of the project that has started during the Verification study. Annual cultivation surface: 1.0 ha Target yield: 2.5 t/ha (For 1st year, a yield of 1.25 t/ha can be attained from result of Verification Study, 30% increase of yield can be attained each year, target yield will be 2.5 t/ha after 4th year.) Cost of Production: 30 % of Production Garden gate price: 1,500 FG/6,250 =0.24 \$/kg • The total benefit for 10 years is \$ 3,778 									
Creation of the new group of farmers		(Already carried out in the Verification study)											
Construction of the irrigation installations													
Training on the water management													
Expected Output						Technical advice							
<ol style="list-style-type: none"> 1) The concerned administrative personnel learn the basic knowledge of irrigation. 2) The farmers and the administrative personnel learn the water management with the irrigation installations. 3) Two annual cultivations are realized and the yield increases. 						<ul style="list-style-type: none"> • Even if the farmers and the administrative personnel have knowledge on the water management through training, most of the time they have problem of putting them into practice. Therefore, the follow up through the training of the leaders is indispensable. • It is necessary to make the follow up so that the farmers do not design a non realizable cultivation plan. 							
Related Agency		DNA, DNGR, DCDRE											
Cost/Benefit		Cost of the project : \$ 0 (Already carried out in the Verification study) Benefit of the project: \$ 3,778 Cost and Benefit: impossible to count											
Period		10 years											
Related Components		I - 1 - 1 Improvement of Rice Farming and Cropping Techniques II - 2 - 1 Group Leaders Training/Organization of Meetings III - 3 Water Management Training Project											
References		Manuals of the water management											

Table M. 15 <<III. Program for Agricultural Production Infrastructure Development/Water Management>> (2/3)

Project		III - 2 Improved Nurseries Project														
Component																
Target group		Rice producers														
Background It is very important to prepare seedlings for rice cultivation during the dry season. However, the preparation of small seedlings is very difficult because of the devastations due the flooding of the nurseries by heavy rains. Consequently, it is necessary to prepare the nurseries that can survive the devastations caused by the floods.						Objective It is possible to attain the component «Improvement of the rice farming and the cropping techniques » through the preparation of improved nurseries where the water level has raised up to 30 cm covering 3% the reserved space in the surface of the rice farms.										
Contents of Activities It is estimated that the maximum water depth of rice farms will be 45 cm in average (depending on the areas) during the period of nurseries preparation following the Verification results. If one supposes that the maximum depth of water attained 2 weeks after sowing, the plants reach 15 cm height at this moment. Therefore, It is possible to assist 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.																
Expansion to Other Areas The development is limited only to the rice farms without agricultural infrastructures.																
Activities					M	J	J	A	S	O	N	D	J	F	M	A
1	Selection of target farmers				■											
2	Preparation of the improved nurseries					■										
3	Growing of the seedlings in the improved nurseries						■									
4	Execution of the rice cultivation							■								
Logistic and Personnel						Benefit										
Item			Price (\$)			<ul style="list-style-type: none"> • Basis of calculation There is almost no quantitative benefit. This component is considered as the project that assists the component «Improvement of the rice farming and the cropping techniques ». • The total benefit for 10 years is \$ 0 										
DNA personnel 0,5 month \$ 100 /month × 0,5 month			50,00													
Diffusion/extension officers 1 Person × 1 month \$ 80 /month × 1 month			80,00													
Agricultural tools			100,00													
Expected Output 1) Good rice seedlings are grown. 2) The rice yield increases.						Technical advice <ul style="list-style-type: none"> • Even if improved nurseries are prepared, it is not possible to get good results unless it is accompanied by execution of the project component « Improvement of the rice farming and the cropping techniques ». • It is necessary to confirm on the spot with the targeted farmers regarding the level the water have raised during the floods in order to determine the height of the improved nursery. 										
Related Agency		DNA, DCDRE, SNPRV														
Cost/Benefit		Cost of the project : \$ 230 × 10 years = \$ 2.300						Benefit of the project: \$ 0								
		Cost and Benefit: impossible to count														
Period		10 years														
Related Components		I - 1 - 1 Improvement of the rice farming and the cropping techniques I - 1 - 4 Introduction of the group specialized in agricultural works														
References		Manuals of the mastered techniques														

Table M. 16 «III. Program for Agricultural Production Infrastructure Development/Water Management» (3/3)

Project	III - 3 Water Management Training Project																	
Component																		
Target group	Farmers groups practicing the irrigated agriculture																	
Background The water management including the operation and maintenance of the hydro-agricultural installations is important to realize the irrigated agriculture using the irrigation facilities. However, because the irrigated agriculture is not yet practiced in the plains of Sonfonia, the farmers have no experience on the management of the irrigation waters. The DNA personnel and the extension officers have also no experiences on the irrigation installations.						Objective The farmers and government officials learn the knowledge of operation and maintenance of the installations and also of water management. In addition, there are areas where the irrigation facilities are not working well because of the non adaptation to the appropriate water management in Guinea. Training programs in water management for the farmers of the other area are presented by inviting them.												
Contents of Activities The small scale irrigation facilities shall be utilized as national training facilities for water management. The training shall be carried out inviting the farmers and irrigation officers in other area to make them learned in the operation and the maintenance of the irrigation facilities and the water management, and they will come to carry out irrigated agriculture. For the training, the manual of water management which was elaborated during the execution of the Verification.																		
Expansion to Other Areas It is possible to develop their techniques and field in the rice farms with irrigation facilities.																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Training on the water management by using the irrigation installations														■	■	■	■
2	Training on the water management for the farmers of other area														■	■	■	■
Logistic and Personnel						Benefit												
Item			Price (\$)			<ul style="list-style-type: none"> • Basis of calculation There is almost no quantitative benefit. This component is considered as the project that assists the component « Small scale irrigation ». The assistance of the good use of the irrigation installations of the other areas is anticipated. • The total benefit for 10 years is \$ 0 												
Personnel of another direction 1 month \$ 100/month × 1 month			100.00															
DNA personnel 1 month \$ 100/month × 1 month			100.00															
Diffusion/extension officers 2 Persons × 1 month \$ 80/month × 2 months			160.00															
Training 3 times × \$ 100			300.00															
Transportation allowances for the farmers of the other areas 10 persons × 3 times × \$ 10			300.00															
Expected Output 1) The regular irrigated rice cultivations in the dry season are realized. 2) The good use of the irrigation installations in Guinea is realized.						Technical advice • When the training is executed for the farmers in other areas, it is necessary to study the summary of their irrigation installations before hand and consider the particular items of the training on the installations. • The basis of the water management is understanding that the irrigation water quantity is limited and is not free of charge by being different from the rain fed cultivation. Consequently, it is necessary to create the concerned persons consciousness that the good use of the limited water quantity is important.												
Related Agency	DNA, DNGR, DCDRE																	
Cost/Benefit	Cost of the project : \$ 960 × 10 years = \$ 9.600 Benefit of the project d : \$ 0 Cost and Benefit: impossible to count																	
Period	10 years (At beginning period of the project, execution will be done with the target group during 3 years. From 4 th year, execution will be expanded to farmers and government staffs of other regions.)																	
Related Components	I - 1 - 1 Improvement of Rice Farming and Cropping Techniques III - 1 Small-scale Irrigation Project																	
References	Manuals of the water management																	

Table M. 17 <<IV. Environment Preservation Program>> (1/3)

Project	IV - 1 Sensitization Project on Mangrove Forest Preservation																	
Component																		
Target Group	Inhabitants of Sonfonia plains and surroundings																	
Background It is necessary to sensitize the populations on the importance of the mangrove forests in Sonfonia and the neighboring, by taking into account the situation of the current deforestation						Objective To sensitize the populations on the importance of the environment, the extension officers execute the sensitization activities concerning the mangrove forests on the role, the situation, the problems, the necessities and methods of their protection, the law for conserving the mangrove.												
Contents of Activities The extension/diffusion personnel, as principal actors, operate the program of sensitization next to the populations. The sensitization sessions take place in meeting-rooms or elementary schools at hours where large audience can be expected.																		
Expansion to Other Areas It is possible to develop the techniques and field to the mangrove regions of Maritime Guinea																		
Activities						M	J	J	A	S	O	N	D	J	F	M	A	
1	Revision of the Verification study's presentation documents					■												
2	Execution of the workshop's presentation					■	■	■	■	■	■	■	■	■	■	■	■	■
Inputs						Benefit												
Items			Price (\$)			<ul style="list-style-type: none"> • Basis of the calculation Under the condition that this activity be executed while the training on the techniques of appropriate cutting of the mangrove wood is performed. Through the preservation of the mangrove forest, it is possible to avoid the loss of 1ha of rice farm per year (25% of the amount of its annual loss during 19 years) and recover the rice harvest Harvest: 1.8 t/ha Cost of Production: 30 % of Production • Total profit by the 2 activities during 10 year is \$ 2,718 												
DNA personnel 3 months \$ 100/month × 3 months			300.00															
Diffusion personnel 2 persons × 3 months \$ 80/month × 6 months			480.00															
Workshop 12 times × \$ 100			1,200.00															
Expected Output						Technical Advice												
<ol style="list-style-type: none"> 1) The build up of the concerned populations' environmental awareness is realized in the plain of Sonfonia. 2) The speed of the mangrove forest loss is restrained. 3) The environment in the plain of Sonfonia is preserved, and the mangrove rice cultivation is promoted 						<ul style="list-style-type: none"> • It is important to make the workshop presentation in the local language. • It is a must that the populations attend the workshop. Consequently, the announcement in the form of posts in public space is important in addition to the notification made by the chiefs of the divisions. • It is necessary to present the results of the training on the appropriate cutting techniques of the mangrove wood and the introduction of improved techniques of salt extraction in the workshops 												
Concerned ministries						DNA, DCDRE												
Cost and benefit						Project cost: \$ 1,980 × 10year = \$ 19,800 Overall cost including the training project on the appropriate cutting techniques of the mangrove wood: \$ 19,800 + \$ 18,200 = \$ 38,000 Whole profit with the training project on the appropriate cutting techniques of the mangrove wood: \$ 2,718, Cost and benefit: 0.1												
Duration						10 years												
Relating projects						I - 1 - 1 Improvement of Rice Farming and Cropping Techniques IV - 2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting IV - 3 Project for Introduction of Salt Extraction Improved Technique												
Data						Documents presentation												

Table M. 19 <<IV. Environment Preservation Program>> (3/3)

Project	IV- 3 Project for Introduction of Salt Extraction Improved Technique																	
Component																		
Target Group	Salt producers (Farmers)																	
Background In Dubreka (beside the Study area), the improved technique of salt extraction is executed, and the technique that uses the tarpaulin to dry the sea water by insulation is disseminated to the populations.						Objective By drying with the tarpaulin, the currently practiced wood cutting for salt extraction is avoided, and minimizing the mangrove forest cutting is anticipated.												
Contents of Activities The improved techniques of salt extraction which consist of proceeding with sun-dried method with the plastic sheets are executed. It is not difficult to diffuse this technique which is very economic since the only new material which is introduced is the black plastic sheet and the bucket which the populations can easily obtain.																		
Expansion to Other Areas It is possible to develop the techniques and field to the mangrove regions of the Maritime Guinea.																		
Activities						N	D	J	F	M	A	M	J	J	A	S	O	
1	Selection of associated farmers							-										
2	Prepare the ground for the tarpaulin							-										
3	Execution of the salt extraction								—————									
Inputs						Benefit												
Item		Price (\$)				<ul style="list-style-type: none"> ▪ Basis of the calculation Production by the improved technique: 80 kg/day Production by the traditional technique: 15 kg/day Increased quantity: 65 kg/day Number of families executing this technique in 10 years : 100 families (10 families/year = 10% of current farmers) Duration of the salt extraction: 105 days Price of the salt (Sale in availability) (1 kg) : 415 FG/6.250 = 0.067 \$ ▪ Total profit by the 2 activities during 10 year is <li align="right">\$ 288,440 												
DNA personnel 2 months \$ 100/month × 2months		200.00																
Diffusion personnel 2 persons × 2 months \$ 80/month × 4 months		320.00																
Material of the improved salt extraction technique (10 families) The tarpaulin, the bucket, roman etc.		1,000.00																
Expected Output						Technical Advice												
<ol style="list-style-type: none"> 1) The raise in awareness to the concerned populations about the environment is realized. 2) The speed of loss of the mangrove forest is restrained. 3) The environment of the Sonfonia plains is preserved, and the mangrove rice cultivation is promoted. 4) The labor spent by farmers that execute the improved technique of the salt extraction reduces and their revenues increase 						<ul style="list-style-type: none"> • It must be taken into account the following points for the selection of the salt extraction sites. <ul style="list-style-type: none"> - A well cleared and ventilated site with a certain extent - A site enclosed with dikes and not submerged even at the time of high tide - A site without shell, roots of trees and crabs which result ripped tarpaulin • Initially, materials should be given to the associated farmers, by explaining that they must procure the materials by themselves next time. 												
Concerned ministries		DNA, DCDRE, SNPRV																
Cost and benefit		Project cost : \$ 1.520 × 10 years = \$ 15.200, Benefit: \$ 288,440, cost and benefit: 19,0																
Duration		10 years																
Relating projects		IV - 1 Sensitization Project on Mangrove Forest Preservation																
Data		Manual of the technique of improved salt extraction																

Table M. 20 Détail of Benefits

Programs	Year											Total	Calculation
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2016		
I-1-1 Improvement of Rice Farming and Cropping Techniques	Beneficiary (fa)	30	65	104	150	202	263	332	412	504	609		(n)=(n-1)*1.15+30
	Area (ha)	23	49	79	114	154	200	252	313	383	463		(a)=0.76ha/m ² *(n)
	Increase (ton)	16.0	34.3	55.4	79.7	107.6	139.7	176.6	219.1	267.9	324.0		(w)=700kg/ha*(a)
	Benefit (US\$)	3,830	8,235	13,301	19,127	25,826	33,530	42,390	52,579	64,296	77,771	340,887	(b)=(w)*240US\$/ton
I-1-2 Diffusion of Rice Adapted Varieties	Group (G)	0	0	0	2	4	6	8	10	10	10		(n)=(n-1)+2
	Area (ha)	0.0	0.0	0.0	1.2	2.4	3.6	4.8	6.0	6.0	6.0		(a)=(n)*0.6ha/group
	Production (ton)	0.0	0.0	0.0	3.0	6.0	9.0	12.0	15.0	15.0	15.0		(w)=2.5ton/ha*(a)
	Benefit (US\$)	0	0	0	864	1,728	2,592	3,456	4,320	4,320	4,320	21,600	(b)=(w)*288US\$/ton
I-1-3 Promotion of Dry Season Vegetables Growing	Group (G)				2	4	6	8	10	12	14		(n)=(n-1)+2
	Area (ha)				1.2	2.4	3.6	4.8	6.0	7.2	8.4		(a)=(n)*0.6ha/group
	Benefit (US\$)				1,180	2,360	3,540	4,720	5,900	7,080	8,260	33,040	(b)=(n)*590US\$/group
	Group (G)				1	2	3	4	4	4	4		(n)=(n-1)+1
I-1-4 Introduction of Groups Specialized in Agricultural Works	Area (ha)				20	40	60	80	80	80	80		(a)=(n)*20ha/group
	Production (ton)				36	72	108	144	144	144	144		(w)=1.8ton/ha*(a)
	Revenue (US\$)				8,640	17,280	25,920	34,560	34,560	34,560	34,560		(b)=(w)*240US\$/ton
	Cost (US\$)				2,592	5,184	7,776	10,368	10,368	10,368	10,368		(c)=(b)*30%
I-1-5 Introduction of Tractor Service by Farmers' Group	Benefit (US\$)				6,048	12,096	18,144	24,192	24,192	24,192	24,192	133,056	(b)=(b')*(c)
	Area (ha)				6.0	6.0	6.0	6.0	6.0	6.0	6.0		(a)=6ha
	Production (ton)				10.8	10.8	10.8	10.8	10.8	10.8	10.8		(w)=1.8ton/ha*(a)
	Revenue (US\$)				2,592	2,592	2,592	2,592	2,592	2,592	2,592		(b)=(w)*240US\$/ton
I-2-1 Improvement of Agricultural Tools	Cost (US\$)				778	778	778	778	778	778	778		(c)=(b)*30%
	Benefit (US\$)				1,814	1,814	1,814	1,814	1,814	1,814	1,814	18,140	(b)=(b')*(c)
	Area (ha)				23	49	79	114	154	200	252	463	(a) : same as I-1-1 (a)
	Production (ton)				57.0	122.6	197.9	284.6	384.3	499.0	630.8	824.3	(w)=2.5ton/ha*(a)
I-2-2 Reduction of Post-harvest Losses	Reduction (ton)				5.7	12.3	19.8	28.5	38.4	49.9	63.1	115.7	(w)=(w')*10%
	Benefit (US\$)				1,368	2,941	4,750	6,831	9,224	11,975	15,139	22,963	(b)=(w)*240US\$/ton
	Area (ha)				1.0	1.0	1.0	1.0	1.0	1.0	1.0		(a)=1ha
	Production (ton)				1.25	1.63	2.11	2.50	2.50	2.50	2.50	2.50	(w)=1.25ton/ha*(a), (w)=(w-1)*130%
III-1 Small-scale Irrigation Project	Revenue (US\$)				300	390	507	600	600	600	600		(b)=(w)*240US\$/ton
	Cost (US\$)				90	117	152	180	180	180	180		(c)=(b)*30%
	Benefit (US\$)				210	273	355	420	420	420	420	3,778	(b)=(b')*(c)
	Area (ha)				1.0	1.0	1.0	1.0	1.0	1.0	1.0		(a)=1ha
IV-1 Sensitization Project on Mangrove Forest Preservation	Production (ton)				1.8	1.8	1.8	1.8	1.8	1.8	1.8		(w)=1.8ton/ha*(a)
	Revenue (US\$)				432	432	432	432	432	432	432		(b)=240US\$/ton
	Cost (US\$)				130	130	130	130	130	130	130		(c)=(b)*30%
	Benefit (US\$)				302	302	302	302	302	302	302	2,718	(b)=(b')*(c)
IV-3 Project for Introduction of Salt Extraction Improved Technique	Production before (ton)				31.5	31.5	31.5	31.5	31.5	31.5	31.5		(w')=0.015ton/day/house*10.5days*20house
	Family (fa)				10	20	30	40	50	60	70	100	(n)=(n-1)+10
	Family Production (ton)				8.4	8.4	8.4	8.4	8.4	8.4	8.4		(w1)=0.08ton/day/house*10.5days
	Production (ton)				84.0	168.0	252.0	336.0	420.0	504.0	588.0	840.0	(w2)=(w1)*(n)
Total Benefit (US\$)	Increase (ton)				52.5	136.5	220.5	304.5	388.5	472.5	556.5	808.5	(w)=(w2)-(w')
	Benefit (US\$)				3,518	9,146	14,774	20,404	26,030	31,658	37,286	288,440	(b)=67US\$/ton
	Area (ha)				10,740	22,712	35,296	56,988	79,800	103,975	129,720	199,025	
	Production (ton)				151,219	173,930	199,025	228,440	263,040	300,000	340,887	963,404	

Table M. 21 Option : Cost and Benefit

Programs	Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	Calcul
		Cost (US\$) (Improvement)	(c)	86,072	86,072	86,072	86,072	496,236	496,236	496,236	-		
Area (ha) (Improved)	(a)	0	65	131	196	261	536	812	1,087	1,087	1,087	-	
Expenses (US\$) (O&M)	(m)	0	455	910	1,365	1,820	3,739	5,658	7,576	7,576	7,576	36,676	(m)=(a)x0.41x17US\$
Expenses (US\$) (Production)	(p)	0	1,927	3,854	5,781	7,708	15,835	23,962	32,088	32,088	32,088	155,332	(p)=(a)x0.41x240US\$x0.3
Cost (US\$)	(1)	86,072	88,454	90,836	93,218	505,764	515,810	525,855	39,665	39,665	39,665	2,025,003	(1)=(c)+(m)+(p)
Area (ha)	(a)	0	65	131	196	261	536	812	1,087	1,087	1,087	-	
Increase (ton)	(w)	0	94	188	282	375	771	1,167	1,563	1,563	1,563	7,567	(w)=(a)x(0.59x0.7+0.41x2.5)
Benefit (US\$)	(2)	0	22,529	45,059	67,588	90,118	185,127	280,136	375,145	375,145	375,145	1,815,994	(2)=(w)x240US\$
B/C	(3)	0.0	0.3	0.5	0.7	0.2	0.4	0.5	9.5	9.5	9.5	9.5	(3)=(2)/(1)

Programs	Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total	Grand Total
		Cost (US\$) (Improvement)	(c)	-	-	-	-	-	-	-	-		
Area (ha) (Improved)	(a)	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087	
Expenses (US\$) (O&M)	(m)	7,576	7,576	7,576	7,576	7,576	7,576	7,576	7,576	7,576	7,576	75,764	112,439
Expenses (US\$) (Production)	(p)	32,088	32,088	32,088	32,088	32,088	32,088	32,088	32,088	32,088	32,088	320,882	476,214
Cost (US\$)	(1)	39,665	39,665	39,665	39,665	39,665	39,665	39,665	39,665	39,665	39,665	396,646	2,421,650
Area (ha)	(a)	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087	1,087		
Increase (ton)	(w)	1,563	1,563	1,563	1,563	1,563	1,563	1,563	1,563	1,563	1,563	15,631	23,198
Benefit (US\$)	(2)	375,145	375,145	375,145	375,145	375,145	375,145	375,145	375,145	375,145	375,145	3,751,454	5,567,448
B/C	(3)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	2.3

Calculation Base

- 20 years Target area for land improvement 1,087 ha (Cultivated land: 749 ha, Uncultivated land: 338 ha)
- Area improved Calculate the improved area of the initial and the intermediate phase from the consolidation cost of drainage and divide the cost to each year.
- Cost of maintenance and management assumed as 1 % of total project cost and therefore, the cost is 1,832,995 x 0.01 / 1,087 = 17 (\$/ha/year).
- Increase of yield Present unit yield of 1.8 t/ha and unit yield after consolidation is assumed to be 2.5 t/ha judging from the result of Coastal Guinea Rice Project.
- As for the uncultivated land after improvement, increased yield is calculated by multiplying increased yield of 0.7 t/ha to improved area.
- As for the uncultivated land after improvement, increased yield is calculated by multiplying 2.5 t/ha to improved area as it is the same as newly improved land.
- Proportion of cultivated and uncultivated area in the target area of land improvement is 59 % and 41 %, respectively.
- Assumed to be 30 % of yield of improved uncultivated land.
- Multiple farm gate price of rice of 2,400 US\$/t to increased yield.

Production cost
Benefit

Improvement Plan for the Operation and Maintenance of Tractors

Since the study area is not equipped with farm roads, which is subject to deep flooding following rains, the tractor service covers a limited service area within the fields located near the village. Therefore, the expansion of the tractor service to the whole study area would be difficult unless farm roads are provided in this area. Accordingly, the application of the results of the verification study should put emphasis on the expansion of the tractor service, which is presently poorly managed, nationwide rather than in the study area alone.

In the country, the government is promoting the importation of tractors in the framework of the Presidential Project and/or through the bilateral assistance. Over four hundred tractors are imported and sold to private farmers at cheap price or distributed to farmers' groups and CAP. However, the government side has many problems such as i) the master plan for the importation of tractors is not formulated, ii) the government does not grasp the existing condition of the tractors after their distribution, iii) monitoring is not executed. At the same time, the receiving side has also many problems. The CAP and farmers' groups which received the tractors do not have a good knowledge on the appropriate operation and maintenance of these machines, and got into difficulties for their sustainable operation; these difficulties are compounded by the problem of unavailable spare parts.

The tractor service in the verification study was executed by the target farmers' group "Lamkoya", which received a tiller through the KR2 and struggled with the ordinary operation and maintenance problems. Since the problems of "Lamkoya" are the mirror image of the tractor service problems in the whole country, the results of the verification study include many outcomes that can be used to improve the operation and maintenance of the tractors in the country.

From such background, the government of Guinea is to implement "The Improvement Plan for the Operation and Maintenance of Tractors" mentioned below, which consists of i) Monitoring Survey, ii) Training Seminar for Agricultural Mechanization, iii) Implementation of Tractor Service by Farmers' Group and CAP, and iv) Procurement of Spare parts.

Table T. 1 Improvement Plan for the Operation and Maintenance of Tractors (1/4)

Sub-plan	(1) Monitoring Survey
Target Group	Government of Guinea (DNA, DIMA, CEPERMAG)
<p>Background and Purpose</p> <p>In the republic of Guinea, the government encourages the utilization of tractors to increase the cultivation area, and is promoting the importation of these machines in the framework of the Presidential Project and/or through the bilateral assistance. However, DIMA and CEPERMAG which are responsible for the national policy of agricultural mechanization are not involved in the decision related to the tractors' importation and distribution, which is executed by the Presidential Cabinet. Accordingly, DIMA and CEPERMAG do not grasp the existing conditions of the tractors deployed in the country and cannot therefore draw up an appropriate policy of agricultural mechanization.</p> <p>In order to improve such circumstances, a monitoring survey is performed to understand the accurate conditions and problems related to the tractors. The results of the monitoring survey is to be used for the baseline and basic information that will help in the drawing up of the policy of agricultural mechanization</p>	
<p>Activities:</p> <ol style="list-style-type: none"> 1) DNA arranges the information of existing tractors through the existing information/materials and through hearing survey, 2) DNA prepares questionnaires and all schedules, 3) DNA executes the monitoring survey, 4) From the results of the monitoring survey, DNA prepares the study reports, and 5) DNA distributes the study reports to the organizations concerned. 	
<p>Inputs:</p> <ol style="list-style-type: none"> 1) DIMA and CEPERMAG Staff 2) Expenses of the monitoring survey such as transportation cost, per diem, and so on 3) Expenses of the preparation of reports 	
<p>Schedule:</p> <p>DNA commences the monitoring survey at the same time as the Project commences.</p> <p>The study is executed dividing the country into two areas such as Coastal/Central and Highland/Forest. The study is executed within two years.</p>	
<p>Costs:</p> <p>Total: US\$ 45,000 (First year: US\$22,500, Second year: US\$22,500)</p>	
<p>Outputs to be Expected:</p> <ol style="list-style-type: none"> 1) DNA can grasp the existing conditions of tractors deployed in Guinea, and the problems are extracted. 2) DNA can identify the spare parts needed by farmers 3) The basic information for formulating the national policy of agricultural mechanization is provided 	

Table T.2 Improvement Plan for the Operation and Maintenance of Tractors (2/4)

Sub-plan	(2) Training Seminar for Agricultural Mechanization
Target Group	Government of Guinea (DNA, DIMA, CEPERMAG), and Users of tractors
<p>Background and Purpose</p> <p>A training seminar is executed, targeting the tractor users who are struggling with ordinary operation and maintenance problems.</p> <p>The training seminar is designed for four categories such as i) the users who own tractors at present, ii) farmers' groups or CAP which intend to execute the tractor service, iii) mechanics from repairing workshops, and iv) the users who will receive tractors through the presidential project in future. The training seminar is executed respectively in accordance with the said categories.</p>	
<p>Activities:</p> <ol style="list-style-type: none"> 1) CEPERMAG prepares the list of trainees in accordance with the categories and the annual execution plan, 2) CEPERMAG prepares the respective programs in accordance with the categories, 3) CEPERMAG executes the training seminar, and 4) CEPERMAG prepares the evaluation reports. 	
<p>Inputs:</p> <ol style="list-style-type: none"> 1) Training materials 2) Expenditure of training seminar 3) CEPERMAG Staff 	
<p>Schedule:</p> <p>The training seminar is commenced after the monitoring survey,</p> <p>The training seminar is executed for each category once a year (a total of four times per year) and is continued for three years. If effects are confirmed, it continues subsequently.</p>	
<p>Costs:</p> <p>Total: US\$50,4000 (US\$16,800 per year)</p>	
<p>Outputs to be Expected:</p> <ol style="list-style-type: none"> 1) Skill of operation and maintenance of users is improved, and tractors are properly maintained. 2) Agricultural mechanization develops. 	

Table T.3 Improvement Plan for the Operation and Maintenance of Tractors (3/4)

Sub-plan	(3) Implementation of Tractor Service by Farmers' Groups and CAP
Target Group	Government of Guinea (DNA, CEPERMAG and DPDRE)
<p>Background and Purpose</p> <p>From the results of the tractor service executed under the verification study, profits of 1.2 million GF were secured, and it was confirmed that the farmers' groups could acquire a method of operation and maintenance that could be continuously managed for the tractor service. Expanding the method of tractor service to the whole country, agricultural mechanization is promoted through the continuous management of the tractors.</p>	
<p>Activities:</p> <ol style="list-style-type: none"> 1) From the results of the monitoring survey, CEPERMAG identifies the target groups implementing the tractor services, 2) CEPERMAG prepares the text book for the tractor service, 3) CEPERMAG explains to the target groups and obtains their mutual consent, 4) The target groups, CAP and farmers' groups, participate in the training seminar, 5) The target groups execute the marketing survey and grasp the actual needs, 6) The target groups decide the service charge, 7) CEPERMAG teaches the method of document preparation to the target groups, 8) The target groups prepare the regulation for the tractor service based on the consultation among groups, 9) The target groups commence the tractor service, 10) The DCDRE staff executes the monitoring, and 11) The DCDRE staff feeds back the results of the monitoring to the next tractor service in cooperation with CEPERMAG. 	
<p>Inputs:</p> <ol style="list-style-type: none"> 1) Travel expenses 2) Expense of training seminar 3) Expense of monitoring 4) CEPERMAG and DCDRE staff 	
<p>Schedule:</p> <p>After the monitoring survey, the tractor service by farmers' groups and CAP is commenced. The tractor service is expanded to four groups per year, two groups from farmers' groups and two groups from CAP, and is continued for three years. If effects are confirmed, it continues subsequently.</p>	
<p>Costs:</p> <p>Total: US\$15,600 (US\$5,200 per year)</p>	
<p>Outputs to be Expected:</p> <ol style="list-style-type: none"> 1) Utilization of existing tractors is activated. 2) Capability of management by users is improved, tractors are properly maintained 3) Expansion of cultivation area. 4) Continuation of agriculture using tractors is ensured, agricultural mechanization develops. 	

Table T. 4 Improvement Plan for the Operation and Maintenance of Tractors (4/4)

Sub-plan	(4) Procurement of Spare parts
Target Group	Government of Guinea (DNA and DIMA)
<p>Background and Purpose</p> <p>In the republic of Guinea, though the government imports many tractors for promoting agricultural mechanization, spare parts are difficult to get, which is one of the reason hindering the operation and maintenance of tractors. Even if training seminars are executed through the support of the Government and the technique of tractor management is improved, it is impossible to ensure a continuous management without spare parts.</p> <p>This scheme promotes the availability of spare parts, entrusting their procurement and the repairing of tractors to the private sector. DIMA will provide the information concerning spare parts to the parties concerned such as users, trading companies and repairing workshops.</p>	
<p>Activities:</p> <ol style="list-style-type: none"> 1) From the results of the monitoring survey, DIMA prepares the list of tractors deployed in the country and identifies the spare parts needed by users, 2) Afterwards, DIMA makes the list of the repairing workshops which have the ability of repairing tractors. DIMA provides the information on the workshops to users and the information on users to the workshops, 3) CEPERMAG executes the training seminar for the workshops in the whole country in order to improve skills for repairing 4) DIMA prepares the list of spare parts presently available with trading companies dealing with agricultural machinery and/or distributors, 5) DIMA provides the information concerning the spare parts needed by users to trading companies for these companies to import the said parts, 6) DIMA provides the information on users and workshops to the trading companies, and 7) Vice-versa DIMA provides the information on the procurement condition of spare parts by trading companies to users and workshops. 	
<p>Inputs:</p> <ol style="list-style-type: none"> 1) Expense of training seminar 2) Travel cost, communication expenses 3) DIMA and CEPERMAG staff 	
<p>Schedule:</p> <p>After the monitoring survey, this scheme is commenced.</p> <p>DIMA allocates the persons in charge, and the scheme is continued for three years. If effects are confirmed, it continues subsequently.</p>	
<p>Costs:</p> <p>Total: US\$12,000 (US\$4,000 per year)</p>	
<p>Outputs to be Expected:</p> <ol style="list-style-type: none"> 1) Repairing skill of workshops' mechanics is improved. 2) Spare parts are available. 3) Tractors which did not work are repaired and operate. 4) Maintenance of tractors is promoted by users. 	

