

REPUBLIC OF NIGER  
MINISTRY OF HYDRAULIC  
AND ENVIRONMENT

JAPAN INTERNATIONAL  
COOPERATION AGENCY

THE STUDY  
FOR  
THE PLAN TO COMBAT DESERTIFICATION  
IN  
TILLABERY DEPARTMENT IN THE REPUBLIC OF NIGER  
  
MAIN REPORT

MARCH 1999

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JAPAN AGRICULTURAL LAND DEVELOPMENT AGENCY

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## PREFACE

In response to the request from the Government of the Republic of Niger, the Government of Japan decided to conduct the Master Plan Study for the Plan to Combat Desertification in Tillabéri Department and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Niger a study team headed by Mr. Nobuyoshi Sakamoto, the Japan Agricultural Land Development Agency (JALDA), three times between October 1997 to March 1999.

The team held discussions with the officials concerned of the Government of Niger, and conducted field surveys at the study area concerned. After the team returned to Japan, work in Japan was conducted and this report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Niger for their close cooperation and support assistance extended to the study.

March 1999



Kimio Fujita

President

Japan International Cooperation Agency

## LETTER OF TRANSMITTAL

Kimio Fujita  
President  
Japan International Cooperation Agency

March 1999

Dear Mr. Fujita,

We are pleased to submit herewith the Final Report on the "Plan to Combat Desertification in the Tillabery Department in the Republic of Niger".

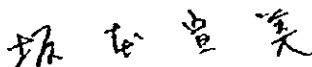
This Study was implemented by the Japan Agricultural Land Development Agency (JALDA) over a period of eighteen months from October 1997 to March 1999, on the basis of a contract between JALDA and the Japan International Cooperation Agency (JICA). In the Study, particular efforts were made to establish the most suitable plan for desertification control by developing sustainable agriculture, stock rearing, and silviculture, and improving the living environment, based on a thorough understanding and careful study of the actual situation of desertification.

The Plan will be started in the year 2000, with a target year of 2014 (15 years). In it, the Study Area has been divided into 3 zones, and we have formulated an overall Master Plan including development concepts for each zone, as well as formulating Priority Projects as specific plans for the Master Plan.

In the Study Area, the population concentration and the advance of desertification are notable, and the increase in poverty and decline in living and nutritional standards of the inhabitants give serious cause for concern. In formulating this Plan, we have given comprehensive consideration to the development of agriculture, stock rearing, and silviculture through rational management and use of land and water resources making effective use of natural resources. Consideration is also given to the improvement of the living environment through the development of rural society infrastructure, plans on the level of the inhabitants, project implementation through terroir management, environmental protection, WID, and other types of measures. If this Plan is implemented, it can be applied not only to the Republic of Niger but also to the entire Sahel region as a model case for desertification control, and it is strongly hoped that it will be implemented quickly.

We wish to take this opportunity to express our sincere gratitude to JICA, as well as the relevant officials concerned of the Ministry of Foreign Affairs and the Ministry of Agriculture, Forestry and Fisheries, for their great understanding and assistance during the Study period. We also wish to express our deep gratitude to the officials concerned from the Government of the Republic of Niger and local donor organisations for their valuable advice, guidance, and assistance.

