

8.6 Improvement of living conditions

(1) Basic orientation

As stated in Chapter 6 Basic Philosophy, it is necessary to make the Plan to Combat Desertification an overall agricultural development plan which creates a sustainable living environment for the inhabitants of the region. One aspect of this is the securing of a basic living environment. As the need to improve living conditions is common to the entire Study area, separate plans based on each individual zone have not been designed.

(2) Health and hygiene

The government has set an objective to improve the basic insurance (*premier santé*) coverage rate (rate of population having access to health and hygiene facilities within 5 km) from the current 32% (in 1996) up to 45% by the year 2002. The major basic health facility in villages is the village dispensary, but the unit installation cost amounts to FCFA 60 million, in addition to which doctors and public health nurses must also be assigned. The Plan does not include the construction of village dispensaries themselves. However, according to the findings of rural society studies, local populations have a strong desire for the provision and maintenance of health and medical facilities. Therefore, simple medical huts in lieu of farming village dispensaries are to be set up. Here, maternity facilities will be set up and maintained. In addition, such first-aid medicines as disinfectants, bandages, binding medicine, antibiotics, clinical thermometers will be provided with. Candidates for both midwives and caretakers of medicine will be chosen from among villagers. After being trained, they will engage in health consultation required by expectant mothers, the preparation of childbirth, consultation of child care, treatment at early stages of sickness and injuries. The number of villages to be considered for providing such facilities and services will be 120 within the entire department, the same villages covered by the agriculture, stock raising and sylviculture provision system plan. In addition, in order to enhance the awareness of villagers towards health, midwives will educate villages' women in health and sanitation.

(3) Potable water requirements

See "Section 8.2.2 Groundwater".

(4) Education

Education is the basis for all forms of development. The government is working to raise the enrolment rate for primary school from 29.5% (as of 1996) to 35% in 1999/2000. Table 8.6.1 shows targets for primary school construction, with an objective of 50% to be achieved by the year 2014. The number of villages targeted by this plan is the same as the number targeted by the 8.5 Agricultural Support System Provision System: 120 in total. Because the total number of

villages is 1,307, the percentage of villages targeted is 9%. At present, the school enrolment rate for girls is much lower than that of boys. However, since the education of girls is essential to regional development, particular emphasis will be placed on raising the school enrolment rate for girls while seeking to the increase in the school enrolment rate overall.

Table 8.6.1 Current status and target number of classrooms in primary schools

District	Filingué	Kollo	Ouallam	Say	Téra	Tillabéri	Dep.
Current No. of rooms	404	461	227	215	352	351	2,010
Target	1,694	1,183	1,015	1,186	1,451	886	7,415
Difference (Plan)	1,290	722	788	971	1,099	535	5,405
Number covered in Master Plan	116	65	71	87	99	48	486

Note: School population will double in 2015 from the current figure (1997).

See Table 4.7.3 for school enrolment rate, and current number of classrooms in 1997.

Taking into account limitations in the number of teachers and future budget allocations, an assistant teachers system will be proposed, in addition to the adoption of multi-grade classes (when one teacher teaches two or more different grade students in the same classroom) in rural areas and double-shift teaching (when school is held for two separate sessions – one in the morning and the other in the afternoon) being applied in urban areas. Further, it is necessary to promote adoption of volunteer teachers.

In addition, school farms of about 0.01 ha in size each will be established where basic techniques regarding vegetable cultivation will be taught (including the provision of one new well). The importance of forest conservation will also be taught by implementing afforestation around the boundaries of school premises.

(5) Dissemination of information and enlightenment

At present, most villages have no electricity, so central and local governments have difficulty in communicating information or instructions to villages. In order to facilitate the dissemination of governmental information or providing education in French, the official language, a television set which works using solar power will be provided and the terrior management committee shall manage and maintain them.

(6) Expected results

Improvement in the fields of health, hygiene, potable water, education, as well as the dissemination of information and enlightenment will result in the development of human resources in the region. In other words, improvement in social capability for sustainability and self-dependent development of project implementation can be expected.

8.7 Protection of the environment

(1) National forests

1) Basic orientation

National Forests, which include Forest Preserves and Protected Forests, are environmental preservation forestlands that are to be preserved in perpetuity.

Promotion of National Forest management to achieve this goal is centered on regional residents and communities directly effected by the destruction of forests and the deterioration of agricultural productivity and the living environment.

2) National Forest Protection and Sustained Utilization

The growth in the regional population continues to push up demand for firewood. It is, therefore, necessary to use woodland resources in National Forests as a source of firewood. Communities can now obtain a monopoly on the sale of firewood by signing an agreement with the authorities to carry out sustainable management of a nearby National Forest including transplanting trees (Ordinance on Village-based Firewood Markets, Law No. 92-037 (August 1992)).

Under this plan, National Forests will be protected and regional resources used effectively thanks to the provision of an environment permitting communities to use this system to perform the sustained management of the National Forests with income serving as an incentive for this activity.

To realize this goal, public information activities will be implemented to teach the local people the benefits of sustained forest management. A system of establishing hierarchies of firewood markets will be provided to strengthen control by the administrative authorities.

3) Expected results

- ① It will be possible to maintain and manage National Forests continuously in order to contribute to the creation of pleasanter regional environments.
- ② A stable supply of the region's key energy source, firewood, will be guaranteed.
- ③ The National Forests will provide the local people with a source of income.

(2) Soil conservation

1) Basic orientation

The target area of soil conservation is the land which is not directly managed by the inhabitants, unlike agricultural land. It is difficult for local inhabitants to take measures on a daily basis. Soil degradation has an important impact on resources, such as water and grass that are used by the inhabitants. Thus, soil conservation measures are implemented as planned public works by administrative authorities, considering their public nature.

2) Soil conservation measures

(a) Restoration of grasslands and woodlands in areas of gradated land

Grassland and woodland restoration measures will be taken upstream of the koris. The creation of vegetation zones will allow the improvement of water holding capacity of soil and reduction of soil erosion, it will also reduce damage, such as flooding in the downstream river basin and the accumulation of sand. At the same time, these measures will allow the increase of grass and forest resources.

The affected area includes 584,500 ha of protected area as shown in Table 8.1.1. There is also a plan to take measures for the 50% of the area to contribute to the revitalization and increase in production of grassland and forest resources.

① Restoration of woodlands

The area to be planted tree in the Study area, as prescribed by the Engagement of Maradi, are about 6,800 ha per year. This area will be adopted in this plan, and the plants that are produced in the district level central tree nurseries and village mini-nurseries will be planted there on the national tree day, etc., with the participation of local inhabitants, who will then manage them. Total planting during the lifetime of the project (15 years) will cover about 102,000 ha (see Annexe 8.7.1 – 3).

② Restoration of grasslands

The restoration of grasslands in the Study area will be done through simple and very low-cost "water harvesting", in order to improve the water holding capacity of the soil. Water harvesting consists of the plowing of sloped land surfaces in the area concerned (see Annexe 8.7.4). The area to be restored during the lifetime of the project (15 years) will total about 190,000 ha, the area of the land remaining after subtracting the 102,000 ha. of woodlands to be restored from 50% of the protected area.

(b) Preventing damage to agricultural land and grasslands

In addition to the measures described in the preceding paragraphs, small dams, dikes, reservoirs, and the like will also be constructed on koris where disasters easily occur. This will help to prevent damage on agricultural land and grasslands caused by floods and erosion.

(c) Taking into account the desires of the inhabitants with regard to implementation

As various public work projects are implemented at national, department and district levels, the opinions of the local inhabitants concerned should be reflected in the implementation of each project, through the respective terroir management committees.

3) Expected results

- ① Grasslands and woodlands where restoration measures are taken can directly serve to restrict the advance of desertification
- ② The measures can be expected to contribute to increases in forest and grass resources.
- ③ Reductions in the amount of damage caused downstream of the koris by floods and sand accumulation can also be realized.

8.8 General design of major facilities

Although the general designs for major facilities will be based on those existing in Niger, particular consideration will be given to the actual results of execution based on the verification Study by JALDA. In addition, local equipment and materials will be used in priority, and facilities will be established using labor intensive work. Table 8.8.1 shows the major facilities included in the Master Plan by sector and their various components (see Annexe 8.8.1 for a chart of the general design).

Table 8.8.1 Major facilities by area and specifications

Area	Major facilities	Specifications	Remarks
1. Agriculture, stock raising, and silviculture improvement plan			
1) Agriculture			
	(1) Agricultural land conservation		Figure A8.8.1
	① Stone ridges		
	② Zai		
	③ Simple eyebrow ridges		
	(2) Agricultural roads, koris crossing works	Simple lateritic pavement, width 4.0 m	Figure A8.8.2
	(3) Large-scale irrigation facilities -1	Canal ground plan, canal cross section plan, canal vertical plan	Figure A8.8.3
	(4) Large-scale irrigation facilities -2	Pump structure plans	Figure A8.8.4
	(5) Small-scale irrigation facilities		Figure A8.8.5
	① Field development		
	② Pumps		
	③ Storage reservoirs	Concrete block construction	
	(6) Dyabou village bridge dam #1	Cross section plan of river bed	Figure A8.8.6
	(7) Dyabou village bridge dam #2	Cross section plan of bridge dam	Figure A8.8.7
	(8) Dyabou village bridge dam #3	Ground plan of bridge dam	Figure A8.8.8
2) Stock raising	(1) Livestock improvement center		Figure A8.8.9
	① Offices	Flat type building with concrete block, 330 m ²	
3) Community forests	(1) Nurseries		Figure A8.8.10
	① Central nursery	Disposition plan of each facility	
	② Village-based mini nurseries	Disposition plan of each facility	
2. Agriculture, stock raising, and silviculture support system provision			
1) Agriculture, stock raising, and silviculture support			
	(1) Offices and training centers	Flat type building with concrete block, 500 m ²	Figure A8.8.11
	(2) Cereal banks, mills	Flat type building with concrete block, 72 m ²	Figure A8.8.12
3. Living environment improvement plan			
1) Living environment improvement plan			
	(1) Wells	OFEDS type, JALDA type	Figure A8.8.13
	(2) Simple health huts	Flat type building with concrete block, 45 m ²	Figure A8.8.14
	(3) Classrooms	Flat type building with concrete block, 85 m ²	Figure A8.8.15

8.9 Initial environmental impact assessment

As the government has not established environmental guidelines applicable to the projects implemented in the country, the assessment was made based on the guidelines of JICA (see Annexe 8.9.1).

The development activities that are covered by this assessment are restricted to the development activities that are likely to have direct influence on natural resources, such as activities that may trigger desertification progress, soil degradation, pollution, the drying up of groundwater, and the like.

(1) Major development activities and their impact assessment

1) Major development activities and their scope

Major development activities	Form	Project scope	Components	Remarks
a. Field development	New	1 ha/site 2,000 sites	Land reclamation, pumps, water tanks, distribution pipes	
b. Development/ rehabilitation of grasslands	New Rehabilitated	1000 ha/site x 1 site 130 ha/site x 1 site	Plowing, harrowing, fertilization, seeding	No cutting and banking of the land
c. Construction of small dams (bridge dam)/ ponds/ koris crossing works	New " "	44 sites 4 sites 240 sites	Within water depth of 10 m or less	For irrigation " "
d. Rehabilitation of ponds	Rehabilitation	57 sites	Excavation, bank raising, reinforcement with gabion	For animal water supply
e. Agricultural road development	Rehabilitation	65 km	lateritic revetment	
f. Construction/ rehabilitation of wells	New " Renovation New Rehabilitation "	34 units 422 units 120 units 8 units 9 units 45 units	Deep wells (M-AEP) Deep wells (PEM) Wells Shallow wells Deep wells Wells	For drinking water use " For miscellaneous use For animal water supply " "
g. Agricultural land conservation measures	New	898,260 ha 208,455 ha 1,122,870 ha 758,955 ha	Stone ridges Contour plantation of Andropogons Zai Simple eyebrow ridge construction	
h. Soil conservation measures	New	190,475 ha	Plowing	

2) Impact assessment

An assessment is made of whether or not any of the above-mentioned development activities will have a negative impact on the natural or social environment (the following items a. to h. correspond to the indications provided in the above table).

(a) Field development

This item consists of small-scale development of around 1 ha per site which will be used only when the water level is reduced at the end rainy season and during the dry season. This was judged not to have any important impact on the environment.

(b) Development/rehabilitation of grasslands

This item is not related to the topographical modification. Plowing and harrowing promote infiltration, reduce soil erosion and increase water holding capacity profitable to vegetation. Fertilization and seeding accelerate plant growth. None of these elements have any negative impact on the environment, even though the area concerned is large.

(c) Construction of small dams (including bridge dams)/ponds/koris crossings works

(d) Rehabilitation of ponds

Waste surface water flowing during the rainy season is stored, or pond storage capacity during the rainy season is increased, thereby allowing waste water to be used in an effective way as a water resource during the dry season. With respect to the extension of water storage period at locations where surface water is concentrated during the rainy season, these activities are not considered as having a negative impact on the environment.

(e) Agricultural road development

This item will deal with the improvement of existing roads (non-paved), the extension of which is limited, and is not judged to have a negative impact on the environment

(f) Construction/rehabilitation of wells

As these are punctual facilities constructed in the required sites, even though these facilities are established on large areas, they will not have a negative impact on the environment

(g) Agricultural land conservation measures and

(h) Soil conservation measures

These items promote water infiltration in the ground, reduce erosion and increase water holding capacity profitable to vegetation. As these are measures for combating desertification aimed at preventing soil erosion and the restoration of vegetation, they will not have a negative impact on the environment even though these measures are implemented over a large area.

The above assessment shows that the development activities comprising the Master Plan are not considered to have a negative impact on the environment and thus, that a more in depth assessment at the next level is not necessary.

8.10 Components of the Master Plan

Please see Figure 8.10.1 for the relationship between the target zones and each area of the Master Plan outlined in 8.1 to 8.9.

Table 8.10.1 Components of Master Plan

(1) Improvement plan for agriculture, stock raising and silviculture			
1) Agriculture	Zone 1	Zone 2	Zone 3
(1) Major cereal ameliorated seed center	0		
1 Improvement of the seed center	0	0	0
2 Ameliorated seed trust	0	0	0
3 Seed distribution	0	0	0
(2) Conservation of agricultural land			
(3) Improvement of agricultural roads	0	0	0
1 Agricultural roads	0	0	0
2 Kori crossing works	0	0	
(4) Restoration of large-scale irrigation facilities			
(5) Restoration of small-scale irrigation facilities	0	0	0
1 Field development (surface water, ground water)	0	0	0
2 Small dam construction	0	0	0
3 Pond restoration			
(6) Improvement of distribution of agricultural products	0 (NIAMEY)	0	
1 Marketplace management system		0	0
2 Model project for improving of collecting shipping	0		
(7) Improvement of land commission		0	0
1 Cadaster elaboration	0		
2) Stock raising	Zone 1	Zone 2	Zone 3
(1) Improvement of livestock			0
1 Livestock improvement center	0	0	0
2 Introduction superior stock			
(2) Improvement of fodder production infrastructure			
1 Grassland development	0	0	0
2 Grassland rehabilitation	0		
3 Livestock nutritional brick production facilities	0	0	0
(3) Improvement of water supply facilities for livestock	0	0	0
(4) Improvement of animal hygiene			
1 Model dairy farm	0	0	0
2 Bee keepers	0	0	0
(5) Improvement of livestock management facilities			
1 Improvement of model dairy farm	0	0	0
2 Improvement of bee keeping farmer	0		
(6) Improvement of livestock product distribution			
1 Fresh milk collection/shipping facilities	0	0	
2 Dry cheese production facilities	0	0	0
3 Yogurt production facilities	0	0	
3) Community forest	Zone 1	Zone 2	Zone 3
(1) Seedling production			
1 Restoration of central nursery	0	0	0
2 Mini-nursery	0	0	0
3 Community forest	0	0	0

(2) Improvement plan for agriculture, stock raising and silviculture support system			
	Zone 1	Zone 2	Zone 3
(1) Agriculture, stock raising and silviculture support (organizational/technical support, etc.)		0	
1 Operation of agriculture, stock raising and silviculture support team facilities	0	0	0
2 Improvement of agriculture, stock raising and silviculture support team facilities	0	0	0
3 Establishment of research system	0	0	0
(2) Agriculture, stock raising and silviculture support system	0	0	0
1 Cereal bank	0	0	0
2 Mill	0	0	0
3 Small-scale credit scheme	0	0	0
4 Agricultural management scheme			
5 Equipment and materials bank			
(3) Living environment improvement plan			
	Zone 1	Zone 2	Zone 3
(1) Improvement of potable water supply facilities			
1 Small-scale water supply system	0	0	0
2 Modern wells	0	0	0
3 Construction of new wells	0	0	0
4 Restoration of wells	0	0	0
(2) Information diffusion/education facilities	0	0	0
(3) Improvement of health/hygiene			
1 Simple health hut	0	0	0
(4) Improvement of education			
1 Classrooms	0	0	0
2 School farms	0	0	0
(4) Environment conservation plan			
	Zone 1	Zone 2	Zone 3
(1) Conservation of soil			
1 Restoration of grassland	0	0	0
2 Afforestation	0	0	0

Priority projects

Chapter 9 Priority Projects

9.1 Selection principles and results

In order for desertification combat activities to have any effect at all in the Study area, it is desirable to simultaneously carry out all of the projects outlined in the Master Plan. However, it must be recognized that due to limited financial and personnel resources, this will be difficult for the GON to carry out.

Most of the priority projects are those in the Master Plan which are the most important, urgent and which will have the highest effective benefits. Projects will be implemented in order of priority.