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 (hereinafter referred to as "the Verification") are: realizing an investigation in the framework of the Master Plan, which is defined provisionally; confirming the feasibility of its components, drawing lesson and experiences from it so that these reflect itself in the framework of a feed-back type action, and formulating a final Master Plan that is realizable and sustainable. Consequently, the objectives of the Verification also include the acquisition of useful information for the formulation of the Master Plan and the confirmation of the effectiveness of the activities carried out to disseminate the components of the Verification.

Besides, the transfer of technologies to the Guinean counterparts and to the local populations concerned has been also implemented during the Verification.

5.1.2 Feed-back on the Master Plan

As indicated above, the final Master Plan has been formulated by drawing the lessons and the experiences learnt from the Verification. The process of the Verification, the lessons and the items which are reflected on the Master Plan are explained in detail in section 5.2: "Evaluation of the components of the Verification Study".

The framework of provisionally defined Master Plan has been reconsidered by taking into account the execution of the Verification, the follow up and evaluation, the suggestions given during the meetings with the organizations concerned and the results of additional interview surveyed, with these the framework of the Master Plan has finally been defined.

The figure in the next page indicates the flow from the provisionally defined Master Plan to the final Master Plan through the Verification, and the contents of modification and the reasons.

Provisionally Defined M/P	Project and Components of the Verification	Components of the Verification	Feed-back on M/P	Final M/P	Contents and Reasons of Framework Changes of the M/P
I. Program for Agricultural Farming and Crop Improvement				I. Program for Agricultural Farming and Crop Improvement	
I-1 Project for Improvement of Cropping Techniques		Improvement of Rice Growing Techniques		I-1 Project for Improvement of Cropping Techniques	
I-1-1 Improvement of Rice Farming and Cropping Techniques				I-1-1 Improvement of Rice Farming and Cropping Techniques	
I-1-2 Diffusion of Rice Improved Varieties				I-1-2 Diffusion of Rice Adapted Varieties	not insisting on the improved varieties, it was changed to the adapted varieties which is suitable for the natural conditions of the area and for the needs of the farmers
I-1-3 Promotion of Dry Season Vegetables Growing				I-1-3 Promotion of Dry Season Vegetables Growing	
I-1-4 Introduction of Groups Specialized in Agricultural Works				I-1-4 Introduction of Groups Specialized in Agricultural Works	
I-1-5 Introduction of Tractor Service by Farmers' Group				I-1-5 Introduction of Tractor Service by Farmers' Group	I-1-6 is included in I-1-5
I-1-6 Training for Agricultural Machines					
I-2 Project for Post-harvest/Distribution		Agricultural Mechanization		I-2 Project for Post-harvest/Distribution	
I-2-1 Improvement of Agricultural Tools				I-2-1 Improvement of Agricultural Tools	
I-2-2 Reduction of Post-harvest Losses				I-2-2 Reduction of Post-harvest Losses	
I-2-3 Improvement of Distribution Channel by Farmers' Group (1)				I-2-3 Improvement of Distribution Channel by Farmers' Group (1)	divided into 2 components, such as the farm input and the farm produce concerning the component "Processing and Sale of Farm Produce", it was deleted as there is little farm produce for processing in the area
I-2-4 Processing and Sale of Farm Produce				I-2-4 Improvement of Distribution Channel by Farmers' Group (2)	
II. Human Resources Training Program				II. Human Resources Training Program	
II-1 Project for Administrative and Extension Officers Capacity Building				II-1 Project for Administrative and Extension Officers Capacity Building	
II-1-1 Technical Training for Diffusion of Cropping Techniques				II-1-1 Technical Training for Diffusion of Cropping Techniques	this component includes the component "Extension Officers' Capacity Building on Monitoring"
II-1-2 Operational Capacities Building of Administrative Department				II-1-2 Operational Capacities Building of Administrative Department	
II-1-3 Extension Officers' Capacity Building on Monitoring		Training of Farmers' Group Leaders			included in II-1-1
II-2 Project for Training of Farmers' Groups				II-2 Project for Rural Community Capacity Building	including II-3, this project name was changed to "Project for Rural Community Capacity Building", and II-3-1 was changed to II-2-2
II-2-1 Group Leaders Training Organization of Meetings				II-2-1 Group Leaders Training Organization of Meetings	the component "Farmers' Training" was deleted as the contents of this component shall be carried out in each component
II-2-2 Farmers' Training				II-2-2 Setting up of Farmers' Groups	
II-3 Project for Sensitization of Rural Community					included in II-2
II-3-1 Setting up of Farmers' Groups					
III. Program for Agricultural Production Infrastructure Development/Water Management		Small-scale Irrigation		III. Program for Agricultural Production Infrastructure Development/Water Management	separating the big-scale reclamation as option, and small-scale projects remain
III-1 Small-scale Irrigation Project				III-1 Small-scale Irrigation Project	
III-2 Improved Nurseries Project				III-2 Improved Nurseries Project	this component is added as the seedling growing is found important in the Verification
III-3 Water Management Training Project				III-3 Water Management Training Project	
IV. Environment Preservation Program		Environment Preservation and Sensitization		IV. Environment Preservation Program	
IV-1 Sensitization Project on Mangrove Forest Preservation				IV-1 Sensitization Project on Mangrove Forest Preservation	concerning the environment preservation, as the water quality management was deleted, it was limited to the mangrove forest preservation
IV-2 Project for Reforestation of Mangroves				IV-2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting	as the execution of the grand-scale reforestation is not easy, it was changed to the appropriate techniques on mangrove firewood cutting, which is suitable for the area, and the small-scale reforestation is included
IV-3 Project for Water Quality Management				IV-3 Project for Introduction of Silt Extraction Improved Technique	the water quality management was deleted, as the farming water quality is found not a problem, and instead of it, the introduction of silt extraction improved technique which was effective for decrease of the mangrove cutting was added

Figure 5.1.1 Contents and Reasons of Framework Changes of the M/P

5.1.3 Selection of the Verification Study

On the basis of the provisionally defined Master Plan, the following elements have been taken into consideration:

- (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 (necessity to proceed to a provisional examination), etc.

Through consultations with the counterparts, the following four (4) components have been provisionally proposed for the Verification during Phase I: 1) Capacities Building of Extension Officers/Farmers' Groups, 2) Training of Farmers' Group Leaders, 3) Small-scale Irrigation and 4) Environment Preservation and Sensitization.

During a meeting held with the counterparts of DNA on May 21 2005, before the beginning of the Verification, the following amendments concerning the components has been proposed and accepted:

- Concerning the component "Capacities Building of the Extension Officers/Farmers' Groups", the idea that it would be more understandable if it were divided into two (2) different parts was discussed, because in fact it is composed of two (2) independent parts.
- Then, it has been decided that when dividing the first component into two parts, the Verification would henceforth be constituted of five components (Improvement of Rice Growing Techniques, Agricultural Mechanization, Training of Farmers' Group Leaders, Small-scale Irrigation, Environment Preservation and Sensitization).

5.1.4 Programs and Components of the Verification Study

The components of the Verification are implemented to draw lessons and experiences that are reflected in the formulation of the final Master Plan. Consequently, the relation between the provisionally defined Master Plan and the components of the Verification are as follows:

Table 5.1.1 Provisionally Defined Programs and Components of the Verification

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

The content of the components of the Verification are as follows: first, hypotheses have been built up 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. Next, since all the components of the Verification are executed under the direction of the Guinean officers, the content of the component "Strengthening of the administrative service's operating capacities" in the Master Plan are verified.

5.1.5.1 Improvement of Rice Growing Techniques

(1) Summary and Objectives

The traditional rice-growing is practiced in the plains of Sonfonia, and technical level differences are noticed among the farmers. Advanced farmers having excellent techniques that allow high yields are identified in the area. These advanced techniques coincide with the ones recommended by the research data or by the educational manuals. Mastered advanced techniques are consequently retrieved in the farming practice. That is to say that an advanced farmer knowing the conditions of his plot, his own economical situations and the labor, can then choose the techniques fitting his conditions. Such techniques can be deemed as "durable techniques". Besides, the technical levels remain generally low and have again a lot of points to improve.

The adoption of excellent techniques possessed by the advanced farmers and its extension towards other farmers are proposed in the component "Improvement of the rice growing techniques" in the Master Plan. Nevertheless, the advanced techniques existing in the area are neither grasped nor

understood in terms of how they could be verified and how they could be disseminated. These points again are not yet clarified. In addition, the capacity of the extension service staff is still unknown.

Thus, in the execution of this component of the Verification, attempts is done to crosscheck the obscure points and the possibilities of the component of the Master Plan by performing some demonstrations on advanced techniques in the farmers' plots. In this process, the collection of the techniques and the means of problems resolution are confided to the extension officers to achieve a sustainable development in the area. As for the selection of the advanced techniques, the ones that can extend to other similar regions and that can be easily executed will be selected.

A soil analysis and yield evaluation will be carried out to test the effectiveness of the introduced advanced techniques. With that, the extension service staff will proceed by themselves to the sampling and will have to master the evaluation methods. Besides, workshops will be organized to disseminate the demonstration results to the farmers. Through the extension activities and the collection of the aforementioned advanced techniques, the possibilities of the execution of soil diagnosis in the component "technical training for the diffusion of improved cultivation techniques" in the Master Plan can be evaluated.

(2) Hypothesis

1. Without development; only with the local cultivation techniques (Improvement of the Cultivation Techniques) for example, the advanced techniques practiced by the farmers themselves can lead to an increase of the production.
2. The extension service staffs can collect and disseminate the advanced techniques to the farmers in the area.

(3) Roles in the programs proposed in the Master Plan

The roles of the concerned persons that could strengthen their capacities during the execution of this component in the framework of the proposed programs in the Master Plan are presented in the table below.

**Table 5.1.2 Roles in the programs proposed in the Master Plan:
Improvement of Rice Growing Techniques**

Program (M/P)	Items to be verified	Results	Project objective	Role of the concerned persons in the M/P
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 Collect the improved techniques used by the advanced farmers and extend them to other farmers I-1-2 Diffusion of Rice Adapted Varieties Augmentation of the rice yield by diffusing the adapted varieties in the area	Identification of the advanced techniques Verification method and advanced diffusion techniques Learning of the seed renewal techniques by farmers Securing the adapted seeds	Elaboration of the inventory of the advanced techniques Comparison between the demonstration plots and the reference plots	The diffusion officers perceive the efficiency of the improved techniques	Scheduling and operation of the M/P component Elaboration of the inventory of the advanced techniques Extension of the advanced techniques in the plain of Sonfonia and in the other zones
I - 2 Project for Post-harvest/Distribution				
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 Strengthening of the capacity of the diffusion officers through the follow-up of rice cultivation, soil investigation (salinity concentration/pH) and yield evaluations, etc.	Verification of the capacity of diffusion officers Strengthening of the capacity of diffusion officers	Arrangement of the results of rice cultivation follow-up, soil investigation (salinity concentration/pH), and yield evaluation, etc.	The diffusion officers perceive the efficiency of the improved techniques	Soil investigation, Yield evaluation, operation and follow-up
II - 2 Project for Rural Community Capacity Building II-2-2 Training of the farmers The implementation of the training by conceiving the practical way to motivate the farmers	Verification of the capacity of the farmers Strengthening the capacity of the farmers	The farmers master and carry out the improved techniques		Diffusion of the improved techniques to the other farmers
III. Program for Agricultural Production Infrastructure Development/Water Management				
IV. Environment Preservation Program				

5.1.5.2 Agricultural Mechanization

(1) Summary and Objectives

In the plains of Sonfonia the plowing works of rice fields are generally carried out manually. Besides, there are rice fields which are abandoned because of lack of labor. Mechanical plowing is also executed, but only at small scale. In the component of the Master Plan "Introduction of the groups of agricultural drudges", the offer of labor by the groups of agricultural drudges is proposed to overcome this problem. In the extension of this component, a Tractor Service is proposed with the concrete introduction of the component "Introduction of the Tractor Service by the farmers' groups". Nevertheless, the capacity of the farmers groups in the management of the group and in the operation of the Tractor Service is again unknown. Consequently, the component "Agricultural mechanization" will be verified taking into account the two aforementioned points on the capacity of the farmers' groups. Training on the agricultural mechanization is also foreseen, which is essential for the tractor service. The effectiveness of the component "Training on the agricultural mechanization" in the Master Plan can thus be verified. In addition, the training on the mechanization that is essential for the introduction of the tractor service is also carried out.

The viable management of the tractor service by the farmers' groups is verified in this component through a program that will take into account covering the expenses for the purchase of spare parts and renewal of the cultivator. In the implementation of this component, the cultivator that was offered in the framework of the KR2 to the farmers' groups operating in the plains is used.

Besides, it can be said that the known problems of management and maintenance related to the

multitude of tractors distributed throughout the national territory find their condensed formula in the management and maintenance problems to which LAMKOYA is confronted. The results of this component are reflected in the Master Plan not only for the plains of Sonfonia alone but also for various other development programs nationwide.

In addition, because it is important to push forward the farming modernization while taking into account the current situations of the area, work is being done for the improvement of the agricultural tools such as the manual threshing machines, the weeding machines, etc.

(2) Hypothesis

1. The farmers' group acquires the operation, maintenance and continuous management method of the tractor service.
2. The problems concerning the management of the tractor service are identified, and improvement measures are proposed.

(3) Roles in the Programs Proposed in the Master Plan

The roles of the concerned persons that could strengthen their capacities during the execution of this component in the framework of the proposed programs in the Master Plan are presented in the table below.

**Table 5.1.3 Roles in the programs proposed in the Master Plan:
Agricultural Mechanization**

Program (M/P)	Items to be verigied	Results	Project objective	Role of the concerned persons in the M/P
I. Program for Agricultural Farming and Crop Improvement				
I - 1 Project for Improvement of Cropping Techniques I-1-4 Introduction of Groups Specialized in Agricultural Works Offer of labour by the groups specialized in the agricultural works and the tractor service as extension of this works service I-1-5 Introduction of Tractor Service by Farmers' Group Promotion of the ariculture mechanization by the introduction of the tractor service	Verification of the capacity of the farmers' groups that operate the tractor service Strengthening of the capacity of the farmers' group in tractor service Verification of the feasibility of the tractor service Strengthening of the capacity of drivers and maintenance operators	The farmers groups master the management and maintenance methods of the tractor servive	The farmers' groups continue the management of the tractor service The diffusion system diffusing the improved agricultural equipments is established	Scheduling and operation of the component of M/P Extension of the tractor service in the study area Extension of the workshop session on the agricultural mechanization for the tractor users in the whole country
I - 2 Project for Post-harvest/Distribution I-2-1 Improvement of Agricultural Tools Manufacture and diffusion of asian agricultural equipments in Guinea	Verification of the manufacture of the improved agricultural equipments	The farmers use the asian made agricultural equipments		Participate in the manufacturing and the diffusion of asian agricultural equipments
II. Human Resources Training Program				
II - 1 Project for Administrative and Extension Officers Capacity Building		Stregthening the capacities of the administrative and diffusion personnel during the execution of the component		Trainers of the farmers' groups
II - 2 Project for Rural Community Capacity Building				
III. Program for Agricultural Production Infrastructure Development/Water Management				
IV. Environment Preservation Program				

5.1.5.3 Training of Farmers' Group Leaders

(1) Summary and Objectives

There are groups of farmers that are supposed to engage in vegetable cultivation or the food industry, but their activities are stagnate and not operational.

Besides, among the components proposed in the Master Plan, some like "Introduction of agricultural drudges' groups", "Introduction of the Tractor Service by the farmers' groups", and "Small scale irrigation programs", generate very concrete activities of farmers' groups. Especially, to realize the development program of agricultural farming infrastructures, it will be necessary to manage the installations in collaboration with the beneficiary farmers, as the water management is very important. The management experience of such installations not existing in the Study Area, is then becomes necessary to establish new groups to this end. The verification of the training of these new groups will be implemented in the component related to small scale irrigation.

For the existing or new groups, the leaders including the secretaries and the treasurers constitute a very important element for the success or failure of the project. In this component of the Verification, the awakening of the leaders' awareness and the acquisition of the necessary basic knowledge to direct the activities of the group are ensured through trainings which aim to ensure the proper realization of the so called activities. Meetings of groups' leaders are also organized to ensure exchanges of views and develop the awareness.

(2) Hypothesis

1. The leading capacity of the farmers' groups' leaders is improved through trainings which are organized to this end.
2. The participation of the groups' leaders in the meetings will stimulate the activities of the farmers groups.

(3) Roles in the Programs Proposed in the Master Plan

The roles of the concerned persons that could strengthen their capacities during the operation of this component in the framework of the proposed programs in the Master Plan are presented in the table below.

**Table 5.1.4 Roles in the programs proposed in the Master Plan:
Training of Farmers' Group Leaders**

Program (M/P)	Items to be verified	Results	Project objective	Role of the concerned persons in the M/P
I. Program for Agricultural Farming and Crop Improvement				
I - 1 Project for Improvement of Cropping Techniques				Participate in the improvement of the capacity of the leaders and realize relevant activities
I - 2 Project for Post-harvest/Distribution				
II. Human Resources Training Program				
II - 1 Project for Administrative and Extension Officers Capacity Building		administrative officers can lead the farmers groups		
II - 2 Project for Rural Community Capacity Building II-2-1 Group Leaders Training/Organizational Meetings Training of the leaders on the management of the groups	Verification of the capacity of the groups' leaders Verification of the efficiency of training/meeting of the groups' leaders	Strengthening of the capacity of the leaders to manage the groups	Pertinent management of the groups Dynamization of the activities	Trainers of the farmers groups Extension of the activity to other areas
III. Program for Agricultural Production Infrastructure Development/Water Management		Administrative officers can lead the farmers' groups		
IV. Environment Preservation Program		Administrative officers can lead the farmers' groups		

5.1.5.4 Small-scale Irrigation

(1) Summary and Objectives

In the plains of Sonfonia, there are practically no farmers using irrigation installations. In the Master Plan, the small scale irrigation using excess water from the Sonfonia reservoir was examined, and the introduction of small-scale irrigation installations is proposed. In addition, the farmers have no experience on the management of irrigation waters; the situation is similar for the National Direction of Agriculture (DNA) personnel and the extension staff who also have no experience on the hydro-agricultural installations. In this component, part of the small irrigation installations proposed in the Master Plan will be introduced to allow the farmers to learn to manage these infrastructures and the irrigation water. The possibility of perpetuation of the small scale irrigation will be verified. Simultaneously, the DNA personnel and the extension service staff will learn on the irrigation installations that will be introduced to prepare the implementation of the program for agricultural production infrastructures development in the Master Plan. As it has been mentioned in the previous component, the role of the farmers' group is important in the introduction of the irrigation; it then becomes necessary to establish a new group and verify this possibility. One can also verify the possibility of the training program proposed in the Master Plan.

(2) Hypothesis

1. The practice of irrigated agriculture allows the farmers and extension service staffs to learn on the water management methods and the maintenance of the installations through the operation of hydro-agricultural infrastructures by the farmers' group, which will perpetuate the irrigated agriculture.
2. The irrigation technicians of the DNA learn the basic methods of water management, planning, conception and setting up of small scale irrigation installations.

(3) Roles in the Programs Proposed in the Master Plan

The roles of the concerned persons that could strengthen their capacities during the execution of this component in the framework of the programs proposed in the Master Plan are presented in the table below.

**Table 5.1.5 Roles in the programs proposed in the Master Plan:
Small-scale Irrigation**

Program (M/P)	Items to be verigied	Results	Project objective	Role of the concerned persons in the M/P
I. Program for Agricultural Farming and Crop Improvement				
I - 1 Project for Improvement of Cropping Techniques		Execution of the dry season vegetable growing Verification of its feasibility		Contribute to the component "Promotion of the dry season vegetable growing"
I - 2 Project for Post-harvest/Distribution				
II. Human Resources Training Program				
II - 1 Project for Administrative and Extension Officers Capacity Building		Strengthening of the capacity of governmental personnel on programming, conception, budgetization, operation, management, maintenance, follow-up and evaluation	The farmers master the rice cultivation by using the small scale irrigation installations	Contribute to the operation of the project through the preparation of the program, the conception, the budgetization, the operation, the management, the maintenance, the monitoring and the evaluation
II - 2 Project for Rural Community Capacity Building		Setting up new groups	The rice harvest increases due to good transplants grown by using the improved nurseries	Trainers of the farmers' groups Contribute to the set up of new groups
III. Program for Agricultural Production Infrastructure Development/Water Management				
III-1 Small-scale Irrigation Project Realisation of the off season cultivation with small scale irrigation by using a siphon structure to transfer water by gravity	Verification and strengthening of the capacity of the governmental and diffusion personnel	The DNA section personnel masters the program, the conception and the set-up of small scale irrigation	Strengthening of the capacity of the administrative officers on the small scale irrigation, the improved nurseries, and the set-up of new farmers groups	Contribute to the extension of the project for small scale irrigation, and extend the water management method to other areas Confection of improved nurseries Execution of the training on the water management to the farmers of other areas
III-2 Improved Nurseries Project Rice cultivations are threatened by the ravages due to nurseries flooding by abundant rain water in the area, and it is necessary to prepare nurseries that can survive to the floods	Verification of the efficiency of the irrigated agriculture Verification of the efficiency of the improved nurseries	The farmers and the diffusion officers master the water management through the irrigation		
III-3 Water Management Training Project Training on the irrigation water management for the farmers of the other areas by using well the small scale irrigation in the area	Verification of the efficiency of the training on water management	The farmers apply the improved nurseries The farmers of the other areas learn on the water management		
IV. Environment Preservation Program				

5.1.5.5 Environment Preservation and Sensitization (Preservation of Mangrove Forest)

(1) Summary and Objectives

The inhabitants of Sonfonia plains are not "sensitized" enough on the environmental preservation; they cut the mangrove for firewood and farm clearing, which often have a harmful influence on the environment. To this effect, the "Project for the sensitization on the environmental preservation", "Project for training on the appropriate techniques of the mangrove wood cutting" and " Project for the introduction of improved technique of salt extraction" are proposed in the Master Plan to raise awareness to the inhabitants on the preservation of the environment.

In this component, a sensitization on the environment conservation (activities of sensitization on the preservation of the local environment including: the protection of the mangrove, demonstration on the

appropriate cutting of the mangrove wood, etc.) takes place in all the divisions neighboring the Sonfonia plains to strengthen the awareness on the environment preservation by the local inhabitants. During the second year of the study, the activities of sensitization were intensified to further strengthen the awareness, and in third year, practical actions of appropriate cutting of the mangrove wood were executed. These activities were principally carried out by the DCDRE and the SNPRV sections, which would also allow them to improve the capacities of their personnel.

(2) Hypothesis

1. The awareness of the inhabitants on the preservation of the environment is stimulated through the activities of sensitization on the preservation and the appropriate cutting of the mangrove wood.
2. The activities of sensitization on the environment preservation are continued by the concerned administration of the DCDRE and SNPRV sections.

(3) Roles in the Programs Proposed in the Master Plan

The roles of the concerned persons that could reinforce their capacities during the operation of this component in the framework of the programs proposed in the Master Plan are presented in the table below.

**Table 5.1.6 Roles in the programs proposed in the Master Plan:
Environment Preservation and Sensitization**

Program (M/P)	Items to be verigied	Results	Project objective	Role of the concerned persons in the M/P
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		Strengthening of the capacities of the administrative and diffusion personnel during the execution of the component		
II - 2 Project for Rural Community Capacity Building				
III. Program for Agricultural Production Infrastructure Development/Water Management				
IV. Environment Preservation Program				
IV-1 Sensitization Project on Mangrove Forest Preservation Implementation of the sensitization campaign aiming at increasing the population awareness on the environmental preservation	Improvement of the environmental preservation and perception by the inhabitants through the sensitization activities, demonstration training on the techniques of the appropriate cutting of the mangrove wood, and the introduction of the improved technique of salt extraction	Administrations concerned by the environment learn the set-up of the project Execution of the training on the appropriate cutting technique of the mangrove wood Execution of extraction of salt by using the improved technique	Administration concerned by environment carry on the sensitization activities; les inhabitants improve their perception for the environmental preservation	Execution of seminars for the environmental preservation Execution of the training on mangrove cutting techniques and salt extraction by the improved technique
IV-2 Training Project for Appropriate Techniques on Mangrove Firewood Cutting Training on the appropriate cutting technique for the good and permanent use of the mangrove wood				
IV-2 Project for Introduction of Salt Extraction Improved Technique The methods are based on the natural evaporation of the bittern by using plastic sheets and they aim at reducing the cutting of the mangroves				

5.1.6 Organization of the Operation Structure of the Verification Study

The organization of the executive structure of the Verification is presented in the diagram below. 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. The independent farmers as well as the groups’ members have been included in the committee of farmers’ groups, because there were components that are operated for the independent too. 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.

Each of the committees conducted in some way a follow-up of the components. The committee of the farmers groups has met in session once every two months, and the consultation committee, once each four months. During the meetings, the anticipations and the results of the activities, the situation of the accounting etc., have been presented and debated. The committees of the farmers’ groups get together the leaders of the groups and its meetings were chaired by one of the elected leaders, and the DCDRE attended the meeting as observer. It has been possible to expect that the knowledge of the other groups’ activities or the exchanges of ideas produce a positive effect on the participants. An official report of the meeting has been established for each session and transmitted to the structures at higher level for opinions.

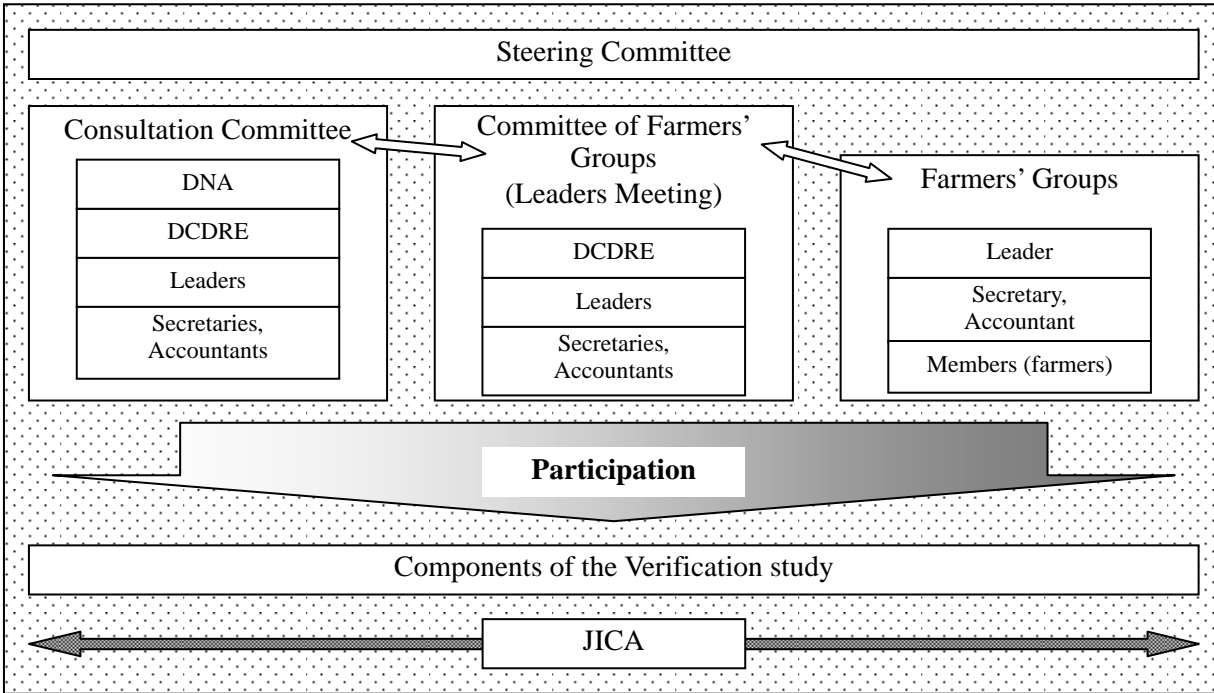


Figure 5.1.2 Organization of the Operation Structure of the Verification Study

The responsible persons in charge of each component were nominated before the beginning of the Verification as follows.

Improvement of Rice Growing Techniques: Mr. KABA Abdoul Aziz

Agricultural Mechanization:	Mr. FOFANA Ousmane
Training of Farmers' Group Leaders:	Dr. MANSARE Bernard
Small-scale Irrigation:	Mr. CAMARA Kombo
Environment Preservation and Sensitization:	Mr. TRAORE Amara

5.2 Process and Evaluation: Improvement of Rice Growing Techniques

5.2.1 Process of Activities

Activities	Expected Effects	Program												Persons in charge	Contributions									
		2005						2006																
		m	j	a	s	o	n	d	j	f	m	a	m			j	j	a	s	o	n			
1-1 Extension officers prepare an execution plan under the guidance of the expert	Establishment of the pilot study	■																					DCDRE Extension officers	Guinea: extension officers JICA: Team members, local Expert, Transportation allowances for the counterparts
1-2 Farming techniques to be improved are selected	List of the techniques used by the advanced farmers	■																					DCDRE Extension officers	Guinea: extension officers JICA: Team members, local Expert, Transportation allowances for the counterparts
1-3 Soil samples study is carried out as the baseline survey	Results of analysis/synthesis																						DCDRE Extension officers Local Expert	Guinea: Extension officers JICA: Team members, local Expert, Cost of the soil analysis, Simple measurement equipments, GPS, Transportation allowances for the counterparts
1-4 Advanced farmers for the demonstration sites of the farming techniques to be improve are selected	Selection of farmers strongly wishing to take part	■																					DCDRE Extension officers	Guinea: Extension officers JICA: Team members
1-5 Execution of the demonstrations of the farming techniques by the advanced farmers	Execution																						DCDRE Extension officers Local Expert	Guinea: Extension officers JICA: Team members, Production materials for study equipments
1-6 Monitoring carried out by the extension officers and the farmers	Results of the follow-up																						DCDRE Extension officers	Guinea: Extension officers JICA: Team members, of Analysis fees
1-7 Extension officers organize seminars aiming at informing the local farmers the results obtained	Number of participants in the workshop																						DCDRE Extension officers	Guinea: Extension officers JICA: Team members, Workshop organization fees
1-8 Manuals of the outputs are prepared	Inventory																						DCDRE Extension officers	Guinea: Extension officers JICA: Team members, Workshop organization fees, Transportation allowances for the counterparts

* ■■■■ : programmed ■ : realized

“Activity 1-1: Extension officers prepare an execution plan under the guidance of the expert”

In June 2005, the team proceeded to a field visit and carried out farmer surveys that allowed us to acquire information related to the ongoing agricultural activities.

The extension officers understood in principle the relevance of the farming techniques, although the

points of view and the means lack for its dissemination. After long discussions the team agreed with the others and exchanged ideas.