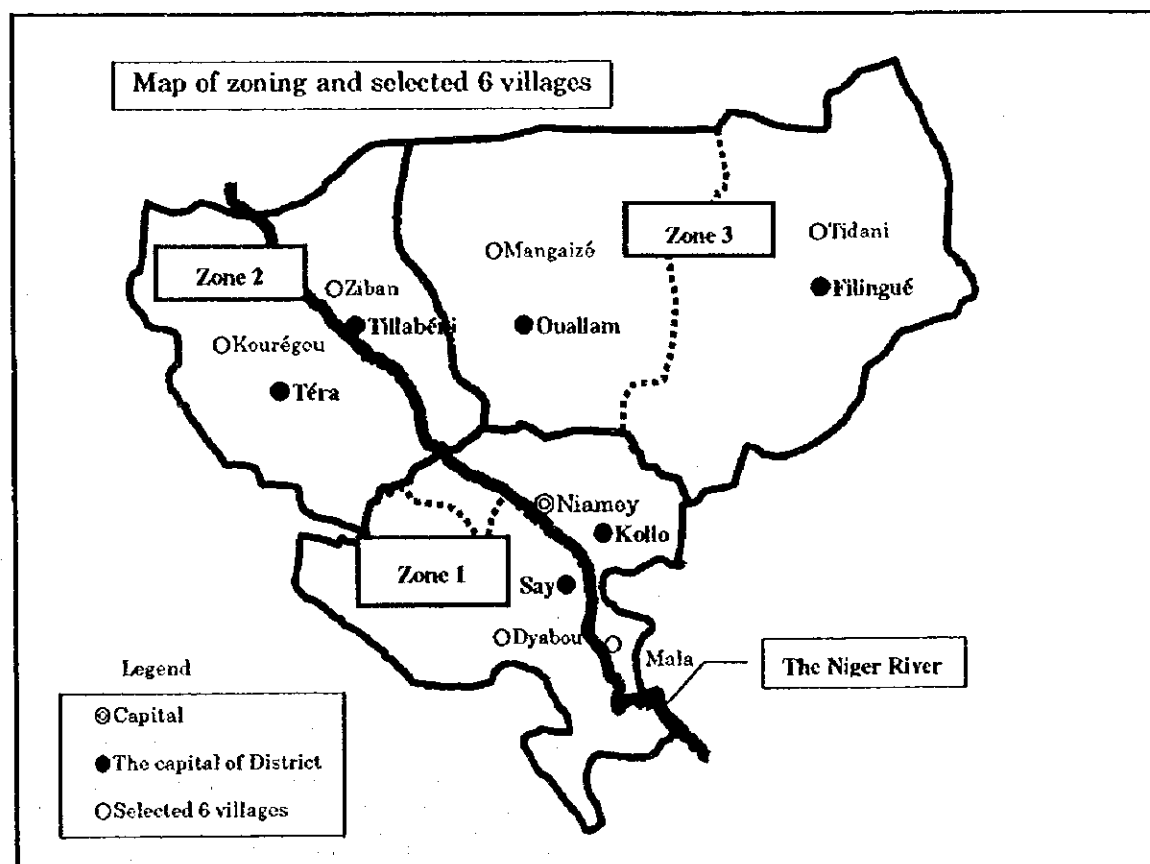
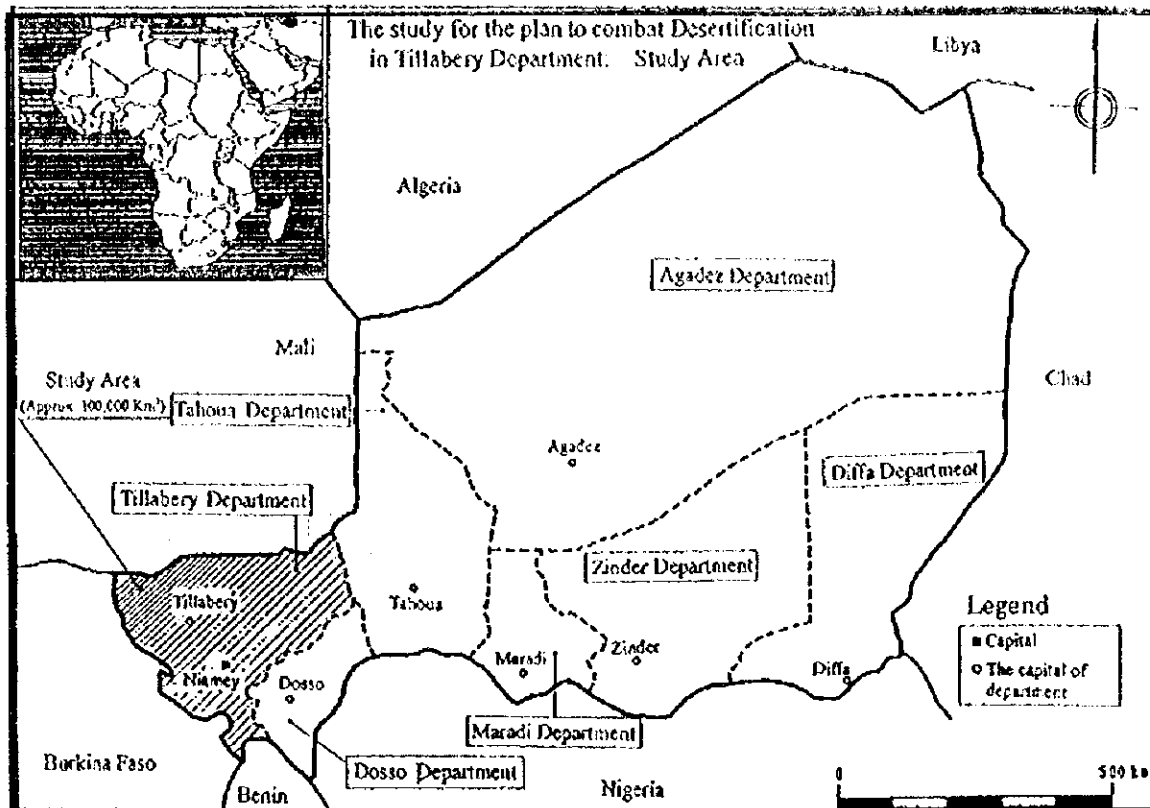
Sincerely yours,