The priority projects in this Master Plan were selected from the points of view of the transfer from exploitative agriculture to sustainable agriculture and maintenance of the basic living environment of the inhabitants. They are the "Survey Area Assistance Project" and the "Model Pilot Project".

The former improves agricultural productivity through securing the participation of inhabitants in work and changing the consciousness of farmers and it provides aid to the entire survey area. The latter selects a total of 3 villages, one to represent each zone, and makes them into "Model Villages for the Combat of Desertification" which serve as a demonstration to surrounding villages. These two projects work in tandem and must be completed together in order to achieve the goals of the Master Plan. They were begun, during the first portion of the work implementation period (the first 5 years).

See Figure 9.1.1 for an outline of priority projects.

9.1.1 Study Area Assistance Project

In order to promote the transfer from exploitative agriculture to sustainable agriculture, it is necessary for the local inhabitants to recognize the problems associated with exploitative agriculture and pursue sustainable agricultural practices. For this reason, it is planned to carry out the agricultural aid strengthening project in order to educate the local inhabitants and improve technological transfer, the major crop ameliorated seed project which has as its purpose the provision to local inhabitants of necessary materials to carry out sustainable agricultural practices (ameliorated seeds, breeding bulls, and saplings), the stock improvement project and the sapling production project in the study area. Table 9.1.1.1 shows the makeup of the aid projects of the study area and their relationship to each other.

Figure 9.1.1 Outline of priority projects

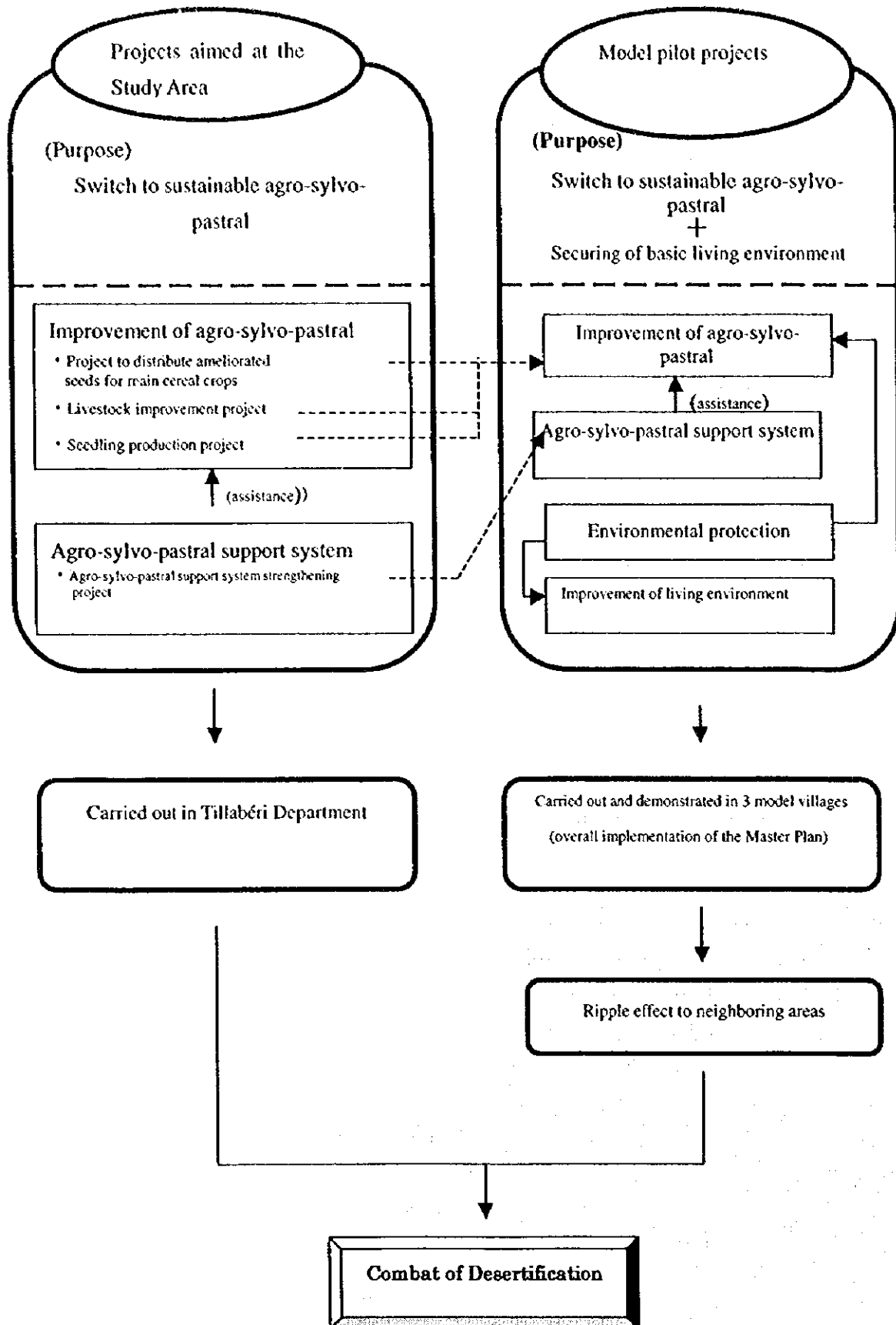
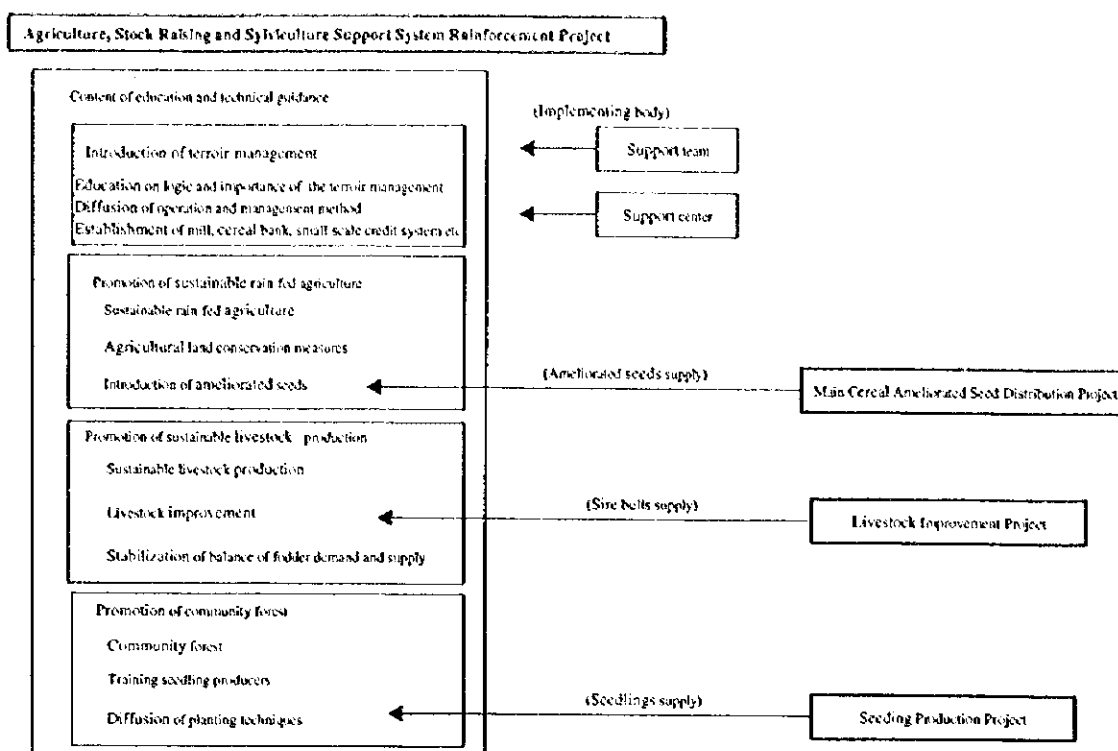


Figure 9.1.1.1 Overview of the Study Area Support Project



9.1.2 Model Pilot Project

9.1.2.1 Model pilot project selection process

Based on natural and social factors in the survey area, 3 were selected to represent the respective zones. These three villages were selected from the 6 villages which were selected to represent each of the 6 departments in Tillabéri (see Annex 9.1.2.1). To narrow these six down to three villages, the following 6 selection criteria were set for evaluation. (Table 9.1.2.1).

- ① They have greater potential for development.
- ② The selected villages are located close to trunk roads and have strong demonstration effects.
- ③ The villagers are well-disposed towards project implementation.
- ④ Desertification control measures are more urgently required.
- ⑤ The leaders of Districts, Sub-Districts, and villages are well-disposed towards project implementation.
- ⑥ Basic infrastructure such as wells, schools, markets, medical facilities, roads, etc. are underdeveloped.

On the basis of these six criteria, the Study Team leader and eight other team members evaluated the villages by giving 3 points for "Best", 2 for "Good", 1 for "Average", and 0 for "Poor" (points reversed in the case of ⑥).

Table 9.1.2.1 Results of evaluation of the 6 villages

Zone	Category		Evaluation						Total
	District	Village	①	②	③	④	⑤	⑥	
1	Say	Dyabou	20	22	15	22	22	15	116
	Kollo	Mala	16	20	13	19	15	22	105
2	Tillabéri	Ziban	25	15	11	20	24	21	116
	Téra	Kourégou	25	18	13	22	23	22	123
3	Ouallam	Mangaizé	24	16	16	22	21	20	119
	Filingué	Tidani	25	17	19	24	21	22	128

Note: ①-⑥ in the Table refer to the selection criteria outlined above.

The villages selected for the model pilot project based on these results are as follows.

- (1) Zone 1 (agricultural zone): Dyabou village (metropolitan suburb agriculture promotion zone)
- (2) Zone 2 (agricultural and stock raising zone): Kourégou village (western region agriculture, stock raising, and sylviculture promotion zone)
- (3) Zone 3 (stock raising zone): Tidani village (northern region stock raising promotion zone)

9.2 Study area support project

9.2.1 Agriculture, stock raising, and sylviculture support project

(1) Objective

To encourage the replacement of plundering type agriculture, stock raising, and sylviculture with sustainable agriculture, stock raising, and sylviculture, it is important to make the people of the region aware of their own plundering agriculture, stock raising, and sylviculture as a problem so they will try to practice sustainable agriculture, stock raising, and sylviculture. To do this, they will be taught the concept of and the importance of terroir management at the same time as they are assisted through the establishment of agriculture, stock raising, and sylviculture support systems to be used for ongoing promotion of management and operating methods, training of farmers, and the provision of guidance in agricultural technology.

(2) Contents

- 1) A team for supporting agriculture, stock raising and forestry, consisting of NGO experts in the field of agriculture, stock raising, and sylviculture, will be set up in cooperation not only with experimental and research institutes and extension agencies but also with GTZ and other international aid agencies in order to support local farmers (see 8.5 Maintenance of the Agricultural support system).

Under this project, the Support team will implement programs in villages such as installation of a mill and establishment of a cereal bank, a small-scale credit system, an

agricultural management credit system and an equipment and materials bank, and will also provide support and guidance for the terroir management committee that is in charge of operation and management of these. It will also carry out follow-up activities for the model pilot project and the Study area support project. Due to the ripple effect of this work, the number of villages targeted by this project is 40, 5% of the 804 total villages as per the guidelines of PRSAA.

2) Agriculture, stock raising, and silviculture support centers, (herein-after referred to as the "Support center") which will serve as the bases for supporting agriculture, stock raising, and silviculture, will be established in six districts of the Department of Tillabéri.

Extension staff specialized in agriculture, stock raising, and silviculture will be assigned to the Support centers. In addition to establishing liaison and carrying out coordination work with the terroir management committee, they will select villages where this project will be implemented and organize educational training and Study tours for members of the terroir management committee in cooperation with the Support team.

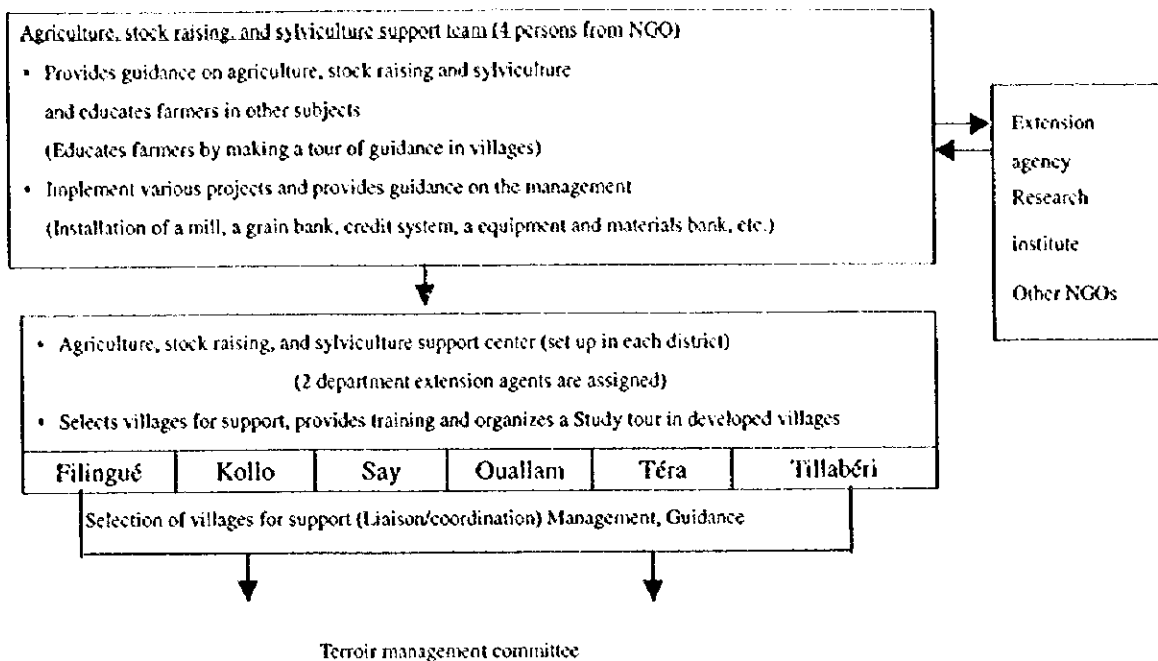
Table 9.2.1.1 Improvement plan

Item	Structure/ Specification	Quantity	Unit	Remarks
(1) Agriculture, stock raising, and sylviculture support team				Organized by NGO
Personnel expenses				
Experts	Senior expert	1	Person	
	Junior experts	3	Person	
Clerks		1	Person	
Operating cost				
Office expense		1	Set	
Repair cost		1	Set	
Fuel cost		1	Set	
Equipment cost				
Jeep	4WD	1	Unit	
(2) Agriculture, stock raising, and sylviculture support center				
Personnel expenses				One center per district (total 6 centers)
Clerks		6	Person	
Operating cost				
Office expense		1	Set	
Travelling expense		1	Set	
Equipment cost				
Office that also serves as lodging	CB one-story building, 500m ²	6	Buildings	One office per center
Motorcycle	125cc	12	Units	Two motorcycles per center
(3) Training system				
Audiovisual equipment		12	Set	Two sets per district
(4) Agriculture support system				
① Mill		40	Units	
② Cereal bank				
Millet depot also serves as office	CB one-story building, 100m ²	40	Places	
Millet		25	Tons/place	
③ Small-scale Credit system		40	Places	
④ Agricultural management credit system		40	Places	
⑤ Equipment and materials bank		40	Places	

(3) Project implementation system

The implementation will be overseen by the Agriculture, Stock Raising, and Sylviculture Support Team at the Project Office. The team members will be experts in agriculture, stock raising, and sylviculture dispatched by NGO. Considering the territory involved (40 villages), and the research, promotional staff training, and other work that the team will perform, the team will include four members: two agriculturists, 1 expert in stock raising, and 1 sylviculture expert. Considering the quantity of work that will be required to support the terroir, and provide technological guidance at each Support Center, two promotion personnel will be assigned to each Center (at peak times, in charge of 3 or 4 villages).

Figure 9.2.1.1 Simulation chart showing the project implementation system



(4) Notes on project implementation

This project covers the entire Department of Tillabéri and will be implemented in 40 villages located mainly in the three Districts, including the villages of Dyabou (Say), Kouregou (Tera) and Tidani (Filingué). When the project is implemented, extension agents of each district will be assigned to the Support center with cooperation of the Directorate of Agriculture of the government and the Agricultural Bureau of each district. Supports will be provided to the village community and the terroir management committee as part of extension activity of each district. When the Support team performs its functions, it is necessary to fully establish liaison and secure coordination with research institutes and extension agencies such as INRAN and to clearly define the extension goal for farmers before providing guidance and education.

Extension agents of each district will be permanently assigned to the Support center and should try to keep close contact with the terroir management committee and provide guidance to the committee. Additionally, they are required to carry out such activities as selecting target villages and trainees each year and elaborating the training programs in close cooperation with the agriculture, stock raising, and sylviculture supporting team. Expenses needed for such activities of extension agents, such as expenses for a means of transportation and travelling expenses, will be included in this project.

(5) Cost

Direct project cost (26,480,000,000FCFA)

(6) Implementation period

Various projects under to the agriculture, stock raising, and sylviculture support project will be implemented in 40 villages over the period of approximately ten years from the start of the work (these projects will be implemented in the three villages selected for the model pilot project). Guidance will be provided on the operation of the terroir management committee and supports will be provided for farmers to improve their production technology over a 15-year period from the first year.

(7) Effects of project implementation

Many complicated factors were involved in the past support projects of aid-providing countries, such as inexperience in management, lack of problem awareness and low education level on the part of farmers as well as inconsistent government policies on rural development. As a result, these projects failed to produce sustained effects. Therefore, it is expected that by implementing this project cross-sectionally and comprehensively from the standpoint of inhabitants and farmers with cooperation from local research institutes and extension agencies, these installations and systems will be effectively used, leading to improvement in sustainable productivity and increase in income, and the effects will be spread to areas in the neighborhood of the villages where the project is implemented.