Indeed, it is following these investigations and workshops that we examined the following points of view for the component:

- The choice of the topics which we are able to develop and to disseminate in favor of the other rice farming areas of Guinea. However, apart from the Study Area, it is important to know that the activities occur under similar conditions so that the effects of this study are profitable to the whole of the country.
- Taking into account the advanced farming techniques which are practiced by the farmers of the Study Area.
- The techniques gathered will be examined to see whether it will be able to introduce them during the second year of the Verification. The dissemination of these advanced techniques should be the principal activity, by considering the increase in number of the demonstration plots and the holding of workshops.
- Rice growing in the Study Area is currently a risky operation, because it is characterized by weak investments and obtaining poor yield; a proposal for an improvement must be based on “few expenditure and few loads for the farmer” thus, only the simplified improvement of the techniques practiced by the farmer himself could carry positive results.
- The extension officers grasp well the constraints on the cultivation practices through the demonstrations and disseminate the improved techniques for each category of farmers (owner, farmer, agricultural employee etc). Thus it is important that the extension officers control the basis of the dissemination, and make the restitution of the results obtained to the farmers through workshops.
- As specified above for dissemination of the advanced techniques in the Study Area, we will rather carry out demonstrations in the plots of the individual farmers than in the groups of farmers. It is by taking into account that the difficulties of the management of collective plots of the groups that individual farmers were targeted.
- The rice farm in the plain of Sonfonia, are not developed and they are submerged during the rice cultivation period due to flooding. The farmers have difficulty accessing their plots. Thus, it was noted that the farmers almost do not employ workforce after the transplanting until harvest. In conformity, the technical topics to improve during the installation of the nursery and the transplanting like at the beginning of the cultivation, which are important factors, and that they will make it possible to achieve an increase in yield. The advanced technique ones are centered during these important periods.

“Context of Activities in 2005”

Within the framework of this component, the district of Kobaya was retained as the demonstrations site because firstly it is geographically located in the center of the divisions, and then it holds the largest

agricultural surface with numerous farm owners. From the point of view of rice growing, the plain of Sonfonia includes three distinct ecosystems areas which are: 1) the upstream, 2) the Intermediary, 3) the downstream. A demonstration plot was set up at each area to apply the advanced techniques. In addition for comparison at the end, it was decided to identify and choose two reference plots close to the demonstration area, whose characteristics must respond to the criteria of the “Good Reference plot” and the “Passable Reference plot”. The follow-up of the demonstration plot is carried out by the extension officers during the crop campaign, from plowing to the harvest; parallel to the examination of the introduced techniques’ implementation, other advanced techniques in practice by the farmer will be collected. The results will then be subject to restitution through workshops and will be widely disseminated to the farmers.

“Context of Activities in 2006”

According to the results of the year 2005, the workshops at the end of the campaign, have appreciated much of the results obtained and wish to practice the advanced techniques confirmed by the Verification of 2005. Thus during the Verification in 2006 within the framework of the dissemination of the advanced techniques a farmer or a group of farmers are targeted in each district of the Study Area.

In the Verification of the second year, the definition of the areas was revised by the topics of relative farming techniques such as: the area of the mangrove rice (Downstream); the area of the rain-fed rice (Upstream) and the plain of Sonfonia, since the identification of the intermediate area was not obvious for the farmers. In conformity, the representative areas of the plain of Sonfonia made up of two quite distinct areas is taken into account, such as Downstream and Upstream.

Concerning the comparison of the choices of reference plots, the Verification of 2005 was made just beside the demonstration plot, but the conditions of these plots were not similar, this is why the Verification 2005 was difficult from the view point of comparison of the advanced techniques. In accordance with this report in the 2nd year of the Verification a reference plot is taken in the same plot as that of demonstration.

Thus after the installation of the reference and the demonstration plots in the same area, through the follow-ups which will be operated, the rate of germination, the growth and the chlorophyll amount, the development of the seedlings (phenologic), etc will be determined and these parameters will be examined until the stage of resumption. The Verification of the Study can be followed only until November (before the harvest of this year), consequently it was not possible to consider the evaluation of the yield in the final report, but it will only be possible to compare the parameters of the resumption from the nursery to the transplanting. The team will study only the influence of these parameters on the yield in the final report. After harvest, the restitution workshops will be organized for the farmers in the Study Area. These workshops will be organized taking into account the importance put on the practice of the improved farming techniques in the Programs of Agricultural Development. During the follow-ups, the advanced techniques will be collected.

Table 5.2.1 Characteristics of the Area of Verification

2005	Upstream	Intermediary	Downstream
	<ul style="list-style-type: none"> - No influence of sea water. - Easy Invasion by the weeds - Dryness at the end of maturity - This type of area is represented by the lands close to the habitations in the plains 	<ul style="list-style-type: none"> - The intermediary area along the top-sequences specific to the rivers running from upstream towards downstream. - Existence of the marshy areas and typical fresh water weeds 	<ul style="list-style-type: none"> - Risks of damages due to salt, is subject to the influence of sea water. - Rice cultivation is practiced traditionally by managing water through the construction of small dams and plot pads. - Rice varieties resistant to salinity are cultivated. - This type is very widespread in the plains of Sonfonia.
2006	Upstream		Downstream
	<ul style="list-style-type: none"> - Plots close to the habitations, where people cultivate the rain-fed rice 		<ul style="list-style-type: none"> - Plots mainly at the border of the sea, - Cultivations are carried out with the method of sea water introduction and salt resisting varieties are cultivated

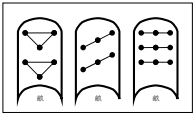
“Activity 1-2: Farming techniques to be improved are selected”

“Techniques Selected in 2005”

The selection of the farming techniques to be improve started at the beginning of June, following a workshop and advanced farmers’ interviews by the extension officers and an Expert agronomist recruited to this end. Following the identified constraints (see table below), the application of the advanced farming techniques has been discussed.

Table 5.2.2 Current Constraints and Techniques to be Improved

Area/period	Constraints	Local strategies	Techniques to be improved
All the plain, year round	Water Management. The tasks of plots development and water evacuation are unordered.	<ul style="list-style-type: none"> - Construction of dykes around the plots - Fashioning of bedding - But in the current case, the farmers cannot protect their plots against the flood and the water movements in the neighbor plots <p><i>Opinion of a farmer in the downstream area</i> Major problem of the area I work from morning to evening to control the water level. There are always risks of flood and high tide. The choice of the place and the period for each nursery are important.</p>	<ul style="list-style-type: none"> - Collective water management (between the farmers, the extension and the extension officers) - Dig the principal evacuation canals, discipline the water management by the farmers themselves - Reinforcement and maintenance of the dykes - Enter regularly the water in the plots (water management)
Downstream/ Beginning of growth of the seedlings and the period of growth	Damage of salt	<ul style="list-style-type: none"> - Culture on balks - Belt Dykes 	<ul style="list-style-type: none"> - Maintenance of the dykes - Bedding - Construction of canals inside the plot (evacuation of seawater)
Downstream, Intermediate/ Nursery, transplanting	Damage of crabs (at the time of transplanting, the crabs attack the young seedlings and dig the dams, that creates damage with the intrusion of salt)	<ul style="list-style-type: none"> - Nurseries aged 40 to 50 days - Strong density of transplantation - Decrease in the water level for the resumption - Chemical and poisons are seldom used: pyrex (1l/ha), the basodine (30kg/ha) 	<ul style="list-style-type: none"> - Robust nursery - Old seedbed which protects from the damage of the crabs, but can prevent the development of productive tillering - Good preparation of the seedbed (choice of the place, 1/20 of transplanted surface, sowing standard 1 kg/10 m²)

Downstream, Intermediate/ Nursery, Transplanting	Damage of fish (at the moment of the floods)	<ul style="list-style-type: none"> - Preparation of site of nursery; fashioning of the nursery bed to avoid the immersion of the seedling. 	<ul style="list-style-type: none"> - Avoiding the submergence of young seedlings - Drainage
Intermediary, Upstream/All the period	Weeds	<ul style="list-style-type: none"> - Burying of the weeds (Wonwongny) - Strong density of transplantation - Preparation of the land (2 to 3 times of plowing) <p><u>Opinion of an upstream farmer</u> The drainage is not sufficient. All the year there are many weeds. Weeding is difficult to do.</p>	<ul style="list-style-type: none"> - Carry out the plowing three times. Crumbling - Clear and burn the weeds before the first rains - Leveling and crumbling right before transplanting
All the area	Quality of the seeds	<ul style="list-style-type: none"> - Self-production, or exchanges between farmers They often buy in Tayaki. - Varieties recommended by the CRAK: Kaolack, WAR 73, WAR77, Dissi rouge are not available at the level of the farmers. - The quality of the seed is not ensured and is mixed. 	<ul style="list-style-type: none"> - Selected Seeds - Improved Seeds
All the area	Acid grounds	<ul style="list-style-type: none"> - Treatment by the use of shells, bran and rice straw. 	<ul style="list-style-type: none"> - Management of water against the stagnation
All the area	Lack of labor	<ul style="list-style-type: none"> - In general in the area, the labor is familial, there are also seasonal farm laborers, the mutual aid or the salaried groups (women or /and the young) <p><u>Opinion of an intermediate farmer</u> The bedding with the spade takes much time. <u>Opinion of a downstream farmer</u> June, is a very busy period, I cannot work for fashioning the bedding and for the preparation of the nursery at the same time.</p>	<ul style="list-style-type: none"> - Mutual help: between the families or the neighbors who help with cola or meal remuneration. - After the high tide of March (mid-March), to begin the bedding and maintenance of the dykes. (Ex: in the downstream area, in the demonstration plot, to avoid the lack of labor in June.)
	Others	<p><u>Opinion of a farmer in Intermediate area</u> I am not convinced of the density of transplanting and the number of bits per tuft. I transplant in the following way (below), with the number of bits, I do not pay attention then that can differ between 5 to 15 according to the size of the seedlings.</p>  <p>Examples of transplanting mode</p>	

Concerning the choice of the improved techniques, they must occupy one or two places of choice for the reasons indicated in the table above, easier to undertake, and the results are visible.

“Techniques Selected in 2006”

During workshops organized in 2006 between the months of April and February, surveys were made on farmers who took part in the workshop to affirm the results of the Verification of 2005. According to these results and appreciations of the farmers, the topics cropping technique were chosen by the extension officers. The Verification of 2006 was based on these advanced techniques introduced during the first year of the Study. In addition data collected by the extension officers, which consist of the choice of adapted varieties, with the preparation of seedbeds, the selection of good salt resistant seed, the method of pre-germination and the density of sowing, the distance between the tufts at transplanting are considered as advanced cropping technique. The technique installed will be examined by the technological packages (the whole of the advanced techniques) proposed by the extension officers and

the agronomist to carry out the activities. The combination of the advanced techniques was chosen by the extension officers and the agronomist considering the situation of the demonstration plots. The comparison of the parameters of the activity was carried out in the same plot; the techniques to be verified have been obligatorily limited to 2 or 3 programs, thus the demonstration plot were split into 4 or 8 pieces. The selection of good seed by the “salt method” which is especially appreciated by the farmers in the Study Area was distributed in each district. The contexts of the selected advanced techniques are presented in the table below:

Table 5.2.3 Contexts of Advanced Techniques Selected

<p>➤ Improvement of the nursery</p> <p>There were numbers of farms where the experiments could not be properly verified, as the nurseries which were prepared in the plot and on the dyke were devastated by the flood and strong rain. Especially in the downstream plots, the seedbeds are submerged and the cultivable spaces for the nurseries are very limited. Nevertheless the nurseries prepared in the plot have remarkable advantages; the farmers proceed several times to seedling even in the event of damage by the floods. The nurseries in the plot have the advantage of easy readjustments because the ground condition is the same as the one after transplantation. Other advantages include the ideal condition for the seedbed (moisture) and the ease of transport. Concerning the confection of the improved beddings, those were introduced with the collaboration of the component “Small scale irrigation”.</p>
<p>➤ Selection of good seed</p> <p>In accordance with the provisions taken by the study, there was question to generalize at the level of farmers of Sonfonia. The selection of seeds by the salt method and taking into account its impact on the rice cultivation, according to positive appreciations' of the farmers having practiced it in off season cultivation last year.</p> <p>In the seeds produced by the peasants, there are grains which did not reach maturity and which are unhealthy. The traditional techniques for the selection of the seeds made only by winnowing or simply with water do not make possible identifying the immature seeds. With the experiment of the practice of the selection by salt on the level of GPI, the team noted that 20% of the seeds were unhealthy or produces weak seedlings. The seeds thus selected result in the production of uniform seedlings. This will allow a good increase in yield for the farmers.</p>
<p>➤ Age of seedling to be transplanted</p> <p>During the previous campaign, 60% of the farmers transplanted old seedlings, with age exceeding 55 days in the downstream area. Whereas the age of the seedlings to be transplanted recommended by the extension is 30 days. If the age of the seedling exceeds 30 days, tillering starts in the seedbed. Whereas the growth of the seedlings is limited, tillering does not develop as in the young seedlings. The extension officers recommend the age of 30 days for the seedling to be translated, but few farmers apply that in this area. Thus with the Verification of 2006, the team prepared two comparative plots with regard to the age of the seedlings 30 days (AG30) and 50 days (AG50).</p>
<p>➤ Density of the seedlings in the nursery</p> <p>In the follow-ups of the advanced techniques in 2005, the team noted that the farmers have practiced sowing in various ways. With the Verification in the last year, according to the techniques followed by the extension officers, the density of sowing varies between 0.77 to 2.2 kg/10 m². The team still tested this year with a farmer of Yataya, at the density of 2.0kg/10 m². According to our observations, if the density is strong, the seedlings in seedbeds are choked and yellow. In accordance with this activity, the team put at Yataya in the demonstration plot, the comparative plots of improved density 1.0kg/10 m² (DS1) and of peasant density 2.0kg/10 m² (DS2).</p>
<p>➤ Improvement of the transplanting techniques</p> <p>Within the framework of the transplantation improvement, it was the question of carrying out the Verification of the influence of number of bits and the spacing between seedlings on the growth of rice and its yield. The team observed the numbers of bits in peasant practice which is 10 to 15 bits per tuft (NB-O), and improved with 2 to 3 bits per tuft (NB-A). The spacing between the peasant seedlings is of 15 × 20 cm (ECT-O) and the improved one is of 25 × 25 cm (ECT-A), from the results' of the follow-up of the Verification of the previous year. After the installation of these plots the Verification was carried out for various parameters: size, tillering, the water depth, the chlorophyll rate.</p>

The following table shows the selected techniques for two years.

Table 5.2.4 Techniques Selected for Two Years

2005	Upstream	Intermediate	Downstream	
Advanced techniques	<u>Techniques of transplanting</u> • Transplanting on line	<u>Techniques of transplanting</u> • Spacing of seed hole and a number of bit per tuft	<u>Techniques of nursery</u> • Density of seedlings for the robust nurseries	
Problems	→Against the invasions of weeds, proceed with lining out facilitating the plot's maintenance	→High density on the transplanted seedlings	→Action of water in the deep plot →Damage of fish and crab	
2006	Lambanyi	Sonfonia	Yataya	Kobaya
Advanced techniques	<u>Diffusion of the adapted varieties</u> (Strengthening of a group of farmers) • Local variety • Improved variety	<u>Techniques transplanting</u> • Spacing between seed hole and line • Number of bit/tuft	<u>Techniques of nursery</u> • Improved seedbed • Selection of the seeds • Density of seedling	<u>Techniques of nursery</u> • Improved seedbed • Selection of the seeds • Age of seedling to be transplanted
Problems	→Difficult access to the improved varieties →Salinity →No farmer for the production of the seeds	→Management of new group →Water management	→Flooding, saline →Choice of variety →Spaces for nurseries are limited	→Flooding →Saline →Spaces for nurseries are limited

“Activity 1-3: Soil sample study is carried out as the baseline survey”

The objective here is to understand the impact of the Study Area’s soils conditions on the farming techniques through the pedologist and laboratory analysis. The acidity of the soils is one of the most important problems in the plains of Sonfonia. For the introduction of improved techniques, it is extremely important to apprehend the conditions of the soils in the demonstration plots and the area as a whole. This constitutes an essential data base helping to measure the anticipated effects by the improvements brought about.

“Soil Sampling in 2005”

The sample collection will have to be done at various levels and depth and it was taken at 0-25 cm and 25-50 cm from 9 plots. For the demonstration plot it will be preceded taking 5 samples from its diagonal, and 2 samples from the reference plots.

Within the framework of the weekly soil sampling, the follow-up program proceeded well. The analysis related to the parameters of pH, the conductivity and the salinity of the saturated paste regarding the soil in the various plots we performed. Taking into account the fact that salinity interferes with the analysis of the organic matter (Total Carbon, Total Phosphorus, Total Nitrogen, Cation Exchange Capacity, Hydraulic Acidity, Somme of the exchangeable bases), the analyses requested from the Environment Research and Study Center (ERSC) will be done only after the scrubbing of the grounds by rainwater, thus involving a substantial reduction of salinity and that especially in the period of transplanting.

Acidity

The table below presents the comparisons of average pH of soils taken at different depths in the plots. The values of average pH at 25-50 cm depth are lower than those at 0-25 cm depth except for the intermediate area which indicates the possibilities of attenuating acidity if one plows more deeply.

Table 5.2.5 Comparisons of pH between Different Depth (pH)

	Upstream			Intermediate			Downstream		
	Demonstration	T 1	T 2	Demonstration	T 1	T 2	Demonstration	T 1	T 2
0-25 cm	4,37	4,27	4,40	5,21	4,77	5,63	3,69	3,63	3,67
25-50 cm	3,80	4,00	4,20	5,70	4,2	6,00	2,85	2,90	3,30

Salinity

Generally, concerning the influences of salinity concentration on the rice yield, it can be said that rice is resistant until the salinity measure with EC reaches 3.0 ms/cm. Following the measurement of the EC of the grounds, the average values of the EC are of 1.89 ms/cm in the upstream, 3.87 ms/cm in the intermediate and 8.63 at the downstream part, which is very high. However, since the presence of water in the rice plantations influences mainly the growth of rice, it can be said that it is possible to practice rice growing with very high values of EC since a sufficient water depth exists during the growth. It is believed that the varieties of rice which are cultivated have resistance to salinity.

Table 5.2.6 Comparisons of Salinity to Various Depths (ms/cm)

	Upstream			Intermediate			Downstream		
	Demonstration	T 1	T 2	Demonstration	T 1	T 2	Demonstration	T 1	T 2
0-25 cm	1,41	2,54	1,73	2,57	2,76	6,36	7,40	11,46	7,05
25-50 cm	1,73	3,74	1,45	4,33	2,57	8,13	11,32	10,62	9,21

Compared to the Other Parameters

The results of the analysis of the organic matter (Total Carbon, Total Phosphorus, Total Nitrogen, Cation Exchange Capacity, Hydraulic Acidity) are presented in the table below.

Table 5.2.7 Results of Analysis of Organic Matter

Area	Name of plot	Total Phosphorus (ppm)	total Carbon (%)	Total Nitrogen (%)	Cation Exchange Capacity, Hydraulic Acidity				CEC		Hydraulic Acidity
					Ca	Mg	K	Na	Total	Significant number	
Upstream	Demonstration	7	2,27	0,1	1,40	2,10	0,14	0,04	11,34	4,54	3,24
	T 1	8	2,62	0,11	1,62	2,23	0,25	0,04	11,15	4,91	4,60
	T 2	48	1,98	0,12	1,42	2,08	0,29	0,05	12,49	4,81	4,32
Intermediate	Demonstration	12	1,63	0,09	5,21	6,01	0,32	0,18	15,05	12,10	5,62
	T 1	8	3,62	0,19	1,78	2,43	0,30	0,06	9,98	5,18	4,99
	T 2	12	1,06	0,07	2,92	3,82	0,32	0,27	10,49	7,69	5,80
Downstream	Demonstration	31	3,08	0,19	2,54	3,13	0,21	0,25	21,43	7,83	2,98
	T 1	13	5,58	0,21	3,61	4,19	0,19	0,44	32,91	11,15	2,43
	T 2	11	4,22	0,22	1,59	2,22	0,17	0,16	23,95	6,35	2,57

“Soil Sampling in 2006”

Concerning the pedological analysis undertaken in the Verification of 2005, the understanding of the farmers was not satisfactory. Thus, this year, the extension officers will do the measurements of pH

and EC themselves, in a regular basis in place of the expert who had made these measurements. From the collected data, they will directly advise the farmers in the demonstration plot.

The Soil samplings were taken on three sites according to the demonstrations plots', at each important stage of the cultivation (preparation of nurseries, development of the nurseries, preparation of fields, before transplanting, etc), carried out by the extension officers. They master the measurement of pH and salinity of the soil and water carried out so that they understand the impact of the conditions on the soil of the Study Area and the farming techniques and gave advice to the farmers. The results of the follow-ups and the observations of the area, are indicated below by divisions, but the execution of the demonstration in the Sonfonia division had started late thus the team couldn't carry out the test sample selection.

Kobaya

In the downstream area of the demonstration plot of Kobaya, the ground is fine and sticky, and its surface is covered with a vegetation of Rhizophora. In the soil, there is lot of sulphur accumulated, following the decomposition of the roots of mangrove mixed with clay. Because of the formation of jarosite the ground becomes very acid and the pH varies from 3.6 to 4.0 at the beginning of the rainy season. In mid-July, with the floods caused by the strong rains, the water depth increases, the pH become more than 4.5. The ideal pH for the rice nursery is 4.5 to 5.0 and if the pH is higher towards 7.0 the seedlings will die after the growth. In this context, the nurseries of Kobaya are adequate for rice. However at the beginning of the rainy season it will be necessary to be wary of the low pH and the high salinity in this area.

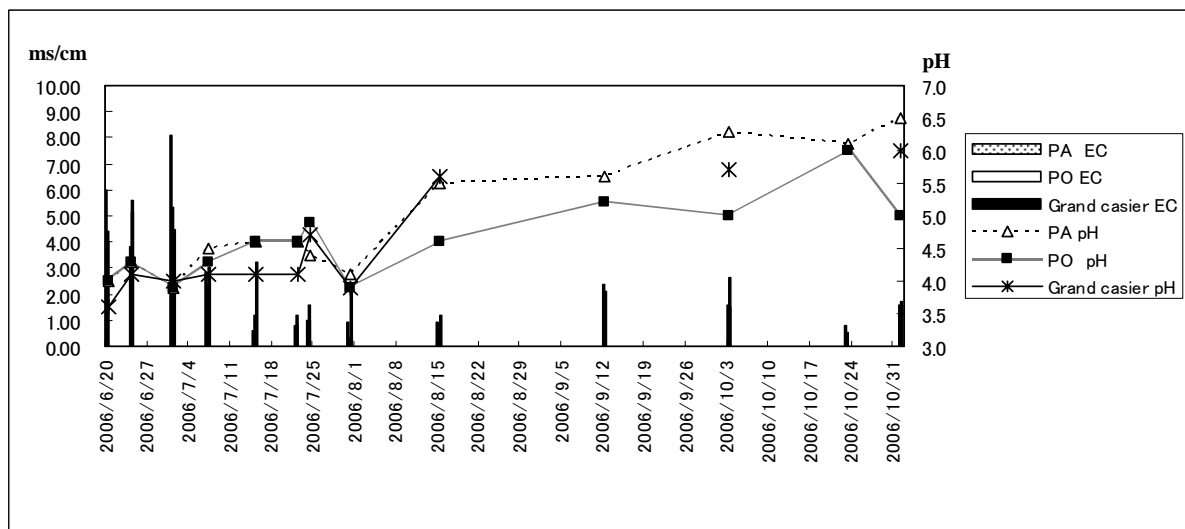


Figure 5.2 1 pH and Salinity of Soil (Kobaya)

Yataya

The demonstration plot of Yataya is located at the edge of the division of Kobaya representing almost the same conditions as that of Kobaya. Its surface was covered with a vegetation of Rhizophora,

with the only difference that the salinity is very high. Even for the period of the seedling in the nursery, salinity exceeds more than 10 ms/cm on the examined seedbed. This year, the beginning of the rain season was late in August; hence, the beginning of the seedling was made on mid-July instead of June. The pH of the improved nursery (Pa) was 3.0 to 4.0 but the influence of salinity was not noticed. Moreover in the ordinary nursery (PO) which is prepared outside the plot in slope ground, the pH was 3.2 to 6.4 and often beyond 5.0. The damage was visible on the ordinary nursery because of acidity and the dryness.

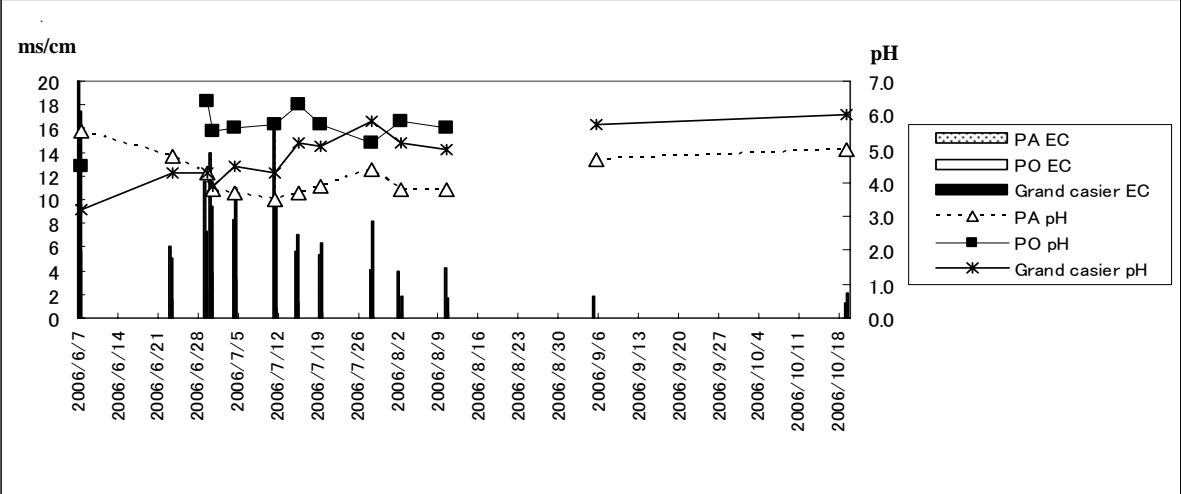


Figure 5.2.2 pH and Salinity of Soil (Yataya)

Lambanyi

In the demonstration plot of Lambanyi, samples were taken in diagonal from the bottom (1), to the middle (2) and top (3) of the surface of the plot. The result of acidity was relatively stable in June to October, with a very high salinity except for the sample 3 which was the lowest in the plot. Moreover the choices of the places of the seedbed were taken according to salinity and acidity with the exception of sample 3.

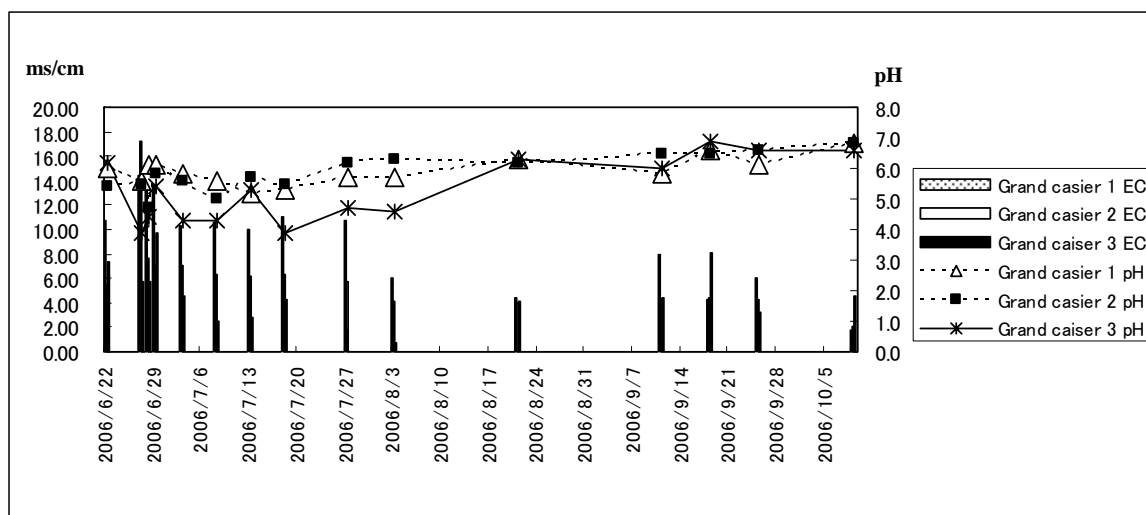


Figure 5.2.3 pH and Salinity of Soil (Lambanyi)

“Activity 1-4: Advanced farmers for the demonstration sites of the farming techniques to be improve are selected”

“Site and Farmers Selection in 2005”

The farmers taking part in the Verification of 2005 were selected by considering their seriousness in the agricultural work. They were chosen by the extension officers at the end of May. In accordance with the working program of the extension officers, a field visit was carried out for the identification of various areas of cultivations according to the choice of the targeted farmers. The names of the participants and the surface of their plots are indicated below:

Table 5.2.8 Selected Farmers and Plots (2005)

Verification Area	Surface and Name of the farmers		
	Demonstration	T1	T2
Upstream	Djibril Soumah 788 m ²	Abdoulaye Soumah 3,640 m ²	Issiaga Soumah 3,120 m ²
Intermediate	Fawouly Sylla 7,048 m ²	Morlaye Sylla 4,118 m ²	Aly Bangoura 1,579 m ²
Downstream	Sonon Soumah 7,676 m ²	Seny Sylla 7,272 m ²	Ibrahima Soumah 8,370 m ²

“Site and Farmers Selection in 2006”

The choices of the farmers and the sites of demonstration were made according to opinions from the farmers during the workshops, follow-ups of the prospecting plots with the advanced farmers. The field visits were carried out in May 2006. By considering the characteristics and the problems of the two areas, the team took the participating farmers or groups from each division of the Study Area.

The targeted farmers are indicated in the table below:

Table 5.2.9 Selected Farmers and Plots (2006)

	Yataya	Kobaya	Sonfonia	Lambanyi
Name of farmers	Abdoulaye Damba	Mamadouba Sonon Soumah	Framers' group GPI	Framers' group Lymania
Surface	4,300 m ² (except the canals of the edges)	6,908 m ² (except the canales of the edges)	352 m ² (88 m ² x 4)	1,750 m ² (50 m x 35 m)

“Activity 1-5: Execution of the demonstrations of the farming techniques by the advanced farmers”

« Execution Cropping in 2005 »

The execution of the cropping was made according to the agricultural calendars' retained by the farmer before launching the activities. In connection with the advanced techniques at the demonstration plot, these were applied under the supervision of the extension officers and an agronomist. The follow-up of the three demonstration plots are compared with the six reference plots located in the vicinities. The evaluation of the yield was made on the nine plots according to samples from square yield.