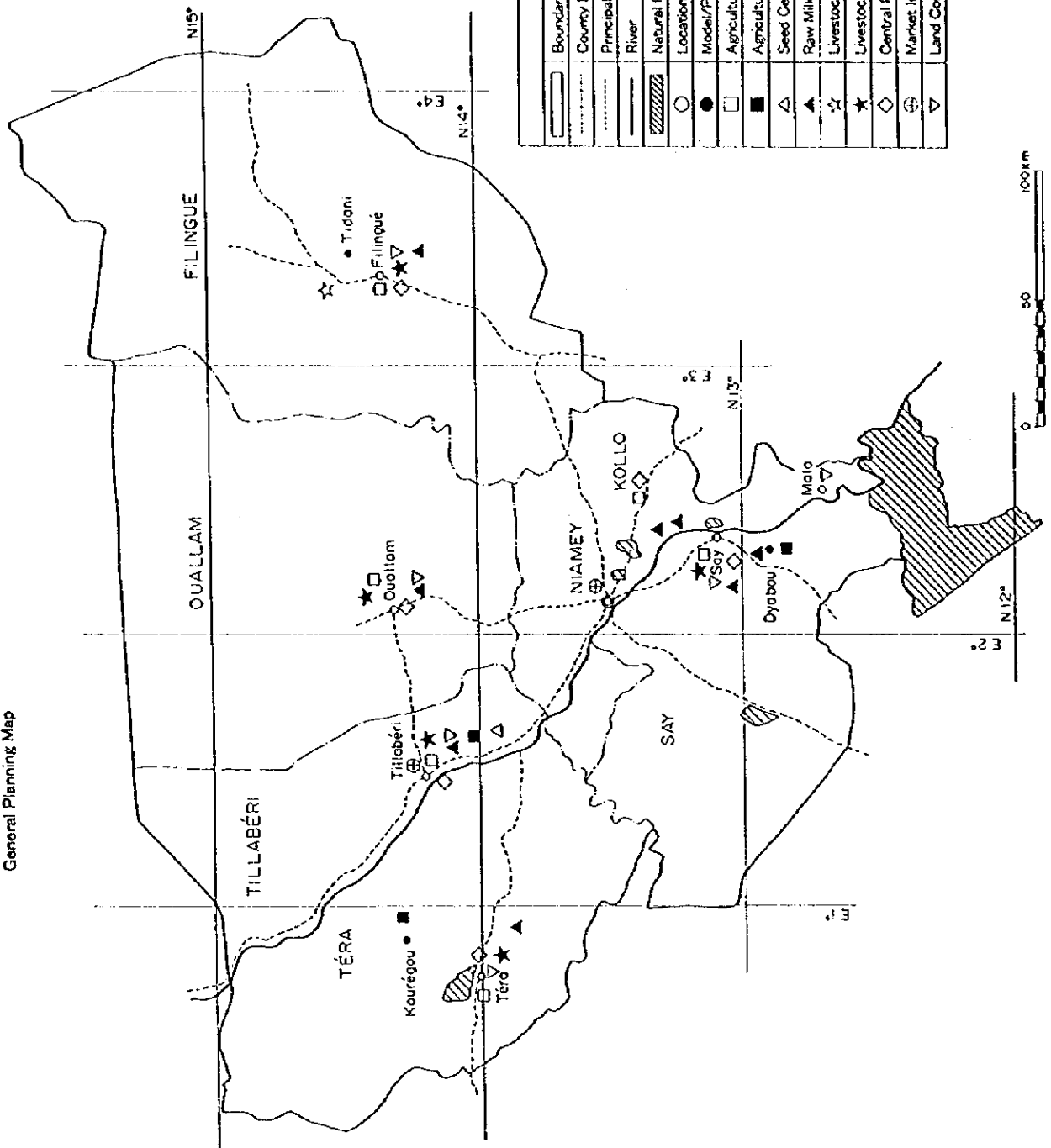
Nobuyoshi Sakamoto  
Team Leader

The Study Team for the Plan to Combat Desertification in the  
Tillabéri Department in the Republic of Niger  
Japan Agricultural Land Development Agency





General Planning Map



Legend	
	Boundary of the Survey Area (National/Department Boundary)
	County Boundary
	Principal Road
	River
	Natural Park etc.
	Location of County Government Office
	Model/Pilot Project Area
	Agriculture, Stock Raising and Forestry Aid Center
	Agricultural Product Collection and Shipment Facility
	Seed Center
	Raw Milk Collection and Shipment Facility
	Livestock Improvement Center
	Livestock Clinic
	Central Plant Nursery
	Market Information Center
	Land Committee



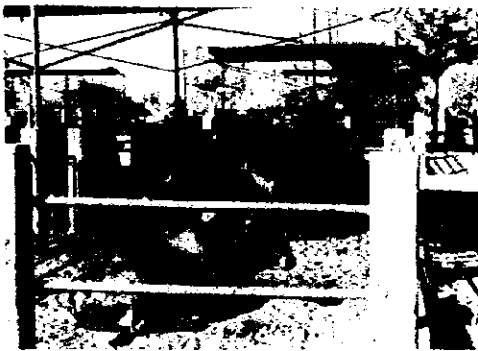
**Millet fields**

: Millet is seeded 1m x 1m, and 10,000 stumps are grown per hectare. One stump branches off into five or six stalks. As can be seen in the picture, there are many withered stumps or unevenly grown stumps which is one of the primary causes of poor harvests.