9.2.2 Distribution of major cereal ameliorated seeds

(1) Objective

Most of the present seeds of millet and sorghum, major cereals of the Republic of Niger, are native. Because of this, seed purity has dropped, and FAO production report indicates their unit yields of approximately 50% of Africa's average. This project aims at widely distributing ameliorated seeds to increase production and improve quality. (According to the GTZ report, it has been successful on a small scale.)

ICRISAT cultivated fixed species and F1 (first filial hybrid) species and examined their local adaptability in an effort to widely distribute and cultivate quality seeds. In addition, INRAN and LOSSA conducted raising and distribution of ameliorated seeds. However, farmers depend on native seeds which they collected from their home grown cereals and have not been fully enlightened by the extension agencies. Accordingly, ameliorated seeds have not come into wide use. This project is for fixed species that can be harvested at home and need not be purchased every year. Ameliorated seeds will be multiplied and distributed systematically according to a schedule to promptly spread the use to the entire Study area. This project is also aimed at diffusing and teaching seed collection techniques to prevent decrease in the purity of the species after they have come into wide use.

(2) Contents

The contents of the project are listed below.

① Selection of ameliorated seeds

Species to be widely distributed in the Study area will be selected from good species of the Department of Agriculture and Livestock, INRAN and ICRISAT (in consideration of their resistance to disease and insects; see Tableau A8.3.1.1-2), and a seed collection schedule and a distribution schedule will be prepared. Guidance should be repeatedly provided especially in the three villages selected for the model pilot project and their neighborings.

② Multiplication and distribution of selected species

At the LOSSA Seed Center the first year The multiplied foundation seeds discussed in ① above will be increased through contracted cultivation at places within the Study area suitable for cultivation in the next year. Collected seeds will be used as seeds for multiplication under contract. All of the multiplied seeds less seeds to be used by farmers themselves in the next year will be purchased by the government (see Table A9.2.2.1). After the third year, in addition to contracted cultivation by farmers of collected seeds, these seeds will be distributed as ameliorated seeds for a fee.

③ Promotion Center

The LOSSA Seed Center will serve as the project promotion center. To this end, machines needed for work and guidance will be provided.

④ Distribution of ameliorated seeds

Distribution of ameliorated seeds will be started from the third year and completed over the next five years. Seeds are charged.

⑤ Promotion of purity of ameliorated seeds

Consideration should be given to maintenance of the purity of the species in accordance with a proper cultivation manual with respect to the distance from crops of the same species (more than 500 m) and cleaning of wild foundation species.

Seed collection schedule and procedures for distribution of ameliorated seeds are shown below (see Tables 9.2.2.1-5).

Table 9.2.2.1 Proposed annual production plan for major cereal ameliorated seeds

Year	Breeder's seeds*						Foundation seeds**						Ameliorated seeds***	
	Millet			Sorghum			Millet			Sorghum			Millet	Sorghum
	Area (ha)	*Unit Yield (kg/ha)	Yield (kg)	Area (ha)	*Unit Yield (kg/ha)	Yield (kg)	Contracted seed plot area (ha)	*Unit Yield (kg/ha)	Yield (kg)	Contracted seed plot area (ha)	*Unit Yield (kg/ha)	Yield (kg)	Distribution area (ha)	Distribution area (ha)
1	0.05	447	22.4	0.05	369	18.5								
2							14.9	447	6,660	4.1	369	1,478		
3							673.3	447	300,965	283.2	369	104,500	4,440	321
4							673.3	447	300,965	283.2	369	104,500	200,643	22,717
5							673.3	447	300,965	283.2	369	104,500	200,643	22,717
6							673.3	447	300,965	283.2	369	104,500	200,643	22,717
7													200,716	22,718
Total	0.05		22.4	0.05		18.5	2708.1		1,201,520		1,136.8	419,479	807,085	91,190

Notes:

* Breeder's seeds will be multiplied at the LOSSA Seed Center.

** Foundation seeds will be multiplied at contracted farm plots, using the foundation seeds distributed by the Seed Center for a fee.

*** All of multiplied ameliorated seeds will be purchased by the government (Ministry of Agriculture LOSSA seed center) except seeds to be used by farmers themselves, and distributed to farmers as seeds for the next year.

Sowing of 15 seeds, in 3 plantings for the area of 1m x 1m (1.5kg/ha) for Millet, sowing of 10 seeds in 3 plantings for the area of 1m x 0.5 (4.6kg/ha) for sorghum (cultivation standard by INRAN)

Table 9.2.2.2 Total target area and total seed plot area of each district for major cereal ameliorated seeds (covering 5 years)

Name of district	Millet		Sorghum		Total seed plot area (ha)	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Millet	Sorghum
Filingué	163,447	20.3	8,061	8.8	548.2	100.4
Kollo	116,523	14.4	4,352	4.8	391.0	54.2
Ouallam	193,034	23.9	27,067	29.7	647.6	337.6
Say	81,310	10.1	26,528	29.1	272.7	330.7
Téra	180,654	22.4	18,305	20.1	606.5	228.4
Tillabéri	72,117	8.9	6,877	7.5	242.1	85.5
Total	807,085	100.0	91,190	100.0	2,708.1	1,136.8

Table 9.2.2.3 Seed plot area of each district and year for major cereal ameliorated seeds

(Unit: ha)

Name of district	Millet						Sorghum					
	2 nd year	3 rd year	4 th year	5 th year	6 th year	Total	2 nd year	3 rd year	4 th year	5 th year	6 th year	Total
Filingué	3.0	136.3	136.3	136.3	136.3	548.2	0.4	25.0	25.0	25.0	25.0	100.4
Kollo	2.2	97.2	97.2	97.2	97.2	391.0	0.2	13.5	13.5	13.5	13.5	54.2
Ouallam	3.6	161.0	161.0	161.0	161.0	647.6	1.2	84.1	84.1	84.1	84.1	337.6
Say	1.5	67.8	67.8	67.8	67.8	272.7	1.1	82.4	82.4	82.4	82.4	330.7
Téra	3.3	150.8	150.8	150.8	150.8	606.5	0.8	56.9	56.9	56.9	56.9	228.4
Tillabéri	1.3	60.2	60.2	60.2	60.2	242.1	0.3	21.3	21.3	21.3	21.3	85.5
Total	14.9	673.3	673.3	673.3	673.3	2,708.1	4.0	283.2	283.2	283.2	283.2	1,136.8

Table 9.2.2.4 Distribution area of each district and year for major cereal ameliorated seeds

(Unit: ha)

Name of district	Millet						Sorghum					
	3 rd year	4 th year	5 th year	6 th year	7 th year	Total	3 rd year	4 th year	5 th year	6 th year	7 th year	Total
Filingué	899	40,632	40,632	40,632	40,652	163,447	29	2,008	2,008	2,008	2,008	8,061
Kollo	641	28,968	28,968	28,968	28,975	116,523	16	1,084	1,084	1,084	1,084	4,352
Ouallam	1,062	47,988	47,988	47,988	48,008	193,034	94	6,743	6,743	6,743	6,744	27,067
Say	447	20,215	20,215	20,215	20,218	81,310	92	6,609	6,609	6,609	6,609	26,528
Téra	994	44,910	44,910	44,910	44,930	180,654	65	4,560	4,560	4,560	4,560	18,305
Tillabéri	397	17,930	17,930	17,930	17,930	72,117	25	1,713	1,713	1,713	1,713	6,877
Total	4,440	200,643	200,643	200,643	200,716	807,085	321	22,717	22,717	22,717	22,718	91,190

Table 9.2.2.5 Procedures for implementing major cereal ameliorated seed distribution project

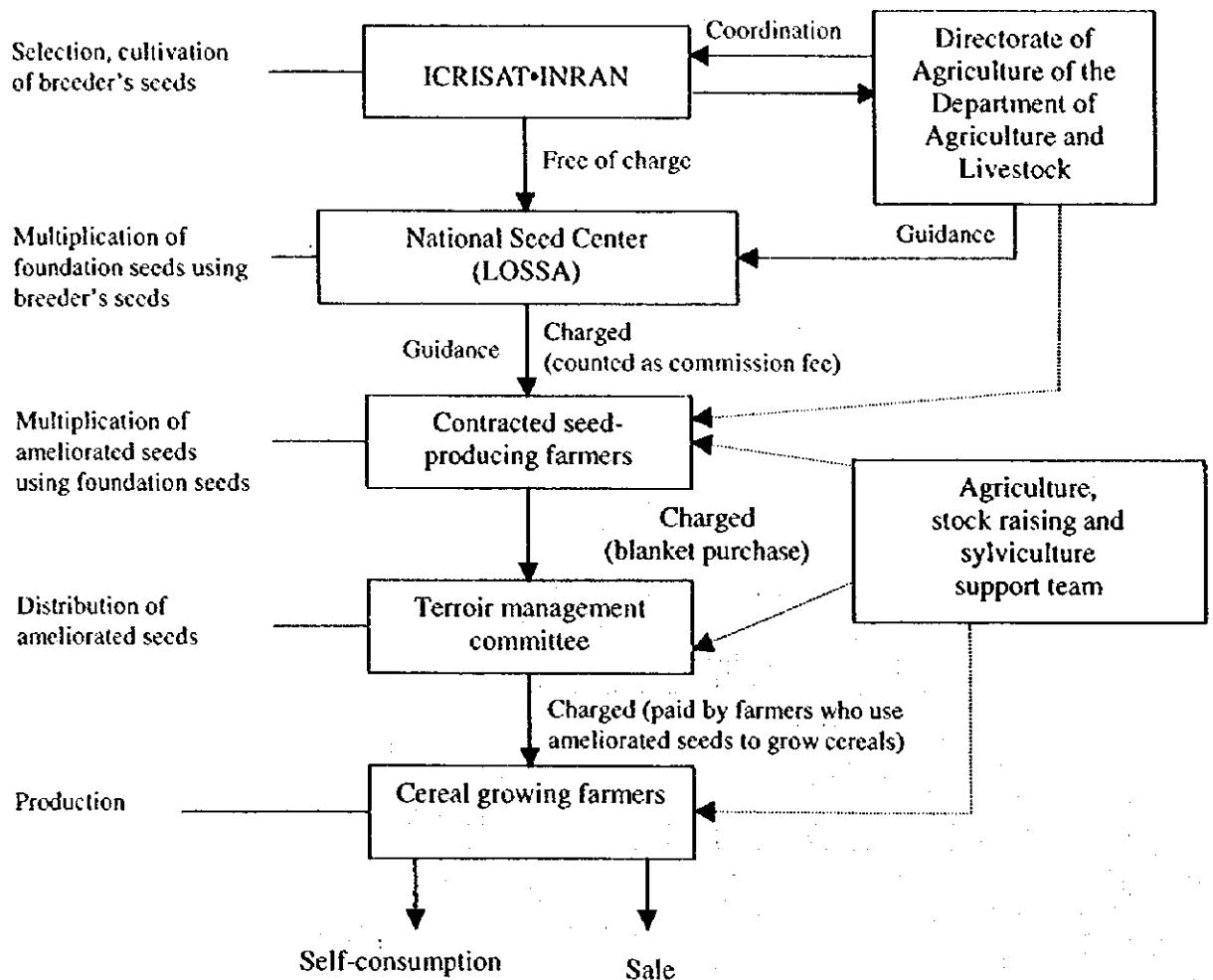
Year	Contents (related agencies)
1 st year	<ul style="list-style-type: none"> ① Preparation of ameliorated seed multiplication/distribution schedule (in cooperation with the Agricultural Bureau of the Department of Agriculture and Livestock, INRAN and ICRISAT) ② Multiplication of foundation seeds, using breeder's seeds (LOSSA Seed Center) ③ Selection of farmers for multiplying seeds under contract (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ④ Provision of guidance to model pilot project sites and priority project sites (40 sites) and preparation of the implementation plan
2 nd year	<ul style="list-style-type: none"> ① Distribution of foundation seeds to seed-producing farmers who multiply seeds under contract <for the 1st year> (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ② Payment of commission to seed-producing farmers (for the 1st year) (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ③ Multiplication of ameliorated seeds (contracted seed-producing farmers) <for the 1st year> Purchase and collection of multiplied ameliorated seeds (Directorate Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ④ Provision of guidance to the model pilot project sites and priority project sites (Agriculture, stock raising and sylviculture support team)
3 rd year - 6 th year	<ul style="list-style-type: none"> ① Distribution of ameliorated seeds to cereal growing farmers <for 1st year - 4th year> (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ② Distribution of foundation seeds <for 2nd year - 5th year> (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ③ Payment of commission fee to contracted seed-producing farmers <for 2nd year - 5th year> (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ④ Multiplication of ameliorated seeds (contracted seed-producing farmers) <for 2nd year - 5th year> ⑤ Provision of guidance to the model pilot project sites and priority project sites (Agriculture, stock raising and sylviculture support team)
7 th year	<ul style="list-style-type: none"> ① Distribution of ameliorated seeds to cereal growing farmers <for 5th year> (Directorate of Agriculture of the Department of Agriculture and Livestock, LOSSA Seed Center) ② Provision of guidance to the model pilot project sites and priority project sites (Agriculture, stock raising and sylviculture support team)

(3) Arrangement for project implementation

The Directorate of Agriculture of the Ministry of Agriculture and Livestock will draw up a schedule for multiplying and distributing ameliorated seeds in cooperation with INRAN and ICRIAT from the second year. The foundation seeds are multiplied at the LOSSA Seed Center using the breeder's seeds and the ameliorated seeds for the next year are multiplied by seed-producing farmers under contract.

All the ameliorated seeds cultivated by the contracted seed-producing farmers will be purchased by the government for foundation seeds and for distribution to cereal growing farmers, and distributed in accordance with the schedule. Ameliorated seeds will be distributed to cereal growing farmers in one delivery through the terroir management committee of the related villages. Seeds are charged at all stages of distribution except the multiplication at ICRIAT, INRAN and the National Seed Center. The flow chart of ameliorated seeds distribution is shown in Fig. 9.2.2.1.

Figure 9.2.2.1 Ameliorated seeds distribution flow chart



(4) Notes on project implementation

① Systematical project implementation on schedule

It is necessary to fully work out the details of the plan and implement the project systematically and efficiently in order to distribute ameliorated seeds to broad target areas in a short period of time. To achieve this, the government, INRAN, ICRISAT and the agriculture, stock raising and forestry support team should work close with one another, take up ideas from villages through the terroir management committee, make contract with seed-producing farmers and distribute ameliorated seeds.

② Improvement of accuracy of seeds multiplying technique

Before seed producing plots are developed, guidance should be given to the contract seed-producing farmers with special maintenance of purity of varieties such the distance from identical crops and the cleaning of identical crops that have gone wild.

(5) Project cost

Direct project cost: 189,400,000 FCFA

Selling price of seed to the contract seed-producing farmers and purchasing price of seed grown on contracted and increased seed plots should be set to a price equivalent to 120% of market sales price so that the cost of seeds for distribution can be offset (see Table A9.3.2.1).

(6) Implementation period

Distribution of ameliorated seeds to the entire Study area will be completed in a period of seven years after starting (five years for distribution of ameliorated seeds).

(7) Effects of project

This plan is aimed at contributing to an increase in food self-sufficiency (see Annex 8.4.1.1).

9.2.3 Livestock improvement project

(1) Objective

Overgrazing is one factor in desertification. In the study area, which has few fodder resources, increasing production by increasing herd size is not as optimal as increasing production by increasing the productivity per head.

Azawak breed, beef and milk cattle that inhabit the Azawak Valley located on the northern part of the District of Filingué, is capable of withstanding severe weather conditions such as dry weather and scorching summer heat, and has excellent productivity for milk and beef. This breed is highly rated not only in the Republic of Niger but also in the Sahara region. About 500 purebreds are raised at Toukounous Ranch. However, such problems as limited grass resources,

inexperience in livestock improvement techniques and budget shortage do not allow the ranch to make use of valuable genetic resources. Livestock improvement in the Study area has not made progress owing to ① lack of an organization that carries out improvement activities, ② inexperience in techniques, ③ extensive raising and ④ low level of consciousness concerning improving production by improving productivity per head. Thus, it is urgently necessary to preserve the valuable genetic resources of Toukounous Ranch and make active use of this breed to work on livestock improvement.

This project is aimed at distributing superior male and female cattle for breeding, speeding up improvement by introducing artificial insemination techniques, and displaying model dairy farming. It is difficult to diffuse artificial insemination techniques among farmers in a short period of time. Therefore, this ranch is regarded as the base for developing artificial insemination techniques and for acquiring techniques in the Republic of Niger and is used to train artificial insemination technicians.

Since this ranch is adjacent to the village of Tidani where the model pilot project will be implemented, it will provide indirect support to the livestock development in the village of Tidani. This ranch has already started to produce dry cheese, and will be placed in charge of providing production techniques.

(2) Contents

The livestock infrastructure of Toukounous Ranch was furnished through aid, but it has become decrepit. Thus, some of the facilities need rehabilitation. Facilities needed for artificial insemination will be newly provided. Facilities for supplying water to livestock, and facilities for artificial insemination will be provided or improved while related machines and farming tools will be introduced as shown in Table 9.2.3.1.

In order to increase livestock productivity, it is necessary to increase the consciousness of the herders. Regarding provision of infrastructure, we will conduct progressive provision taking into account the needs of the herders. For this reason, facilities for artificial insemination will be provided later on.