Table 5.2.10 Execution of Demonstration (2005)

Area	Improvement of the techniques	Executed demonstrations	
Upstream	<u>Techniques of transplanting</u>	In the upstream plots, the farmers transplant in bulk, the distance between the seedlings is 10 to 15cm with a high density. Thus, it was retained to improve the technique of lining out with the cord marked on 25 X 20 cm between the seedlings and the lines. The transplanting was carried out by six farmers.	12/6 germination of the seeds 10/6 plowings/weeding/planning 15/6 seedling 20/7 plowing planning 24/7 lifting 25/7-19/8 transplanting 29/11 harvest
Intermediate	<u>Spacing the seedlings and Numbers of bit by tuft</u>	The technique to be improved was transplanting on balk by taking into account the distance between the seedlings and the number of bits per seed hole. And in this area, the distance between the seedlings is practiced variously from 15 to 30cm, the number of bits per tuft was 5 to 10 bits. The advanced technique which was retained is 2 to 3, the distance is of 25cm.	10/6 incubation of the seeds 14-15/6 bedding 19-28/7 bedding 31/7-1/8 lifting 1-19/8 transplanting 26/11 harvest
Downstream	<u>Density of seedlings on the nursery:</u> <u>1 kg/10 m²</u>	The objective of this activity is to prepare robust seedlings, which can be transplanted at an age of seedling between 30 to 40 days. The plots in the downstream area were limited for the places of nursery, thus the nurseries are found on the dykes or the non-flooded places. The time of sowing must be after the scrubbing of the land's salinity by the abundant rains.	12/3 labor/ bedding 8/6 incubation 9-11/6 plowing/weeding 10-15/6 seedling 5/8- lifting 6-18/8 transplanting 17/12 harvest

«Execution of Cropping in 2006»

The comparison of the parameters on the activity was carried out in the same plot; the team were obliged to limit to 2 or 3 programs, thus the demonstration plot were split into 4 or 8 plots. The selection of good seed by the “salt method” which is especially appreciated by the farmers of the Study Area was disseminated to each division. The technical farmers and topics were selected according to the opinions of the farmers during the workshops, follow-ups of the prospecting of the plots with the advanced farmers. The contexts of the demonstration are indicated in the table below:



Selection of Good Seeds by the “Salt Method” using Eggs

Table 5.2.11 Execution of Demonstration (2006)

Division	Improvement of the techniques	Executed demonstrations	
Kobaya 8 pieces	<u>Seedbeds Boards</u> <u>improved Selection of the seeds the age of seedling</u>	The downstream plots are often flooded on the period of nursery, the limited surface of sowing. However the advantages of the seedbed in the interior of plot are remarkable according to the ease of transport, the readjustment of the seedlings is fast and there is less damage by the dryness. The confection of the seedbeds made with the collaboration of the members of the component small scale irrigation. The height of the improved nursery (Pa) was 30 cm, for the ordinary nursery (PO) is 20 cm, two parcels prepared in the same plot. Then the age of the seedling retained with the Verification of 2005 was not carried out thus the team examined them in the 8 different parcels.	19/6 confection of the parcels 21/6 selection of the seeds visits of the vicinities 24/6 seedlings 24/7 transplanting (seedling of 30 days) 16/8 transplanting (seedling of 50 days)
Yataya 8 parcels	<u>Nurseries</u> <u>improved nursery bed</u> <u>Selection of the seeds</u> <u>density of seedlings</u>	The plots of Yataya have same weak points as the plot of Kobaya, which do not have enough sowing surface. The team took the same topic on the improvement. The height of the improved nursery (Pa) of 25 cm is prepared in the plot, the comparison with the ordinary nursery (PO) prepared outside the plot on the slope. The density of seedlings applied in this area is very high, since the surface of sowing is limited like the aforementioned. The farmers sow 2 kg/10 m ² to have more nurseries but in fact they cannot have robust seedlings. This density called ordinary density (C), and the other one improved density with 1 kg of seeds by 10 m ² , is called (D-A).	20/6 confection of nursery beds 27/6 selection of the seeds visits by LANKOYA group 30/6 seedling (failure because of the cover which lasted more than 10 days) 11/7 seeding 16/8 transplanting
Sonfonia 4 parcels	<u>Transplanting seedlings spacing</u> <u>numbers bits</u>	Because of the general strike in July, the activities of Sonfonia have delayed compared to the other sites. The demonstration plot was selected in the farm of the GPI group where they cultivated during off-season. The nurseries were prepared at 35 days age with the variety: Siguikoda. The team combined two technical topics over 4 parcels, the number of bits 2 to 3 per tuft (NB-A) and the spacing of the seedlings of 25×30cm (ECT-A). Against the ordinary transplanting of the farmer, the number of bits 10 to 15 per tuft (NB-O) and spacing of the seedlings of 15×20cm (ECT-O).	10/7 selection of the seeds 12/7 seedling 7/8 lining out 15/11 harvest
Lambanyi 2 parcels	<u>Formation of a farmers' group for seeds production</u>	Two varieties were chosen by the group with the advice of the expert; the local variety Kaolack and the improved variety Rock5 are retained, taking into account the resistance to salt and iron, with a late seedling cycle (130 to 140 days). For the transplanting of the two varieties, the plot was divided into two parts while taking into account a broad alley plug of 3 m, which must be used as area of separation or insulation to avoid the risks of mixture of the two varieties. Within this framework, trainings were programmed in accordance with table 5.2.20.	2/6 1st workshop (cropping program) 22/6 nursery 5/7 selection of the seeds 8/7 seeding 5/8 Transplanting

“Activity 1-6: Monitoring carried out by the extension officers and the farmers”

«Follow-up in 2005»

The advanced techniques that were collected during the execution of this component are the following:

Upstream

- The leveling of a rice farm plantation is important and pulverization must be made more finely;
- It is necessary to make the second and the third plowings immediately before the transplanting while waiting for the water depth recess;
- The water depth must not be very deep to ensure a good resumption of the roots;
- It is better to do nursery in the same rice farm where transplanting is envisaged and to transplant immediately after the resumption of the seedlings;
- It is useful to replace the seedlings which were consumed as flood;
- It is necessary to take into account a programmed labor;

Intermediate

- It is necessary to take into account the formation of the balks with the hiding of the weeds (Wonwongy in Sousou), which is useful for the cropping;
- It is better to avoid a large nursery to ensure an easy leveling;
- It is necessary to make large spaces between the bits at the time of the transplanting like the width of a balk;
- It is necessary to choose varieties adapted to the deep water (Domé Malé, Wonsongorhon);

Downstream

- It is necessary to take into account the confection of the balks with the hiding of the weeds (Wonwongy in Sousou), which is useful for the cropping;
- It is necessary to take into account the time, the periods, and the place of the nurseries until the end of June;
- Consideration of the early bedding, before June, even in March;
- Choice of variety, cycle, size and the resistance to salt and iron (Wonsonghoron)
- It is necessary to ensure the water management; for example, introduce sea water into the rice plantations in the dry season and wash out (leach) the salinity in the rainy season;

(1) Result of the Verification in Upstream

The average yield of the upstream demonstration was 2.6 t/ha. Nevertheless the results of the samples are varied with the same plot. At the places where lining out was well followed with the supervision of the extension officers the yield was of 4.0 t/ha, and the sites having no lining yield 1.62t/ha, showing the effectiveness of the advanced technique of lining out. Moreover the sites planted without lining delayed by two weeks compared to the others. Concerning the result of reference that was 4.0 t/ha, the team believed that the conditions of the labor sufficiency would lead to a yield of 1.5 times

that of the demonstration plot.

(2) Result of the Verification in Intermediate

The yield of the Intermediate demonstration was better compared to that of the reference. Even the comparison with the average output in the plain of Sonfonia, showed an increase of: 1.5 t/ha for the fresh water area, 2.0 t/ha for the mangrove rice area.

The appreciations of the farmers are the advantages from the economy of seedlings and seeds used in the demonstrations; the diminished number of bit and the spacing of the seedlings made it possible to have more productive tillerings. Indeed the two techniques are approved by the farmers as advanced techniques.

(3) Result of Downstream Verification

In the Downstream area, the demonstration plot succeeded in preparing robust seedlings with sowing standard. As a result, even if the numbers of bit is diminished, the seedlings resist against the damage by crabs and fish. The farmers appreciated these qualities, and they undoubtedly will disseminate the technique to the other farmers as advanced techniques. With the yield which shows successes, the demonstration plot had given better compared to the references. These successes owed to the care of the farmer, the strategies against the spring tides and the success of the advanced technique.

(4) Yield Evaluation

A study on paddy samples taken in the demonstration plot and the reference plots was carried out for the calculation of the yields. The sampling was carried out on November 26 to December 17 by the extension officers. From each plot, 5 samples of one square meter (1 m²) paddy were collected. The weight of the paddy was corrected on the basis of 14% water content.

The results of the study are presented in the table below.

Table 5.2.12 Study Results on Output of Paddy

Area	Name of plot	No. of feet (/m ²)	No. of stems (/m ²)	No. of Ear . (/m ²)	No. of panicles (/ear)	Weight of paddy (g/m ²)	YLD (t/ha)	Others (variety, cropping)
Upstream	Demo	19	208	142	93	258	2.6	Foé Malé, on the flat/lining
	Reference 1	25	359	259	81	404	4.0	Foé Malé, on the flat
	Reference 2	21	171	111	55	118	1.2	Foé Malé, on the flat
Intermedi ate	Demo	9	158	128	111	388	3.1	Karia, on the balks
	Reference 1	13	118	94	74	223	2.2	Karia, on the flat
	Reference 2	11	189	142	90	272	2.7	Karia, on the flat
Downstre am	Demo	11	187	163	88	222	1.8	Wonsonggonron, on the balks
	Reference 1	3	42	37	74	51	0.4	Wonsonggonron, on the balks
	Reference 2	10	245	148	90	151	1.3	Wonsonggonron, on the balks

NB) These results represent the average value of 5 samples taken in each plot. Calculations of outputs for the bedded plots 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 plots edges.

«Follow-up in 2006»

The advanced techniques which were collected during the execution of this component are following:

Upstream

- After seedling the sheets used for protection against birds must not be left in place more than a week. Usually the farmers do not cover with soil, the cover with a little ground or the monitoring is recommended against the damage of the birds.
- The water (deepwater) management after transplanting can reduce the invasion of weeds.
- At the time of plowing and after harvest, the restitution of the dykes must be considered for the water management.
- The transplanting proceeded at the same day as the lifting.

Downstream

- The sheets against the birds are not to be left covering more than a week. Usually the farmers do not cover with the ground, covering with a little ground or monitoring is recommended against the damage of the birds.
- Among the farmers who do not prepared bedding each year because they do not have enough labor, but without the plowing (no bedding), the yield will be decreased by half. The bedding is recommended each year.
- The transplanting proceeded at the same day as the lifting.
- Preparation of ideal nursery in the plot. (Where the transplanting will be carried out)

(1) Result of the Verification of Kobaya

1) Impacts of the improved nursery

After one week of the seedling, the seedling on the ordinary nursery had better growth because the rain of the year arrived tardily; the water depth was nearer to the surface of the nursery bed compared to the improved nursery for which it is higher. In spite of the beginning of the growth, the seedlings of the improved nursery succeeded on their growth in terms of the robustness and the size. One of the objectives of the improved nursery, which is to protect the seedlings against the floods, was noted several times because the seedlings resist the action of water. The improved nursery was effective as an advanced technique. In addition, the confection of the improved nursery beds was made with a total leveling, which favors to obtain uniform seedlings.

2) Impacts of the selection of good seed by the salt method

To obtain a reliable result related to getting pure seeds, it is taken into account the Verification of the following indicators: the robustness of the seedlings, the opinion of the farmers, rates of germination and chlorophyll. The chlorophyll rate indirectly shows the quantity of nitrogen in the seedling, thus the photosynthesis of seedling was reported enough on the leaves.

The growth of seedling resulting from seed is the beginning of the nursery. Consequently, the

chlorophyll rate was determined with the equipment type “SPAD 502”, after the sowing on June 24th, the measurement results are indicated below. The development of the leaves on parcels SBS was higher compared to parcels SNS, at the beginning of the growth.

Table 5.2.13 Measurement of Rates of Chlorophyll by SPAD502

	Improved nursery		Ordinary nursery	
	Selected	Non selected	Selected	Non selected
July 1	17.5	12.6	19.9	15.5
July 7	23.7	21.8	25.8	16.7

* the chlorophyll rate on the second leaf under development for each seedling, the numbers represent an average of 20 samples which were taken by parcel.

The table below shows the follow-up of the parameters of size and number of tillerings. The nurseries with the seeds selection gave better resumption after transplanting until the moment of the maximum tillering, parcels SBS were always superior to parcels SNS.

Table 5.2.14 Follow-up of Parameter of Size and Tillering by Salt Method

		July 24	August 15	August 23	August 30	Sept. 20.	Oct 11	Nov 1	Nov 7	Nov 14
No. of tillers	Selected	3.0	6.0	13.3	16.5	29.2	29.5	28.7	25.1	20.8
	Not selected	3.0	6.0	8.1	10.2	24.8	27.6	26.9	25.1	19.0
Cut (cm)	Selected			81.2	79.3	87.2	92.7	118.3		
	Not selected			76.5	74.8	79.3	90.0	104.0		

3) Impacts of the age of the seedling to be transplanted

The observation made at the time of the field visit carried out on November 14, obviously did not prove to the team the difference between two seedlings of different age. But the results of the follow-up on the evolution of the size and tillering indicate well that the growth of the seedlings was better on the improved nursery beds and the seedlings of age 30 days except in the case of PO/SBS/AG50. The number of counted productive stems on November 14, is also remarkable based on the 30 days old seedlings, it is obtained an average of 21.4 stems per tuft, whereas the 50 day old seedlings were on average 118.4 stems per tuft. Thus by extrapolation it can be obtained a 15% difference in yield if the panicles evolve in the same condition.

Table 5.2.15 Follow-up of Parameters of Size and Tillering by Age of Seedling

		23 aug	30 aug	20 sept.	11 oct.	1 nov.	7 nov.	14 nov.
No. of tillers	Age of the Seedling 30days (AG30)	10.7	18.5	31.8	33.1	30.0	27.8	21.4
	Age of the Seedling 50days (AG50)	-	8.2	22.2	24.0	25.6	22.4	18.4
Size (cm)	Age of the Seedling 30days (AG30)	80.3	79.5	84.2	93.6	112.3	-	-
	Age of the Seedling 50days (AG50)	77.4	74.6	82.3	89.1	110.0	-	-

(2) Result of the Verification of Yataya

1) Impacts of the improved nurseries

In the demonstration parcels of Yataya, under the influence of the strong rains in September and

August, and the action of the spring tides, the majority of the seedlings were ripped off by water. The only parcel which was saved and which remained in place is parcel PA/SNS/D-O (the improved nursery bed; ordinary density; not selected seed). Farmer A remade the transplanting with the nursery of parcel PA/SNS/D-O in the place of the other parcels destroyed.

After all that the result obtained from these site, the team note that the nurseries prepared in the plot (improved nursery) resist the floods better.

About the comparison, the team took into consideration the field conditions, i.e. the places where the prepared improved nursery beds were not washed out completely. Then it was better to choose a place far away from the sea. The result of the nurseries made outside the plots (ordinary) had given thin seedlings. The observation made at the stage of transplanting proved to one that the seedlings were already choked by insufficiency of fertility or by other factors. The team has also observed at the level of the chlorophyll function that the color of the leaves of the seedlings tended towards yellowish.

2) Impacts of the selection of good seed by the salt method

In the demonstration of Yataya, farmers have proceeded to the protection against birds; the sheets were left more than one week covering the nurseries. Indeed the seedlings turned yellow, and one could not measure the influence of the selection of good seed on the nurseries. Concerning the damage by birds the team recommends monitoring by children. In addition, the seedbeds are choked by the sheets and weeds, the seedlings were destroyed and ripped off when the sheets were removed.

But according to the result of the test of germination which the extension officers had made in the station, it appears that the rate of germination is higher for the selected seed in comparing with the non selected seed.

Table 5.2.16 Growth Rates with Selected and non Selected Seeds

	Yataya		Kobaya		Lambanyi	
Variety	Kaolack		Wonsongorron		Kaolack	Variety
Technique	Selected	Not selected	Selected	Not selected	Selected	Selected
Rate	95.5%	89.2%	99.3%	88.4%	95.5%	89.2%
	8 days after sowing		6 days after sowing		8 days after sowing	

3) Impacts of the density of sowing in nursery

The experiments of agriculture are indicated at the moment of transplanting “if the seedlings are robust the number of bit decreases, if the seedlings are thin the number of bit increases”. The farmers of Yataya chose to transplant the seedlings of the parcel D-A (Improved Density) using 5 bits per tuft, and parcel C (Ordinary Density) using 15 to 20 bits per tuft with spacing of 30x30 cm. Thus the seedlings of D-A were more robust than the seedlings of DS2. This number of bits was recommended by the peasant themselves to overcome the damage of fish or crabs. Hereunder is the table indicating the chlorophyll rates on July 28 and on August 2, the improved nurseries had given better resumption than the ordinary nurseries, and the comparison of the parcels of different density gave a better result for piece D-A.

In conformity the density of sowing is a major element to prepare good seedlings.

5.2.17 Rate of Chlorophyll (Yataya)

	Improved nursery				Ordinary nursery			
	SBS/D-A	SBS/D-O	SNS/D-A	SNS/D-O	SBS/D-A	SBS/D-O	SNS/D-A	SNS/D-O
July 28	33.0	29.2	34.1	33.9	27.8	20.4	25.0	25.7
August 2	33.8	30.8	31.6	25.6	28.5	20.9	26.2	21.2

(3) Result of the Verification of Sonfonia

The Verification of Sonfonia was related to the number of bit per tuft and the spacing of the seedlings, according to observations made by the team on the growths of the seedlings by the rhythm of tillering, the size and the rate of chlorophyll. Parcel NB-O/ECT-O (ordinary techniques) is relatively weak for the growth of seedling. In the squares of the experimentation the results of the observation, according to estimates made by the team are indicated in the table below. With the result of the size, the parcel which has a nutritional space of 33.3 cm² by bit (NB-O/ECT-O) is considerably weak and the growth of the seedlings is inhibited by something.

Table 5.2.18 Estimation of Nutritional Spaces by Bit (cm²/bit)

Pieces	No. of bits transplanted (A)	No. of estimated tufts/m ² (B)	No. of estimated bits (/m ²) (C)= (A) X (B)	Nutritional space (cm ² /bit) (D) = 104/(C)
NB-A / ECT-A	3	16	48	208
NB-A / ECT-O	3	30	90	111
NB-O / ECT-A	10	16	160	62.5
NB-O / ECT-O	10	30	300	33.3

Table 5.2.19 Follow-up of Size par Parcel (cm)

	August 30	Sept. 20.	Oct 11	Oct 25
NB-A/ECT-A	52.8	73.2	101.8	103.4
NB-A/ECT-O	49	63	91.6	101.4
NB-O/ECT-A	50.8	66.6	90.2	96.2
NB-O/ECT-O	49.6	49.6	65.2	72.2

Taking into account the techniques of transplanting, the team carried out the evaluation of yield on November 15, 2006. The evaluation was made by the square of yield, after harvest the numbers of tufts, tillerings, ears, and of the weight were measured by the extension officers. The result was calculated by the average of three samples taken by parcel. Thus the effects of two techniques gave the same result as the aforementioned on pieces NB-O/ECT-O which had a lower yield among the four pieces. The result of the yield evaluation was better for parcel NB-O/ECT-A, which gave a yield of 5.2 t/ha. The techniques of transplanting must be considered for the combination of these two elements.

Table 5.2.20 Result of Output by Sampling

Parcel	No. of bit (/m ²)	No. of tillers (/m ²)	No. of ears (/m ²)	Weight of panicle (g/m ²)	Yield (t/ha)
NB-A /ECT-A	16	214	176	376	3.8
NB-A /ECT-O	30	226	184	389	3.9
NB-O /ECT-A	16	265	242	523	5.2
NB-O /ECT-O	30	333	272	339	3.4

*NB) These results represent the average value of 3 samples taken in each parcel.
The weight of paddy was corrected on the basis of 14% water content.*

(4) Training of Farmers' Group for Seed Production in Lambanyi

The training workshops of the community seed production were carried out with the extension officers and 28 participants, which are members of Limanya group. The trainer is invited by division seed of the DNA, the program was shown in the table 5.2.20.

Table 5.2.21 Programs and Context of Training

Activities	Persons in charge	Participants	Modules	Technical topics	Date
Initial training in terms of the seeds production	*DISIA (DNA)	Diffusion officers Extension officers Counterpart	I	Production of seed 1) organization of the production 2) production planning 3) multiplication of seed in generality 4) techniques and methods of production 5) preparation and the conditioning of the seeds	June 22
Initial training in Community seeds production technique	*DISIA Diffusion Officers Extension Officers Counterpart	Limanya group	II	Production of seeds of acceptable quality 1) method of production 2) preparation of the seeds 3) practical sessions (selection of good seeds) "method of salt"	July 4
Training within the framework of the control and Verification of seeds quality	*DISIA	Diffusion officers Counterpart Extension officers	III	Control Verification of quality 1) control in the field 2) quality control/tests 3) Tutorials (rate of germination)	July 31
Training of the recipients in technique of seed conditioning	*DISIA	Limanya Group Diffusion officers Extension officers Counterpart	IV	Conditioning of seeds 1) objective of the conditioning 2) tutorials 3) storage of the seeds	August 18

*DISIA: Division Seeds and Agricultural Inputs

During the implementation of the component on the technique of Community seed production in the area of Lambanyi there were generally certain limiting factors of natural condition which compromised the seed production of this year; in particular the non respect of the agricultural calendar, the age of the transplanted seedlings and the condition of the plot which remained without being exploited for more than three campaigns. However, these constraints are by no means factors of blockade to the seed production in the area. This year the team could not produce the community seeds, and had certain lessons to be learnt during the training and from the workshops. Within the framework of the Master Plan these weak points will be taken into account.

The team recapitulated the principal information in the table below:

Table 5.2.22 Causes and Remedies for Seeds Production

Period	Activities	Events	Causes	Remedies
July 8	Sowing of the two Kaolack varieties and rock5 in nursery	<ul style="list-style-type: none"> - Weak growth rate - flood and immersion 	<ul style="list-style-type: none"> - Choking and warming because of the cover against the birds - damage of crabs and fish - flood and tide 	<ul style="list-style-type: none"> - reduce the sheets of cover - cover the seeds with ground - make the monitoring
August 5	Transplanting of the two varieties	<ul style="list-style-type: none"> - lifting of the seedlings 	<ul style="list-style-type: none"> - age of the seedlings 25 days, insufficient size - bad hiding - level of high water depth 	<ul style="list-style-type: none"> - the age of ideal seedling at 40 days - transplanting in September
August 9	Follow-up of transplanted rice	<ul style="list-style-type: none"> - rot and losses of the seedlings 	<ul style="list-style-type: none"> - flood - immersion of the plots during 2 weeks - stagnation of water due to the tide 	<ul style="list-style-type: none"> - dredging out of the canal interior and opening the tubes
August 21	Follow-up	<ul style="list-style-type: none"> - resumption for Rock5 	<ul style="list-style-type: none"> - Low tide and rains intermittently 	<ul style="list-style-type: none"> - regulation of the water depth
September 11	Follow-up	<ul style="list-style-type: none"> - lifting and burn of the seedlings 	<ul style="list-style-type: none"> - stagnation of the salted water because of the spring tide 	<ul style="list-style-type: none"> - Reinforcement of the dyke - drainage
September 22	Follow-up	<ul style="list-style-type: none"> - overplanting - transplanting of another variety (counter) empty places - displacement of the transplanted seedlings 	<ul style="list-style-type: none"> - lack of understanding in terms of the intention of the seed production - lack of supervision by the diffusion/extension officers 	<ul style="list-style-type: none"> - practical training at the time of transplanting and harvest - verify again the farming calendars - choice of variety
October 16	Follow-up	<ul style="list-style-type: none"> - various stages of the demonstration to the totality of the plot - several varieties transplanted in the same plot 	<ul style="list-style-type: none"> - lack of understanding on the method of overplanting - displacement of the transplanted seedlings - lack of supervision by the diffusion/extension officers 	<ul style="list-style-type: none"> - respect of methodology, in accordance with the contents of the received trainings - reinforcement of the training and the workshops

“Activity 1-7: Extension officers organize seminars aiming at informing the local farmers the results obtained”

«Workshop in 2005»

After the harvest, seminars of restitution were organized for the farmers in the Study Area. Four seminars were organized in each division on the results of the activities of Kobaya. These seminars were organized taking into account the importance of the practice of the advanced farming techniques in the Programs of Agricultural Development. During this occasion there were 190 farmers (Kobaya 32, in Yataya 45, Sonfonia 53 and Lambanyi 60) who took part in the workshops. The appreciations of the farmers relate especially to the application of the selection of good seed wished for the next agricultural year.

«Workshop in 2006»

In the year 2006, the first seminar that was organized on November 23, 2006 with Kobaya, had 46 participants in spite of the enormous activities in this period. The restitution of the result in the four divisions was followed by the distribution of the manuals on the advanced techniques which the team had to check in the area. The same type of seminars will be organized by the extension officers. The publication of the seminars has been done by posting in public places (mosque, market, taxi station etc) to reach more farmers in the area.

“Activity 1-8: Manuals of the outputs are prepared”

In the activities of two years of Verification, the team carried out the development of technical manuals illustrated for the farmers of the project’s area; the manuals are related to the application of the farming techniques such as: selection of seed by the method of “salt”, the list of the advanced techniques in the zones Upstream and Downstream, the inventory of weeds.

The manuals of the adapted techniques will be distributed at the time of the workshops; it will be then published in national language Soussou for dissemination.

5.2.2 Evaluation

(1) Results of the Project Evaluation

This evaluation was carried out based on the surveys made on 100 farmers in the 4 divisions. In the framework of the final evaluation of this component, it is noteworthy that, in term of the agricultural techniques applied during the Verification Study, the improved ones proposed and implemented by advanced farmers were widely used in the Study Area. Hence, the evaluation results from the perspective of the main evaluation criteria are as follows:

Relevance

- The extension items of this component are in line with the objectives of Guinea agricultural policy and agree well with the said policy because of the remarkable possibilities offered by the plains of Sonfonia in increasing rice production. There is hope that these advanced techniques can be spread all over the country at minimum cost.
- The objective of this component could enable the implementation of a sustainable extension method. Furthermore, farmers rely on these introduced advanced techniques to increase their yields.
- Demonstration sites for the study have been selected in each division; targeting individual farmers or groups. Among the farmers who answered the interviews, at least 70% have visited the demonstration sites. This means that the site selection was relevant to the program beneficiaries.

Effectiveness

- Concerning the specific objective of the project « the extension officers and farmers will learn advanced techniques » through the demonstration and workshops organized; as the extension officers could learn how to undertake a study and a yield evaluation for the purpose of extending or diffusing the techniques, the effectiveness against the extension officers is expectable.
- In compliance with the result of the interview surveys, 49% of the farmers who applied the advanced techniques said having an increase in yield this year, and only 10 % of them said having a decrease. As such, it can be said that the advanced techniques influenced the increase of the yield.
- The effectiveness of the project can also be demonstrated through the extension staff and facilitators who have diffused the selected cultural techniques. Their experience will help in the

implementation of the project on the improvement of cultural techniques in the Master Plan. One can say that the effective criterion has been fulfilled.

- The four workshops held in the four divisions were attended by 190 farmers. The results of the advanced techniques were discussed through fruitful exchanges of opinions there. Since the farmers were able to learn other techniques and showed their trust in the extension officers, the Verification can be said to be effective.

Efficiency

- The introduction of advanced techniques not necessitating high operation costs, their application will yield sustainable results. It is foreseen that their diffusion to other areas will be possible by means of agricultural manuals which will be elaborated and distributed during the workshops.
- An « Inventory of advanced techniques » was made, and the identified techniques was diffused to the farmers through workshops and training; contributing in sensitizing the rural community. Then, 100 manuals were distributed during the workshops held in November 2006. In the seminars, as the advanced techniques were presented using a projector with many pictures to make the details visual, the farmers could easily understand what was presented.
- As regards the « soil study », pH and salinity data, the extension officers are actually able to take samples and operate the measuring devices, though their understanding on data processing is not yet sufficient. It shows their capacities were built and the extension works became smooth, as they have come to monitor the soil condition simultaneously with rice growing.
- The « comparison between the demonstration sites and other sites » brought out the following efficiencies:
 - The improved nursery made it possible to produce vigorous and uniform plants.
 - The age of the plant at the stage preceding tillering (30 to 40 days) boosted the growth of the transplanted plants and the yields to at least a 15% increase.
 - The selection of good seeds made it possible to produce strong plants and a good germination compared to other seeds.

Impact

- The advanced techniques applied by the farmers of the demonstration plots are diffused to other farmers in the four divisions. What follows can be said.
 - as regards seeds selection using the salt method, 13% of farmers applied this method against 63% of them applied the traditional method by winnowing.
 - as regards nursery preparation in the plot, 55% did.
 - as regards the seeding norm, the recommended density has been followed by 22% of the farmers.
 - as regards the number of plants to be transplanted, 36% of the farmers applied the recommended norms of 1 to 3 plants.
 - as regards the age of 30 to 39 days for the plants to be transplanted, 37% of the farmers observed it, while at the beginning of the Verification most of the farmers never applied the

advanced techniques.

Since, the farmers except some innovated farmers did not apply these techniques before, this diffusion proves great impact existed.

- Because the extension staff visited and successfully assisted farmers in the Study Area, other farmers of the four divisions, who were not assisted, showed interest in the activities of the component for competitiveness reasons. The same could be said for other farmers outside of the Study Area.

Sustainability

- Extension and counterpart staffs are able to diffuse the extension techniques, as such diffusion would not require a lot of investment; the mere application of improved farming techniques gave good results. The extension staffs can continue the application of the advanced techniques in their agricultural activities even after this study phase.
- Following the organization of workshops, a great number of farmers appreciated the advanced techniques. This has promoted an effect of a self-diffusion system between farmers of the Sonfonia area.
- The extension principles of this component as regards the cultural methods will make it possible to have a sustainable extension impact in the Sonfonia area. In such a case, the roles of the extension staffs are important for the correct implementation of the extension activities even in other areas of Guinea.

(2) Verification of Hypotheses

Hypothesis 1: Without any development and only with the local cultural techniques (Improvement of Cultural Techniques); for example, with the advanced techniques practiced by farmers themselves, one can get production increase.

The average yield in the Sonfonia area considered by the Study Team was 1.80 t/ha. With the application of the advanced techniques, the average yield in the demonstration plots was 2.5 t/ha against 1.97 t/ha in the control plots. As a result, a yield increase associated with the application of the advanced techniques was observed.

Table 5.2.23 Yield of the Verification

Verification result (t/ ha)					
Demonstration plots			Control plots		
Upstream	Down-stream	Average	Upstream	Down- stream	Average
2.65	2.45	2.50	2.60	1.65	1.97

Concerning the result of the Verification in 2006, Yield measurement was carried out on the part of the demonstration farm in Sonfonia District on 15 November 2006, and the yield amounted to 4.0 t/ha. The natural conditions of the demonstration farm in the Sonfonia are better than those of the other parts

of the plain of Sonfonia and are not representative of the natural conditions of all the plain of Sonfonia. Even if it is taken into account the deduction of this advantage, the introduction of the advanced techniques was efficient for the increase of the yield.

Hypothesis 2: Extension staffs could collect and diffuse advanced techniques to farmers of the area.

The extension staffs can understand the problems of the area through the collection of advanced techniques; gaining some knowledge. The results on the advanced techniques introduced the first year were diffused through workshops. The four workshops organized in the four divisions gathered 190 participants (or 19% of the households of the Sonfonia area). The results on the advanced techniques were discussed through fruitful exchanges of opinions. The farmers could learn other techniques and increase their trust of the extension staffs.

Based on the last year farmers' comments, it is noted that all the techniques were more or less mastered, and most of the farmers want to continue diffusing the said techniques the coming growing seasons in line with the recommendations received from the extension staffs of the component.

The publication of the seminars in 2006 has been done by posting in public places (mosque, market, taxi station etc) to reach more farmers in the area, since the participants in 2005 were as small as 32.

As a result of the monitoring done one year after the seminars where the advanced techniques had been presented to the farmers, 55% of the participants of the seminars said they applied the said advanced techniques, and 49% of them appreciated their yield increase. Therefore, it can be said that the advanced techniques are starting to diffuse steadily.

5.2.3 Analysis of Effectiveness and Results of the Project

(1) Effectiveness of the Project

The effectiveness of the project which have been noticed during the Verification include in particular:

- The farmers had fresh impetus, and they have learned the new advanced techniques, because the participating farmers did not have experiences of these advanced techniques.
- The advanced techniques have been verified, and have been noticed by the participating farmers. One can hope that the techniques will be carried out during the next year's agricultural campaign.
- The inventories of the advanced techniques noticed during the Verification will be expanded to the Study Area and largely to the other zones.
- The Study team has applied the extension in a way that it is based on the roles of the counterparts (the extension officers) and of the farmers; this experiment was the first of its kind for them. They have got stimulative experiences to reinforce their independences.