**Irrigated vegetable farming during the dry season (Magou Village)**

: Irrigated vegetable farming is a means of concentrating and diversifying production. The picture shows cultivation in fields worked by women in JAI DA's pilot plots in Magou Village. Here, a variety of breeds are produced satisfactorily under careful farming control. The Plan is designed while referring to such actual results.



**Dairy barns at a cooperative dairy cattle housing and facilities in Kirkssoye**

: In 1996, a cooperative was set up with 100% investment by the Government of Niger. Eight Azawak breed cattle on average are reared per house, and raw milk is shipped to processing facilities in the city of Niamey.



**Village-owned forest in Dyabou Village in Say District**

: Village-owned forest in the village of Dyabou is mainly used for logging as firewood. It is located 10km south-west of the village center. Landforms around the area consist of plateau tops which are deposited with soil sediment turning.



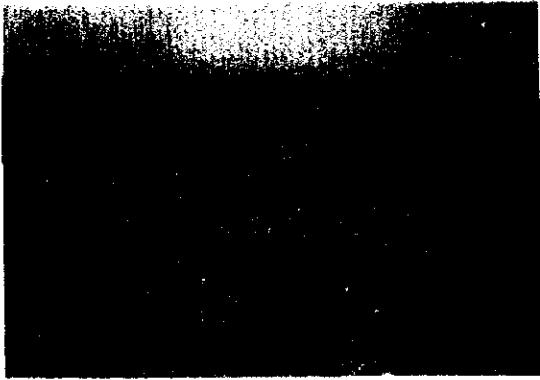
**A mini-nursery (nursery stock cultivation implemented in the district of Ouallam in 1991)**

: Vegetable cultivation carried out after the rainy season is generally the work of women. They have grown nursery stock on the side that they need. Each woman is entitled to one potful of stocks as her portion.