Table 9.2.3.1 Improvement plan (Tonkounous Ranch)

Item	Structure/specification	Quantity	Unit	Remarks
(Production infrastructure) Improvements of facilities for supplying water to livestock	Installation of a pumping machine (windmill)	8	Places	
(Relates to artificial insemination facilities)				
Office				
Shed	CB one-story building 300m ²	1	Building	Installation CMB
Paddock	Simple steel frame 100m ²	2	Buildings	
Ranch fence	Steel frame barrier 300m ²	1	Place	
Facilities for producing liquid nitrogen	Barbed wire	10	Km	
Liquid nitrogen storing vessel	Storing volume 140 liter	1	Unit	
Straw making and filling machine	Medium 1, small 3	4	Units	
Fake cattle stand		1	Unit	
Sperm extractor	Oil pressure model	1	Unit	
Microscope		3	Pieces	
Vaginal speculum	Binocular model	1	Piece	
Straw injector	Stainless	2	Sets	
Equipment for veterinarian		3	Piece	
Weighing balance		1	Set	
Liaison vehicle	It 4WD	1 1	Unit Unit	
(Relates to display of model dairy farming)				
Bulk cooler				
Generator	2,000 liter	1	Unit	
		1	Unit	
(Equipment for training)				
Audiovisual equipment		1	Set	

1) Land use plan

The land use plan does not require a change in the present land use. Natural grassland is kept in a good condition and is capable of feeding 1,000 head of cattle. If the grassland needs to be renewed, it should be done so by ranch's own efforts through farming. The land use plan is shown in Table 9.2.3.2.

Table 9.2.3.2 Land use plan

(Unit: ha)

Category	Present area	Planned area	Remarks
Facility lot	14	14	
Natural grassland	4,400	4,400	Renewal by ranch's own effort
Improved grassland	60	60	Renewal by ranch's own effort
Total	4,474	4,474	

2) Stock raising plan

Purebreds of Azawak species will be raised. The ranch has about 200 head of brood cattle and a total of 500 head of cattle. This plan is aimed at increasing the number of brood cattle to 300 head to match the ranch's feeding capacity, thereby increasing the production of breeding stocks and stepping up efforts to improve livestock. The livestock raising plan is shown in Table 9.2.3.3.

Table 9.2.3.3 Stock raising plan

			(Unit: head)
Category	Present state	Planned	Remarks
Grown female cattle	198	300	
Cattle being raised	164	500	
Calves	130	126	
Sire bull	9	10	
Total	501	936	

3) Production plan

The livestock production plan is shown in Table 9.2.3.4. As for frozen sperm for sale, 6,000 straws of sperm are expected to be produced yearly from five seed bulls. As for milk, 1,000 kg of milk per year is expected to be produced by one head of brood cattle.

Table 9.2.3.4 Production plan

Category	Present state	Planned	Remarks
(Livestock sale)			
Sire bulls	20 head	35 head	
Female cattle being raised	40 head	60 head	
Male cattle being raised	50 head	70 head	
Waste cattle	26 head	39 head	
Fresh milk	160 t	300 t	
Frozen sperm		30,000 tube	

4) Business earnings and expenses plan

The earnings and expenses plan is shown in Table 9.2.3.5. Personnel expenses for government officials will be covered by personnel expenses allocated to the present number of officials, and thus will not be appropriated in the operating cost (see Annex 9.2.3.1 for detailed earnings and expenses plans).

Table 9.2.3.5 Business earnings and expenses plan

			Unit: 1,000FCFA
Category	Present state	Planned	Remarks
Earnings	48,910	108,627	
Expenses	38,345	86,845	
Balance	10,565	21,782	

(3) Project implementation system

Since this ranch is currently operated by the state, the implementing agency will be the Directorate of Livestock of the Ministry of Agriculture and Livestock under this plan. The project implementation system is shown in Fig. 9.2.3.1. Technical assistance will be obtained from Niamey University, INRAN and ICRISAT when this project is implemented.

The plan for this ranch, which consists of three sectors, production of breeding stocks, display of dairy farming and administration, will be directly administered by the Directorate of

Livestock. It is hoped that there will be 25 livestock management staff members, p staff member per 40 head.

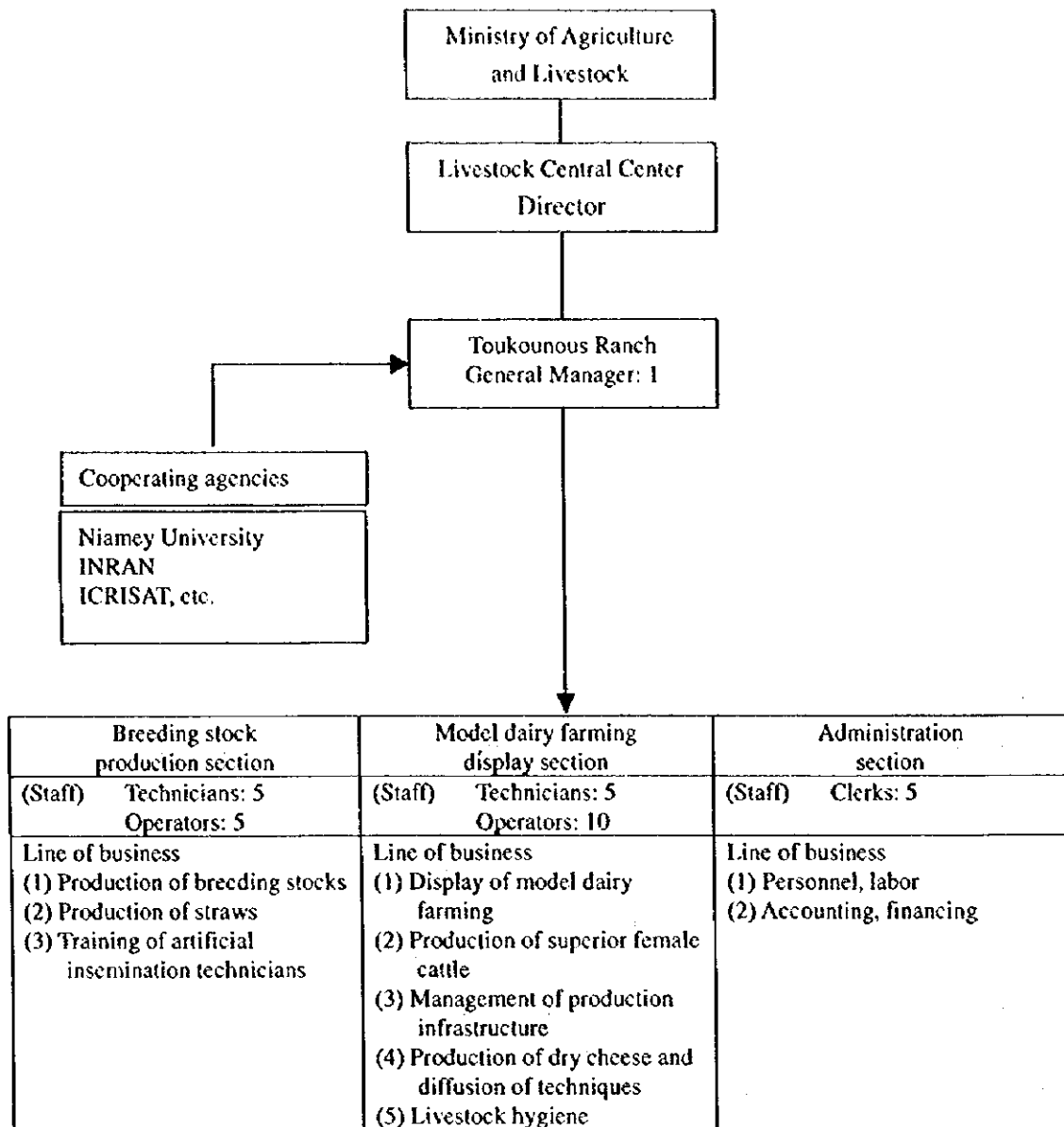
(4) Notes on implementation

The consciousness of herders concerning raising productivity by improving stock is low. However, raising production by increasing herd size creates much damage during droughts and speeds up desertification. It is necessary to increase the consciousness of herders that it is better to raise productivity by improving stock than to raise productivity by increasing herd size. Fortunately, the herders around Toukounous and the herders near the Niger River have begun to recognize the importance of improving the productivity by herd improvement and achieving balance of supply and demand. For this reason, we will promote a revolution in the consciousness of herders around Toukounous.

While making Toukounous a model area, we will promote research centered on herder instructors. Herder research will be conducted with the assistance of agricultural support teams. Herd improvement will be particularly promoted. The improved stock produced will be distributed as a priority project model in the pilot project area. We will make herders in the district surrounding the model pilot project area aware of the need for stock improvement and balanced supply and demand for feed.

Further in the future, we plan to introduce artificial insemination through the creating of testing and technological specialists in order to speed up the progress of stock improvement. In the Sahel region, artificial insemination technology has not yet been distributed. There has been some success with it in Burkina Faso with the Azawak breed. However, the technology has not been distributed to the herders. However, there are some successful cases using Azawak breed in Burkina Faso, a neighboring country. There are a few researchers and technicians working at Niamey University, the Directorate of Livestock of the Ministry of Agriculture and Livestock and other institutes in Niger. The prospects for livestock improvement through introduction of this technique are encouraging, but it will be introduced only once its necessity in stock improvement is decided upon.

Figure 9.2.3.1 Arrangement for project implementation



(5) Project cost

Direct project cost (521,100,000 FCFA)

(6) Implementation period

Five years

(7) Effects of project implementation

- ① Productivity of fresh milk and beef can be increased by introducing superior cattle to dairy farmers.

- ② Azawak breed is highly rated in West Africa, and can be expected as a prospective export product in the future if genetic resources are protected and production is increased.
- ③ The implementation of the project will lead to diffusion of techniques to farmers by training artificial insemination technicians in Niger.
- ④ In the model dairy farming section, exhibition of techniques from production to processing is planned, which will lead to increase in farmers' income if such techniques are spread to farmers.

9.2.4 Seedling production project

(1) Objective

One of the factors involved in desertification is the overcollection of firewood. With regard to this problem, our objective is to provide a system to grow and manage a sustainable forest resource to supply the inhabitants. In order to do this, the system must include the following two aspects.

- 1) inclusion of education and extension activities which show inhabitants the importance of community forest activities.
- 2) Provision of saplings to inhabitants

(2) Contents of project

(a) Central nursery: In order that management of small-scale seedling goes smoothly at the village level, seedling production specialists will be trained. A standard central nursery should have an area of 10,000 m² and produce 100,000 seedlings a year and public planting will be used to prevent soil degradation.

Table 9.2.4.1 Standard facilities/equipment required by central nursery

Category	Components	Quantity	Remarks
Facilities	Construction of new wells	1	60m
	Office that can be also used as warehouse	1	
	Research lab (80m ²)	1	
	Fence (400m ²)	1	
	Motor pump	1	
	Generator	1	
	PVC water conduit (150m)	1	
	Water receiving tank (4m ³)	1	
	Water distributing tank (0.5m ³)	6	
Equipment and materials	Pot for seedlings	For five-year use	Necessary number of pots + 10% of the number (this is because pots are easy to break)
	Seeds	For five-year use	Quality-controlled seeds for seedling production
	Agricultural chemicals	For five-year use	5 kg/year
	Thin rope	For 50m	Needed for making nurseries
	Watering can	5	
	Pruning shears	2	
	Rake	3	
	Spade that can be also used as a pick	2	
	Shovel	5	
4x4 double cabin	1	Needed for follow-up activity by district forestry office	

(b) Mini-nursery: The standard nursery should have an area of 2,500 m² and produce 5,000 seedlings a year as promoted by the PFN. This nursery will be established in 40 villages covered by the agriculture, stock raising and forestry support project. The total number of seedlings produced by this plan will be 200,000 per year. These seedlings shall be managed by the seedling production specialists who trained at the central nurseries.

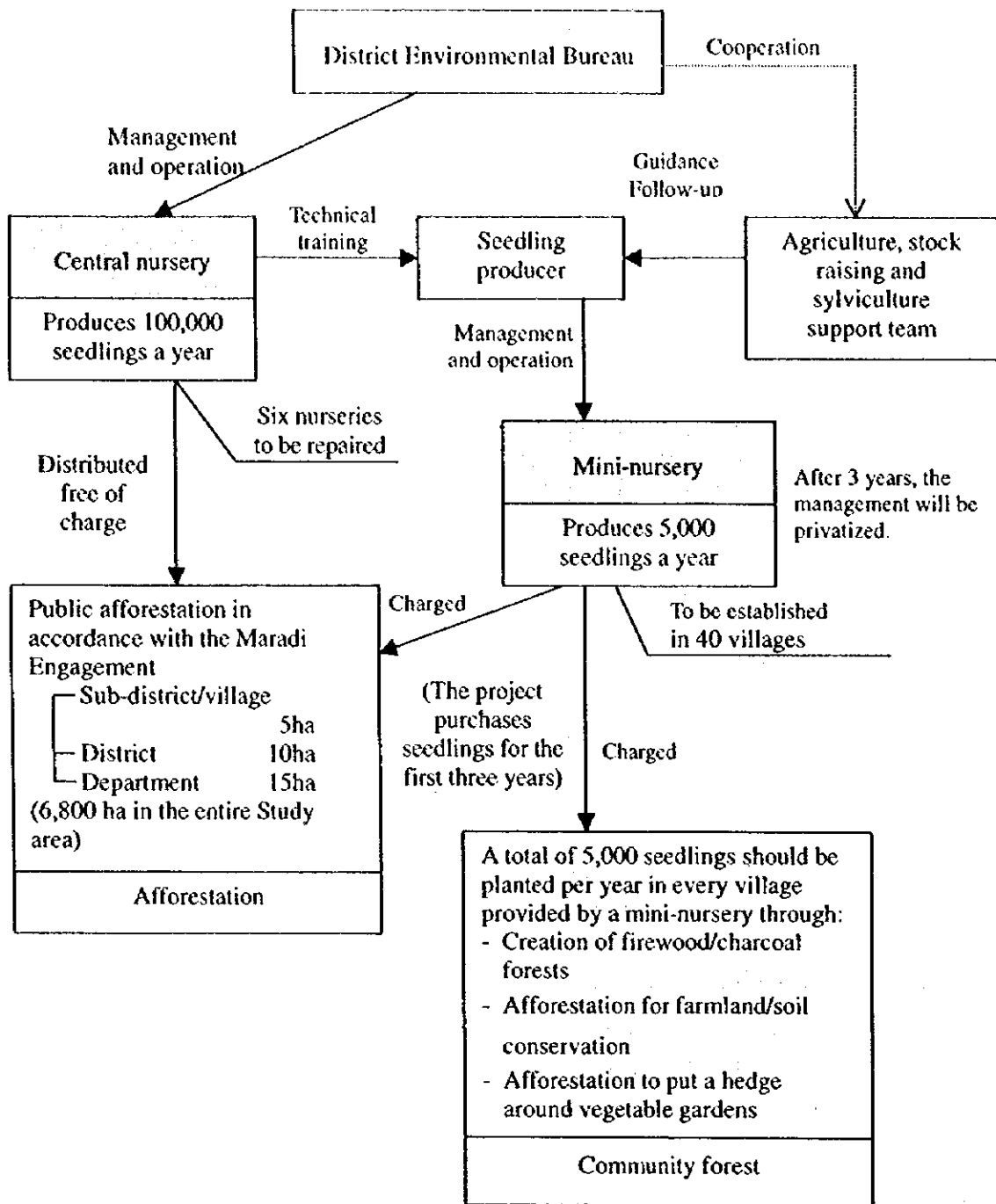
Table 9.2.4.2 Standard facilities/equipment required by mini-nursery

Category	Components	Quantity	Remarks
Facilities	Construction of new wells	1	30m
	Warehouse (25m ³)	1	
	Fence (200m)	1	
	Small water tank (1m ³)	1	
Equipment and materials	Pot for seedlings	For 5-year use	Necessary number of pots + 10% of the number (this is because pots are easy to break)
	Seeds	For 5-year use	Quality-controlled seeds for seedling production
	Agricultural chemicals	For 5-year use	5 kg/year
	Rope	For 20m	Needed for making nurseries
	Watering can	3	
	Pruning shears	2	
	Rake	2	
	Spade that can be also used as a pick	2	
	Shovel	3	
125cc motorcycle for motorcross	1	Needed for moving from one place to another for management purposes	

(3) Project implementation system

Carrying out education and diffusion activities is the key element for successful implementation of the community forest plan. Thus, arrangement for project implementation will be made, using the agricultural aid support team of the agriculture, stock raising and silviculture system strengthening support project, and seedling producers will be trained in a central nursery (see "9.2.1 Agriculture, stock raising and silviculture support project"). Flowchart for management of seedling production project is shown in Fig. 9.2.4.1. For 3 years after the introduction of small-scale nurseries, seedling production specialists will train on small-scale nursery management and raise consciousness concerning planting activities of the inhabitants. During this time, with the assistance of the Environmental office of the department, the agricultural assistance team will give guidance to the seedling production specialists. Starting 4 years after the introduction of the small-scale nurseries, the desertification combat project office will entrust the territorial management committee with their management.

Figure 9.2.4.1 Flow chart for management of the seedling production project



(4) Notes on project implementation

Mini-nurseries were encouraged by the (PFN) over a period from 1982 to 1990. However, efforts to enlighten residents on afforestation and follow-up on the nursery management were not sufficient. Lessons learned from this experience should be fed back into promotion of mini-nurseries with the following notes in mind.