(2) Improved Nurseries

The growth of seedlings on the improved nurseries, the status width and the height of the stems and leaves was excellent compared to the seedlings grown in the ordinary nursery. Indeed, the seedlings of the improved nursery greatly resisted floods devastation until the transplanting. In addition, the seedlings from the ordinary nursery transplanted to large plots were damaged by the floods. Following the damage, the remaining seedlings grown in the improved nursery was transferred to the ordinary nursery, these seedlings adapted to the plots in the ordinary seedbed, contributing to minimize the damage. However part of the seedlings transplanted in the large plot were devastated at the places where the current was fast. Thus, the choices of the surface in nursery must take into account the force of the currents in the plot.

(3) Techniques of Adapted Seeds Production

The rice seeds in the plains of Sonfonia were produced by the farmers themselves, their quality being mixed with other varieties; it is difficult to ensure good quality of the seeds. Thus, this Verification aims at ensuring the farmers groups provide the seeds by themselves, therefore they must master the methods of the seeds renewal.

Nevertheless, after transplanting, the Study team being absent, the seedlings relating to the study were devastated by the floods and high-tide. Moreover lack of nursery caused a mixture of other varieties. While the extension officers were absent because of the bad climatic conditions, the farmer decision resulted in faults of over-planting on the empty spaces and in the displacement of the transplanted seedlings.

In spite of numerous trainings that have been carried out, the consciousness of the farmers on the principles of seeds production was not enough, the supervision of the extension officers on the preparation of nurseries and their understanding of the training was insufficient. In addition, the choice of the plot was targeted near the residential area. But the plot was placed at a water discharge location, it receives water directly from the dwellings, consequently, the majority of the seedlings transplanted in the plots were devastated at the time of strong rains. Within the framework of the Master Plan these weak points will be taken into account.

(4) Difficulties of Crops Management against Floods

The rice farms in the plain of Sonfonia are not developed and they are submerged during the period of rice cultivation because of the floods. The farmers have difficulty accessing to their plots. Thus, it was noted that the farmers almost do not employ the workforce after transplanting until the harvest. In accordance, technical topics were improved during the installation of nurseries and the transplanting as starting point of the rice cultivation; those are important factors which will make it possible to achieve an increase in yield. With the Verification, the techniques are focused on the preparations of nurseries against the floods and on the transplanting.

With regard to the problem of total water management at the time of the flood, the farmers themselves seem to have difficulties of solving it, therefore the execution authentic adjustments of drainage is wished by the farmers of Sonfonia.

5.2.4 Feed-back of Lessons Learnt

Table 5.2.24 Feed-back of Lessons Learnt: 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 practised in the Study Area barely uses any labor just after transplanting up to harvesting. Based on such a practise, 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 organised 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, what 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"> ⇒ As regards the development of the drainage installations, the Master Plan considers a 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 inform the local farmers on the obtained results. (I-1-1) ⇒ Drawing up of an inventory of local needs through the frequent organization of workshops and trainings at the beginning of the programme 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)

5.3 Process and Evaluation: Agricultural Mechanization

5.3.1 Process of Activities

[Activity 1]: Tractor Services

Activities	Expected effects	Program												Persons in charge	Contribution												
		2005						2006																			
		m	j	j	a	s	o	n	d	j	f	m	a			m	j	a	o	n							
1 Tractor services																											
1-1 Farmers' group "LAMKOYA" prepares a program of activities under the supervision of DNA and DCDRE staff	Plan of activities																										
1-2 Improvement of the access roads proposed by the group is accomplished	Improve the access roads running from the housing to the farm																										
1-3 Farmers' group attends the Tractor Services training workshop	Acquisition of knowledge on the tractor operation and maintenance																										
1-4 Farmers' group accomplishes a market study to know the needs of the Tractor Services	Service cost Proposed execution program																										
1-5 Farmers' group prepares the operation rules of Tractor Services	Exploitation rules																										
1-6 Farmers' group constructs the shed and receives the spare parts	The cultivator's shed and spare parts																										
1-7 Farmers' group starts Tractor Services	Tractor Service																										
1-8 Farmers' group supervises Tractor Services in collaboration with DCDRE personnel	Monitoring results																										

* : programmed : realized

“Activity 1-1: Farmers' group “LAMKOYA” prepares a program of activities under the supervision of DNA and DCDRE staff”

The contents of the Verification were explained to the members of the group's executive board in June, 2005. Then, the group held a general assembly, and the executive board of the group explained the contents of the Verification to all members and unanimously a general agreement in favor of the implementation of the tractor services was obtained. In addition, the members of the tractor service's management committee, which was composed of a president, an accountant, an auditor and two drivers were appointed. By general agreement, the assembly considered necessary to associate a woman to the drivers. The general assembly held on June 27th has discussed all the process up to the operation of the

tractors services. At the end of the debates, the farmers' group prepared a program of activities which was distributed to all members.

“Activity 1-2: Improvement of the access roads proposed by the group is accomplished”

The farmers' group has performed a lot of debates on the methods of use of the cultivator under the supervision of the personnel of the DNA and the DCDRE sections. The activity for the improvement of the access roads was discussed during the general assembly proposed by a member to revitalize the agricultural activities and to extend the target area of the tractor service.

The improvement of the access roads proposed by the group requires the leveling and the spreading of a gravel layer on the existent road having a length of 400 meter as well as the construction of three access bridges. The improvement of the access roads running from the housing section of Yataya to the plains' borders has begun since June and a wooden bridge was accomplished with the participation of women in the group.



Wooden Bridge Constructed

The works for the improvement of the access roads have been accomplished owing to the participation of the members with locally available materials (stones, laterite); however several years are needed for the accomplishment of all the works in the access roads.

Moreover, the group has used its own fund to elongate the portable bridge by 2.5 meters in order to ease the cultivator's access to the plains. The portable bridges have been used previously for the activities of tractor service in the plain.

“Activity 1-3: Farmers' group attends the Tractor Services training workshop”

The training workshop session has been scheduled and carried out in collaboration with the counterpart in charge of the agricultural mechanization according to the details which are mentioned below:

- Date: from January 23rd till February 04th, 2006 (12 days);
- Participants: Five groups (LAMKOYA and 4 other farmers' groups) and a DCDRE officer, total 11 persons;
- Place: CEPERMAG

The object of the training workshop session was to allow the trainees acquire the basic techniques and knowledge for the operation, maintenance and repair of tractors and/or the cultivators. This training program has been prepared by the counterpart in charge of the Verification study by inspiring from the ordinary program of CEPERMAG.

The last two days of the training have been dedicated to the evaluation of the trainees to confirm the

assimilation with what they learn. Theoretical and practical tests composed on one hand of a general inquiry concerning the adequacy of the training's contents and on the other hand a technical evaluation, concerning the management of maintenance and security. After the evaluation the trainees having shown a mastery of the given courses compared to others, for a better collective understanding. The mean average of the evaluation was 68 %.

“Activity 1-4: Farmers’ group accomplishes a market study to know the needs of the Tractor Services”

(1) Marketing Study and Trial of Tractor Services

The marketing study has been carried out to know the true needs expressed for the tractor service. According to the results of the marketing study, the group took a census of a request for a tractor service of 47 ha (80 plots) in the plain. However, some contradictions had been identified: some lands that are absolutely inaccessible had been included in the Study Area. Another marketing study was carried out with the request corresponded to a target area of 10 ha.

In addition, it has been noted according to the results of marketing study that the group knew neither the working capacity nor the oil consumption of the cultivator; so a trial of the tractor service has been carried out to show these elements.

According to the trial results of the cultivator service, it has been confirmed that the working capacity was of 2,500 m²/day and the oil consumption was of 4.5 litres/day.

(2) Setting-up of Service Price

The price of the tractor service has been discussed on the basis of the durable operation and the replacement of the tractor. According to the results of the analysis, the cost of the cultivator's replacement in 2013 taking into account the inflation rate will be 12,000,000 FG and the annual necessary savings are 1,070,000 FG in the current value.

In addition, according to the results of the trial of the tractor service and considering the necessary sum to save for the replacement of the tractor, the study team proposed two scenarios as basis of the calculation of the service price:

30 days of activity/year (complete area of 7.5ha)

40 days of activity/year (complete area of 10ha)

Table 5.3.1 Price of Tractor Services

Details	Case #1 Total working days 30 days an year (Surface area=7.5 ha)		Case# 2 Total working days 40 days an year (Surface area=10 ha)	
	Formula	Value	Formula	Value
(1) Area worked out per day		0.5 ha/day		0.5 ha/day
(2) Oil Consumption		4.5 liters		4.5 liters
(3) Oil cost	3,600 FG*4,5	16,200 FG/ day	3,600 FG*4,5	16,200 FG/ day
(4) Lubricant	(3)*10%	1,620 FG/day	(3)*10%	1,620 FG/day
(5) Drivers salary	5,000FG*2	10,000 FG/day	5,000FG*2	10,000 FG/day
(6) Cost of the spare parts	(7)*30%	10,700 FG/day	(7)*30%	8,025 FG/day
(7) Savings/day		35,667 FG/day		26,750 FG/day
(8) Service price	$\Sigma(3)\sim(7)$	75,000 FG/day	$\Sigma(3)\sim(7)$	63,000 FG/day
(9) Total savings	(7)*30 days	1,070,000 FG/year	(7)*40 days	1,070,000 FG/year

The farmers' group has reconsidered the cost of the tractor service offered by the study team in collaboration with the counterpart in charge of this component and the DCDRE officers; so the cost of service was fixed at 63.000FG/ day /0.25ha, which corresponds to a 40 days working per year according to the following reasons:

- The requests for tractor service are going to concentrate between the months of May and June. However the group can materially operate 40 days (that is the 10ha of annual service) during this period.
- Concerning the labor, the service cost of 63,000 FG/day is higher than the expense of the labor for agricultural workers.

“Activity 1-5: Farmers’ group prepares the operation rules of Tractor Services”

The document about "the rules of the tractor service exploitation" (draft) has been prepared by the members of the executive board of the group, the counterpart in charge of the component agricultural mechanization and his assistant of the DCDRE. Then, the document has been approved by all members of the group during a general assembly held on 27th June 2005. The supports of CEPERMAG and DCDRE sections have been explained in the document (Exploitation Rules) to establish governmental supports.

After fixing the tractor service's cost, the members of the management committee have prepared and approved the document "Exploitation rules" on 8th February 2006. The final document will take into account the following points on approbation of the group's members:

- The cost of the tractor service in 2006 (63,000FG /2,500m²) to be reviewed in 2007
- The annual area targeted for the tractor service in 2006:10 ha.
- Bonuses for the drivers in 2006 (5,000FG / day / person)
- The year of the cultivator's replacement (2013) and the target sum to be saved until 2013 is (12,000,000 FG);
- The documents to be worked out;

- Support of CEPERMAG and DCDRE;

“Activity 1-6: Farmers’ group constructs the shed and receives the spare parts”

The group lacking a shelter for their cultivator constructed a shed for the machine and spare parts. The group purchased the building materials such as the gravel, sand, cement, cylindrical woodblock, and iron for concrete, from the neighboring Yataya market. The construction works were accomplished with the cooperation of the members under experts' supervision; the shed was accomplished at the beginning of the month of February and the spare parts have been delivered later to be kept in the same shed.



Shed under Construction



Shed Constructed

“Activity 1-7: Farmers’ group starts Tractor Services”

The tractor service began on the basis of the exploitation rules. The tractor services were carried out in accordance with the following points:

- 1) The farmers’ group prepares "the Annual Plan of Operation" mentioned in i) list of the customers according to marketing study, ii) area to be worked out and iii) the execution date;
- 2) The farmers’ group prepares "the table of daily reservation" on the basis of "the Annual Plan of Operation";
- 3) The farmers’ group carries out the services and records the results in the document "Activities Register";
- 4) The accountant collects the money form the customers and records all the transactions, income/expenses of the tractor service in the document "Cash-book";
- 5) After the end of tractor service of the ongoing year, the accountant must present to all the members of the group during a general meeting the accounting activities and the profits realized".

(1) Procedure of tractor service

- 1) The tractor service began in February 7th, 2006.
- 2) At the end of the month of May, only 4.3 ha was realized, showing that 40 % of the activities have been fulfilled in considering the annual target of 10 ha to be completed at the end of May.

The reason of the delay in the execution of the tractor service, according to the group, was the delay of rainfall referencing to the average of the previous years. Then, the cultivator could not work at that time since the soil was still very hard because of lack of moisture. The study team and the farmers' group have confirmed again the execution of the target area of 10 ha.

- 3) At the end of June, an area of 8.0 ha has been accomplished, that is the equivalent of 80 % of the target area for this year. It has rained starting from the end of May. After the rain, the soil having become ready for the preparation of the lands by a cultivator, the execution of the service has accelerated. However, around June 10th, the plain was completely flooded following heavy rains. As a result, the tractor services were stopped because it was impossible for the cultivator to reach the plots in the plain. At about the last week of the month of June, the tractor services restarted for the less flooded plots and this reducing the areas ready for the service.
- 4) In July, the access to the plots was impossible because all the plain was flooded. So, the tractor service was stopped at the end of the month of June with a result of 8 ha coverage for this year.

(2) The breakdown of the cultivator and the measure taken

- 1) During the absence of the study team in the months of March/April, the cultivator of the farmers' group broke down (by a loss of power). The group contacted the CEPERMAG for assistance, and they decided to call a mechanic from a private repair shop. After a general check of the motor, the mechanic estimated the repair expenses to be 650,000FG. However, the group could not mobilize this amount for the repair because the tractor service had just begun and the amount saved was insufficient. However, the farmers' group requested the help of the CEPERMAG. After negotiations, the CEPERMAG lent to the group the same type of cultivator without requesting any compensation, so the tractor service had started over.
- 2) After the restart of the tractor service, the piston of this new cultivator was also broken owing to bad operation. So, the group took the piston from their own cultivator, which was also broken, to fix the cultivator lent by CEPERMAG with other spare parts provided by JICA through the study team. Finally, the group finished repairing the cultivator lent by CEPERMAG and then the tractor service resumed. The expense of repairing for both breakdowns was estimated to be 1,060,000FG.
- 3) The first failure was caused by the lack of compression on the motor owing to a lack of appropriate maintenance of the air filter. In fact, the group has never made the maintenance of the air filter since the reception of this donation.
- 4) In mid-June, the repairing of the cultivator was finished with the replacement of certain parts. Among the replaced parts, the cylinder and the segment are procured by Kubota agency which stocks up the spare part of the Japanese cultivator and the piston comes from the stock of spare parts given by JICA. For the cylinder head gasket, by lack of an original part which they cannot find in the market, the mechanic substituted it with a local part.
- 5) Because of deficiency of know-how on cultivator's maintenance, the cause which have lead to the breakdown, it was a matter to organize two days of training for the drivers of the group on

the general maintenance and the procedure of maintenance in CEPERMAG in July, 2006 by an officer of the CEPERMAG. The Expenses of this training were supported from the Guinean party.

- 6) The study team "lent" to the group the sum of 1,060,000FG for repairing the cultivator because the group has just started the tractor service and had no that amount in their saving. Later, an agreement had been reached so that the group reimburses only 300.000FG to the study team; this sum was fixed while taking into account the financial creditworthiness of the group while being ensured that the savings for the replacement of the cultivator and necessary sum for the next campaign will be available.

“Activity 1-8: Farmers’ group supervises tractor services in collaboration with DCDRE personnel”

The supervision was carried out by the DCDRE personnel in collaboration with the counterpart of the component and the study team during the months of May, June and December. The supervision was carried out using not only the result of interview surveyed but also the documents "results of the activities" and "Cashier’s book".

(1) Procedure of tractor service

- 1) The area accomplished by the tractor service is 8.0 ha, while the targeted area was 10 ha for this year. Therefore, the ratio of the accomplishment is 80%. The execution period of the tractor service is restricted to the period going from the time when the earth is dampened enough by several rains, making it appropriate for the service up to the time of the plains’ inundations. This period is influenced by the pluviometer which changes its intensity and frequency every year. The area to be worked out has an influence on the cost of the service which must include the risks which are linked to the rainfall.
- 2) The tractor service of this year could not satisfy the needs of the service expressed by the neighboring farmers. The needs have been confirmed but the working capacity (working period) of the cultivator could not satisfy all the customers. It is assumed that the request of the tractor service is superior to the offer of working capacity of the cultivator; this is explained even after an increase in the service’s cost, the request will always be higher.
- 3) According to the "results of the activities" and the "cash book", the area worked out per day was of 0.2 ha and the oil consumption per day was 3.3 liters. Besides, if the risks of variations of the rainfall are taken into account, the annual length of the real work would be in the daytime. As a result, the cost of the service for the next campaign is as in the table below by considering 44% increase in oil cost this year. It is proposed that during the marketing study which will be carried out by the management committee the cost of service of 87,000 FG/day/0.20 ha is to be applied for the next campaign and the cost of final service will be fixed on the basis of the request from the customers.

Table 5.3.2 Service Price (Year 2006 and 2007)

Details	Next year (2007) Working days - 30 days (A=6.0 ha)		Ongoing year (2006) Working days - 40 days (A=10.0 ha)	
	Formula	Value	Formula	Value
(1) Area worked out per day		0.20 ha/day		0.25 ha/day
(2) Oil consumption		3.3 liter		4.5 liter
(3) oil cost	@5,200 FG	17,160 FG/day	@3,600 FG	16,200 FG/day
(4) Lubricant	(3)*10%	1,716 FG/day	(3)*10%	1,620 FG/day
(5) Operators salary	10,000FG*2	20,000 FG/day	5,000FG*2	10,000 FG/day
(6) Cost of the spare parts	(7)*30%	10,700 FG/day	(7)*30%	8,025 FG/day
(7) depreciation value for saving		38,166 FG/day		26,750 FG/day
(8) Service price 1	$\Sigma(3)\sim(7)$	87,000 FG/day	$\Sigma(3)\sim(7)$	63,000 FG/day
(9) Service price 2	(8)/2,000m ²	43,5 FG/m²	(8)/2,500m ²	25,2 FG/m²
(10) depreciation value for saving	(7)*30 days	1,145,000 FG/year	(7)*40 days	1,070,000 FG/year

(2) Financial Condition

- 1) According to the results of the audit in November, the amount of 1,210,000FG which comes from tractor service, exceeding the amount of the annual value of depreciation to be saved this year, it was confirmed in the group's bank account. The reasons for the target amounts to be saved even though the targeted area was not attained are due to i) the study team has made a donation of combustible to the group for the starting up of the tractor service and ii) the group has increased the service cost by 20 % (from 25 to 30 FG/m²) on the advice of the counterpart for this component.
- 2) According to the results of the audit in June, the existence of unpaid debts for the tractor service was observed. The method of recovery of the amount was discussed with the group in the general assembly. During the general assembly, proposals were made to reduce the unpaid debts in case of situation where there is additional requests as follows, i) the customer who pays in advance has priority, ii) the service will be restricted to the customers who pay in cash.
- 3) According to the results of audit in November, it is confirmed that a total sum of 162,000FG remains unpaid and the names and the amounts of each customer has been revealed by the farmers' group. This amount must be reimbursed after the harvest. Currently, the profit realized this year amounts to 1,290,000FG and unpaid amount is envisaged for the start up of the service of the next agricultural campaign such as the expenses of the marketing study and the purchase of combustible.

Table 5.3.3 Balance Sheet of Tractor Services

Details	Income (FG)	Expenses (FG)	Balance (FG)
Total income	2,190,000		
Unpaid amount	(-162,000)		
Necessary expenses		438,000	
Repair cost		300,000	
Total	2,028,000	738,000	1,290,000

- 4) Then, regarding the financial aspect, a problem on the procedure of recording in the "account book" was determined. Recording errors in the "Cash-book" are discovered for payments by installments plan, anticipated payment or direct deposit in account. In the cases of complex financial fluxes, even the officers of the DCDRE section who are supposed to support the group are not able to explain them to the group. It is for this reason that the format of the "cash-book" has been modified to make the recording method easier in compliance with the time series.

(3) Management Problem

- 1) According to the results of the audit of May, it was noted that certain documents which the group compulsorily had to prepare had not been worked out. Since the person in charge with the preparation of the documents has left Sonfonia without transferring the duty, the document relating to the "results of activities" had not been prepared. But fortunately, given that the results of the activities of the tractor service are followed by the personnel of the DCDRE section, the document "results of activities" could be prepared by the new representative on the basis of these notes.
- 2) The farmers' group must prepare four documents which are "The annual Plan of operations"; "The table of daily reservations"; "The results of activities"; and "the cash-book" based on the group's management regulations. The importance of these documents was re-confirmed during a meeting with the members of the executive board on the basis of the following questions:
 - Does the group understand the importance of the existence or the nonexistence of documents?
 - Is the management of documents a too heavy duty for the group?
 - Is it possible to introduce some simplifications of the documents?

According to the results of this meeting, the following proposals were made by the attending members:

- an appropriate management of the activities cannot be fulfilled without keeping the documents;
- the documents keeping is necessary for the transparency of the activities with regard to the other members;
- the preparation of documents was difficult at the beginning, but it improves progressively;

It was then decided that four documents will be supported and prepared for the next campaign.

- 3) Two drivers have been selected and have participated to the tractor service training workshop session to allow them to carry out the tractor service well. However, one of these two drivers has provisionally left his task to his own agricultural activity because he was too much busy with the activities of the group and could not get any more time for his own activity. The resolution of this problem has been discussed in the general assembly on July 3rd. As a solution, the following proposals were reached:
 - A system of rotation is introduced during the period of intense activities, and the drivers

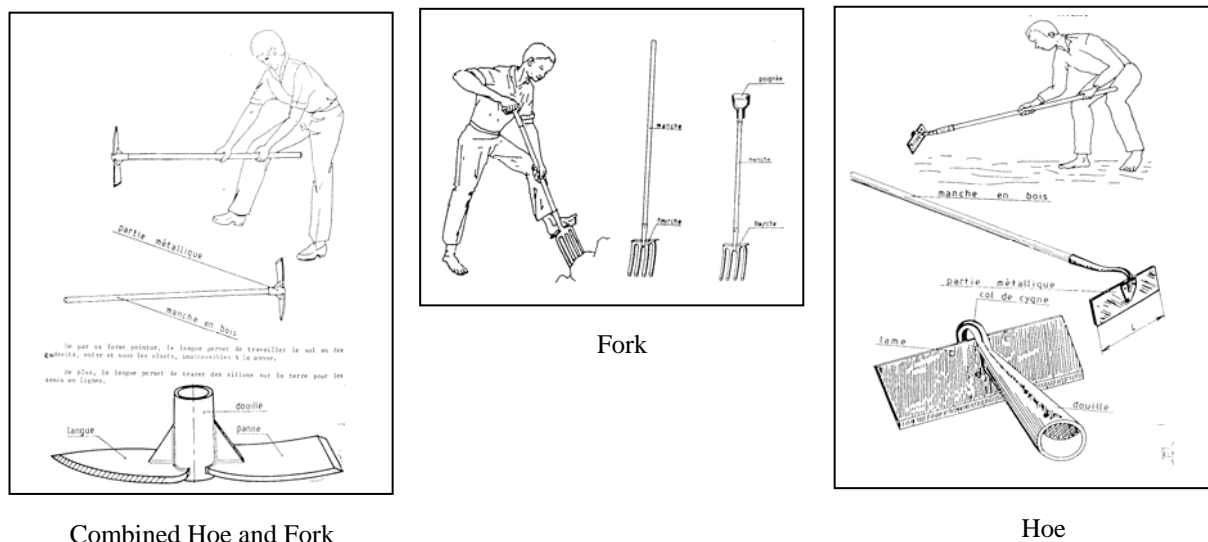


Figure 5.3.1 Improved Agricultural Tools

“Activity 2-2: The improved agricultural tools are fabricated and a diffusion system is organized”

(1) Loss of grains during the transport

After the harvest, the farmers often transport their crop in the form of bunches from the field to their houses in the divisions of the Study Area. Although the farmers use varieties by which the grains separate easily from the straw, it is assumed that the grain losses during the transport are important. Therefore, the losses are estimated. According to the result of the estimation, 0.9% and 0.4% losses by weight of bunches have been confirmed for 25 meters distance during the transport respectively of RC4 and Siguikoda varieties. The results show that more than 10% losses will be recorded if the crop is to be transported over a distance of 1km from the field to the houses. Although the grain losses during the transport are huge, the introduction of improved tools able to reduce the losses (closer to the fields) is necessary. If the farmers pack the grains and transport them after the threshing, the losses diminish consequently. In case the rice bunches are transported, it is proposed to tie them in cloths.

Table 5.3.4 Results of Grain Transport Losses

Details	RC4	Siguikoda
(1) Weight of the losses	109 g	44 g
(2) Weight of the grains after transport	12 kg	10 kg
(3) Grain losses during transport (1)/((1)+(2))	0.9%/25 m	0.4%/25 m

Note) RC4 has the characteristics of much easier grains separation from the straw than the Siguikoda.
RC4: The bunches of the RC4 were dryer than those of the Sigukoda.

(2) Manual Threshing Machine

In the Study Area, the threshing is generally performed by hitting the rice with a stick or by overriding the rice. The reduction of hard work was considered by introducing the small scale threshing

machine. Several experimental pieces were fabricated, and finally the small scale threshing machine was accomplished. The expected impacts are; 1) the traditional method requires additional activities for the collection of the grains in order to obtain a clean work, such work can be unnecessary with the introduction of threshing machine, 2) the solution of the grain losses by scattering, 3) the solution of the grain loss related to the transport of crop; it is portable (can be moved) for a work in the plain, 4) the materials used for this threshing machine can be procured in the proximity and this fabrication was made by the woodsman and the boilermaker which lived in the plains, so the cost of fabrication is not expensive (175,000 FG for the wooden part and 200,000 FG for the part in metal) and it is affordable for the advanced farmers.

(3) Improvement of Agricultural Tools

Among the agricultural tools conceived by the CEPERMAG (but were not fabricated by the centre), three tools are identified as the most solicited by the groups such as the hoe, the pitchfork which were fabricated by the blacksmiths of Sonfonia and Yataya. The cost of manufacture for one tool ranges from 30,000 FG to 40,000 FG which is almost the same price as the Kéri which was disseminated in the Study Area. It is possible that the improved agricultural tools can easily be disseminated to the poor farmers for their costs and local availability.



Weeding Tool in Experimentation

The technique of line transplanting was realized during the Verification study for the improvement of rice cultivation techniques in order to reduce the activities of weeding after transplanting. Furthermore, the line transplanting was performed by using the rope and the leveling tool fabricated by the farmers during the Verification study on the small scale irrigation during off season. The weed-killer fabricated by the study team has been tested in the plots after the introduction of the technique of transplanting and the positive impact of weeding has been confirmed. It is necessary that these improved tools such as the weed-killer, the leveling and the transplanting rope are introduced into the package of technology to be transferred for the improvement of the transplanting technique.

(4) Rice Seeds Storage (Small Silo)

The major problem in the Study Area related to rice seeds is that rats eat and destroy them due to lack of suitable storage. FAO plans to introduce metallic silos, which are however too big and too expensive for an individual farmer. In addition, it would be difficult to get chemicals and to control the gas after these chemicals are applied in the silos. Therefore, the Team made a simple rice seed conservation storage using a 20 liters can provided with a cap made of galvanized steel plate. It is quite simple and consists of just washing the inside of a used oil can and putting a cap, which is enough to prevent rat damage. This is a first step introducing a rice seed protection container and the next shall be a

metallic silo at farmers' group level.

(5) Extension System

In the framework of the agricultural tools, the study team worked especially on the manual threshing machine, weed-killer, leveling, transplanting rope, small metallic silo, hoe with blade, and the pitchfork during the Verification study and the prospectuses of these tools have been prepared in order to diffuse them. The photographs of the manufacturers are shown on the prospectus to make easier the contact with the farmers' groups as well as photographs and the contact numbers of officers. The prospectuses are distributed to the farmers and farmers' groups by the manufacturers and the DNA and the DCDRE personnel. Furthermore, the marketing of the small metallic silo, the hoe with blade, the pitchfork and the hoe was directly confided to the farmers' group La Paix which can either sell directly or act as intermediary between groups and concerned manufacturers.

5.3.2 Evaluation

(1) Results of the Project Evaluation

From the results of interview to 22 farmers concerned, questionnaires, accounting notes filled in by the farmers' group, activity records, and questionnaires to the beneficiaries of the tractor service, the evaluation using the five criteria was executed.

Relevance

1) Governmental policy for agricultural mechanization

- In the republic of Guinea, the government encourages the utilization of tractor for the increase of the cultivation area, and the importation of tractor is promoted in the framework of the Presidential Project and/or bilateral assistance. However, the tractors which were deployed in the whole country could always not be managed properly. The management of the motorized cultivator or tiller owned by LAMKOYA represents the epitome of the tractor problem in the country as a whole. The relevance in this Verification study is verified through the effects resulting from the management of the tractor service in not only the plains of Sonfonia but in the country as a whole.
- In the republic of Guinea, public tractor services are executed by CAP, but generally the machines are not utilized rationally, and the expected outcomes are not often achieved. This is due to the inability to repair and maintain machines, lack of knowledge and technology on operation and maintenance of tractors and difficulties in getting spare-parts. Therefore, the Government of Guinea initiated the action introducing the method of tractor services to CAP. The accounting documents for the tractor service were prepared by the counterpart in charge of this Verification study during the training workshop held in CEPERMAG.
- Furthermore, the program which introduces the tractor service to other farmers' group owning a tractor, and the training program to CAP and/or farmers' group for the purpose of acquiring the method for tractor operation and maintenance in CEPERMAG were prepared by DNA. Such

programs have already been submitted to the Ministry of Cooperation in order to find the donors.

- The relevance of the method of management of the tractor service was confirmed because the assets resulting from the Verification study are programmed for diffusion at the national level.

2) Needs of the parties concerned

- Concerning land preparation, the number of skill labor available in the plains of Sonfonia for undertaking such a task is insufficient for the whole area. In addition, the decision to set a price for the service largely depends on this skilled labor. In order for the service to be executed with a reasonable price (with respect to the area), it must coincide with the needs of the farmers of the plain.. In addition, from the results of the questionnaires to the beneficiaries of the tractor service, 80% answered that they desire to receive tractor services next year also (remaining 20% said it will depend on the service price). 20% answered that they desire to increase the service area next year compared to this year. Additionally, regarding the question whether the service charge was expensive, all beneficiaries answered that it was reasonable. In fact, the service charge of this year was set cheaper than the manual labor. From the reasons mentioned above, it is judged that the implementation of the tractor service is harmonized with the needs of the farmers in the community.
- Because the farmers' group did not know how to properly manage the tiller, its utilization was only restricted to the group. The farmers' group acquired the method of proper operation and maintenance in this Verification study. As a result, the utilization of the existing tiller was more revitalized through the tractor service. The tractor service coincided with the needs of the farmers and contributed to the improvement of agriculture in Sonfonia.
- The staffs of DNA (DIMA and CEPERMAG) are responsible for the promotion of agricultural mechanization but do not exactly apprehend the actual situations concerning the operation and maintenance of the tractors deployed in the whole country. They are aware of the existing problems related to the use and maintenance of these machines but do not take any measures relevant to this effect. The governmental staffs acquired the method of management of tractor through this Verification study. Acquiring such knowledge and method coincided with the needs of the governmental staffs and will contribute in the promotion and implementation of measures related to agricultural mechanization.

3) Equity

- The tractor service brings many benefits to big land owners who can afford to pay the service charge in cash. In the process of mechanization, it is the one who possesses the capital that benefits first; afterward benefits are brought to all social strata including poor farmers. That is why, from the aspect of equity in this Verification study, the JICA study team has set forth improving the agricultural tools that could positively influence poor farmers.

4) Adequacy to the selection of the Study Area

- Since the Study Area does not have farm road and is subject to flooding after rains, the area that

can be devoted to the tractor service is physically restricted. If this Verification study was implemented in a less flooded area, more convincing results could be expected. However, since the Study Area is located near CEPERMAG and the Central Government (Conakry Special Region), the advantages are that the results can be easily shown and diffused.