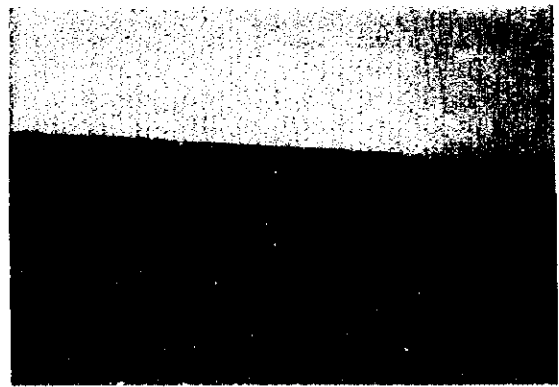
**A road connecting the village of Kouregou and a national route**

: The water flow across the road encroaches on it from the upper right-hand side, and erodes it before running-off from the lower left-hand side. After drying up, those areas available for traffic on either side of the road are used as a roundabout way.



**Farmland continues to be eroded**

: Waste land in Tidani Village, where soil erosion has escalated from the stage of surface erosion to that of rill erosion. At present, bare areas are larger; but it can be seen from the millet stumps shown in the right-hand side of the picture that the site used to be a millet field.



**Desolate plains on plateau**

: Plains on plateau are only used for pasturing and the logging of firewood. In recent years, however, these areas have been becoming increasingly desolate. This phenomenon has resulted in a decrease in the water holding capacity of the soil, and so has become the source of floods as well as inflow of soil and sand in surrounding areas.



**Ponds appear seasonally (Kouregou Village)**

: Water run-off pools, and wide but shallow ponds appear for short periods of time. These type of ponds are used as drinking fountains for livestock. On the other hand, existing roads leading to the other sides of marshes are submerged under water and people are obliged to make long detours. If the soil is heaped up by koris crossing works, they are not only usable for storing some water, but re also passable by people.



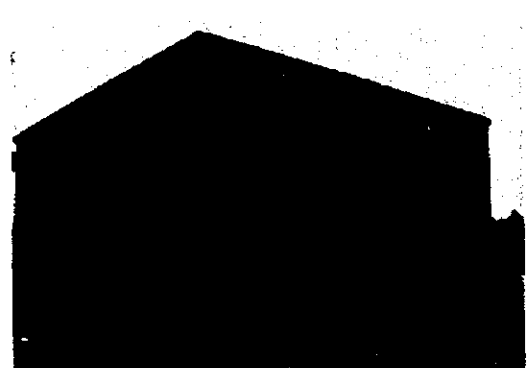
**Wells in the enclave of Banguir tying away from the village of Tidant**

: These wells which are used for drawing drinking water and for water for livestock dry up for two to three months during the dry season. (Concrete tubes are used as water tanks for livestock; their excrement soaks into water-lifting nets, thereby contaminating the water.



**Classrooms built by inhabitants of the village of Dyabou**

: These classrooms are built of BANCO (brick dried out by the sun). While building costs were low, they needed to be repaired every year. The shortage in classrooms is a major problem resulting in instruction being given in through double sessions or even by postponing attendance at school until the following school year.



**Additional classrooms built by the administration of the village of Dyabou**

: These classrooms are built of concrete blocks.



**Sheep and goats shipped to a livestock market in the district of Say**

: Livestock are traded by person-to-person dealings by way of a broker. The broker collects a commission on sales from both the seller and buyer. A tax official of the District Administration is stationed in the market and collects a tax upon the conclusion of a deal.



**Production of dry cheese**

: A view of cheese being dried in the sun that is produced by farmers. Two pieces of dry cheese each weighing 120g. are produced from one liter of cow's milk.



**Hard female labor**

: Women spend 3 to 4 hours each day manually threshing and milling grain using a mallet and a mortar. (For women to be able to participate in development projects, it is essential to build mills so that women can be relieved of such hard labor.)