- ① A seedling producer should be trained in a village to produce seedlings, operate the nursery and carry out follow-up activities after afforestation.
- ② The species of trees that are mainly used in public afforestation activities will be produced with project aid (a set of equipment and materials required initially and expendable supplies will be provided) for the first three years after establishment of the mini-nursery. Production of fruit seedlings that may profit the seedling producer will be approved, whereby establishing a system that allows him to continue to operate the nursery on a self-paying basis.
- ③ Beginning 4 years after the introduction of the small-scale nurseries, a system should be established so that their management is independently financed by the sale of seedlings. (see "9.2.1 Agriculture, stock raising, and silviculture support project").
- ④ The annual number of seedlings to be produced by a mini-nursery should be set to about 5,000 so that seedling production specialists are able to produce them using their spare time during farming. The number of seedlings to be produced under this plan will total 200,000 a year.

(5) Project cost

Direct project cost (737,100,000 FCFA)

(6) Implementation period

12 years

(7) Effects of project implementation

The agriculture, stock raising and silviculture support project will promote activities for enlightening residents on afforestation, and they will play a central role in carrying out sustainable afforestation activities. Directly, this will secure firewood production and indirectly, this will lead to increase in earnings from agriculture and stock raising, thereby improving the living condition of local residents.

9.3 Model pilot project

As for the 3 villages selected for the priority project area, because all 3 are lacking in rural infrastructure such as wells, schools and roads, a mutual plan will be carried out. In addition,

there are many similarities in the construction of production base, but there are differences seen in the amount of work necessary. For example, examining the work costs per village, the cost for Dyabou is 862,000,000 FCFA which is 3 to 4 times that of the other 2 villages. The reason for this is that the construction of the embankments for the roads leading into Dyabou and the surrounding irrigated fields cost much more than the other 2 villages. Conditions related to the basic situation of the village, development plan and planning are as follows.

9.3.1 The Dyabou Village Model Plan (metropolitan suburb agriculture promotion zone)

(1) Natural conditions

Dyabou is reached by travelling 16 kilometers along the national highway towards Benan from Say, turning off onto a "piste" (unpaved connecting rough road) heading eastwards for about 10 kilometers, and crossing the Goroubi river. Annual rainfall fluctuates between 500 and 800mm. Dyabou is on a plateau sandwiched between two tributaries of the Niger river (the Goroubi to the north and the Dyamangou to the south), and has a total land area of 139 square kilometers.

(2) Society

Dyabou consists of 150 families and 869 individuals. It was first established by hunters from neighboring Dosso Department, who settled here in the 1880's because of the large wild animal population. Dyabou means "cave", referring to the fact that there was a cave by the Goroubi river below the village at that time.

Until the 1970's, the village was covered with trees and had only scattered farmland. But a government appeal for a return to agriculture in 1981 triggered a boom in migration from surrounding areas, and farmland expanded progressively since around 1984 due to forest felling after the big drought.

The village consists of the four districts of Zarmey-koara, Dayo-banda, Doggassingui, and Zongo, all but the first being populated by settlers from outside. Apart from the village proper, Dyabou also includes more than 100 scattered "*hameaux*" (hamlets consisting of a few households each) which have arisen over the last 30 years. Each *hameau* is inhabited by people from the same ethnic group speaking the same language. There are two types of *hameau*, some that have separated off from the village proper and some that were formed by outside settlers. In either case they require the approval of the village chief, though outside settlers have never yet been refused entry, as long as their method of land use is clearly defined. Each *hameau* is headed by a "*chef de famille*" (family head), though the village chief governs the entire village including the *hameaux*. The *hameaux* generally consist of houses, grain silos, wells, and hay storage facilities (fenced or roofed), with millet fields and pasture land positioned around them.

Dyabou has kinship with Boki village, as well as enjoying good relations with the four neighboring villages. The inhabitants are mainly Zarma and Peulhs people, each having their own customary leader.

(3) Customs

The village chief is hereditary and is nominated by the family assembly. Village decisions are made by a meeting of the village chief with a Muslim priest and the village elders. Whenever a dispute arises in the village, it is mediated by the chief. The existence of a dual chief system does not necessarily aid unity between the two ethnic groups.

Customary law recognizes the right of land ownership by the original occupants and their descendants. Land owners are entitled to use their land as they wish, and can transfer or sell it to anyone they wish.

The village chief has the right of jurisdiction over village-owned land and the right to allocate common land to new settlers. Whenever the chief exercises these rights, he has to notify the District Environmental Bureau. Exceptionally, open pasture land can be used by anyone who wishes to.

In the village, disputes often occur between herders and farmers over damage to field crops by livestock, as do disputes between land owners and tenants over land repossession.

Weddings, funerals, and other ceremonies are conducted according to Muslim custom. Women marry at age 15-17 and men at 18-20.

(4) Village organizations

① Youth group

This was formed in 1975, its members being all the young people in the village. Its activities include helping with farm works, house construction, and preparations for weddings, and other ceremonies. In spite of this, most young people go away to work in the dry season.

② Women's group

Formed in 1988, this group's members are all the adult women in the village. Its activities consist only of regular meetings, and it does not undertake any development activities. Problems facing the Women's Group are shortages of millet grinders, farm machinery, peanut seeds, health clinics, firewood, and various types of technology. Millet grinding is particularly heavy and labor-intensive work, so the group wants access to millet grinders even if it means paying rental charges.

Some of the women cultivate okra, peanuts, and sesamis on an individual basis in the rainy season, while others make pancake, fatten sheep, or make and sell matting or soap.

③ Islam group

Organized in 1991 for the purpose of promoting Islam in the village. It has 3 members, all decisions being made by the Imam priest (the leader). The Group's activities consist of spreading Islam and performing ceremonies such as weddings and funerals.

④ Commercial group (Cooperative association)

The Cooperative association was established on the proposal of joint sales by the Boki Village Cooperative. It has 8 members, its main activity being millet selling. However, it now faces problems in fund shortage and there are no means of transportation (carrying carts). Its assets are a small fund and one broken millet grinder.

⑤ Students' parents group

Established in 1987 with the aim of improving the educational environment for children. The Imam priest serves concurrently as the head of the Parents Group. One of the three classrooms now available was built by this Group. Whenever necessary, it maintains and repairs classrooms with donated funds, as well as attempting to solve educational problems. The Group has no assets.

(5) Records of past development projects

- ① Small-Scale Vegetable Cultivation and Forest Seedling Plantation Project: This has been implemented by fencing off a field (20m x 20m) near a cement well. Watering cans and other implements have been diverted to other purposes and lost, the fence surrounding the field is broken, and the project was only functional in its first year. At that time, because the terrior management committee had not been established, maintenance and management was poor.
- ② Tamou Support Project for the Blind: Carrying carts, 2 sheep, and 2 goats were loaned to 3 disabled people in the village. The condition for the loan of the carts was an initial payment of 1,000 FCFA and a monthly payment of 2,5000 FCFA thereafter. The condition for the loan of the sheep and goats was to provide one lamb and one kid per year. Two boxes of medicines were also supplied, and one representative from the village received training for 5 days in Tamou. The representative sells the medicines to patients after adding an agency commission, then buys additional supplies with the sales revenue and this is proceeding well.
- ③ UNICEF's Population Project: Weighing scales for infants (1 set), ante-and post-natal medicines (1 box), and household medicines (1 box) have been supplied. Two representatives (1 man and 1 woman) have undergone training for 15 days at a hospital in Say. The method of replenishing medicines is the same as in ② above.
- ④ Natural Resources Management Project by IBRD (PGRN): A joint *Terroir* Management Committee was set up and a grain bank established by 3 villages including Dyabou in 1998. To build the bank, the local inhabitants provided stone, gravel, and labor, while other

tools and materials, designs, and technical guidance were provided with support from the PGRN. Because this project was established in 1998, evaluation has not yet been conducted.

9.3.1.1 Land use

(1) Present situation

The expansion of agricultural land caused by population influx is diminishing the forests that used to take up much of the village. *Hameau* settlements are scattered in the north and center on a plateau sandwiched by tributaries of the Niger river to the north and south, while millet fields and grassland extend over the sandy terrain near them.

The present state of land use according to remote sensing (high-resolution Spot satellite image analysis) is shown in Table 9.3.1.1.1 and Fig. 9.3.1.1.1. The total land area of Dyabou is 13,889 hectares, of which the proportion taken up by agricultural land is about 40%.

Table 9.3.1.1.1 Areas for land use classification

								(Unit: ha)
Classifi- cation	Agricul- tural land	Grassland	Bare land	Wood- land	Marsh- land	Aquatic zone	Settle- ments	Total
Area	5,575	3,208	2,767	2,269	0	51	19	13,889

Source: JICA Remote sensing study commissioned in 1998

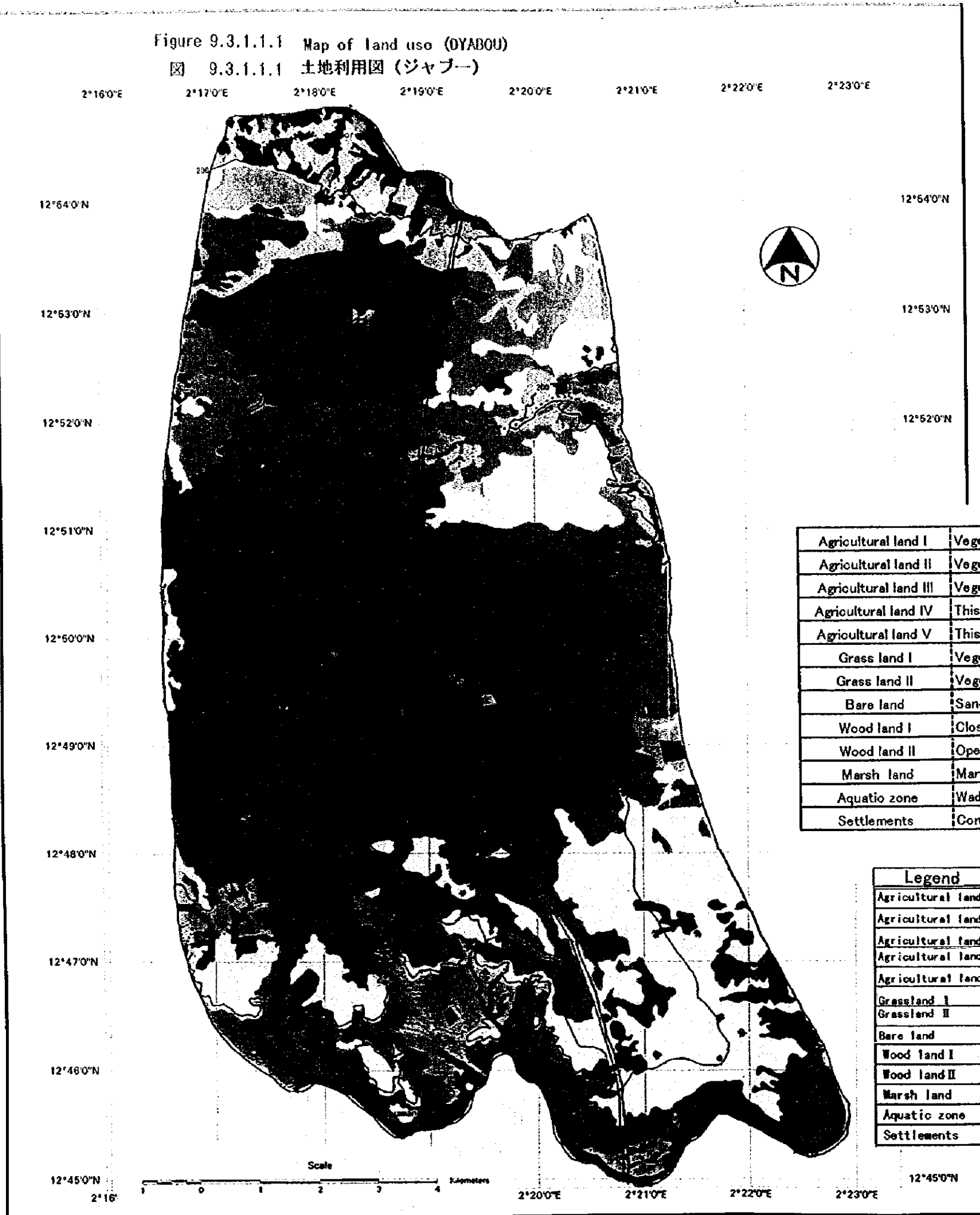
Notes: The land use map divides each land classification into sub-classifications. The area of each classification is the total of all sub-classifications (see Table A 9.3.1.1).

(Explanation of land classifications)

- ①Agricultural land: planted land, fallow land
- ②Grassland: land with at least 20% vegetation coverage, used mainly for pasture
- ③Bare land: land with less than 20% vegetation coverage, mainly exposed base layer or sandy land
- ④Woodland: land with at least 60% vegetation coverage, with numerous trees
- ⑤Marshland: marshland formed around the kori
- ⑥Aquatic zone: rivers, ponds
- ⑦Settlements: settlements with at least 10 households

Figure 9.3.1.1.1 Map of land use (DYABOU)

図 9.3.1.1.1 土地利用図 (ジャブー)



農地Ⅰ	被覆率70%以上。天水耕作地として利用。
農地Ⅱ	被覆率30~70%。
農地Ⅲ	被覆率30%未満。休耕地。
農地Ⅳ	砂丘上の農地。被覆率50%以上。
農地Ⅴ	砂丘上の農地。被覆率50%未満。
草地Ⅰ	被覆率50%以上。放牧地として利用。
草地Ⅱ	被覆率50%未満。
裸地	砂地または基盤露出地。
森林Ⅰ	樹間密度高。密林地。
森林Ⅱ	樹間密度低。疎林地。
湿地	ワジ川が砂丘で流路を遮断され形成される湿地。
水域	ワジ川。
集落	10戸以上の集落地。

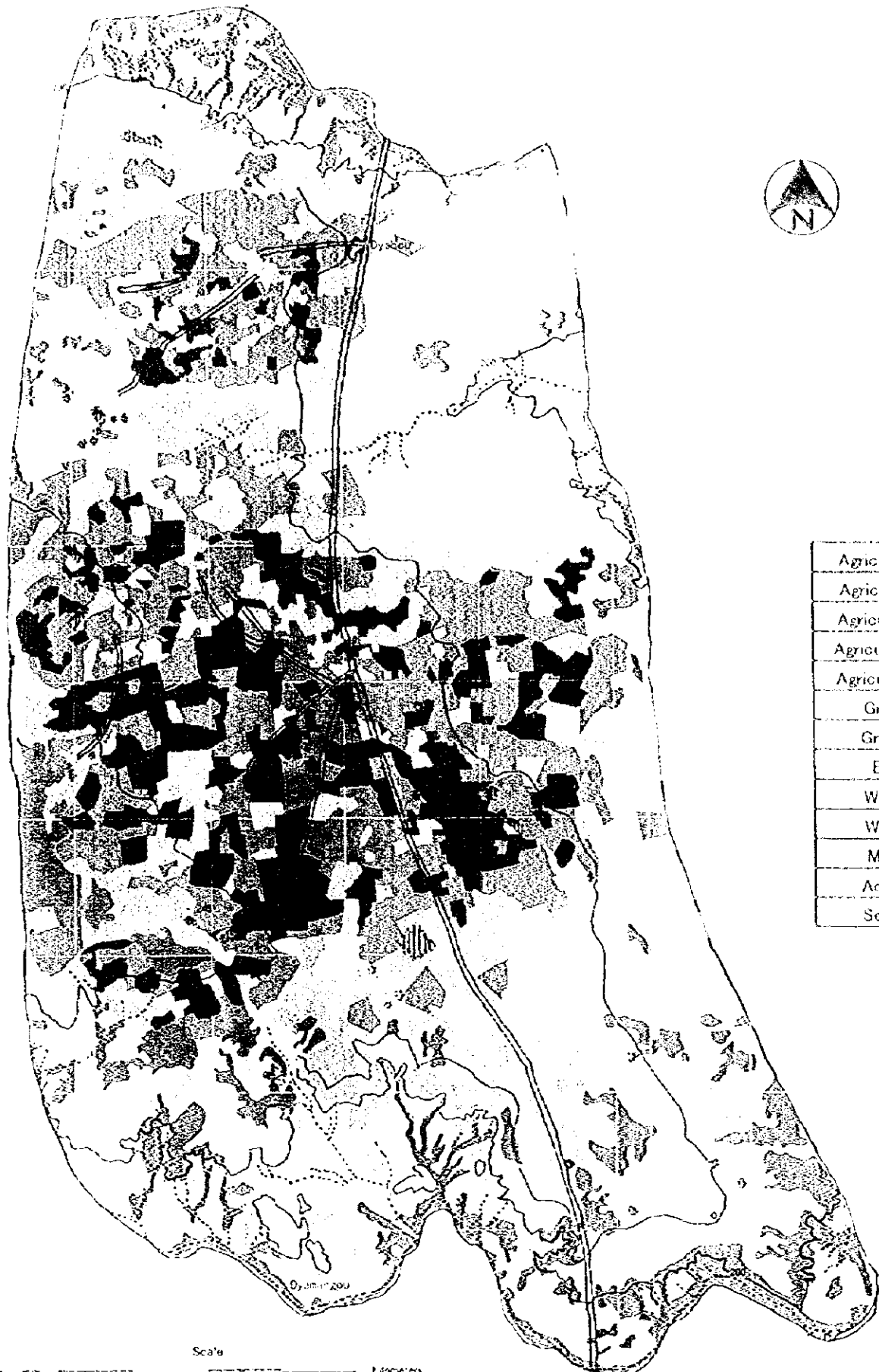
Agricultural land I	Vegetation coverage \geq 70%. Generally used as rainfed field
Agricultural land II	Vegetation coverage \geq 30% and $<$ 70%
Agricultural land III	Vegetation coverage $<$ 30%. Not used so much contemporary
Agricultural land IV	This agricultural land is on dune. Vegetation coverage \geq 50%
Agricultural land V	This agricultural land is on dune. Vegetation coverage $<$ 50%
Grass land I	Vegetation coverage \geq 50%. Generally used as pasture
Grass land II	Vegetation coverage $<$ 50%
Bare land	Sandy land or exposed base layer
Wood land I	Close forest
Wood land II	Open forest
Marsh land	Marshland which is formed by interception of wadi by dune
Aquatic zone	Wadi
Settlements	Consists of more than 10 houses