Effectiveness

1) Achievement of the project purpose

- The project purpose is “The farmers’ group becomes able to administrate and manage the tractor services continuously”, and the objectively verifiable indicator is “The farmers’ group saves the annual replacement cost at the bank”. It was confirmed that the amount of 1,210,000 FG was already secured at the bank; exceeding the target amount of 1,070,000 FG. However, since the degree of achievement of the target service area was only 80%, the project purpose was not going to be achieved if the outside support such as the fuel provided by the JICA study team was not extended.

2) Conditions governing the achievement of the project purpose

- From the results of the Verification study, the following three conditions govern the achievement of the project purpose: i) spare parts are available, ii) the price of commodities does not increase more than expected, iii) machine breakdown does not occur if ordinary maintenance is made (or unexpected accidents do not occur).
- The tiller owned by the farmers’ group broke down during the period of the Verification study. Fortunately, the farmers’ group could obtain the spare parts to repair it. However, as the supplying system for spare parts is poor in Guinea, a large number of spare parts are unavailable. The skill and technique for repairing machines were confirmed, but repair cannot be made without the availability of spare parts.
- The price of fuel increased 44% in 2006 due to a rise in crude oil price, and the exchange rate had a big fall at the same time. Though the inflation rate was set at 7% for the replacement of the tiller, the replacement year might be delayed in case the inflation proceeds.
- The causes of the breakdown of the tiller were the following: i) the farmers group neglected the maintenance of the air filter, and ii) an unexpected accident occurred. As the Farmers group acquired the importance of maintenance and knowledge through the trouble, ordinary maintenance for the tiller would be continued. However, in case the trouble occurs frequently even though ordinary maintenance is made, the continuous operation and management by the farmers’ group level would become difficult.

Efficiency

1) Achievement of the output

- The output of this Verification study is “The farmers’ group acquires the method of management of the tractor service” and “The farmers’ group acquires the method of operation and maintenance of the tiller”.

- From the results of the records of monitoring and questionnaire to farmers' group, the following points were confirmed concerning the acquisition of method of management: i) the farmers' group understood the needs of the beneficiaries, ii) the farmers' group learned the method for setting the service charge, iii) the farmers' group understood the capability of the tiller through the trial tractor services, iv) the farmers' group understood the importance of record keeping.
- The farmers' group and staffs of DCDRE participated in the training workshop in order to acquire the basic knowledge for operation and maintenance for the tractor and/or tiller, and the score of examination was 70%. After the workshop, the restitution by well-learned trainee was made for less learned trainee to improve more understanding.
- Because the maintenance of the air filter was neglected, it resulted in the engine trouble. Therefore, a training workshop on general maintenance including the method of maintenance for air filter was implemented by CEPERMAG once again.

2) Adequacy of the inputs

- It is judged that effectiveness is ensured in the aspect of the cost because of not procuring a newly purchased machine but utilizing the existing tiller.
- A material easy to get locally was used for the construction of the warehouse with the participation of the members, and it is not an excessive input. However, if the security of the necessary materials and equipment such as the tiller and spare parts could be ensured, the construction of the warehouse would not be necessary. In order to minimize the risks of theft, the warehouse was constructed in this Verification study.
- The spare parts and fuel which were necessary for the initial operation were provided by the JICA Study Team. Unless these inputs were brought, the implementation of a continuous tractor service, which is the project purpose, would have been difficult, and the targeted saving amounts could not have been achieved.

Impact

1) Partnership among Farmers' Group

- The farmers' group LAMKOYA implemented the tractor service in accordance with the needs of the farmers' group "Pilot" who tried rice cultivation in the dry season. Through the partnership both groups have benefited from the tractor service, the cultural calendar of the "Pilot" group was secured in time, and the tractor service has brought benefits to the rural community.
- The dry season rice harvested by the farmers' group "Pilot" was purchased by other farmers' group "La Paix", and "La Paix" sold it to rural farmers as rice seeds. In addition, related to the question to the beneficiaries in the questionnaire "How did you know about the LAMKOYA tractor service (from whom)?", twenty (20) percent answered "La Paix". Previously, though the partnership among farmers' group was scarcely seen, it has gotten progressively better through the tractor service.

2) Contribution to Rural Community

- The road improvement program was proposed by the members of the farmers' group and was commenced in order to revitalize agricultural activities and to extend the area for the tractor services. Though it is expected several years until completion, the road section going from the village to the plains was improved, and a bridge was constructed. This improved road is utilized by not only farmers but also by local residents.

3) Impact to the Farmers' Group

- The youths are not willing to engage in agriculture in the Study Area because of the influence of urbanization. The farmers' group LAMKOYA" is composed of members in their fifties or more. The group tried to recruit young people since its establishment and remained unsuccessful. However, the necessity to increase the number of operators for the tractor service this year was stressed, which finally made a young farmer join the group. The new member was to be involved in not only the tractor operation, but also in all the activities of the group. Group activities were revitalized through the tractor service. The new young member who came into the group was evaluated as a positive impact.
- However, negative impacts were found as regards women's participation. Although a woman operator was included in the initial plan, the executive members understood that it was too difficult for women to operate the tiller from the viewpoint of physical strength through implementing the trial tractor services. Accordingly, opportunities of women's participation on implementing tractor services decreased. Therefore, the method of women's participation apart from operator was discussed in the general meeting, and the followings women's participation was proposed and carried out i) cleaning of machine, tire and attachment, ii) assistance in accounting activities, iii) market study, and iv) public relations.

Sustainability

1) Possibility of Continuous Operation

- From the results of the questionnaires, the members of the farmers' group desire to continue the tractor service now and in future.
- As for setting-up the service charge, the will for improvement was found among the executive members. A positive proposition was made by an executive member who proposed a separate service charge for ploughing and harrowing because working hours and fuel consumption for both activities are different.

2) Problems and Solutions

- The engine broke down twice in the term of the Verification study. Appropriate supports from CEPERMAG and staffs of DCDRE were provided. Through their troubles, the farmers' group could identify private workshops able to repair machines and an agent who could supply Japanese made spare parts. Such experience will help in the continuous operation of the tractor service.

- As one of the operators temporarily quitted his duty to devote more time to his own agricultural activities, measures for solving this problem were discussed in the group general assembly, and measures for improvement would be implemented the next season.
- It was observed that the tractor service was carried out for some farmers who did not pay, and some money was still remaining as uncollected money. Such uncollected money will be paid after harvest. A general assembly was held, and the solution for the problem of uncollected money not to occur in the future was discussed. The measure for improvement would be implemented next season.
- From the results of monitoring, the farmers' group did not prepare the necessary accounting documents. In addition, in case money flow became complicated, the farmers' group would not be able to correctly record its activities. As for the "Accounting Book", format was modified, and the importance of recording on the continuation of management was reconfirmed in the meeting of the executive members.
- Through these measures taken on the problems and coped with by the farmers' group in this Verification study, the system for solving problems and the capability to propose solutions were confirmed in the farmers' group when problem occurred.

(2) Verification of Hypotheses

Hypothesis 1: The farmers' group acquires the method of operation and maintenance for tractor service, and can manage it continuously.

As points which farmers' group acquired the method of operation of the tractor through the tractor service, the following were confirmed through the results of the questionnaires, records of monitoring: i) the farmers' group understood the actual needs of the beneficiaries through the market survey, ii) the farmers' group learned the method for setting up the service charge taking into consideration the machine replacement, iii) the farmers' group understood the capability of the tiller through the trial tractor service, iv) the farmers' group understood the meaning of record keeping. As for the maintenance, the farmers' group and staffs of DCDRE participated in the training workshop in order to acquire basic knowledge for ordinary operation, maintenance and repairing. Moreover, the operators of the farmers group participated in the training workshop by CEPERMAG concerning the general maintenance; including the maintenance of the air filter, and knowledge was acquired. In addition, the consciousness that the farmers' group wanted to contribute in the improvement of agriculture in the rural community through the tractor service was confirmed; it is judged that the farmers' group has the necessary knowledge and consciousness for the continuous management of the tractor service. However, as important assumptions for the continuous management of tractor service, the following three conditions were confirmed, i) the spare parts are available, ii) the price of commodities does not increase more than expected, iii) a breakdown does not occur if ordinary maintenance is made (or unexpected accidents do not occur).

Hypothesis 2: Problems concerning the management of the tractor service are identified, and the farmers' group can propose countermeasures against the problems.

Through the implementation of the tractor service, four problems such as i) breakdown of engine, ii) abandonment of duty by operator, iii) uncollected money, iv) record taking errors were identified. As measures to cope with such problems, it was confirmed that the farmers' group could tackle their problems through the general assembly and was able to find solutions for the problems.

5.3.3 Analysis of Effectiveness and Results of the Project

(1) Effectiveness of the Project

The effectiveness of the project which have been noticed during the Verification include in particular:

- After the V/S has carried out the farmers' group of tractor service expanded the service area outside of their group once worked on their tilling jobs. This expanded service job accompanied with group leaders' meeting has brought the communication between other groups very close. This activity has given the site area some benefits.
- The farmers' group tried young farmers to join the group from the beginning of the tractor service. This time, during the V/S a young farmer joined as an operator. He took part in operating tractor as well as other group activities and brought life to the group.
- CEPERMAG considered a serious problem of tractors usually occurred due to lack of good maintenance. Therefore, CEPERMAG put in practice of giving training on tractor maintenance for operators with the financial support from the government. Furthermore, MAE planed to expand the tractor service project to other area of the county using the collateral funds of 2KR and actually the Minister of MAE presented a formal request of the funds to the Ministry of Cooperation. Thus, the V/S has brought MAE a sense of independence and promotion and MAE has become aggressive.
- Farmers start to presented opinions, aggressively, on the improvement of farming equipments such as a leveling instrument, a manual threshing machine, etc.

(2) Possible Service Area

The target area of tractor service to be achieved in 2006 was 10 hectares, however, only 8 hectares, which was 80 % of the target was covered. Tilling service by hand tractor is carried out in Sonfonia lowland at the time when the soil becomes soft after a few rain falls until inundation comes. This timing changes according to the fluctuation of rains. In 2006, the rainy season delayed but soon after rain start to fall the land was submerged due to high intensity of the rain. Therefore, the only suitable period for tractor service was half month. The Team considered in the discussion with a farmers' group that two months from May to June could be the time for tractor service if the group wanted to till 10 hectares, however, this duration changes due to unforeseen climatic change. The price of service reflects on the size of working area; therefore, the price should be decided in consideration to the risk of rains.

(3) Needs of Service and Service Price

The tractor service in 2006 could not satisfy some of the needs of farmers. The request was there but the capacity of hand tractor and available working hours were not sufficient. As there are still strong needs for tractor service, there may be more requests of the service than the capacity of tractor even if the group raises the price of service.

The results of the tractor service in 2006 shows that the tilling area per one day is 0.2 hectare and the consumption of fuel is 3.3 liters. The working days may be 30 days considering the risk of rains. As fuel price increased by 44 % during the service days in 2006, the execution committee of farmers' group set the price of service as 87,000 FG/day/0.20ha. Final decision of price shall be done after grasping the farmers' needs.

(4) Arrears

The monitoring done in July 2006 showed that there were arrears of tractor service. This is because the service was carried out under a reliance on farmers' society while the group considered the service fee would be paid during one of the day and did not dare to collect the money on time. Another reason of arrears may be that in Sonfonia lowland rewards of labor service traditionally paid not always in cash but in kind (produces). If the group leaves the remaining arrear as it is, it gives wrong impression and is unfair for those people who have already paid after the service and furthermore, and the service itself may be collapsed. Farmers discussed the arrears matter in the general meeting of farmers' group. They have agreed that there were big requests for the tractor service; however, arrears should be minimized. Therefore, the group should give priority for those farmers who can pay in advance or paid in cash at the spot after receiving the service.

(5) Operators Treatment

The farmers' group selected two operators, gave them training and began the tractor service. However, one of the operator quit the job for a while because he had been too busy to work in his own farm. The remaining operator had to succeed his job, which gave the operator heavy load of job. The first operator had returned to his duty after finishing his own job. This operator was one of the key people who set up the group. His absence was a big incident, and even the issue was raised and discussed in the general meeting. The meeting came up with the suggestion that the group had to make a rotation plan of works in the farming season and the operator could get enough time to work in his own farm. The group increased his salary to compensate what the operator would loss in the group works. In addition a young operator starts to take part in the group working starting from October.

(6) Agricultural Mechanization in Guinea

It is hard to get spare parts for tillers and tractors in Guinea. This problem is common to all part of the country. It cannot be solved only by farmers' group itself; therefore, the support of the government is indispensable. The government must decide the roles or duty of procurement of spare parts both for the government and private company and set up a system of supply.

There are many farmers’ groups and public tractor service agencies which have a problem of getting technicians for the maintenance of machines. It is useful to give them training on agricultural mechanization. In case there is a plan to give a machine, only a person who received the training should get it. The training should be done in a continuous basis several times in order for farmers to master the contents.

There are many tractors and tillers imported in this country, however, DNA, that is an organization to conduct the policy of agricultural mechanization, does not know where the machines are disposed, how the machines are operated, whether the machines are apt to the sites or not and what are the problems of the machines. Guinea is promoting the agricultural mechanization without having a clear policy or regulations. This situation must be improved. At the same time, it is important to promote the agricultural modernization not only introducing tractors but also improving other agricultural equipments which should appropriate to the local need.

5.3.4 Feed-back of Lessons Learnt

Table 5.3.5 Feed-back of Lessons Learnt: Agricultural Mechanization

Lessons learnt	Feedback to the Master Plan () component concerned
<ul style="list-style-type: none"> • The capacity of the cultivator depends on rainfalls. The price of the service should take into consideration the risks related to rainfalls at the next growing season. 	⇒ The annual number of working days is changed from 40 to 30 days, considering the risk related to rainfalls. Service price is decided based on 6 ha 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)
<ul style="list-style-type: none"> • In order to ensure a good financial management, some measures to collect the non paid bills of the tractor service are necessary. 	⇒ 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)
<ul style="list-style-type: none"> • A solution to reduce the cost of the drivers is necessary. 	⇒ 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)
<ul style="list-style-type: none"> • When transporting the harvests, big losses are observed. 	⇒ 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)
<ul style="list-style-type: none"> • The provision of spare parts is difficult. 	⇒ The recommendation is to be made in the Chapter 6.
<ul style="list-style-type: none"> • In the framework of agricultural mechanization, the organization of a training workshop for all owners of agricultural machines is necessary. 	⇒ Ditto

Participants: Leaders 25 out of 27 from the 8 groups

Training Program:

			Training Contents
1	July 28	Thursday	Pre-evaluation of the participants
2	July 29	Friday	Generalities on the groups (group set-up, necessity of regulation, selection of the leader, qualities of a right group, content of groups activities, role of the leaders)
3	July 30	Saturday	Basic accounting/stock management (definition of accounting, roles of the accounting files, cash-book, accounting charts, stock management, reports)
4	August 1	Monday	Necessity of meeting/official meeting report
5	August 2	Tuesday	Group project (by explaining the existing examples)
6	August 3	Wednesday	Project set-up and campaign assessment
7	August 4	Thursday	Training evaluation

The pre-evaluation of the participants made on the first day has revealed that only twelve (12) leaders among the 25 participants were able to write. Then, the lecturer advanced to explain as follows.

- 1) Capacities are indispensable for the group leaders in order to push forward the activities in a dynamic and wholesome way.
- 2) Therefore, the strengthening of capacities is the objective of this training.
- 3) Reading and writing skills being the basic qualification of a leader, this becomes a condition for attending the training.

In addition, the groups were requested to precede voluntarily to the replacement of their representatives in case of the already selected ones do not have the ability to read and write necessary for attending the training.

Since there were four (4) groups where the secretaries did not have the writing ability, it was found that the current situation of the groups in the Sonfonia plains could not be a better one. Finally, all the group leaders who have the ability to write attended the training in August.

The evaluation was based on a number of questions related to the roles and the functions of leaders. The results obtained were that 12 among 26 persons got passing marks and eight (8) persons needed support for strengthening their capacities, and six (6) persons needed a complete reinforcement.

«The second group leader training : March 20th - 26th 2006»

After the first training, the monitoring was carried out for 5 groups among the participated groups. As a result, the followings were revealed.

- 1) Most of the leaders did not perform their roles properly, especially, the management of the documents needed for operating the groups.
- 2) The fundamental cooperative spirit was not cultivated, and the members did not apprehend what are groups properly.
- 3) The execution of the routine matters such as preparation of meetings, etc. was not conducted properly.
- 4) The groups' accounts were not appropriately kept.

5) Without sufficient preparation and planning, they started new activities.

As such, it was found that the first training was not sufficient to create the leaders' capacities and the following this activity, in order to better equip the groups for the management of their jobs, the 2nd training was held from the 20th till 26th March 2006 during the Team's absence.

Participants: Leaders 25 out of 27 from 8 partner groups

Training Program:

			Training Contents
1	March 20	Monday	Dissemination around the current principles of your groups management Basic Cooperative Principles of the farmers' Organizations
2	March 21	Tuesday	Dissemination around the current principles of your groups' creation
3	March 22	Wednesday	On the training of the elected in Basic Accounting and Stock Management
4	March 23	Thursday	- ' -
5	March 24	Friday	Meetings diffusion decision follow-up
6	March 25	Saturday	Funds management (own and external)
7	March 26	Sunday	Participants evaluation

«The third group leaders training: July 12th and 13th 2006»

At the beginning of the third year Study, the accounting of the group Pilot was checked and it was noticed that there were not proper records of accountings and the members did not grasp their assets and liabilities correctly. Moreover, they had planned the next rice growing and had started acquiring the tractor services without considering their financial conditions. The same situations were found for most of the other groups. Consequently, it is decided to carry out another training especially based on the assets and liabilities in accounting, as the previous trainings had not included this subject. For this training, the concerned extension officer played the role of the trainer with the assistance of the expert.

Participants: Leaders 26 out of 27 from the 8 partner groups

Training program:

			Training Contents
1	July 12	Wednesday	Initiation of the leaders to the new accounting tools: The cash-book centralizing the data from the books of loan, contribution, sale of chicken droppings, rice purchase, diverse incomes, diverse outlets, purchase of material, service performance and repair of the cultivator, sale of vegetables, and bank book, that are tools made available to the leaders for the record of their activities and to facilitate the accounting information at the level of the group's members.
2	July 13	Thursday	Leaders' initiation to the status and the internal rules of operation. Regulation relative to the new law on the farmers' organizations

The evaluation was based on a number of questions. The results acquired are as follows:

Sixteen (16) group leaders can regularly keep the accounting tools. Six (6) others must have a training to better improve, which is the task that will be done during the follow up by the expert.

“Activity 1-2: Farmers’ group leaders organize periodical meetings”

«The first group leaders’ meeting: July 26th 2005»

Chairperson: M^{me} Soumah (president of La Paix)

Secretary: M. Diallo (secretary of La Paix)

Participants: Leaders 25 out of 27 from 8 partner groups

Being the first meeting, the session started with the introduction and the election of the chairperson of the session and the secretary. The discussions during the meeting were carried out as follows:

- According to the leaders themselves, the responsibility, the behavior, the tolerance, and the consciousness are crucial factors for the success of any collective actions. In addition, they affirm that it is necessary to bring assistance to those who are in need. It is by this way that collective objectives can be achieved.
- The participants unanimously recognized that the absenteeism to the meetings creates misunderstandings, which are source of confusion between people in a given group.
- Although the farmers record losses in the rice cultivation, they succeed sometimes to realize more or less positive results in vegetable cultivation.
- The current problems are lack of appropriate tools, no access to micro-credit, lack of means to fight against pests (birds, insects, worms, fishes, bad weeds), lack of training, lack of group’s own farming domain, flooding due to the lack of drainage facilities.

«The second group leaders’ meeting: Novembre 20th 2005»

Chairperson: M^{me} Soumah (president of La Paix)

Secretary: M. Diallo (secretary of La Paix)

Participants: Leaders 26 out of 27 from 8 partner groups

In the training carried out after the first meeting, it appeared that there were leaders that could not read and write and therefore are not able to lead the group properly, thus half of the leaders were replaced. Consequently, this meeting has become the first experience for the newly elected leaders. Since the meeting had been held after the activities of the group have reached certain level, the content of the discussions has revolved essentially around the content of these same activities.

The presentations concerned essentially the problems of the lack of seeds and fertilizers, that is to say they would appear to depend on donors.

In addition, there was a positive presentation by one group which was not participating in the component, and which transformed and sold vegetables grown by others; but from the time of their participation to this component, they have been stimulated by other activities of the groups and they have decided to produce their own vegetables, to transform and sell them.

«The third group leaders' meeting: March 30th 2006»

Chairperson: Mr Soumah Djibril (group La Paix)

Secretary: Mr Camara Mamadouba (Treasurer of the Group Wali fanyi)

Participants: Leaders 23 out of 27 from 8 partner groups, 8 other groups members

At the beginning, the review of the second training held from 20th to 26th March 2006 was conducted by Mm N'Gady Soumah and Mr Naby Laye Moussa and it concerned essentially the themes « Meeting diffusion and basic cooperative principles of the farmers' organizations».

The difficulties were summarized in the following terms: The 'non development' area in the domains often provoked by the rise of the seawater, the insufficiency of organic fertilizers on the market and the lack of means to support the activities. Concerning the attack on the crops, peasants solutions were proposed by the farmers themselves such as: the use of kitchen ash on the leaves of the seedlings in the nurseries and the crop rotation on a same plot.

«The fourth group leaders' meeting: July 5th 2006»

Chairperson: Mme Camara Foulématou (group Wali fanyi)

Secretary: Mr Cissé Ibrahima (group La Paix)

Participants: Leaders 25 out of 27 from 8 partner groups, 13 members of the other groups

Before the meeting, the leaders affirmed that they have already nominated the chairperson and the secretary and set the agenda of the meeting at the same time. The head of the component satisfied with this declaration and qualified it as a gain of perpetuity in the move for the organization of periodical meetings of leaders and invites them (the leaders) to further do better even without the head of the component. He suggested that from now on it should be the leaders who organize the meetings and invite us (the component) for participation.

Concerning the agricultural tools proposed by the component « Agricultural Mechanization», the participants have unanimously appreciated the agricultural tools that are manufactured and made available to them. While, there was a question that in case of purchasing them, it would be needed to learn how to use them.

Concerning the difficulties related to the activities, most of the leaders complained that all the agricultural inputs were expensive due to the deterioration of the national economy of Guinea. In addition, there were also many groups who complained that most of the seedlings had been lost after transplanting owing to the effect of the huge heat generated by the strong and prolonged sunshine. However there was a positive opinion as such, if the team had engagement and the courage, the group could reach the objective.

Concerning the credit, the participants developed an argument that: when one requested a credit from someone, he should know how to reimburse it. Consequently, they called upon all people to never take an amount that they cannot reimburse, and otherwise it would be the credibility of the groups that would suffer.



Group Leaders' Meeting

5.4.2 Evaluation

(1) Results of the Project Evaluation

In accordance with the evaluations before and after the group leaders training, the monitoring by the expert, the minutes of meetings and questionnaires to 19 leaders and 2 counter parts, the evaluation using the five criteria was executed.

Relevance

- There are farmers groups which target different activities in the Study Area, but as the leaders of the groups in this area are normally elected among the celebrities, it is rare that elected leaders are capable people. It can therefore be said that the component; targeting the stimulation of the groups through the strengthening of the leaders capacity is in line with the need of the area and the society.
- The strengthening of the leaders capacities is relevant because it is an action which agrees with the objectives of LPDA 2 in which the strategies « Speeding up privatization », « Improvement of conditions to speed up private investments» and « Strengthening of local administrations capacities » are pointed out. It is also an action that will allow leaders to fully play their roles and functions in revitalizing the groups.
- Based on the evaluation forms, all 19 groups leaders of the component who responded to the questionnaires expressed their satisfactions; wishing to continue the said trainings. Hence, it can be said that the component agrees with the need of the target group.
- The evaluations of the first day of training showed that some leaders selected by their groups could neither read nor write. After the explanation that knowing how to read and write was a prerequisite to being a leader, people were replaced by the ones who were able.

Effectiveness

- During the Verification, it was felt that the population still expected very much from the donor in spite of the sensitization on the self-help mentality. It can be said that the insufficiency of the self-help mentality constraints the reaching of the specific objective which says that « The adequate operation of the groups is going to stimulate the agricultural groups activities».

- After the different training sessions, the leaders used the documents and held regular meetings. This is an efficient means for them to be at the same level of information. The keeping of the documents at each activity makes it easy the transparency of the data.
- As regards the target indicator of the following specific objective «Each group expands its activity», 4 groups out of 8 programmed by themselves and initiated new enterprises. Therefore, the rate of achievement of the objective is 50%.
- To reach the above mentioned specific objective, the important assumption « Leaders who were trained will continue to assume their role as leaders » must be fulfilled. According to the evaluation forms, all 19 leaders responded they would continuously assume their role.

Efficiency

- Tests on the understanding of the leaders' roles were organized in the first training. The average score evolved from 26/100 at the beginning of the training to 60/100 at the end. After that, and based on the evaluation that followed the supplementary training, 62% of the groups leaders could regularly keep their accounting books. As a result, it can be said that the result « The management capacity of the agricultural groups leaders will be improved » is somewhat reached.
- As regards the target indicator of the following result « The necessary documents are prepared », this was done in most of the groups.
- As regards the other target indicator of the result « The regular holding of meetings», meetings were held. The meetings that were held up to now were not under the initiatives of the leaders, but they would be from the next one.
- Leaders keep the documents (accounting and minutes of meetings). The exchanges of experiences inside the group and among groups are made possible by leaders.
- The cost of the training is not high, and the result is sensible.

Impact

The positive and negative impacts generated in the process of this component are as follows:

- The groups made the yields evaluation for the non members' farmers groups, but the latter said they would do their own evaluation the next time around. (Positive impact)
- The opening of the groups to the world outside for any negotiation with the development support institutions has become a reality.
- Leaders who could not read or write were eliminated at the beginning, which must have hurt some feelings (Negative impact).

Sustainability

- All activities are undertaken in the natural environment of the groups; there is no transport cost associated with the meetings held at the working site.
- Based on the interview forms related to the government assistance, both of the two officers interviewed answered that even if there are restrictions, they would do their best to assist the groups as much as possible.

- As regards the getting of the budgets to implement the Master Plan, the questionnaires showed that all government officers answered that even without a government funding, the will is there to ask donors assistance such as international organizations and NGOs.

(2) Verification of Hypotheses

Hypothesis 1: The management capacity of the agricultural groups leaders will be improved, and groups activities will be undertaken through trainings organized by them.

. One can say that this hypothesis was somewhat verified, even if it could not be said that the improvement of the capacity is sufficient. However, the monitoring, which followed the organized trainings, showed the followings. If there are a continuous monitoring and some complementary training, the capacity will be increased, and the activities will be more performing than before.

Hypothesis 2: The participation to the groups leaders meetings will stimulate the farmers' groups activities.

Periodical meetings in which the groups' leaders participate are organized. The leaders have expressed their satisfaction and their wishes that such meetings are continued. Based on the evaluation forms, one is convinced that the leaders are able to organize these meetings because they feel it is a chance to revitalize the groups and to learn about the activities undertaken by other groups. In addition, the revitalization is observed, as 4 groups out 8 initiated new enterprises. Therefore, it can be said that this hypothesis is somewhat verified.

5.4.3 Analysis of Effectiveness and Results of the Project

(1) Effectiveness of the Project

The effectiveness of the project which have been noticed during the Verification include in particular:

- Some of the members who attended the group leader training and meeting have been seen challenging new projects. This movement is believed to bring revitalization to the sites.
- At the first day of the group leaders' training it was realized that more than half of the attendants could not read and write. It was agreed that they should be replaced by persons who can read and write as the leaders' job was not an honorable one but an actual one. This opinion brought some trouble to the chief of district; however, after the counter parts explained that the ability to write and read was indispensable for revitalization of the group activities, he finally understood the meaning and promised to change them. This action gave the groups some autonomous philosophy to stand independent and to be active.
- At the beginning it was the counterparts that managed the group leader meeting, however, as time goes by leaders themselves start to manage their meeting. This attitude changes shows that the leaders have promoted autonomy.
- Similarly, at the beginning it was an outside expert who used to give lectures on leaders training,

however, after the third training course the counterparts have catch up the subject well and start to give lecture by themselves.

(2) Autonomy

The Team insisted in the training the importance of group autonomy, however, it was found that donor dependency persist among leader even at the final meeting. They could not have changed the idea of old experience. It may take long time for them to create the autonomy in the group. It is recommendable to set up such system as the leaders meetings continue and the counterparts suitably advise them.

(3) Sense of Activity

The Pilot agricultural group, that was set up in the small scale irrigation project, prepared an account book, however, the members did not understand the true meaning of the book, therefore, they did not grasp how much the Pilot had property and debt. Furthermore, they planned the cultivation of the next season without considering the condition of assets and liabilities, and actually began the tilling with tractor service which needed some money. The situations of other groups were almost the same. Even the extension officers did not have a sense of assets and liabilities. As Pilot members did not grasp even the capacity of their labor force, their plan of cultivation area was often too large to manage. This mentality must be changed through training.

5.4.4 Feed-back of Lessons Learnt

Table 5.4.1 Feed-back of Lessons Learnt: 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. 	<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)
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> ⇒ Continuous training must be stressed in the creation of the program. (II-1-1, II-1-2, II-2-1, II-2-2)
<ul style="list-style-type: none"> • The execution of the leaders' meeting brought about the revitalization of the group activities, such as making other groups' activities a good guide. 	<ul style="list-style-type: none"> ⇒ The program must stress that the participants can positively present their activities in the meetings. (II-2-1)
<ul style="list-style-type: none"> • Lack of the agricultural infrastructures in the plain of Sonfonia was raised as the problem the farmers confront in the leaders' meetings. 	<ul style="list-style-type: none"> ⇒ The improvement of the agricultural infrastructures is a fundamental issue in this development, and it shall be stressed in the Recommendation. (Chapter 6)
<ul style="list-style-type: none"> • Awareness creation of the leaders' independency takes long time. 	<ul style="list-style-type: none"> ⇒ The program must stress that the extension officers make proper advices in the leaders' meetings. (II-2-1)
<ul style="list-style-type: none"> • 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"> ⇒ 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)

5.5 Process and Evaluation: Small-scale Irrigation

5.5.1 Process of Activities

[Activity 1]: Preparations

Activity	Anticipated effects	Program												Persons in charge	Contribution									
		2005						2006																
		m	j	j	a	s	o	n	d	j	f	m	a			m	j	a	s	o	n			
1-1 DNA officers in charge of irrigation understand this component and set-up the working plan	Execution plan	■																					DNA	Guinea : DNA JICA : Expert in charge of irrigation contracted Computer
1-2 In conformity with the working plan and under the direction of DNA, the extension officers recruit farmers to be participated in, explaining the content of the activities	Concerned farmers	■																					DNA	Guinea : DNA, Diffusion extension officers JICA : Irrigation expert contracted, Support
1-3 The concerned farmers understand the essential points of this component and set-up the management rules under the direction of the extension officers	Management rules	■																					Extension officers	Guinea : DNA, Diffusion extension officers JICA : Irrigation expert contracted, Support
1-4 The concerned farmers pay shares	Dues	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Leaders of the farmers' group	Guinea : DNA, Diffusion extension officers JICA : Irrigation expert contracted, Support

* ■■■■ : programmed ■ : realized

The responsible persons of this component hold meetings in May 2005. The extension officers appointed as assistants and the DNGR's Rural Engineer attended the meetings. The following points have been discussed and decided.