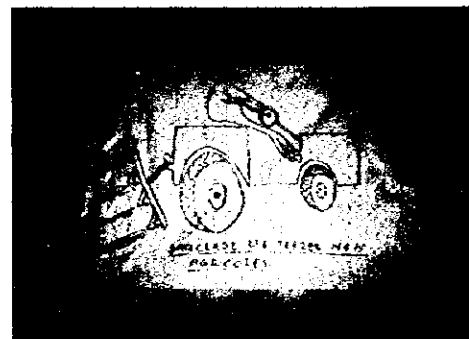
**Birds and other fauna in the "W" Natural Park**

: The "W" Natural Park designated as a world cultural and natural heritage preserve located in the southern part of the department of Tillabéri. It is blessed with water resources even in dry seasons, which support many species of animals and trees that inhabit and grow in the park. However, as a result of the progress of desertification, the number of poachers, illegal herders, and firewood cutters from the surrounding areas is increasing.



**Implementation of social study participated in by local inhabitants**

: In order to enlighten inhabitants, visual methods such as the use of caricatures must be used as much as possible since literacy rate among the population is so low. Here, surveyors are studying the usage of existing trees by species by local inhabitants, or their preference for certain species of trees, using millet stumps or small stones.



**Material used in social study participated in by local inhabitants**

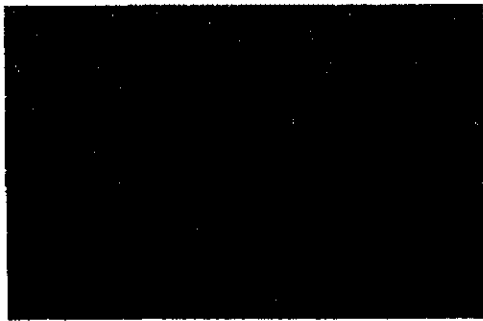
: In order to have local inhabitants review the implementation of a project and a method of management, a caricature of the project is displayed on a large sheet of paper (MARP method). The picture shows the smoothing of surface soil as a soil conservation measure.



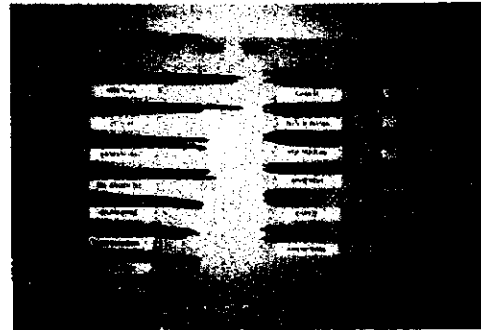
**The Goroubi River, a tributary of the Niger River, and a bridge that was swept away**  
 : The Goroubi River is a valuable water resource which will hopefully be made much use of in the future. However, traffic across the river is hampered because its bridges have been swept away by a flood.



**Deep wells that are out of order and unused, and dunes that approach the village**  
 : Three large and small dunes lie in the village which affect the living of villagers as well as agricultural production. Deep wells which had been used for producing sun-dried bricks because the water was salty is now rusty and are not used today.



**The enclave of the village of Tidani that is gradually becoming increasingly desolate**  
 : The enclave of Dabaga is a new territory where people to which people have been going to produce food and pasture livestock as the population of the village grows. There is little rainfall in the area, and the soil is sandy and is easily degraded. Because of such conditions, the land is becoming increasingly degraded and desolate.



**Samples of millet species in ICRISAT**  
 : The breeding of major crop species is being carried out. The picture shows samples of millet species under ICRISAT as well as INRAN. In this Project, the good species bred here are going to be distributed to various target regions.



**Livestock improvement project**  
 : These are Azawak thoroughbred sire bulls reared on the state-run Toukounous pastureland. These cattle originate in Azawak Valley, in the Study Area, and are capable of enduring dry as well as intensely hot weather. They are both dairy and beef cattle highly prized in the Sahel region.



**Central nursery in the district of Filingue**  
 : Because of budget shortages as well as of obsolete equipment and materials, yearly nursery stock production from 1992 to 1997 averaged some 20,000 stocks only, 20% of the amount planned. Of these, 80% were used by the government for reforestation purposes, while the remaining 20% were distributed among local inhabitants for free.