Legend	凡例	Colour
Agricultural land I	農地Ⅰ	■
Agricultural land II	農地Ⅱ	■
Agricultural land III	農地Ⅲ	■
Agricultural land IV	農地Ⅳ	■
Agricultural land V	農地Ⅴ	■
Grassland I	草地Ⅰ	■
Grassland II	草地Ⅱ	■
Bare land	裸地	■
Wood land I	森林Ⅰ	■
Wood land II	森林Ⅱ	■
Marsh land	湿地	■
Aquatic zone	水域	■
Settlements	集落	■

Map of Land Use (DY 1973)
土地利用図 (ジャブー)

2°17'0"E 2°18'0"E 2°19'0"E 2°20'0"E 2°21'0"E 2°22'0"E 2°23'0"E

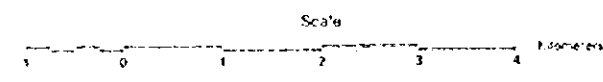
12°54'0"N
12°53'0"N
12°52'0"N
12°51'0"N
12°50'0"N
12°49'0"N
12°48'0"N
12°47'0"N
12°46'0"N



農地 I	被覆率 70% 以上。天候に依存して利用。
農地 II	被覆率 30~70%。
農地 III	被覆率 30% 未満。休耕地。
農地 IV	砂丘上の農地。被覆率 50% 以上。
農地 V	砂丘上の農地。被覆率 50% 未満。
草地 I	被覆率 50% 以上。放牧地として利用。
草地 II	被覆率 50% 未満。
裸地	砂質または岩質露出。
森林 I	閉鎖型森林。森林。
森林 II	開閉型森林。疎林地。
沼地	ワジ川が砂丘で断絶を断断され形成される。
水域	ワジ川。
集落	10戸以上の集落。

Agricultural land I	Vegetation coverage \geq 70%. Generally used as rainfed field
Agricultural land II	Vegetation coverage \geq 30% and $<$ 70%
Agricultural land III	Vegetation coverage $<$ 30%. Not used so much contemporary
Agricultural land IV	This agricultural land is on dune. Vegetation coverage \geq 50%
Agricultural land V	This agricultural land is on dune. Vegetation coverage $<$ 50%
Grass land I	Vegetation coverage \geq 50%. Generally used as pasture
Grass land II	Vegetation coverage $<$ 50%
Bare land	Sandy land or exposed base layer
Wood land I	Close forest
Wood land II	Open forest
Marsh land	Marshland which is formed by interception of wadi by dune
Aquatic zone	Wadi
Settlements	Consists of more than 10 houses

Legend	凡例	Colour
Agricultural land I	農地 I	
Agricultural land II	農地 II	
Agricultural land III	農地 III	
Agricultural land IV	農地 IV	
Agricultural land V	農地 V	
Grassland I	草地 I	
Grassland II	草地 II	
Bare land	裸地	
Wood land I	森林 I	
Wood land II	森林 II	
Marsh land	湿地	
Aquatic zone	水域	
Settlements	集落	



12°45'0"N 2°18'0"E 2°19'0"E 2°20'0"E 2°21'0"E 2°22'0"E 2°23'0"E 12°45'0"N

(2) Development principle

For the metropolitan suburb agriculture promotion zone, the development plan is as follows:

- ① agricultural production will be increased based on a nucleus of commercial crop production, by reviving the fertility of agricultural land and introducing irrigation farming through appropriate management of rotational agricultural land.
- ② Rational land use will be promoted to facilitate land productivity which will enable sustained production, without any great change to the present situation.(9-year non-planting period)

(3) Plan

The land use plan for Dyabou village will be as shown in Table 9.3.1.1.2 and Fig. 9.3.1.1.2. The rotational agricultural land will have an annual planting rate of 25% and will be subject to rain-fed agriculture over a rotational cycle of 12 years: a 3-year planting period (a suitable agricultural land conservation measure will be introduced in the 1st year of planting; see "9.3.1.3 Farming"), and a 9-year non-planting period (including a 3-year fallow period).

Irrigated agricultural land consists of vegetable fields distributed over 11 hectares near the Goroubi river and the Dyamangou river. In order to prevent soil deterioration in non-agricultural land, suitable environmental protection measures will be carried out (see "9.3.1.7 Environmental protection"). In order to secure saplings to produce firewood, a mini nursery field of 0.25 hectares will be created.

Table 9.3.1.1.2 Land use plan

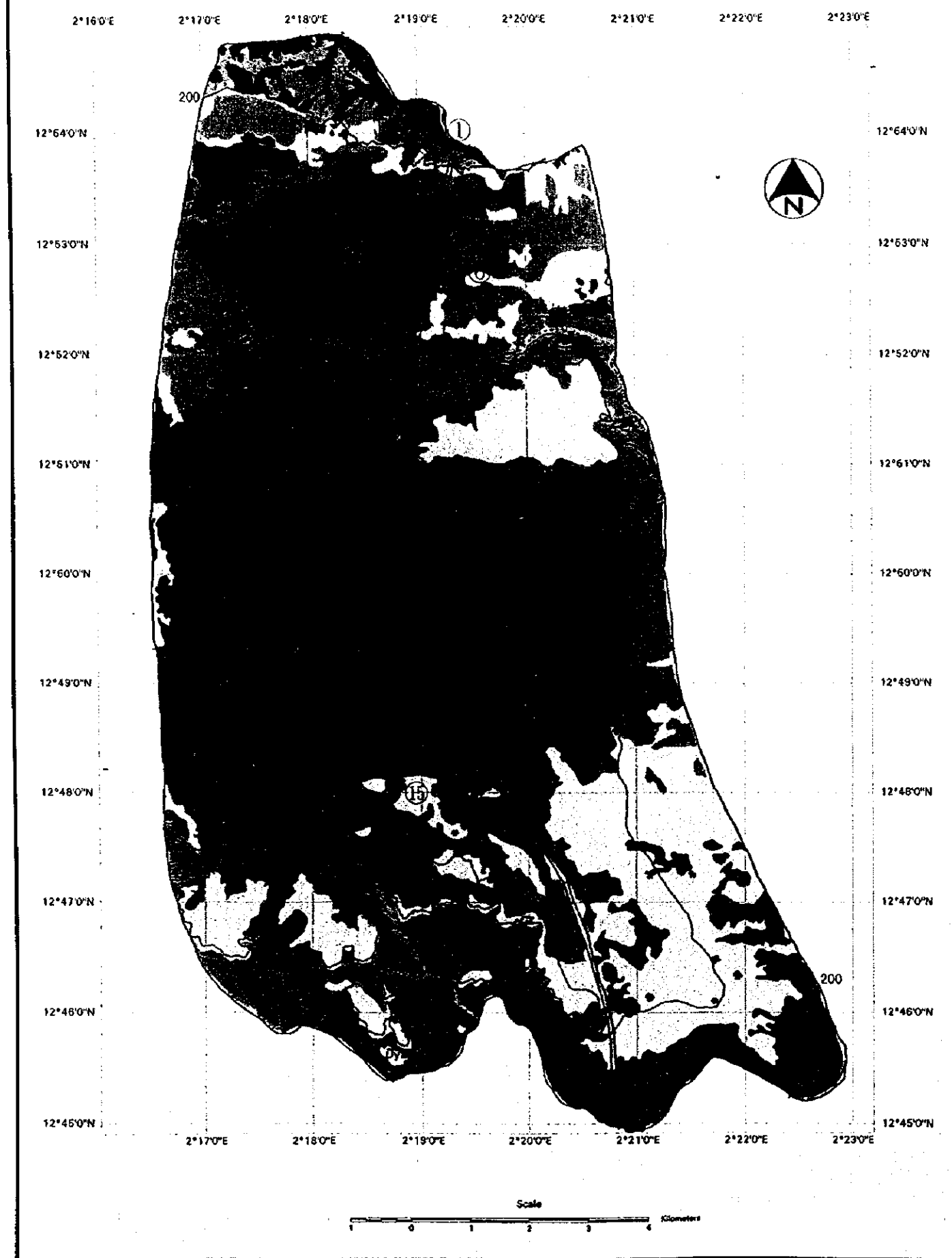
(Unit: ha)

Current classification	Current area	Planned land use									
		Agricultural land					Non-agricultural land				
		Rotational agricultural land			Irrigated agricultural land						
		Planted land	Non-planted land			Vegetable fields, etc	Grass-land	Forest	Bare land	Marsh-land, aquatic zone	Settle-ments
Fallow land	Grass-land, etc										
Agricultural land	5,575	5,563	1,391	1,391	2,781	12					
Grassland	3,208						3,208				
Woodland	2,269							2,269			
Bare land	2,767								2,767		
Marshland	0									0	
Aquatic zone	51									51	
Settlement	19									19	
Total	13,889	5,563	1,391	1,391	2,781	12	3,208	2,269	2,767	51	19
		100%	25%	25%	50%						

Source: JICA remote sensing survey commissioned in 1998

Notes: The 12 ha of irrigated agricultural land is rounded up from 11.25 ha which is the total of 11 ha of irrigated agricultural land and the 0.25 ha of mini nursery field.

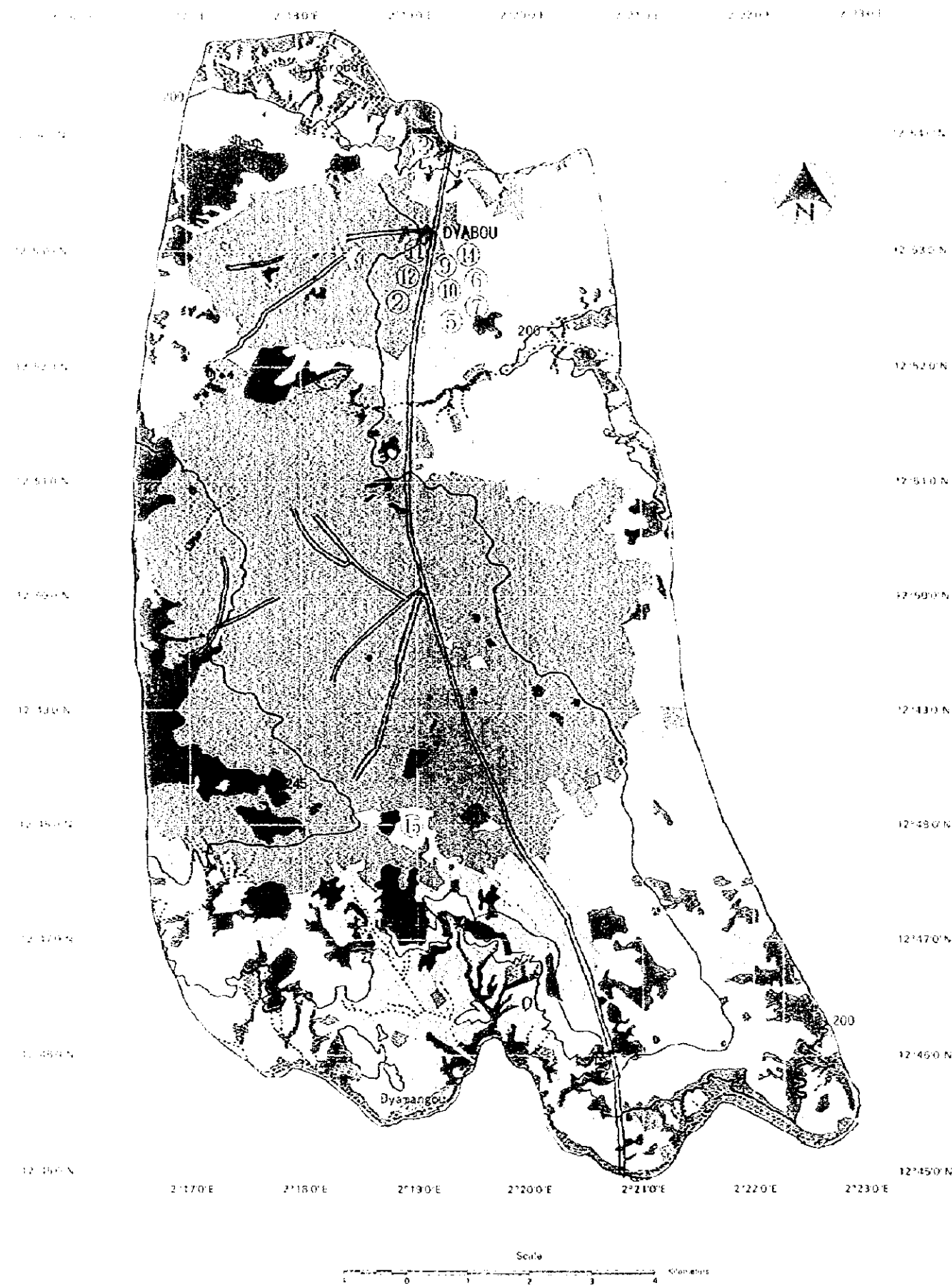
Figure 9.3.1.1.2 Map of land use plan (DYABOU)
 図 9.3.1.1.2 土地利用計画図 (ジャブー)



Colour	Legend	凡例
[Dark Grey]	Agricultural land	農地
[Light Grey]	Grassland	草地
[White]	Bare land	裸地
[Dark Grey]	Wood land	森林
[Dark Grey]	Marsh land	湿地
[Light Grey]	Aquatic zone	水域
[Dark Grey]	Settlements	集落

①	Bridge dam
②	Well development
③	Small scale irrigation
④	Rehabilitation of ponds
⑤	Installation of dry cheese production facilities
⑥	Development of collecting and shipping facilities
⑦	Fresh milk collecting and shipping facilities
⑧	Crop bank
⑨	Equipment and materials bank
⑩	Mill
⑪	Simple health hut
⑫	Primary school
⑬	Firewood development
⑭	Mini-nursery
⑮	Soil conservation (grassland restoration)
①	潜り橋
②	井戸整備
③	小規模かんがい
④	沼改修
⑤	チーズ製造施設
⑥	農産物集出荷施設
⑦	生乳集出荷施設
⑧	穀物銀行
⑨	資機材銀行
⑩	製粉所
⑪	簡易診療所
⑫	小学校
⑬	薪炭林
⑭	小規模苗圃
⑮	土壌保全 (草地復元)

Figure 4.1: 2 Map of land use plan (DYABOU)
 ジャブーの土地利用計画図 (ジャブー)



Colour	Legend	凡例
[Pattern]	Agricultural land	農地
[Pattern]	Grassland	草地
[Pattern]	Bare land	裸地
[Pattern]	Wood land	森林
[Pattern]	Marsh land	湿地
[Pattern]	Aquatic zone	水域
[Pattern]	Settlements	村落

[Symbol]	Bridge dam
[Symbol]	Well development
[Symbol]	Small scale irrigation
[Symbol]	Rehabilitation of ponds
[Symbol]	Installation of dry cheese production facilities
[Symbol]	Development of collecting and shipping facilities
[Symbol]	Fresh milk collecting and shipping facilities
[Symbol]	Crop bank
[Symbol]	Equipment and materials bank
[Symbol]	Mill
[Symbol]	Simple health hut
[Symbol]	Primary school
[Symbol]	Firewood development
[Symbol]	Mini-nursery
[Symbol]	Soil conservation (grassland restoration)
[Symbol]	沼り池
[Symbol]	井戸整備
[Symbol]	小規模かんがい
[Symbol]	沼改修
[Symbol]	チーズ製造施設
[Symbol]	農産物集出荷施設
[Symbol]	生乳集出荷施設
[Symbol]	穀物銀行
[Symbol]	資機材銀行
[Symbol]	製粉所
[Symbol]	簡易診療所
[Symbol]	小学校
[Symbol]	薪炭林
[Symbol]	小規模苗圃
[Symbol]	土壌保全 (草地復元)

9.3.1.2 Water use

(1) Present situation

- ① Rainfall: According to data for the last 31 years (from the observation point in Say), the yearly rainfall is 548.8mm. There is no rain between November and February. (There are no meteorological observation facilities in Dyabou).
- ② Rivers: The Goroubi river and the Dyamangou river are both major Koris or tributaries of the Niger river. Surface runoff water exists until November. In the Dyamangou, pools of water can still be seen in February. The characteristics of the Goroubi river are being studied by JALDA in the demonstration field in the Magou village. An aquifer layer develops in the flood area, and sufficient groundwater is available even in the dry season. No irrigation facilities have been installed in either of the rivers.
- ③ Wells: There are 11 shallow wells and 1 deep well in the whole village. There is no seasonal change in water levels. As for management, although there is no water management committee in accordance with the Water ordinance, the village chief manages cement shallow wells that were installed by the State in 1960. The woman staff of the Water Management Committee manages tube wells (treadmill-type wells) that exist in 2 places in the village. Water from the tube wells is sold at 5 FCFA per 40 liters. A manager is paid 1,500 FCFA per month by the Water Management Committee to supervise the wells, and collects payment from users on the spot. Drinking water is mainly supplied by a deep well and the two tube wells. The shallow and deep wells in the village are available for anyone to use, whether villagers or outsiders.
- ④ Ponds: there are ponds that reserve water for 2 months after the rainy season in about 10 places throughout the village. They are used as water supply facilities for livestock for about two months after the end of the rainy season.
- ⑤ The demand for water sources for the cultivation of vegetables during the dry seasons is high

(2) Development principle

- ① Modern wells will be constructed to provide potable water of good quality.
- ② Wadi flood areas will be developed to utilize the abundant water resources. A bridge dam will be constructed and the storage and flow of irrigation water will be improved..