- This component is constituted of two parts. The first part is technical and will allow the DNA officers in charge of irrigation to learn the introduction method of irrigation facilities. It was programmed in the Master Plan during the execution of this component, and prepare the implementation of the program for the development of agricultural production infrastructures in the master Plan. The second part that assumes the aspect «execution of irrigated agriculture» will help the farmers and the extension officers to learn the management of a durable agriculture by mastering the water management and maintenance of the irrigation infrastructure. To manage the facilities in collaboration with the beneficiary farmers, it is then necessary to establish new groups. Consequently, the set-up of the new group will be realized during the execution of this component, and they will learn the importance of activities within a group.
- The extension officers will participate essentially to the second part, and will support the farmers to practice in the irrigated agriculture without problems.
- The engineer of rural engineering sector must train the DNA officers to allow them to be able to operate the project by themselves through the execution of this component.
- For the selection of the members of the new group, the extension officers will program the

methodology.

“Activity 1-1: DNA officers in charge of irrigation understand this component and set-up the working plan”

This activity has been elaborated as training, and it has been decided that the extension officers would participated to the training, even though the understanding of some parts would be difficult for them, because it is crucial that they understand perfectly the component.

The training to understand the content and the significance of the component has begun on June 9th, 2005 and has continued for 6 days. The Rural Engineer has played the role as trainer.

The trainees: 2 of the DNA, 4 extension officers

Content of the training: the extension and the role of extension officers, the topography, the approaches to follow-up for the developments, the synthesis and the set-up of the work program

All the trainees have visited the field and have confirmed the entire component on June 15th. The trainees have presented the execution plan scheduled by themselves and have presented it in the meeting carried out on the last day.

“Improved Nursery: 2006”

The results obtained by the component «Improvement of the rice growing techniques» in the second year of the study, have proved that the preparation of the seedlings is very important for the cultivation in the wintering. In the plains of Sonfonia, it is difficult to prepare good seedlings because of the damages related to the floods. Thus, it is necessary to prepare the nurseries that are not flooded even during the period of floods. The fashion of improved nurseries consists of a small and simple construction. To this effect, their preparation is organized and their Verification is carried out with the component «Improvement of the rice cultivation techniques» in the third year of the Study.

The collective meeting between «Small scale irrigation» and «Improvement of the rice cultivation techniques» has been held on May 19th, 2006, and the following points have been discussed and decided.

- The choice of the farmers and the fields is the responsibility of the two components.
- The fashion of the nurseries is the responsibility of the component «Small scale irrigation».
- The advise and the follow up of the the rice cultivations with the seedlings which are growing in the improved nurseries are the responsibilities of the component «Improvement of Rice Growing Techniques».

“Activity 1-2: In conformity with the working plan and under the direction of DNA, the extension officers recruit farmers to be participated in, explaining the content of the activities”

A workshop to inform the farmers on the details of the small scale irrigation component has been held on 20th June 2005 at the CEPERMAG section of the DNA. After the workshop, membership forms

have been distributed through the heads of divisions and the president of C.GAMAR to collect more candidates with particular consideration for the candidates.

Forty-eight forms have been recuperated in July. In order to select the farmers, criteria such as age, address (the distance between the field and the domicile), experience in agriculture, etc. have been taken in account. In addition, where the selection on the basis of the forms has been difficult, the heads of the divisions have made their choice. Finally, sixteen (16) farmers (10 men and 6 women) have been chosen on July 14th.

“Improved Nursery: 2006”

According to the resolution of the corrective meeting, the choice of the farmers and the fields has begun. During the choice, a general strike has taken place during 9 days from June 8th, 2006 in Guinea. Therefore, the selection has delayed until the strike subsides, and the farmers and the fields have been definitely chosen on June 17th.

Two targeted fields have been decided in Kobaya and in Yataya, and M. Sono and M. Damba have been chosen respectively as the farmers to cooperate with. M. Sono who had cooperated to the Verification last year.

“Activity 1-3: The concerned farmers understand the essential points of this component and set up the management rules under the direction of the extension officers”

A workshop has been held on July 19th, 2005, and the members of the groups’ management team have been chosen as follows:

Mr Kaba Aboubacar, president, Mr Sylla Nabylye Moussa, treasurer and Mr. Sylla Salifou, secretary. The group has been named GPI (Pilot Group for Irrigation). They have completed the group registration at the Ratoma Commune in August.

Another workroom has been held on August 11th, and the items concerning the cultivation plan and the contributions by the members have been discussed. The amount of contribution has been fixed to 100.000 Guinean Francs.

“Activity 1-4: The concerned farmers pay shares”

In conformity with the decision made and written above, the group members have begun to pay the contribution from August 11th, 2005. However, until the end of October 2006, the amount paid is 980.000 Guinean Francs which is less by 220.000 Guinean Francs referencing to the total time anticipated. Concerning the unpaid amount, the members agreed during a group meeting that one who still owe should allocate a portion of their rice crop to be perceived at the time of harvest and that was done on the last off-season’s rice harvest at a rate of 25% of their portion.

[Activity 2]: Facilities Set-up

Activity	Anticipated effect	Program												Persons in charge	Contribution				
		2005						2006											
		m	j	a	s	o	n	d	j	f	m	a	m			j	a	s	o
2-1 The DNA officers in charge of the irrigation carry out a field study for the facilities	Results of the study																	DNA	Guinea : DNA JICA : Irrigation expert Irrigation technicians, Study tools
2-2 Design and estimate of the facilities are carried out by the DNA officers in charge of irrigation	Design and estimate																	DNA	Guinea : DNA JICA : Irrigation expert Irrigation technicians, Necessary materials
2-3 Construction of the irrigation facilities is carried out by the DNA officers in charge of irrigation	Set up of the facilities																	DNA	Guinea : DNA JICA : Irrigation expert, Irrigation technicians, Supervision of construction, Acquisition of the pipes fitters, Drillers for the distribution mains, Equipments and materials
2-4 The group members participate in the construction of the facilities	Set up of the facilities																	Leaders of the farmers' group	Guinea : DNA JICA : Irrigation expert : Irrigation technicians Necessary materials

* : programmed ■ : realized

“Activity 2-1: The DNA officers in charge of irrigation carry out a field study for the facilities”

As the DNA officers in charge of the irrigation have been initiated to the techniques of hydro-agricultural infrastructures installation, they have carried out a detailed study of the conception of those facilities under the direction of the Rural Engineer. Before the aforementioned study, the engineer has made a briefing on the techniques related to the irrigation facilities to the DNA officers in June 2005.

The on site training or OJT (one the job training) has begun on June 27th, 2005 by the detailed field study the conception of the facilities.

The location of the discharge basins and the alignment of the pipes between the basins and the dykes were provisionally decided, and pickets have been placed on the intersection points (I.P.) on the first day. In addition, tutorials on the manipulation of the leveling survey equipment have been made. Then, the measurements of the leveling and the I.P. angles have been carried out. The calculations of the study results have been done in July.



Indoor Training



On Site Training

“Activity 2-2: Design and estimate of the facilities are carried out by the DNA officers in charge of irrigation”

The design and estimate of the facilities started on 5th July 2005. The design and estimate related to facilities were elaborated as follows: calculation of water requirements, determination of facilities scale, set up of the existing longitudinal section, design of water tanks, elaboration of drawings, materials and unit price survey, cost estimate and preparation of working program. The works were carried out by the DNA officers in collaboration with the engineer using the knowledge acquired during the training.

(1) Water Requirements

The calculation of water requirements was performed by the methods learnt during the training (crop evapotranspiration, puddling water, percolation, irrigation efficiency, etc.)

(2) Facilities scale and Design

Although this component is planned for on one ha of rice and 0.25 ha of vegetable cultivation in the Verification, the facilities were designed considering three (3) hectares of rice cultivation and one ha of vegetable growing taking into account a future expansion as programmed in the Master Plan.

The water intake at the Sonfonia Lake is made up of a system of siphon, and the facilities are composed of siphons, pipeline and water tanks. Two water tanks were planned; the first being for the rice-growing and the second for the vegetable growing.

Concerning the pipeline, two (2) pipes have been programmed for the two different water tanks in order to make a simplified water management, and taking into account the fact that the management of the irrigation facilities waters is the first experience for the farmers.

As a result of the calculations, the PVC pipes of 200 mm and 150 mm diameters were chosen for the rice growing and the vegetable growing respectively. The triangular spillway and the deflector are installed in the water tank of rice-growing for measuring the water quantity, which is an indispensable structure for the water management. The structure of water tank for the vegetable growing was planned simple, taking into account the water management to be conducted by counting the watering frequency.

The design and estimate of the facilities were made according to the standard in Guinea.

“Activity 2-3: Construction of the facilities is carried out by the DNA officers in charge of irrigation”

After the preparatory meeting held between the DNA officers in charge of the irrigation and the Rural Engineer, the determination of the land to be cultivated and the preparation of the working plan started, and a field training was held on 2nd November 2005. At the same time, the detailed working plan was prepared.

(1) Preparation for Construction of Facilities

The preparations for the facilities construction works started on 4th November 2005 in conformity with the detailed working plan.

The setting up of the pipe alignment took for two weeks and was accomplished on 17th November. Simultaneously, procurement of principal materials, such as the PVC pipes, started. The pipes were delivered on 17th November.

(2) Pipe around Outflow of the Reservoir

The survey was carried out just at the outflow of the reservoir which had been inaccessible during the rainy season due to high water flows. Consequently, it appeared difficult to install the underground pipe for 35 m long, and it was decided to install steel pipes because PVC pipes installed uncovered could easily be damaged during the rainy season.

(3) Installation of PVC Pipes (excavation, sand bed, pipe installation, backfill)

The works for the installation of PVC pipes carried out from November 2005 until January 2006. The total volume of excavation was 330 m³, of which 173 m³ of rock excavation. That is to say, except for the rocky part, about 200 m³ of excavation was carried out by the participation and the collaboration of the members of the Pilot farmers' group. After the installation of the sand bed, the installation of the PVC pipes and the butterfly-valve was carried out, and the test run (to confirm the water flow through the pipeline) was carried out in January. There were holes



Excavation carried out by the Participation and Collaboration of the members of Pilot

(manufacturing defects) in the PVC pipes due to their bad quality and malevolence by children, and the reparations were conducted and the pipelines were buried completely at the end of January.

(4) Installation of Steel Pipes (steel and concrete pipe support, pipe installation, painting)

In conformity with the site conditions, two construction methods were applied. The first was the steel support fixed on the concrete or rock wall drilling holes there; the second method was based on concrete blocs placed along the pipe alignment where there is a certain distance between the alignment and the walls.

The hole drilling for the steel supports started on 2nd December 2005, and the installation of steel pipes was accomplished at the end of January 2006. The joints of steel pipes were welded.

(5) Water Tanks

Three water tanks were constructed; the first was the discharge tank for the rice farm and the second was for the vegetable cultivation. The third one was an accumulation tank to be used as a relay between the siphons placed at the reservoir and the pipelines, which had not been programmed in June 2005 but was designed after the survey made at the beginning of the construction.

The construction of the accumulation tank started on 23rd December 2005, and all the works completed in January 2006.

(6) Others

After the test run carried out on January 11th, 2006, drawing water to the paddy field started on the same day. Consequently, the first rice transplanting was done on 13th January 2006 with the presence of the Minister of Agriculture and Livestock. The Minister's visit was broadcasted on the television by the RTG.

On 17th January 2006, with the presence of the Minister of the Agriculture and Livestock, the National Directors and/or their representatives, and the representative of the Embassy of Japan, the inauguration ceremony of the irrigation facilities was held.

“Activity 2-4: The group members participate in the construction of the facilities”

Members of the Pilot group participated in the construction works such as clearing and excavation for the irrigation facilities.

«Improved Nursery: 2006»

The reconnaissance survey was carried out on 17th June 2006 after the general strike on the field of Mr. Sono in Kobaya. It was difficult to develop the seedlings on the nurseries with a normal height, because, owing to the delay generated by the strike, the water-level had been raised to that when the normal sowing is done. Consequently, it is requested to Mr. Sono to develop the nurseries at the level he thinks convenient until June 20th. The study team visited the field again on June 20th and the height of the nurseries is found at 20cm above the ground surface. According to Mr. Sono, the water level would have increased up to 30cm, and it is decided to increase the nurseries' level by additional 10cm for the improved nurseries and then their total height has fixed at 30 cm. The set up of two improved nurseries has been accomplished the same day and their dimension has been 10 m x 1 m x 0.3 m.

(1) Dry-season Rice (paddy field: 0.75 ha, nursery: 500 m²)

About the cultivation techniques, as indicated in the component “Improvement of Rice Growing Techniques” in the rainy season, three advanced techniques were put into practice such as:

- The norm of sowing that is 1 kg of rice /10 m²;
- Line transplanting: 30 cm between lines and 25 cm between seedlings;
- Number of stems per bunch: 2 to 3

On the other hand, a good variety seeds were selected with "the salt method ", which generally practiced by Japanese farmers.

The rice varieties were chosen by the farmers and the extension officers as follows.

- RC4 (the improved variety of ADRAO Rokupr) : growing period: 120 days
- SIGUICODA (Koba) : growing period: 105 days

(2) Vegetable (0.25 ha)

In accordance with the market survey and the intention of the concerned farmers, taking into account the commercial potential, the vegetative cycle and the climatic conditions, the okra (gumbo), the lettuce, the cucumber and the local spinach were selected for a total surface area of 2.500 m² that is 625 m² per cultivation.

“Activity 3-2: The concerned farmers and the extension officers learn the methods of operation and maintenance of the irrigation facilities through training”

“First Training: 2005”

The training on the water management and the methods of operation and maintenance of the irrigation facilities was carried out for 4 days starting from 18th January 2006. The Rural Engineer has played the role as a lecturer. The first 2 days were assigned to the DNA officers in charge of irrigation and the extension officers and the last 2 days to the group members and the Maneah farmers. For each course, one day was assigned to the theoretical training and the other day to the practice in the field using the Sonfonia irrigation facilities.

Concerning the water management, it is applicable to other areas not only to the plain of Sonfonia, ant the research was carried out around the nearby areas. As a result, one farmers’ group with irrigation facilities was found in Manesh, the neighborhood of Conakry. Consequently the leaders of Maneah’s group were invited to Sonfonia to participate in the training on the water management and the maintenance of the irrigation facilities.



On Site Training

The manual for the facilities operation and maintenance was prepared prior to the training.

The trainees: 2 from the DNA, 8 extension officers, 4 members of the pilot group, 3 farmers of Maneah.

Contents of the training:

- Requirement for the water management and the maintenance of the irrigation facilities:
Difference between pluvial and irrigated rice-growing, limited source of water, irrigation facilities
- Water management:
Irrigation facilities necessary to the water management, critical points of the water management, water management in the plain of Sonfonia
- Maintenance of facilities:
Daily inspection, monthly inspection, temporary inspection before the dry-season farming

“Second Training: 2006”

It appeared that the maintenance of the dykes was not properly done during the absence of the team, and this caused the water losses by infiltration through the broken dykes. As a result, the water consumption increased 150% in reference to the designed quantity. According to the aforementioned, it was revealed that the trainees had problems of putting into practice what was taught to them during the first training.

Consequently, the second supplementary training on the water management was carried out taking into account the points which the trainees had not mastered sufficiently and were cleared listening to the opinions of the concerned persons.

The second training was carried out for 3 days starting from 26th July 2006, and the irrigation expert played the role of lecturer.

The trainees: 3 from the DNA, 4 diffusion officers, 5 extension officers, 5 executive members the Pilot Group

Contents of the training:

- First day: Theoretical training at the headquarters of Ratoma
Water control techniques, maintenance of farms, dykes and canals, quantity measurement of irrigation water
- Second day: Technical transfer to other farmers
Technical transfer to other farmers by the farmers who received the theoretical training on the first day
- Third day: Practical training on the farm
Practical training consists of the process of execution in the field concerning the construction of the dykes and canals, leveling, etc.

After the second training, the trainees who mastered the contents of the training increased from 39%

to about 100%. In addition, the appointment of responsible persons to each job after the set up of a committee for the group's water management was made.

However, even though it is difficult to say that they sufficiently understood the practice of the water management, it can be expected to get better results in the next dry-season rice farming.

“Activity 3-3: The concerned farmers carry out irrigated agriculture in collaboration with the extension officers”

The concerned farmers practice irrigated agriculture according to the cultivation plan defined with the help of the extension officers.

(1) Rice cultivation

- 13th December 2005: Field visit for the identification and measurements of the locations retained for nursery.
- 14th December: First plowing on the selected plot began at the same time as the works of the nursery.
- 16th December: Preparation of the nursery, 500 m² for the plot of 1 ha and nursery of 2 m x 5 m were prepared.
- 19th, 24th December: Seeds selection and the preparation of germination.
- 22nd, 29th December: Sowing on the nursery was made.
- 13th January 2006: Transplanting started.
- end of April 2006: Harvest started.

The transplanting started on 13th January after having known the difficulties of leveling of which the resolution represents the primary conditions in inundated rice-growing.

In the transplanting on 14th January, equipments (transplanting rope and leveling instrument) invented by a member of the farmers group on the advice of a DNA officer have been used ; the transplanting rope can allow transplanting along 3 lines at the same time.

The produce of the off-season rice was 873 kg in total. 40% of the produce was shared in equal parts between the members, 37% sold and 23% kept as seeds for the next farming. The money generated by the sale was deposited on the group's account.

The produce of 873 kg harvested gives an average yield of about 1.25 t/ha. This yield represents more than 80% of the average yield from freshwater rice-growing in the plain of Sonfonia which is 1.5 t/ha. It can be said that this yield is acceptable taking into account the fact that the irrigated rice-growing was the first experience for the farmers.

The group was able to prepare and start the rain-fed rice-growing immediately after the end of the dry-season rice growing. It can be said that the rain-fed rice-growing progresses without significant problems because the early rice has been harvested in mid-November. The program of rice-growing

using the irrigation facilities of the next dry season was elaborated and its preparation according to the program has already started.

(2) Vegetable growing

The field visit for the vegetable growing was made on 21st December 2005, and the sowing started on 29th December.

The harvest started in mid-January 2006 for the early variety. The yields from the vegetables are presented below:

Lettuce	963
Okra	122 kg
Spinach	497
Cucumber	36 kg
Eggplant	180

“Activity 3-4: The concerned farmers carry out maintenance of the facilities”

Concerning the irrigation facilities, the big problem faced was the decrease of the water-level in the Sonfonia Lake, and the difficulty to draw water up to the accumulation basin. To facilitate the drawing by siphoning, part of the basin’s wall has been removed.

To prepare the next dry-season rice, the farmers proceeded to the installation of a sand-filled weir at about 50 cm height on the outlet of the reservoir. This increases the water quantity retained in the reservoir about 50.000 m³ and this can help to avoid the lack of irrigation water, and the control of the siphoning will be easier due to the rise in water level.

“Activity 3-5: The concerned farmers monitor with the extension officers”

This activity has already carried out with the organization of the groups’ leaders meeting in the component "Training of the Farmers’ Group Leaders", and will continue.

5.5.2 Evaluation

(1) Results of the Project Evaluation

In accordance with the evaluations before and after the trainings, the monitoring by the expert and questionnaires to 9 farmers and 6 counter parts, the evaluation using the five criteria was executed.

Relevance

1) Governmental policy for agriculture

- This component is in line with the orientations of Guinea agricultural policy because the plains of Sonfonia offer great potentials for rice production increase. In addition, it puts forth the implementation of dry season irrigated rice cultivation with the objective to increase production and is pertinent with the policy aiming to reduce the importation of rice.
- There are areas where the irrigation installations would not operate well because of the lack of

knowledge in operation and maintenance and in water management even though irrigation had been introduced in such areas. The Ministry of Agriculture recognizes the importance of water management in irrigation and hopes that training in this field to the administrative personnel will continue in the framework of this Study. We have invited farmers of other areas to participate in the training, which is to be expanded and continued in the Master Plan.

2) Needs of the parties concerned and adequacy to the selection of the Study Area

- According to the questionnaires distributed before this evaluation, all the nine groups' members concerned, who responded to the questionnaires, expressed their happiness to work in the component and wished that it continued. In addition, they were glad to work inside a group in which the component was fairly well implemented.
- The concerned group included 10 men and 6 women with rice and vegetables cultivable areas initially of 1 ha and 0.25 ha, respectively. Following the selection of only farmers living close to the sites, the number was reduced to 6 men and 6 women, and the rice cultivable area dropped to 0.75 ha. There would not be any problems concerning the structure of the group members.

3) Equity

- The dry season rice harvest was undertaken from the end of April to mid may 2006 with a total production of 873 kg. 40% of it was equally distributed among members, 37% sold, and 23% kept as seeds for the next cropping seasons. The money generated from the sale was put in the group bank account. As a result, the benefit sharing was equitable.
- Concerning the equity for the expenditures related to the activities, one cannot say that there is equality because there are members who have not yet paid all of their contributions. However, each member has participated in the construction of the irrigation installations in line with the program. There were members that did not participate and finally resigned from the group. Up to date, 6 members out of the 12 have completely paid their contributions. For the ones that did pay, members have agreed during a group meeting and have decided that they will give part of their rice production in exchange. This took place at the last dry season harvest and represented 25% of the harvest.

Effectiveness

1) Achievement of the project purpose

- A production of 873 kg was harvested in the dry season, which corresponded to a yield of about 1.25 t/ha. This yield represents more than 80% of the average yield of rain-fed rice harvested in the plains of Sonfonia, which is 1.5 t/ha; one can say that the obtained yield was acceptable considering that irrigated rice cultivation is a first experience for farmers.
- The group could initiate the rainy season rice cultivation soon after the dry season one. One can say that rain-fed rice cultivation is progressing without great problems because the early maturing rice was harvested on mid-November. A future program of rice cultivation; using dry season irrigation facilities was elaborated, and the preparation according to this program has

already begun.

- Based on the questionnaires, all the group members that responded said they held some trust on the group activities. In addition, based on the activity reports of the administrative staffs, one can observe that the group has undertaken the necessary activities required for a new group such as holding meetings, preparing minutes of meetings and accounting books, and managing capital, etc. However, everything that was decided in the group was not always done as planned, which would necessitate some improvements at this point.
- Based on the above considerations, one can say that the specific objective «Farmers will be able to manage farming; using the small-scale irrigation facilities» was reached with the assistance of the administrative staffs. However, as regards the implementation of irrigated rice cultivation, one could find there was an insufficiency in the water management capacity, and some assistance would be needed to better fulfill the specific objective.
- The construction of the small-scale irrigation facilities was completed with the help of the irrigation expert, and the irrigated rice agriculture was commenced. Through the questionnaires distributed prior to this evaluation, the irrigation senior executives of DNA seem to have the confidence to implement alone such irrigation facilities. However, in accordance with the evaluation carried out after the water management trainings by the expert, 5 members out of 6 did not make the passing mark, and it seems to far to say they learnt the basis of the irrigation project concerned. Therefore, it will be indispensable to seek the assistance of DNGR for implementation of the agricultural infrastructures.

2) Conditions governing the achievement of the project purpose

- To reach the specific objective «Farmers will be able to manage farming; using the small-scale irrigation facilities», and the results «The irrigation senior executives of DNA will learn the basic methods of water management, planning, design and implementation of the small-scale irrigation facilities», and «The practice of irrigated rice agriculture will allow farmers and extension staffs alike to learn the methods of water management and maintenance of the facilities», the important assumption «The targeted farmers and extension staffs have adequate cultural techniques» must be satisfied. However, it was felt that the technical level of the extension staffs was not as sufficient as planned; making it necessary to strengthen the capacities of these staffs through training.

Efficiency

1) Achievement of the output

- The result «The irrigation senior executives of DNA will learn the basic methods of water management, planning, design and implementation of the small-scale irrigation facilities» is not yet reached; making the interventions of DNA and DNGR necessary for the realization of big scale developments.
- The target indicator of the following result «The construction of the irrigation facilities is completed» has been already reached.

- As regards «The practice of irrigated rice agriculture will allow farmers and extension staffs alike to learn the methods of water management and maintenance of the facilities», as mentioned above, the rice cultivation using the small-scale irrigation facilities is underway, but the problem of the lack of capacity on water management is not solved.

Concerning these water management problems, a good maintenance of the bunds was not carried out during the absence of the Study Team, and water was lost; infiltrating through the bunds. Based on these considerations, the water volume used was 150% of what was planned. As a result, a second supplementary training on water management was organized taking into consideration the opinions of the people concerned on points they did not sufficiently master in the first training.

Following the second training, 39% of the trainees said they have learnt the content of the training in the pre-evaluation, and almost 100% said they understood the content in the post evaluation. In addition, people in charge of each working position were elected after the establishment of a water management comity. Though it cannot be said that these people understand sufficiently the water management practices, one could expect better results in the next dry season rice growing.

2) Conditions governing the achievement of the output

- Concerning the important assumption «The DNA staffs have the minimal capacity to implement the project », there is currently no problem as it is true they have carried out a series of complicated tasks ; going from the planning to the construction of irrigation facilities, even though they were helped by the irrigation expert. Furthermore, the other important assumption «The concerned farmers will understand the components of the activities and will positively participate in them » was satisfied without problem as farmers positively participated in the facilities construction and are practicing rice growing; using these facilities.

3) Adequacy of the inputs

- The commitment of the staffs and the procurement of the materials were in line with the program and the set standards of quality and quantity. However, there were times when the activities were delayed due to a lack of implementing capacity of the irrigation project, as mentioned above.
- The construction and materials cost amounted to US\$ 16,600, and that of the personnel to US\$ 16,600, or a total of US\$ 32,200 for a 4 ha development. This cost is however adequate when compared to that of other projects executed in similar natural conditions. Furthermore, taking into consideration the natural conditions of the Study Area, there are no alternative facilities.
- One should wait 10 years for the incomes generated to equal the construction cost, but as the purpose of the facilities was to train farmers and the administrative personnel of other areas in water management and maintenance, the devoted cost was deemed adequate for the specific objective.
- Concerning the improved nurseries, the results were not as expected because of the flood.

However, most of the plants that resisted to the flood came from the improved nurseries; it was observed that these plants were stronger than the ones coming from the ordinary nurseries.

Impact

Negative and positive impacts were generated during the implementation process of this component and they were as follows:

- Members help one another in activities outside the component.
- It was learnt not only water management, but also human resources and financial management.
- The president of the group started vegetables production independently of the group activities to show an example and incite other groups members to undertake this activity which directly generate income increase. After about 2 months, 3 groups' members followed the example in consultation with the president. Hence, the exchange of information and knowledge in the group is being effective.
- There were members that were excluded and replaced due to repeated absences in the group works.

Sustainability

- The facilities are strong and well secured and will last long.
- The siphon system is very simple, cheaper, and materials are available in Guinea.
- The techniques are simple and can be mastered by the farmers, and the maintenance costs are minimal. It would be possible to continue them after the Study. Furthermore, according to the questionnaires related to the government assistance, all the 6 administrative staffs responded that even if there are restrictions, they would do their best to assist the government
- Concerning the improved nurseries, farmers who did the trials said they would continue the practice next year.
- Concerning the funding for the implementation of the Master Plan, the questionnaires showed that the 6 administrative staffs responded that even if it was impossible to get the government fund, the will is there to seek the assistance of donors such as the international organizations and NGOs.
- The farmers designed some devices to solve lack of water such as, they mounted soil bags in front of spillway to raise the water level in the reservoir.

(2) Verification of the hypotheses

Hypothesis1: The practice of irrigated agriculture will allow farmers and extension staffs to learn the methods of water management and maintenance of the installations through the use of irrigation infrastructure, which is going to sustain agriculture.

The average yield of 1.25 t/ha is acceptable considering that irrigated agriculture is a first experience for the farmers.

Furthermore, the group could start rain-fed rice growing soon after the dry season rice cropping.

One can say that the rainy season rice growing is underway without great problems as the early rice was harvested in mid-November. A program of rice cultivation; using dry season irrigation facilities was elaborated for the next growing season, and its preparation according to this program has already begun.

Based on the questionnaires, all the group members that responded said they held some trust on the group activities. In addition, based on the activity reports of the administrative staffs, one can observe that the group has undertaken the necessary activities required for a new group such as holding meetings, preparing minutes of meetings and accounting books, and managing capital, etc. However, everything that was decided in the group was not always done as planned, which would necessitate some improvements at this point.

Based on the above considerations, one can say that the specific objective « Farmers will be able to manage farming; using the small-scale irrigation facilities » was reached with the assistance of the administrative staffs. However, as regards the implementation of irrigated rice cultivation, one could find there was an insufficiency in the water management capacity, and some assistance would be needed to better fulfill the specific objective.

Hypothesis 2: The irrigation senior executives of DNA will learn the basic methods of water management, planning, design and implementation of the small-scale irrigation facilities, and the whole thing will be completed in practice under the supervision of the irrigation expert.

The construction of the small-scale irrigation facilities was completed with the collaboration of the irrigation expert, and the irrigated rice agriculture was commenced. Through the questionnaires distributed prior to this evaluation, the irrigation senior executives of DNA seem to have the confidence to implement alone such irrigation facilities. But in reality, the supervision of an expert would be necessary for a total mastering of all the aspects of these techniques. Furthermore, it is true that they have executed a series of complicated tasks; going from the planning to the construction of the irrigation facilities; such an experience will help in the implementation of the irrigation project in the Master Plan.

5.5.3 Analysis of Effectiveness and Results of the Project

(1) Effectiveness of the Project

Remarkable results of the group leader project are shown as follows.

- The Pilot Farmers group under the V/S could collect the yield of 1.25 t/ha of rice in the dry season with irrigation and 4 t/ha in the rainy season. The yields were reasonable and farmers may be able to get more yields in the next dry season, setting up a stable double cropping.
- In spite of the Pilot having some problem in planning the group activity, it has an aggressive leader with good leadership. High yields of rainy season mostly owe to his power. He also took a step to raise the water level in the reservoir preparing water for shortage in the dry season. The Pilot group will survive and go well with person like him.
- Irrigation facilities which were made in the V/S will be used not only for the cultivation of Pilot

farmers but also as a training plot for farmers from other area who have irrigation facilities with ineffective use.

- Paddy field with irrigation facility is almost ideal in Sonfonia lowland as it has no sea water intrusion and irrigation water during dry season. This field may be used for NERICA seeds production.

(2) Irrigation facilities

The big problem that was facing the project on irrigation facilities was related to the siphon. The siphon did not work well when water level of the reservoir went down. The reasons for this are 1) Materials that the siphon is made were not suitable. 2) The intake at water adjusting box was not suitable for the pipes. Therefore, since March 2006 the farmers had to use a pump to bring water to the fields.

The Team could not find a flexible and transparent pipe and could not help use the existing hard and opaque one. It is well known that in opaque pipe one can not check whether air enters into the pipe or not. As it was very hard to get a suitable pipe for siphoning in Guinea, the Team improved the intake structure of the water adjusting box.

The farmers designed some devices to improve the project. For instance, they mounted soil bags in front of spillway to raise the water level in the reservoir and they made the cultivation season earlier so as to be able to harvest in March.

(3) Water management

During the second field study, the Team carried out training on water and facility management for extension workers and farmers. The Team continued giving OJT in the fields; however, the Pilot farmers could not manage to maintain the ridges in the paddy fields after the Team returned to Japan. The ridges were broken and irrigation water flew uselessly. The farmers consumed about 1.5 times more water than the design requirement. Further training on water and facility management is necessary.

5.5.4 Feed-back of Lessons Learnt

Table 5.5.1 Feed-back of Lessons Learnt: 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 programme. • When the extension staffs/facilitators prepared the cropping calendar, they experienced difficulties as this 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-2-2)

of improved stoves, fish smoking by using ovens, the development of rice cropping plains and the mangrove forests, etc.

After making contact with the farmers who were making the salt extraction and the project management, the team decided to take inspiration from this experience.

(2) Execution Plan

It is in this way that, with the help of a recruited consultant, the activities of writing the texts related to the content of the sensitization themes on the preservation of the mangrove forest and the set up of the plan of execution have begun.

The different activities that have been retained:

- Sensitization on the preservation of the mangrove
- Dissemination of the texts of law and regulations preserving the mangrove
- Training on the techniques of wood cutting

The execution plan, in the first year must be the sensitization activities on the preservation of the mangrove and the dissemination of the texts of law in all the districts of the Study Area. In the second year begins the demonstration of the training on the techniques of wood cutting.