(3) Plan

- ① Judging from the fact that the resident population is currently 869 and that, in the government's Drinking Water Well Installation Program, 1 modern well is to be installed for every 250 persons, there should be wells in 4 places for the present population. Since

there are only 3 wells at present, a new tube well will be installed in one place. (see 8.2.2 Groundwater for calculations)

- ② The bridge that was washed away by the abnormally heavy rains in 1988 was indispensable to the life of the Dyabou villagers. A bridge dam (length 385m, depth 8.0m) will be built with the aim of developing water resources (See Annex 9.3.1.2.1 and Figure A 8.2.6- 8 for building conditions).
- ③ Small-scale fields for irrigation purposes and a mini nursery (0.25 ha) will be created in stages (1 hectare in Stage I, for village consumption; 5 hectares in Stage II, and 5 hectares in Stage III, for the Niamey market). As for the specifications for individual plots, the standard which has been introduced and proved operational in the Magou village (JALDA verification Study is applied). That is, each plot will be 100 square meters, with a net irrigation area of 60 square meters. The required water volumes will be based on the standards of irrigation by the Ministry of Hydraulic and Environment, and the irrigation method will be that a water tank will be placed in one location per four plots, and water sprinkling will be done.
- ④ A shallow well will be set up in 1 location on the Dyamangou river flood area, to be used as a water supply facility for livestock and fruit trees.

9.3.1.3 Farming

(1) Agriculture

1) Present situation

(a) Agriculture

From the results of the surveys, the average farmland area per household (crop planting land as per the land use plan; the same applies below) is 2.9 hectares. The main form of farming is rain-fed agriculture in the rainy season, and besides the main cereal crops of millet (81.6%, as a proportion of the crop planting area; the same applies below) and sorghum (9.5%), other crops such as cowpeas (34.8%) and dock (5.0%), as well as peanuts (0.2%), okra (0.2%), sesame (3.4%), and maize (1.8%) are also cultivated in combination with these. In the dry season, lowlands are used (despite their restricted land area) for the cultivation of tomatoes, chilli peppers, pumpkins, cabbages, salad greens, melons, and maize.

(b) Agricultural land conservation

As a whole, the land topography is situated on a gently sloping plateau surface. The koris that flow into the Goroubi and Dyamangou rivers have carved out valleys. Farmland has been lost from the valley heads of these koris. In addition, owing to the population increase in recent years and the associated shortening of non-planting periods, soil is progressively deteriorating due to runoff of surface soil.

Under present circumstances, in some cases farmland conservation measures are being implemented using tree branches to retain flying soil. But the area of such measures is limited. Rapid soil degradation is not being prevented. In addition, knowledge concerning soil preservation measures is poor and organized farmland conservation measures are almost non-existent.

(c) An overview of individual farming

The cultivation of crops is carried out in the form of single crop mainly of millet, along with other cereal crops such as sorghum and cowpeas, as well as dock, sesame, okra and others, or a mixture of these crops. Dry season vegetables such as green peppers and cabbages are also cultivated, albeit on a tiny scale. The cultivation technology, however, is at a low level, and productivity is also low. Crops are usually grown to satisfy the family's own demand, and are only sold when in excess or when cash is needed.

Stock raising is mainly sedentary in combination with agriculture, although some nomadic pasturing is also practiced when seeking grassland in the dry season. An average livestock-owning farm household will have 5 cows, 15 sheep, and 14 goats. Farm households of UBT8 or more account for about 40% of the total. In addition, stock raising, like agriculture, follows a traditional style of practice whereby livestock are sold whenever cash is needed, but is not practiced in the rigorous pursuit of profits. As for non-agricultural income, each household has an outside work income of around 140,000 FCFA.

2) Development principle

(a) Agriculture

- ① As for the main cereals of millet and sorghum, ameliorated seeds cultivated by INRAN and ICRISAT will be introduced and the productivity and the quality will be improved, in a bid to break out of the low productivity caused by native species and in addition crop rotation will be thoroughly implemented.
- ② The percentage of agricultural land in crop rotation is 25%.
- ③ A shallow well will be built near the site of construction of the bridge dam over the Goroubi river, and a production area will be created via dry season vegetable cultivation.
- ④ Since livestock feed production is self-sufficient in the village, penning (enclosure) is rotationally practiced in millet fields in the village.

(b) Agricultural land conservation

- ① Small basin agricultural land conservation group activities: The village will be divided into two districts on the basis of the Goroubi and Dyamangou basins, and agricultural land conservation measures will be promoted by each group separately (see Fig. A 9.3.1.3.1).
- ② Agricultural land conservation measures: Will adopt a simple eyebrow ridge method with combined use of stone ridge and Zai.
- ③ Soil fertility improvement measures: Depending on the conditions of agricultural land and farmers, three soil fertility improvement measures (organized introduction of penning

(enclosure), intermediate planting of cowpeas and other pulse crops, production of manure and the utilization for Zai) will be combined as the agricultural land conservation measure in ② above, with the aim of improving soil fertility

- ④ Measures for improving water holding capacity of soil that has become glacié will be practiced (see "9.3.1.7 Environmental protection").

(c) Individual farming

As the target for farming, diffusion and guidance in cultivation techniques will be rigorously carried out, as well as devising measures such as procuring ameliorated seeds and setting fallow periods to maintain soil fertility will be implemented. In this way, unit yields of millet and sorghum will be increased by 50% and the productivity of cowpeas, vegetables, etc. will be raised to a standard level through concentrated cultivation. In addition, by developing small-scale irrigation facilities, dry season vegetable cultivation will be promoted taking advantage of the proximity to Niamey City.

In the case of stock raising, operation will be improved through the improvement of livestock development and technology, the distribution of superior cattle and introducing selling at appropriate times.

3) Plan

(a) Agriculture

① Main cereal crop production increase plan

The production (by 30%) and the quality of millet and sorghum will be improved by introducing ameliorated seeds. In addition, non-planting period is secured, penning (enclosure), intermediate planting of cowpeas and other pulse crops, agro-forestry and water harvesting will be promoted. Thus land fertility will be improved, and the production will be increased by 20% (or 50% overall) by comprehensive implementation of these measures. Cowpeas will be increased by 20% through a recovery in land productivity due to water harvesting. See Table 9.3.1.3.1 for the calculated increase effect of these measures.

Table 9.3.1.3.1 Yield increase by introducing ameliorated seeds

Item	Planted area (ha)*		Unit yield (kg/ha)*		Yield (t)		Yield ratio (%)	Yield increase (t) (b)-(a)	Sale price ** (FCFA/kg)	Sales amount of increased yield (1,000 FCFA)
	Present	Planned	Present	Planned	Present (a)	Planned (b)				
Millet	1,171	1,135	743	1,115	870	1,266	146	396	155	61,380
Sorghum	136	132	497	746	68	98	144	30	148	4,440
Cowpeas	499	484	151	181	75	88	117	13	221	2,873
Total	1,806	1,751	-	-	1,013	1,452	143	439	-	68,693

Notes: * Present figures are averages for three years from 1991 to 1995, excluding the highest and lowest years. Planned figures are predictions based on remote sensing analysis.

** Average prices at the Petite Marché market in Niamey, 1996-97.

② Dry season vegetable cultivation plan

We will take advantage of the proximity to Niamey, the consumption area and conduct cultivated vegetable agriculture. For this reason, we will select crops that have a stable demand and are storable. They will be produced systematically and shipped collectively. The production and sale plan of the vegetables to be introduced is shown in Table 9.3.1.3.2

Table 9.3.1.3.2 Calculations for introduced vegetable production/sales plan

Item	Planted area (ha)	Unit yield (kg/ha)*	Yield (kg)	Sale price ** (FCFA/kg)	Value sold (FCFA)
Onions	4	24,294	97,176	315	30,610,440
Cabbages	3	25,328	75,984	300	22,795,200
Tomatoes	2	5,195	10,390	384	3,989,760
Melons	2	16,026	32,052	600	19,231,200
Total	11	—	215,602	—	76,626,600

Notes: * Unit yields in the Magou village (JALDA verification Study), ** Sale price is the price in the Niamey market, 1996-7.

(b) Agricultural land conservation

a) Rationale on small basin divisions and characteristics of each division

① Group I (Northern part)

This is the area that includes the center of the village. It mainly consists of agricultural and pasture land on a flat plateau, with progressive soil erosion towards the koris of various sizes that flow down to the Goroubi river in the north of the village.

② Group II (Southern part)

This is agricultural and pasture land, similar to that in Group I, but in the south of the village. There is progressive soil erosion towards the koris of various sizes that flow towards the Dyamangou river flowing along the southern edge. There is also an area with extensive glaciais land

b) Characteristics of measures by group

① Group I

- Intensive measures may be devised since the area is adjacent to settlement area. In part, the land has become glaciais owing to soil runoff, and measures will be implemented mainly in areas affected by it.
- In addition to stone ridge and Zai, one of the native methods, namely the measure of laying tree branches will be promoted to retain earth that would otherwise be blown away by the wind. The quarrying site for stone used as stone ridges is located in the south of the village, and, since it is about 10 kilometers from the village center, assistance with its transportation by truck will be conducted.

② Group II

- Though set apart from settlement area, this area includes a quarrying site for stone that can be used for stone ridges. Therefore, this work will be gradually executed starting from farmland

with advanced soil deterioration.

- Agricultural land conservation measures will be broadly executed using Zai and the simple eyebrow ridge that is easy to execute and is not labor intensive. Permeation of surface runoff into the groundwater will be promoted so as to revive productivity as soon as possible.
- In order to improve the water holding capacity of soil of glacia land, grassland restoration measures will be implemented through surface leveling (see "9.3.1.7 Environmental protection").

c) Protection Plan

The content of the agricultural conservation work plan is shown in Table 9.3.1.3.3.

Table 9.3.1.3.3 Agricultural land conservation plan (annual)

Contents	Implementation area (ha)	Materials etc.
① Stone ridge construction	93	Stone 1,209 t
② Zai	116	Compost 232 t
③ Simple eyebrow ridge construction	70	
④ Penning (Enclosure)	509	Livestock excrement 2,545 t
⑤ Intermediate planting of pulse crops	696	
Total of agricultural land conservation measures	279	①+②+③
Total of soil fertility improvement measures	1,321	②+④+⑤

Note: 1 Part of the Zai will be combined with stone ridge constructions.

2 Zai has been added to the total area of countermeasures for both agricultural land conservation and soil fertility improvement.

(c) Farm management by type

With regard to the formulation of the agricultural management plan, in accordance with 8.3.4 Agricultural management, through the results of a farm family survey conducted in the Study Area, the conditions of farm management in villages were grasped and based on this understanding, farm families which it was possible to target were selected and management calculations were conducted for each type of farming. The types of farming present in these villages are as follows: ① exclusively rain-fed agriculture (most farms belong to this type, and carry out farm management for self-sufficiency; they also raise 1-2 small ruminants for own use), and ② rain-fed agriculture + stock raising (mainly rain-fed agriculture).

Table 9.3.1.3.4 ① Exclusively rain-fed agriculture

Category	Average Farm Land Area	Planted Land			Corresponding Households		
Present	2.9 ha	4.0 ha			60%		
Planned	2.7 ha	3.8 ha					
	Category	Millet	Sorghum	Cow peas	Cock sorrel	Others	Totals
Present	Planted Area ha	2.4	0.3	1.0	0.1	0.2	4.0
	Unit yield kg/ha	743	497	151	100	500	--
	Total production kg	1,783	149	151	10	100	--
	Unit price FCFA	142	139	237	110	69	--
	Gross production value FCFA	253,186	20,711	35,787	1,100	6,900	317,684
	Operating expenses FCFA	2,275	203	398	100	0	2,976
	Farming income FCFA	250,911	20,508	35,389	1,000	6,900	314,708
Planned	Planted Area ha	2.3	0.3	1.0	0.1	0.1	3.8
	Unit yield kg/ha	1,115	746	181	120	24,294	--
	Total production kg	2,565	224	181	12	2,429	--
	Unit price FCFA	142	139	237	110	315	--
	Gross production value FCFA	364,230	31,136	42,897	1,320	765,135	1,204,718
	Operating expenses FCFA	3,413	305	597	150	233,366	237,831
	Farming income FCFA	360,817	30,831	42,300	1,170	531,769	966,887

* "Others" are typically peanuts for the present stage and onions for the planned stage, when it is anticipated that irrigation facilities will be developed. Unit yields of main crops and onions are according to Tables 9.3.1.3.1-2. Operating expenses are expected to rise 50% from present, and onions were calculated based on the results of the verification Study in the Magou village.

Table 9.3.1.3.5 ② Rain-fed agriculture + stock raising (sedentary type)

Category	Average farmland area	Planted area		Average number of animals reared			Corresponding households		
Present	2.9 ha	3.7 ha		5 cattle, 15 sheep, 14 goats			40 %		
Planned	2.6 ha	3.6 ha		8 cattle, 30 sheep, 28 goats					
Category		Millet	Sorghum	Cowpeas	Stock raising			Total	
					Cattle	Sheep	Goats		
Present	Planted Area	ha	2.4	0.3	1.0	5 (heads)	15 (heads)	14 (heads)	—
	Unit Yield	kg/ha	743	497	151	—	—	—	—
	Total Production	kg	1,783	149	151	—	—	—	—
	Unit Price	FCFA	142	139	237	39,210	10,380	7,110	—
	Gross Production Value	FCFA	253,186	20,711	35,787	196,050	155,700	99,540	760,974
	Management Expenses	FCFA	2,275	203	398	27,790	23,360	14,920	68,946
	Farming Income	FCFA	250,911	20,508	35,389	168,260	132,340	84,620	692,028
Planned	Planted Area	ha	2.3	0.3	1.0	8 (heads)	30 (heads)	28 (heads)	—
	Unit Yield	kg/ha	1,115	746	181	—	—	—	—
	Total Production	kg	2,565	224	181	—	—	—	—
	Unit Price	FCFA	142	139	237	63,760	12,000	7,710	—
	Gross Production Value	FCFA	364,230	31,136	42,897	510,080	360,000	215,880	1,524,223
	Management Expenses	FCFA	3,413	305	597	109,270	54,180	32,400	200,165
	Farming Income	FCFA	360,817	30,831	42,300	400,810	305,820	183,480	1,324,058

(2) Stock raising

1) Present situation

The method of stock raising in the village is basically sedentary. Animals are sometimes moved to the south (where the rainy season starts early) for pasturing 1-2 months before the rainy season. The villagers consist 80% of crop farming Zarma people and 20% of stock raising Peulhs people, though the latter tend to own more animals. The numbers of animals raised are shown in Table 9.3.1.3.6. The Zarma people include some farmers who own no livestock. Breeds of cattle are Dijelli, Goudali, and crossbreeds of these. The main breed of sheep is Ara Ara. The breed of goat is Sahel. People living in Niamey and elsewhere sometimes raise livestock by entrusting cattle, sheep, and goats to local Peulhs herder boys (the number of animals raised is unknown). Some Peulhs people even receive a monthly wage of 10,000 FCFA in exchange for tending cattle. In the six months of the rainy season between May and October, the monthly wage is 1,000 FCFA per cow, and 500 FCFA per sheep or goat. Zarma farmers who have no livestock enter penning (enclosure) agreements with Peulhs herders, offering millet in exchange for animal excrement to lay on the fields. Milk is mostly for own consumption by the Zarma. The Peulhs sell milk. Although the Zarma do sell fattened sheep and goats each year in order to purchase necessary machinery for cereal production, the number of cows sold is small, except in emergencies.

The problems facing livestock farming, among others, are that ① although the location is close to Niamey and other major consumption sites, not enough advantage is being taken of this owing to an underdevelopment of distribution infrastructure, and ② herders augment their herd intake with dry grass during the dry season to make up for scarcity and because they have little interest in improving production by stock improvement.

2) Development principle

This village, bordering on the Goroubi and Dyamangou rivers, is blessed with abundant water resources. Attempts should be made to promote agricultural production based on these resources, and livestock farming will be given secondary importance to agriculture in the plan. Agricultural production will be supported by penning (enclosure) and other means. As a way of increasing milk production, Azawak sire bulls will be introduced to promote livestock improvement. Nutritional bricks will be manufactured using millet bran produced in the fields and given to livestock, thus livestock productivity will be improved in the dry season. As the Peulhs people, albeit in the minority, are engaged mainly in livestock farming, a milk shipping cooperative will be set up for the effective shipment to Niamey.

3) Plan

(a) Stock raising plan

Livestock will be tended by herder boys and allowed to graze on non-planted grassland, non-agricultural grassland, and woodland in the rainy season. In the dry season, they will be freely grazed on agricultural land and fed with residues of millet, sorghum, cowpeas, and other crops, hay, and livestock nutritional bricks, etc. As part of the improvement of farm practice, guidance will be given in storing excess grass as hay in the rainy season and using it as feed in the dry season. Since a surplus of fodder resources may be anticipated in this village, the numbers of cattle, sheep and goats will be increased. The stock raising plan is shown in the Table 9.4.1.3.6.

In order to increase milk production, Azawak breeding bulls will be introduced. The bulls introduced will be distributed at the rate of one bull per 30 brood cow for a total of 7 bulls.

The mechanism used to produce stock nutrition block will be at the rate of 1 set per UBT60 (Dorugm: large and medium bowl: 2, 1 bucket) and 19 sets will be introduced through financing by the agriculture assistance system.

Table 9.3.1.3.6 Livestock raising numbers plan

Kind of livestock	Present		Planned		Remarks
	Number	UBT	Number	UBT	
Cattle	400	320	600	480	
Sheep	1,100	154	2,000	280	
Goats	1,000	140	2,000	280	
Camels	2	2	2	2	
Donkeys	70	35	70	35	
Horses	3	3	3	3	
Total		654		1,080	

(b) Fodder supply and demand plan

The calculation for fodder supply and demand is shown in Table 9.3.1.3.7 (see Tables A 9.3.1.3.1-6 for the method of calculation). Fodder is in surplus, both at present and in the future. This is the result of adopting sufficient numbers of raised livestock in anticipation of the use of livestock owned by residents of Niamey.

Table 9.3.1.3.7 Calculation of fodder supply and demand

(Unit: tons)

Category	UBT	Required dry matter	Estimated quantity available			Supply/demand balance
			Grassland etc.	Crop residues	Total	
Present	654	1,552	4,429	1,649	6,078	4,526
Planned	1,080	2,562	4,457	1,804	6,261	3,699

(c) Livestock product production plan

The Livestock Product Production Plan is shown in Table 9.3.1.3.8. For cattle, great increase in production is anticipated through measures such as livestock improvement by introducing superior animals, nutrition improvement using livestock nutritional bricks, and the provision of balanced feed throughout the year through guidance on stored feed production. Moreover, the planned values have been given by calculating from present livestock productivity. Also, the amount of animal excrement that can be used for penning (enclosure) is 2,400 tons for cattle, 1,400 tons for sheep, and 1,400 tons for goats.

Table 9.3.1.3.8 Livestock product production plan

Category	Kind of livestock	Numbers raised	Of which, number of adult females	Produce (tons)			
				Meat (male)	Meat (female)	Waste meat	Milk
Present	Cattle	400	140	5.88	1.96	2.94	46.20
	Sheep	1,100	522	6.26	3.11	1.27	26.10
	Goats	1,000	202	3.65	2.70	0.34	14.14
	Total			15.79	7.77	4.55	86.44
Planned	Cattle	600	192	16.63	8.45	5.25	96.00
	Sheep	2,000	894	13.03	6.97	2.65	53.64
	Goats	2,000	373	8.14	6.16	0.74	29.84
	Total			37.80	21.58	8.64	179.48

(3) Community forest

1) Present situation

This village is blessed with forestry resources, although vegetation is affected by the topography.

The topography of this village can be divided into two types, namely ① the plateau, consisting of arable sandy soil (*sols sableux*), and the soil that has become glaciais, used as pasture grassland and land for firewood materials, and ② the valley of the Dyamangou river, used as vegetable gardens.

Vegetation consists of low natural trees and herbal plants, the main tree species including *Combretum glutinosum*, *Combretum nigricans*, *Guiera senegalensis*, *Sclerocarya birrea*, *Piliostigma reticulatum*, *Balanites egyptiaca*, *Bombax costatum*, and *Cucumis melo*.

The problems facing the community forest are as follows.

- ① As one aspect of lifestyle improvement, the inhabitants are planting trees on the land they themselves own, i.e. in their gardens or fields for various purposes, namely to promote greenery, as fruit orchards, or as hedging around vegetable plots. The seedlings for planting are distributed free of charge by the Directorate of Environment or NGOs involved in tree planting activities. The varieties most commonly planted are margosa, baobab, eucalyptus, and *Parkia biglobosa*. Most of the inhabitants take part when tree planting rallies are held. However, owing to financial difficulties on the part of the government of Niger, not enough seedlings can be produced to satisfy the inhabitants' needs.
- ② When promoting the community forest, there is a problem of budget. The government has not yet introduced mini-nurseries into the villages or started campaigns to increase awareness of tree-planting among inhabitants.

2) Development principle

The inhabitants of this village are aware of the decline in forest resources, and recognize the importance and obligation of forest resources. The key to success with community forest activities is that the inhabitants themselves should have the right to make decisions on planting and maintaining trees with a view to obtaining adequate necessary supplies of firewood and construction materials, and to improve lives through increased income.

The promotion of community forest should be targeted at the following areas in order to improve the living conditions of the inhabitants and prevent desertification. The following activities are particularly necessary in Dyabou.

- ① Recovery of glaciais land via CES/DRS activities aimed at increasing agricultural production.
- ② Re-forestation of natural forests in order to raise production capacity.
- ③ Tree planting on farmland with the aim of increasing soil fertility.
- ④ The species of seedlings to be provided for tree planting are as follows.
 - Tree species with economic value: *Adansonia digitata*, *Balanites egyptiaca*, *Combretum nigricans*

- Tree species that are useful as fuel: *Combretum nigricans*, *Guiera senegalensis*, *Balanites egyptiaca*, *Piliostigma reticulatum*, *Azadirachta indica*
- Tree species for improving fertility of fields: *Acacia albida*, *Acacia nilotica*
- Tree species that have pharmaceutical uses: *Bombax costatum*, *Guiera senegalensis*, *Balanites egyptiaca*
- Tree species for shade: *Azadirachta indica* (Neem), *Piliostigma reticulatum*, *Sclerocarya birrea*, *Balanites egyptiaca*
- Tree species with commercial value: *Adansonia digitata* (leaves and fruit), *Balanites egyptiaca* (fruit), *Ziziphus mauritania* (fruit), *Acacia nilotica* (fruit), *Acacia seyal* (rubber)
- Live hedging for vegetable gardens: *Prozopis juriflora*

3) Plan

The plans related to the community forest are as follows.

- ① Education for inhabitants on the need for tree planting in fields, vegetable gardens, along roads, and village-owned forests (in order to produce firewood)
- ② Training representatives from the village in seedling production
- ③ Organization for managing a mini-nursery within the *Terroir* Management Committee
- ④ Setting up a mini-nursery, and producing seedlings of tree species that have economic value
- ⑤ Tree planting for soil recovery, prevention of soil flow in sloping parts of koris, and increasing greenery on waste lands
- ⑥ Maintenance and management of juvenile trees after planting

9.3.1.4 Agriculture, stock raising, and silviculture support

(1) Present situation

In 1998, a cereal bank was established in this village with the cooperation of extension staff of the Agriculture of Say District Office and support from the natural resources management project (PGRN) of the IBRD. Through this support, cereal banks where food is distributed in times of famine and paid back at harvest time were established.

Besides, two mills had been installed in Dyabou by merchants, but they are not functional because of later breakdowns. The women of the village used these mills until they malfunctioned at a price of 25 FCFA per bowl charged by the merchants.

Through operating the cereal bank for the initial year, the *Terroir* Management Committee gains greater self-confidence in its management ability. With continuous guidance to the farmers, it will be possible for them to fully accept and manage the support for agriculture as envisioned by the project.

(2) Development principle

- ① The women are forced to take part in hard works including grinding millet, housework, childcare, fetching water, collecting firewood, and helping with work in the fields. A mill will be installed to eliminate some of this work in order to contribute to maintaining the women's health. A fee for using the mill will be set and the income used to operate the machine on a permanent basis.
- ② A materials and equipment bank will be established to loan carts and two-wheel barrows pulled by domestic animals to be used to collect firewood and transport agricultural products or organic fertilizers, watering cans for irrigation use, and farm tools for women to use for dry-season vegetable cultivation.
- ③ Agricultural management credit will be provided to improve agricultural and forestry management, and farm households that will serve as models in their respective regions will be nurtured.
- ④ Small scale credit will be provided to women for the cultivation of dry-season vegetables, the breeding of small domestic animals, the manufacture of handicrafts, and the manufacture of cheese, etc.

Specific activity groups will be established in the Terroir Management Committee to manage the utilization of these facilities, materials, and the financing systems. These groups will establish regulations governing the setting of usage fees, qualifications to receive financial support, repayment conditions, and determining security for the financing. At the same time, the groups will be provided with guidance and education under the project so that they can manage the project appropriately.

The materials and equipment bank will establish a fund with utilization fees collected from users. This will permit continued operation of the bank by providing farmers with a consciousness of being owners of the farming equipment, an awareness that will encourage them to maintain and manage the machinery themselves.

(3) Plan

- ① A mill will be installed to be used to grind millet.
- ② A materials and equipment bank will be established to loan farm equipment and carts and two-wheeled barrows pulled by domesticated animals, etc.
- ③ A agricultural management credit system will be introduced to nurture model farm households.
- ④ A small-scale credit system will be introduced to guarantee cash income to women.

9.3.1.5 Market distribution

(1) Present situation

The piste from the national highway through the Boki village plateau and across the Goroubi river to Dyabou village was constructed by the village residents. It is an important distribution infrastructure used to bring production materials and equipment to Dyabou and ship its agricultural products. But the bridge across the Goroubi river collapsed during a flood in 1998, cutting off links to Boki village, which is the largest market in the Dyabou region and dealing a serious blow to the economy of Dyabou. While there was a small market in Dyabou for products such as millet, cow peas, sorghum, cock sorrel, peanuts, etc., it is now inactive.

Some of the women make and sell cakes, and soap, while others raise sheep and goats that they sell in the market in Boki. Domestic animal markets are located in Dyabou, Boki, and in Gueme. The largest of these is the market in Boki.

Milk is mainly consumed in the village and nearby. However, because this village is near Niamey and Say, there is room to increase production. Close to the city of Niamey, Dyabou has rich water resources, but problems relating to market distribution prevent full use of the village's potential productivity.

Dyabou does not distribute any forestry products because lacking any national forest land where cutting is permitted under an authorization system, its inhabitants consume all the firewood they cut.

Dyabou faces three distribution problems. 1) Access to the village has been disrupted by the collapse of the bridge over the Goroubi river on the road from Dyabou to Boki, 2) there is no infrastructure to process and store agricultural products, and 3) transportation has not been modernized and mule and hand-pulled carts are still used.

(2) Development principle

- ① The route across the Goroubi river is the road linking Dyabou to the city of Say that administers the region and to Canton Tamou that handles tax collection and lawsuits. The bridge over the Goroubi river that has been destroyed will be restored in order to revive economic activities in Dyabou. Access for distribution purposes will also be improved by repairing access roads and by constructing works across koris along the course of the road.
- ② To take advantage of its proximity to the capital, vegetable, fruit, and dairy production will be encouraged and joint collecting and shipping facilities will be constructed. At the same time, transportation methods will be modernized to gain timely access to the Niamey market.
- ③ Milk will be processed to dry cheese for sale by groups of women.

(3) Plan

1) Agricultural roads

When the bridge is repaired, it will be rebuilt as a bridge dam that will also provide a dam function. And at the same time, a 2 km access road section will be repaired. And on the road from the national highway through Boki to the bridge, crossing works will be constructed at three locations where the road intersects koris.

2) Collecting/Shipping and Processing

① The amount of agricultural products sold in the village was vegetables: approximately 200t, and fresh milk: approximately 100t, ② profits from cooperative sales are expected, ③ transportation costs have been reduced, ④ cooperative transportation facilities will be provided in connection with the organization of farmers. The facilities presented in Table 9.3.1.5.1 will be provided at a single location as a joint collecting and shipping facility for fruit and vegetable products. And the facilities presented in Table 9.3.1.5.2 will be provided at a single location as a joint shipping location for dairy products.

Table 9.3.1.5.1 Joint collecting/shipping facilities

Item	Structure/Standards	Number	Unit	Remarks
Collecting/shipping facility	Simple steel frame 50m ²	1	Building	
Transport vehicles	2t	1	Unit	
Scales	500kg	1	Unit	
Shipping cases	Plastic	100	Case	

Table 9.3.1.5.2 Dairy product collecting/shipping facilities

Item	Structure/Standards	Number	Unit	Remarks
Collecting/shipping facility	Banko50m ²	1	Building	
Transport vehicles	2t	1	Unit	
Scales	100kg	1	Unit	

A total of 180 tons of milk will be produced. Internal consumption by the villagers is forecast as 40 tons, 100 tons will be shipped from the village, and the remaining 40 tons will be processed to make dry cheese. Dry cheese processing plants with capacity for between 10 and 15 tons each will be installed at three locations. A detailed description of these facilities is presented in Table 9.3.1.5.3.

Table 9.3.1.5.3 Dry cheese processing plant

(one location)

Item	Structure/Standards	Quantity	Unit	Remarks
Processing plant (processing facilities)	Banco construction 30m ²	1	Building	
1. Table	Cast iron 2m×1.5m×0.6m	1	Unit	
2. Nylon insect proof netting (wooden framework)	Wooden frame 1.9m×0.9m	1	Net	
3. Perforated plate		1	Panel	
4. Supporting column for item No. 2.		1	Set	
5. Bucket	20 liters	1	Bucket	
6. Wooden framework to be covered with the mosquito net	2m×19.5cm	1	Frame	
7. Other small tools and equipment	Buckets, vinyl cans, bowls, 1-liter vessel, vessel for use as a rennet, foam scoop, wooden tablespoon, measuring cups, sieves, brushes, etc.	1	Set	

9.3.1.6 Living environment improvement

(1) Present situation

1) Health and hygiene

There is no dispensary in the village, but a past IDA population project trained one emergency worker and one midwife. The midwife later passed away and there is no midwife in the village, because no one has been trained as a successor. The emergency worker sells pharmaceuticals in the village at present. Patients are taken either to the dispensary 15 kilometers away in Canton Tamou or to a hospital in the city of Say that is 26 kilometers from Dyabou. Periodic examinations are performed and aspirin and similar drugs are provided under the provisions of a mother and childcare program and a basic community improvement plan. A simple health hut should be established in the village to overcome obstacles posed to the transport of patients imposed by poor road conditions.

2) Education

An elementary school with three classrooms was constructed in Dyabou in 1987. The government built one classroom made of concrete blocks. The villagers used dried bricks to construct the other two (one is reinforced with cement). The government provided the roof and door for one of these classrooms, while a merchant born in Dyabou contributed the roof and door of the other classroom. A total of 110 children, including 66 boys and 44 girls attend the school which teaches 6 grades (grade 1 to 6, age 6 to age 13). Two grades are taught in each classroom. The maximum capacity of the school is 116 children. As it is the only elementary school in the zone, its pupils include both children of Dyabou and children from nearby villages. It has a staff of three: a principal and two other teachers. A total of 35 new pupils, 21 boys and

14 girls, entered the first grade in 1998. The principal says the school attendance rate for the entire village is about 24%. Many more want to attend, but because of the small size of the classrooms, they cannot all be accommodated. Acceptance is based on first-come first-served, with those who apply but are not accepted in the year are given first priority in the following year.

3) Information

To provide information and raise the people's awareness, the national government installed a single television set and a single solar electric tower to charge the television set battery. The TV malfunctioned, and the residents spent 80,000 FCFA to repair it, but it malfunctioned again and has not been used since. The solar electric tower and the battery still function.

(2) Development plan (see 9.3.1.2 for potable water)

1) Health and hygiene

A simple health hut will be opened and adequate emergency medicines will be provided in order to improve the present backward level of health and hygiene and to permit the minimum necessary initial treatment capabilities. One woman chosen from among the villagers will receive a two-week training as a midwife at the hospital in Say. The existing drug seller will be assigned responsibility to take care of the emergency medicine supply. The drugs will be replaced by profits from their sales.

2) Education

Because the supply of classrooms is inadequate for the number of children of school age, a new classroom will be constructed. (the GON will provide teachers to go with the classrooms) The normal program of school education will be supplemented by constructing a school farm to be used to teach basic cultivation technology: knowledge of future practical value to the children. Trees will be planted around the schoolyard in order to teach the children the importance of conserving forests.

3) Information

There is no electricity available in the village. It is, therefore, difficult for the central and regional governments to transmit information or instructions to the village. A single TV set will be installed to spread government information and knowledge of French: the official language of the nation. The terror management committee will manage this.

(3) Plan

- ① A simple health hut will be constructed at a single location and lacking emergency drugs will be provided. One woman will be selected from among the villagers for two weeks of midwife training.
- ② A new classroom and a school farm of 0.01 ha (including one new well) will be constructed. Trees (2 rows of approximately 400 m) will be planted along the boundary of the school

yard. The children will be taught simple vegetable cultivation techniques and the importance of forest conservation.

- ③ A TV set will be installed. Instruction will be given concerning the maintenance of the equipment.

9.3.1.7 Environmental protection

(1) Present situation

To the north of the village lies the Goroubi River and to the south, the Diamongu River. For this reason, there is massive soil degradation on both river bank areas and massive gully degradation is taking place. In addition, although the plains are relatively flat, the soil is losing fertility due to wind erosion.

(2) Development plan

Environmental conservation measures have not been incorporated into the practices and lives of the farmers and if left this way, the resource use situation will further deteriorate. We will take the following 2 measures:

- ① Prevention of degradation of upriver farmland by improving gullies on both bank areas.
- ② Recovery of plant life in lands that have become glaxis.

(3) Plan

1) Soil conservation measures for both bank areas

In order to halt the spread of soil degradation damage described above, in addition to education the inhabitants on the necessity of these types of conservation measures, planting will be conducted on graded areas through planting fairs.

2) Methods of recovery for grassland areas which have become glaxis.

① Work implementation and methods

For the 300 ha area which has become glaxis in the south central portion of the area, the grassland will be recovered through surface improvement and improvement of water retention.

As for the implementation of the work, it will be carried out on land that the inhabitants do not usually use and because the incentive is low due to the fact that the recovery cannot be directly anticipated, work will be carried out as quickly as possible using mechanized means.

② Maintenance and management

In order to maintain the recovered grasslands, the terrior management committee will prohibit grazing on it for several years thereafter and limit grazing after this period.