The targeted groups are the farmers, the farmers' groups, the woodcutters (lumberjacks), the salt makers, the fish smokers, the students, the women, the young, etc.

Documentation for the sensitization on the mangrove preservation

The documentation for the sensitization on the preservation of the mangrove was prepared, through targeting the inhabitants and making them understand the current situation of the environment, and make them identify problems and discuss the countermeasures available. The anticipated themes of the sensitization were divided into two parts and are indicated as below.

«First Part»

- The benefits of the mangrove
Fertile lands, basic aliments (for the fishes, shrimps), protection against the erosion, air purification
- The current situation
Excessive and anarchical cutting of fire wood, clearing of new lands the rice cultivation, salt cultivation, sand extraction, erosion due to the diminution of mangrove plant
- The consequences
Salinization of the lands leading to loss of soils fertility and the decrease in harvests, flooding of cultivable lands, decrease of fish families and others, coastal erosion

«Second Part»

- Necessity to protect the mangrove

Protect the rice plots, protect the halieutic resources (fish, shrimp etc.) and the birds, maintain a good micro-climate (purification and air softening), regularize the hydrologic system (sea arm included), create the conditions of a durable agricultural development.

- The proposed solutions

- 1) Give information on the dangers of the mangrove destruction
- 2) promote the active participation of villagers to the protection of the mangrove
- 3) promote the active participation of villagers to the reforestation
- 4) extend the new techniques of natural resources usage that have low wood consumption:
 - salt production using tarpaulin instead of the use of fire wood
 - fish smoking with charcoal furnace, the bole stoves etc.
 - food cooking with the improved stoves (metallic or clay made)
 - forbid the sand extraction on the beaches
- 5) large dissemination of the texts of law (forestry code, environment code, water code etc.)

[Activity 2]: Execution of the sensitization activities on the environment preservation

Activity	Anticipated effects	Program												Person in charge	Contributions				
		2005						2006											
		m	j	a	s	o	n	d	j	f	m	a	m			j	a	s	o
2-1 Seminars on sensitization activities in conformity with the execution plan are organized	Sensitized groups																	DNA	Guinea : DNA, DCDRE personnel, Extension officers, Farmers, Students etc. JICA : Team members, Environment expert locally contracted, Documents drafting material
2-2 Demonstrations in conformity with the execution plan are executed	Planted mangroves seedlings																	DCDRE	Guinea : DNA, DCDRE personnel, Extension officers JICA : Team members, Environment expert locally contracted, Materials
2-3 Concerned farmers and the extension officers carry out monitoring	Follow up																	Extension officers, Farmers' group leaders	Guinea : DNA, DCDRE personnel JICA : Support

* ☐ : programmed ■ : realized

“Activity 2-1: Seminars on sensitization activities in conformity with the execution plan are organized”

Owing to the support of an expert the documents on the sensitization and the preservation of the environment have been drafted for the seminar. After the amendment of this document by the two counterparts and the extension officers, the group in the component has proceeded to the demonstrations of the seminar in presence of some DCDRE officers. Then they proceeded to taking images to better illustrate the document, and started the seminar at the level of the concerned districts. In addition to the

farmers the local elected, the lumberjacks' groups, the salt cultivators' groups, the fish smokers' groups, the students, etc were also invited.

The seminars are held at the level of each district, the fixed day being Fridays. An official correspondence is sent in advance to the chiefs of each district to let them take all necessary dispositions for making available a seminar room for the component and mobilizing the population.

For the seminar on the dissemination of the texts on law and regulations of protecting the mangrove, the component has insisted the preparation to take into account the poor knowledge of the resident populations exploiting the plains of Sonfonia regarding the laws into force.

For this purpose, a DCDRE expert of Water and Forest, in charge of the forestry legislation to which it was explained the objective of the component and the content of our activities, has prepared a document related to the seminar. It has been presented to the counterpart and the extension officers of the component who in turn have asked questions that have been responded satisfactorily. The valuable critics and the amendments have been taken into account. Then, the essential has been put on Power Point and the final document has been translated in Soussou national language that is the language used to disseminate the seminars.



Seminar at Lambanyi

The seminars on the dissemination of some texts of law and regulations revolve around the following points:

- basis of the laws on the preservation of the mangrove
- national laws and regulations
- international treaties and conventions ratified by Guinea
- infractions and sanctions

The seminars on the dissemination of some texts of law will be held in all the districts of the Study Area. After the seminar, and in order to further facilitate the dissemination, the component will proceed to handing ten (10) copies of some questions on laws related to the protection of mangrove zone to the different chiefs of the districts who are in the Study Area.

Here it is presented the situation of the participants of four districts that were sensitized.

Table 5.6.1 Situation of Participants of Four Districts

Date	Location	Participant
June 10 th , 2005	Kobaya (the first)	65
July 8 th , 2005	Kobaya (the second)	59
July 29 th , 2005	Lambanyi (the first)	116
August 5 th , 2005	Lambanyi (the second)	52
November 25 th , 2005	Sonfonia (the first)	79
December 16 th , 2005	Sonfonia (the second)	94
December 23 rd , 2005	Lambanyi (the third: concerning the laws)	78
February 10 th , 2006	Yataya (the first)	84
February 24 th , 2006	Yataya (the second)	83
March 17 th , 2006	Sonfonia (the third: concerning the laws)	87
April 14 th , 2006	Kobaya (the third: concerning the laws)	87
May 26 th , 2006	Yataya (the third: concerning the laws)	102

Before and after each seminar, the extension officers conducted evaluation surveys at the level of each district. The survey consists of interviewing 100 persons on a number of questions to know the number of respondent on: how many are making agriculture as a main activity and how many among them have a secondary activity; how many have a knowledge of mangrove; how many use the wood for cooking and how many propose alternative solutions and what type of solutions. The survey results of are presented as follows:

Table 5.6.2 Survey Results Conducted at the Seminars (%)

Districts	Farmer	Secondary work		Necessity			Fuel	
		Salt	Other	Reforestation	Sensitization	Other	Mangrove	Charcoal
Kobaya (before)	100	18	19	50	43	7	64	36
Kobaya (after)	100	57	9	69	27	4	70	30
Lambanyi (before)	85	1	-	23	5	-	44	56
Lambanyi (after)	90	-	-	69	27	-	48	52
Sonfonia (before)	30	14	-	60	27	13	77	23
Sonfonia (after)	31	12	-	80	20	-	100	-
Yataya (before)	100	-	-	94	4	2	100	-
Yataya (after)	100	-	-	100	-	-	100	-

In the discussions during the seminar, the necessities of activities to extend the techniques of appropriate cutting of mangrove wood including the small scale reforestation and the new techniques to save firewood have shown up.

In addition, the Chief of Lambanyi district has forbidden the sand extraction that diminishes the

extent of the mangrove and the cultivation site about 87 ha just after the explanation has been given in the seminar on the diminution of the land.

“Activity 2-2: Demonstrations in conformity with the execution plan are executed”

“Sun-dried salt extraction: February - April 2006”

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. With this method the mangrove wood is saved whereas with the traditional method 44 kg of wood was required to extract 15 kg of salt a day.

Consequently, the component decided to tackle with this method to verify its effectiveness with some salt manufacturers and selected some salt extraction demonstration sites in February 2006. Demonstration sites shall fulfill some criteria so that the targeted objective is attained. Thus it is required:

- A well cleared and ventilated site with a certain extent
- A site enclosed with dikes and not submerged even at the time of high tide
- A site without shell, roots of trees and crabs which result ripped tarpaulin
- Site located at a popular alley to favor the dissemination of the technique

Two demonstration sites were selected in February 2006:

- Kanapeya: site located outside of the Study Area in Tayaki
- Sanfoui Dabon: located in the Study Area between Kobaya and Sonfonia

Two plots were selected form each site; and the sun-dried salt extraction demonstration was carried out on totally 4 plots with 4 families. Each family benefited from a material support (tarpaulin, buckets, spring balances, etc.) and started the demonstration. The quantities of salt extracted with this method are presented as follows:

Tableau 5.6.3 Quantities of Salt Extracted with the Sun-dried Method

N°	Name	Quantity of Salt Produced in kg / Month				Total (kg)
		February	March	April	May	
1	Kèouni Camara	1,996	2,744	3,160	672	8,572
2	Mohamed Sylla		1,621	2,614	660	4,895
3	Yamoussa Camara	-	2,129	2,640	672	5,441
4	Mamadouba Soumah	-	337	2,628	648	3,613
	Total	1,996	6,831	11,042	2,652	22,521

It was verified that the average production with the sun-dried salt extraction method was 80 kg a day without firewood consumption and was five times more than the traditional method. It is a low cost method, that does not require the use of firewood to boil the brine, and the producer is not exposed to the heat, and can quietly sleep in night time, He can deal with other activities during the salt extraction. In

addition this method produces purer salt and does include iodine and the color is white, Consequently, the manufacturer said that they would continue this method continuously.



Traditional method



Sun-dried extraction method

“Conducting the appropriate cutting of mangrove: July - August 2006”

It has always been recommended the necessity of the mangrove preservation in the seminars and the concrete counter-measures have been examined. The suggestion of conducting appropriate cutting of mangrove that has been discussed each time in the seminars organized during the second year of the study has proven efficient. Thus conducting appropriate mangrove cutting is programmed as the main activity in the third year of the study.

(1) Examination of Training Contents

To prepare the training on the good and permanent use of the mangrove, the component had made a visit to Dubreka in order to inquire on the experience acquired by the mangrove project. Consequently, it has been decided to abide by the following items;

- 1) Do not cut the main bole.
- 2) Let the branches that have mangrove grains, fruits, or flowers for the next year.
- 3) One must cut and use as firewood the branches that do no longer shoot in order that the mangrove stays healthy and the light could penetrate to its bottom after cutting.
- 4) One must consider the renewal of the mangrove by calculating the distance between the standing trees and those that are cut and recommend a cutting only in the garnished areas.
- 5) One must plant the mangrove propagules if the propagules are discovered during the mangrove cutting work from June to September.

(2) Small-scale Reforestation Trials

It is recommended to make a small scale reforestation after the mangrove cutting during the training on the appropriate cutting of mangrove. Consequently, two reforestation sites were chosen, where small scale trials have been made and have succeeded on June 10th, 2006. The Sonfonia site by the planting of

18 propagules of rhizophora and the site of Lambanyi by the planting of 11 propagules, the observation made after 20 days have revealed 16 propagules that have shot leaves, thus a success rate of 89% for Sonfonia and four that have shot new leaves, thus a success rate of 36 % in Lambanyi. The lessons drawn from these trials have permitted us to carry out the small scale reforestation during the training on mangrove cutting.

(3) Training on Appropriate Techniques on Firewood Cutting

In the framework of the environment preservation, a training seminar on the appropriate techniques of wood cutting destined to the lumberjacks of wood port of Sonfonia and Kaporo is prepared on June 27th and July 8th, 2006 in Sonfonia and Kaporo respectively. This seminar for the Sonfonia port has experienced the participation of 34 lumberjacks, and 43 lumberjacks from Kaporo port.

Surveys are made on 34 lumberjacks after and before the training in Sonfonia and 43 lumberjacks in Kaporo, and the survey after the training has been done more than 1 month after the training.

Table 5.6.4 Results of Surveys Before Trainings

Location	Number	Branches with flowers	Branches with propagules	Young trees	In the channel	The roots	Distance between the holes	fall direction of trunks	Nber of reforestations
Sonfonia	34	32	28	11	21	0	22	21	0
Kaporo	43	31	30	0	26	0	39	31	0
Total	77	63	58	11	47	0	61	52	0

77 lumberjacks never practiced reforestation and do not know that the reforestation is possible with human action, No reforestation trial even at small scale has been done in the area.

Table 5.6.5 Results of Surveys 2 Months after Trainings

Location	Number	Branches with flowers	Branches with propagules	Young trees	In the channel	The roots	Distance between the holes	fall direction of trunks	Nber of reforestations
Sonfonia	34	0	0	0	0	0	0	0	30
Kaporo	43	0	0	0	0	0	0	0	33
Total	77	0	0	0	0	0	0	0	63

After the trainings, 30 lumberjacks proceeded to reforestation actions on the wood cutting sites at Sonfonia and 33 lumberjacks make reforestation actions on the woodcutting site in Kaporo.

(4) Activities of Appropriate Cutting of Mangrove on Site

The seminar has been followed by the activities of appropriate cutting of mangrove on the sites of Sonfonia and Kobaya on July 4th and 5th 2006. The participants have been 10 persons in Sonfonia and 6 persons in Kobaya, In the activities of appropriate cutting of mangrove, the contents of the training have been explained practically on the sites. The participants have not been numerous due to narrow sites,

The small scale reforestation has been done for the variety rhizophora by planting some propagules. The propagules planted have been 85 in Sonfonia and 105 in Kobaya, In addition, the planting has been

done in Lambanyi by the extension officers and the planted propagules have been 40.

“Activity 2-3: Concerned farmers and the extension officers carry out monitoring”

The small scale reforestation has been done in the seminars on the appropriate techniques of mangrove wood cutting, The follow up of the reforested area is done periodically. The result of the census is indicated as follows;

Table 5.6.6 Result of Monitoring on Small-scale Reforestation

	Day transplanted	Seedlings	Remained seedlings			
			Confirmed day	Seedlings	month	
Sonfonia 1 (Trial)	10 th June 2006	18	9 th October 2006	11	4.0	61%
Lambanyi 1 (Trial)	10 th June 2006	11	27 th October 2006	4	4.5	36%
Sonfonia 2	4 th July 2006	85	27 th October 2006	59	3.5	69%
Kobaya	5 th July 2006	105	27 th October 2006	51	3.5	49%
Lambanyi 2	6 th July 2006	40	27 th October 2006	28	3.5	70%

5.6.2 Evaluation

(1) Results of the Project Evaluation

In accordance with the evaluations before and after the seminars, the monitoring on the small-scale reforestation and questionnaires to 3 counter parts, the evaluation using the five criteria was executed.

Relevance

- The component is in line with Guinea agricultural policy which aims to increase production and farmers income; preserving the natural resources.
- There were requests (19%) calling for the multiplication of these meetings during the workshops; 91% of the people want to participate in reforestation activities. These activities agree with the needs of the groups.
- Training on appropriate tree cutting techniques and on mangrove reforestation was requested by the lumberjacks.
- The applied method is participatory, and the transfer of techniques to the beneficiaries is simple. The method can be easily imitated and applied elsewhere.

Effectiveness

- The specific objective target indicator « The sensitizations of the populations of the four divisions are carried out» was reached. However, the other target indicator « The mangrove preservation activities by the populations are continuously carried out» could not be deemed reached because there was no confirmation yet, though the administrative staffs concerned have the intention to continually assist in the execution. As a result, it cannot be said that the specific objective «The environment preservation is advanced» is completely reached.
- 75% of the people responded that they are using mangrove trees as firewood in spite of the ban imposed by the government. We have seen that it is possible to reduce the mangrove cutting

through the introduction of new techniques of salt extraction. It would be necessary to change the mentalities through sensitization on the appropriate cutting of the mangrove, the extraction of salt using plastic canvas sheets, and through reforestation.

Efficiency

- The Guinean government has carried out sensitization seminar on environment conservation for more than a year.
- 4 family units received the training, the technical and material support of the component for salt extraction on crystallizers.
- 77 lumberjacks were trained in appropriate techniques on tree cutting and on reforestation and understood the necessity to preserve the mangrove forest.
- Hence, it can be said that the result « The sensitization on the mangrove preservation is carried out » and « The demonstration on the mangrove preservation is carried out » is already realized.
- Small-scale *Rhizophora* reforestation trials (on 4 sites) were undertaken. These gave encouraging results that can reassure the riparian populations that the mangrove reforestation is possible through the human action.
- The training was very effective because 800 people understood the necessity of nature conservation. The expenses were effectively utilized.
- The costs of this component consists of the sensitization seminars and the training on the appropriate techniques for firewood cutting were low.

Impact

The impacts generated in the process of this component are presented as follows.

- The restitution carried out by those present to those absent in the workshops.
- The Chief of Lambanyi district has forbidden the sand extraction that diminishes the extent of the mangrove and the cultivation site about 87 ha just after the explanation has been given in the seminar on the diminution of the land.
- The settlement in the area of family units involved in salt extraction has led to several local traditional producers to being interested in the activity.
- More than 80% of the lumberjacks who attended the training on appropriate cutting of firewood started to carry out reforestation after wood cutting which they had never considered important before attending the training.

Sustainability

It can be said that this component is sustainable based on the followings.

- The sensitization method is simple and easy to understand, and the information passes smoothly from a person to the next.
- The training method to the appropriate tree cutting and mangrove reforestation is participatory, and simple. The technology transfer to a group or to individual people is easy. The method can be easily imitated and applied elsewhere

- The extraction of salt with the crystallizers is very simple and can be transferred from a target group to the next. It can therefore be easily disseminated along the littoral.
- The sensitization techniques are very simple, and the costs related to the organization of the workshops are minimized.
- As regards the getting of the budgets to implement the Master Plan, the questionnaires showed that all 3 government officers answered that even without a government funding, the will is there to ask donors assistance such as international organizations and NGOs.

(2) Verification of the hypotheses

Hypothesis 1: The awareness of the inhabitants on environment conservation will be stimulated through the sensitization activities on conservation and mangrove reforestation.

The organization of sensitization workshops on environment conservation has made it possible for residents, users of the plain, and for the extension staffs to not only learn the sensitization methods, but also to understand the importance of the mangrove, the necessity to preserve it, and the consequences related to its degradation. This has resulted in a awareness and a big motivation of the populations to actively participate in the demonstration activities of the component in order to learn practical methods of mangrove tree cutting, the use of canvas sheet for salt production, ovens for fish smoking, improved stoves for cooking, etc. , which will make possible the sustainability of environment conservation in the area.

Hypothesis 2: The continuous sensitization activities on environ conservation by the concerned administration of DCDRE and SNPRV will contribute in reducing the cutting down of the mangrove.

The senior executives of DNA in charge of this component planned, prepared and executed activities of the component. They also improved the contents of these activities based on the real field conditions. They executed these activities 12 times in all the divisions. Furthermore, according to the questionnaires related to the government assistance, all the administrative staffs responded that even if there were restrictions, they would make efforts to carry out the component as much as possible. This would generate the possibility of the continuation of the component.

5.6.3 Analysis of Effectiveness and Results of Project

(1) Effectiveness of the Project

Remarkable results of the education on the conservation of environment are shown as follows.

- Public sense on the mangrove protection has become popular through the environmental protection education seminar.
- Small scale mangrove plantation which was carried out in the study of the suitable cut down method showed a good result. Therefore, this activity shall expand to other area.
- More than 80% of attendants in the suitable way of cut down study planted mangrove seeds after

they cut the existing plant.

- The improved salt making method showed a good result of 5 times more production than that of the old one without using any mangrove wood. Salt producing farmers said they would continue this method even in the next dry season.

(2) Training on Mangrove Cutting Method

Training on the mangrove cut down method even in a short period brought good results as mentioned above. In case the training is carried out near the residential area of attendants it is more useful as they can visit the site easily and the training cost may be smaller.

(3) Sense of Wood Merchants

Wood merchants are normally experts of mangrove. They have plenty of experience and knowledge on mangrove. They used to cut the plant without considering replanting; however, they soon understood the importance of reforestation after the training. As they were much impressed in the lecturer's key word that says "the mangrove forest is your bank!"; they would surely continue the plantation.

(4) Small-scale Reforestation

Attendants tried a test of planting mangrove seeds in the training of suitable cut down method. Twenty days after planting propagules (seeds), 89 % of the seeds were alive in Sonfonia. Hence, plantation of mangrove has been included in the training.

Then the training of the small scale planting mangrove was carried out. Average percent of survived propagules after four months were more than 50 %. Test period was only four months, therefore, we should not say it is useful, but must be checked continuously. At any rate, there is big possibility in the planting of mangrove.

(5) Extension of Improved Salt Manufacturing Method

The improved salt making method with vinyl sheet, which is popular in Dubreka, produced salt more than five times the traditional method. However, in Sonfonia it was not popular. The reasons and countermeasures are as follows.

- The NGO, Univer Sel, extended the method in Dubreka without any public relation works and without any relation to the governmental organization; therefore, there were no extension through the government. The government should take part in the extension of this method
- In Sonfonia farmers did not know how useful this method was but succeeded the traditional method. The merit of this method should have been publicized.
- The price of a vinyl sheet is almost as high as the income from five days works from traditional salt making method. There should be some countermeasures such as a donor gives initial cost of the sheet or gives some soft loan to the farmers for the easier extension.

5.6.4 Feed-back of Lessons Learnt

Table 5.6.7 Feed-back of Lessons Learnt: 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 result 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, then not only 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 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

This study aims to formulate a master plan for the agricultural development in Sonfonia lowland. The plan shows the actual direction of agricultural development that should be available and sustainable in the area. During a period of three years since 2004, the Study Team prepared a draft Master Plan (M/P), verified the plan in the Verification Study (V/S), fed back the results of the study to the draft M/P and finalized the M/P. The results of the study are mentioned below.

(1) 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.

As for the improvement of rice cultivation techniques, studies were carried out during two rainy seasons. It was found out that the improvement of techniques before transplanting influenced highly on the rice yields. These techniques include growing good nurseries, selecting suitable time for transplanting, keeping suitable distance of nurseries, etc. After the transplanting, farmers can not manage the water under natural condition. As a countermeasure against floods, the Team tried to mount a nursery bed 30 cm higher level than the paddy surface, which produced a good result. Other useful methods are; using weeding equipment, following a cultivation calendar, using a rope for regular transplanting, etc. all of which are the basic techniques for rice cultivation. Farmers shall continuously use these methods, since they receive the actual benefits.

This study provided a chance to the farmers and the extension officers to interchange opinions and information. This practice is quite important in order to improve the agricultural standard, and therefore it should be continued with governmental effort.

(2) Agricultural Mechanization

The contract work of mechanical cultivation by groups is a new cultivation system introduced to this area. The group members have learned the basic idea of group management through the actual management, which shall result in a continuous development of mechanization. The main subjects they learned in the study are 1) it is necessary to manage the work schedule elaborately as the works are influenced by climate, 2) the cost of works should be calculated considering risks, and 3) the works should not be concentrated into few operators. The present problem that may also be a problem in the future is the difficulty to find the spare-parts of the machines.

Not only the persons in the project site, but also the persons involved in tractor management outside the project area were fortunate to receive mechanical training in CEPERMAG.

The extension of the tractor service to the entire country is the most important subject of the Ministry of Agriculture. The verification study of mechanization provided a chance for DNA to prepare a

program to expand it to all over the country. The Ministry considered that the collateral money of KR2 was the most suitable financial source and presented a request of KR2 money to the Ministry of Cooperation.

The Team introduced some agricultural tools to the farmers and they could make these tools by themselves. Since the plow and hoe used in this area are mainly made of woods, it is very hard for the farmers to use them for a long time. Therefore, the Team made and introduced improved agricultural tools with the help of a blacksmith. If the farmers consider these tools as useful, they may use them continuously since the blacksmith has already the know-how of making such tools.

As for reducing rice grain loss after harvest, the Team proposed to thresh grains in the farmyard and to transport them in a bag or a wrapper. Furthermore, the Team together with the farmers invented a simple hand-operated thresher. All of these tools were devised by the Team and the farmers and therefore would continuously be used by the farmers of the area.

(3) Training for Group Leaders

The trainings for group leaders were carried out three times. The trainings were not fully satisfactory because there were some persons who did not have enough capacity as leaders or some who did not sufficiently understand the training subjects, and further trainings shall be necessary. It is important for future agricultural development to introduce a function of cooperative into the groups, and therefore, each group should mature at the level of mastering it. As for the groups of agricultural mechanization and of small scale irrigation, they have shown a comparatively good performance, with both activities undertaken in the verification study. By studying these experiences, the groups shall attain further development.

(4) Small-scale Irrigation

Irrigation technique includes broader areas such as irrigation planning, facilities construction, water management, group management, etc. It was comparatively difficult to introduce the techniques to the counterparts who did not have any experience in irrigation. However, they already received two years of experience in the verification study, and they shall extend them to the farmers. Further supports of the government shall also be necessary. The Minister of Agriculture frequently stressed the importance of water management and the counterparts also recognized its importance. Besides, they had an actual practice of water management in the verification study, and deepened the understanding of the techniques. The irrigation facilities constructed in the verification study is nearer to the capital city, which the Ministry of Agriculture can use easily as a water management training field.

The Team prepared this master plan aiming at projects that can be undertaken through the farmers' own efforts. Therefore, a large scale agricultural land preparation plan was prepared outside of the master plan. This plan shall be the final solution of the agricultural development problems in the area. However, judging from the Guinean government's ability, the time might be too early to commence such a plan, even though the Guinean government strongly requested its inclusion in the master plan. Therefore, the Team put it in the plan as an optional plan. Not only the government, but also the Team hopes that the

plan would be implemented, and DNA and the Team looked for donors to finance its implementation. Contacting of the possible donors should be continued even after the completion of the study.

Even though it is an optional plan, the Team carried out the needed survey. Especially, a map was prepared by the Team using GPS, which shows an erosion of sea coast and destruction of mangrove forests, and the map had a strong impact on the people in the Study Area. This map made the people of the Study Area realize the importance of environmental protection, which would make the protection of mangrove much easier. Furthermore, there have been some actions in that the chief of Lambanyi District newly prohibited the removing of coastal sands from the coastal areas.

(5) Environment Preservation and Sensitization

The environment preservation sensitization seminars were carried out three times in each of the four Districts, totaling 12 times. The participants of the seminars were not only the farmers, but also the salt and brick makers and even primary school children considering the future support in protection. Through the seminars, the participants realized the critical situation of destroying mangrove forests. In the seminars, they studied a better mangrove cutting down method, planting method, a new salt making method which did not need fire woods, etc. A salt making method using vinyl sheets had yielded a better result. Therefore, the Team included the planting method of mangrove in the seminars.

The Team practiced and understood that the replanting of mangroves could succeed in high percentage if they are replanted soon after the cutting down. However, it was difficult in the barren land. This replanting method shall be practiced in other mangrove areas.

(6) Strengthening of Counterpart Personnel Capacities

The counterparts have improved remarkably in techniques and administration management in these three years of the Study. They have experienced many training courses in the verification study including a course in Japan. They conducted project plans and implemented verification projects with the Team members. These actions made them get a sense of good administrator and teacher of farmers with a high responsibility. Many of the counterparts have a high level of education and stayed at the same level without further studies. However, having worked together with the Japanese study team, they understood that techniques acquired only through the papers were not real techniques. They also understood that the lack of trust of the farmers by some officers of the Ministry of Agriculture might be of no use. This study has made a larger and smoother link between the farmers and the government and has been useful to diminish the human poverty.

To cite an actual example, the Team, who visited the site to explain the draft final report after a half year absence from the end of the Verification Study, observed that the counterparts had voluntarily planned and started carrying out the demonstration program together with the extension officers using the part of the farm reserved for the small scale irrigation project in order to verify the validity of the results of the Study. The program is to carry out a series of activities from farm preparation to post-harvest treatment, making free use of their specialties and experiences acquired in the Study. They explained the program in the seminar held for the farmers concerned and asked them to visit the

demonstration farm anytime and ask questions on the farming techniques.

6.2 Recommendations

(1) Promotion of the Master Plan Projects

The Study Team conducted the M/P, verified most of the plan in the V/S and proposed 19 projects to be carried out. The project components include “Agricultural farming and crop improvement”, “Human resource training”, “Agricultural production infrastructure development/water management” and “Environment preservation”. These components contribute for the farmers to improve their technical level and to increase their income. However, they shall not add value on agricultural lands. Therefore, every farmer including landless persons can attain the benefit of these projects, if he has some motivation in these kinds of training activities. Most 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 government projects.

(2) Strengthening of Agricultural Extension

The agricultural extension service is carried out under SNPRV of the Ministry of Agriculture. Even if the project plan is good enough with good projects, it cannot be carried out without proper capacities of the implementation organization. The extension officers stand in between the administration and the farmers and have a role of a pipe connecting them. Especially, through this Study, the role of pipe has become even bigger. The farmers have become more familiar and rely on the administration, and this relationship should be strengthened further. Therefore, further strengthening of agricultural extension service is necessary.

(3) Acquisition of Financial Resources

The master plan includes many types of projects such as 1) projects to be carried out by farmers (cultivation techniques, post harvest techniques, improved salt industry, etc.), 2) projects to be carried out mainly by groups (vegetable cultivation in dry season, contract work in farmland, improvement of marketing system, small scale irrigation, etc.), 3) projects to be carried out mainly by communities (enlightenment of mangrove forest protection, etc.), 4) projects to be carried out mainly by the government (irrigation projects, education of mangrove cutting down method, etc.). The financial source of the government is necessary for the government projects. Finance is also needed for other projects, since extension officers may participate in most of the projects, and the government should obtain budget as much as possible. The financial sources should be basically from the government; however, it may be very difficult in the existing condition. The other sources shall be from international organizations, advanced countries and NGO. As many organizations are presently providing assistances to Guinea, the government should continuously contact with the donors. Counterpart funds of the Japanese KR2 shall be used in and around the projects assisted by the Japanese government, and therefore, this counterpart funds may be the best source for these projects.

(4) Preparation of Agricultural Statistics Data

According to the National Service of Agricultural Statistics (SNSA) of MAE, Conakry Special Region where the Study Area belongs to is not an agricultural district where agricultural statistical survey is carried out. Therefore, no agricultural statistical data has been collected for this area. Ratoma DCDRE, a local agency of MAE in Ratoma Commune, also does not collect data of agricultural production and farmland area. If there is no data on agriculture, agricultural policy based on the actual conditions of the area cannot be planned. As far as there is agriculture in Conakry Special Region, data on agriculture must be collected and agricultural statistics must be prepared without exclusion.

(5) Promotion and Extension of Techniques Developed in the Study

An extension system was proposed in the Mater Plan and many useful techniques were found in the verification Study as follows;

Program of rice cultivation techniques: improvement of nursery bed, production of good nursery, preparation of cultivation calendar, etc.

Program of agricultural mechanization: group management method, O/M method of agricultural machines, reducing method of harvest loss, simple hand-operated thresher, farming tools, etc.

Program of small scale irrigation: construction of small scale irrigation facilities, construction method of improved nurseries, water management, etc.

Program of sensitization of environment preservation: improved method of salt manufacture, and mangrove cutting down and planting method, etc.

These techniques and methods were verified and found to be useful in the V/S, and therefore, these shall be automatically expanded to other areas. The Team proposes the government to push these ideas more to accelerate the progress of the extension. Since all the counterparts understand these ideas, extension may be easier, if the government supports them.

As for the introduction of rice adapted varieties, good results could not be attained due to floods. Further study should be carried out by the government who should concern himself in the introduction of rice adapted varieties on his own initiative continuously.

(6) Practical Use of Manuals

The Team presented manuals on rice cultivation, water management, suitable cutting method of mangrove and improved salt making. These components were programmed in the Verification Study by OJT. These should be utilized by anybody related to the projects.

(7) Procurement of Spare parts of Agricultural Machines

A tractor service project has been verified in the Verification Study. It was realized that the difficulty of procuring spare parts was a bottleneck of the agricultural mechanization project. This difficulty became an obstacle not only for this project, but also for other agricultural mechanization projects including the President's project. Many important machines have been abandoned because of the lack of

spare parts. Although procurement of spare parts is basically a job of private companies, they are lagging behind in this service, and therefore, the Government should provide needed support to strengthen the system.

(8) 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 completely improve agricultural condition of this area. Even though the government strongly requested it, it would be very hard to carry it out soon due to the lack of fund. Therefore, the Team presented the said plan as an optional one, and if the government finds a donor, it will be possible to implement it. It is recommended that the government continues its search of donors for the implementation of the plan.