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## List of abbreviations

AFP	Adduction d'Eau Potable
AGRHYMET	Centre de formation et d'application agro - hydro - meteorologique
ANPIP	l'Agence Nigérienne de Promotion de l'Irrigation Privée
BAD	Banque African de Developpement
BEEH	Bureau d'Evaluation Environnementale et des Etudes d'Impact
BIIN	Basic Human Needs
BID	Banque Islamique de Développement
BOAD	Banque Ouest Africaine de Développement
C/P	Counter Part
CA	Central d' Approvisionnement
CCD	Convention to Combat Desertification
CDEDD	Conseil Départemental de l'Environnement pour Développement Durable
CDR	Contribution au Développement Rural
CECI	Centre d'Etudes de Coopération Internationale (Project International Cooperation Study Center)
CES/DRS	Conservation des Eaux et des Sols et Défense et Restauration des Sols
CGTV	Comité de Gestion Terroir Villageois
CIEH	Comité Inter - africain d'Etudes Hydrauliques
CISS	Comité Inter - Etats de Lutte contre la Sécheresse au Sahel
CLUSA	Cooperative League of United State of America
CNCA	Caisse Nationale de Crédit Agricole
CNCOD	Comité National de Coodination des ONG qui luttent contre la Désertification
CNEDD	Conseil National de l'Environnement pour un Développement Durable
COOP	Coopératives
DSCN	Direction de la statistique et des comptes nationaux
EC	European Community
EIRR	Economic Internal Rate of Return
FAO	Food and Agricultural Organization of the United Nations
FED	Fonds Européen de Développement
FIRR	Financial Internal Rate of Return
GAEC	Groupements des Adhérents a l'Epargne et au Crédit (Saving and Fund Members' Group)
GAS	Groupes d'Actions Spécifiques
GDP	Gross Domestic Product
GM	Groupement Mutualiste
GNP	Gross National Product
GPS	Global Positioning System
GTZ	Gesellschaft fur Technische Zusammenha (German Technical Cooperation Organization)
HDI	Human Development Index
IBRD	International Bank for Reconstruction and Development
ICRISAT	International Crop Research Institute for the Semi - Arid Tropics
IDA	International Development Association
IFAD	International Fund for Agricultural Development / UN
IIED	International Institute for Environment and Development
ILRI	International Livestock Research Institute
IMF	International Monetary Fund
INRAN	Institut National de Recherches Agronomiques du Niger
IRAT	Institut de Recherche Agronomiques Tropical
JALDA	Japan Agricultural Land Development Agency
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteer
LLADC	Least-Less-Developed Country
M/P	Master Plan

M-AEP	Mini-Addiction d'Eau Potable
MARP	Méthode Active de Recherche et de Planification Participatives
NGO	Non – Governmental Organization
OECD	Organization for Economic Cooperation and Development /UN
OFÉDES	Office des Eaux du Sous-sol
OLANI	Office du Lait du Niger
ONAHA	Office National des Aménagements Hydro - Agricoles
OPVN	Office des Produits Vivriers du Niger
ORSTOM	Office de la Recherche Scientifique et Technique Outre - Mer
PANA	Projet Aménagement de Nord Ader (Nord Ader Improvement Project)
PASP	Project Agro - Sylvo - Pastoral
PBVT	Projet Basse Vallée de la Tarka:
PDLT	Projet de Développement local du canton de Torodi
PEM	Point d'Eau Moderne
PFN	Le Projet Forestier National (Keita Integrated Development Project)
PGRN	Projet de Gestion des Ressources Naturelles (Natural Resources Management Project)
PGTF	Projet de Gestion des Terroirs Filingué
PIK	Projet de Développement Rural Intégré de Keita
PNEDD	Plan National de l'Environnement pour un Développement Durable
PRSA	Programme de Renforcement des Services d'Appui à l'Agriculture
RINI	Société Riz du Niger
SAW	Scope of Work
SAP	Projet de Système d'Alerte Précoce
SCF	Standard Conversion Factor
SD	Société de Développement
SONARA	Nigérienne de Commercialisation de l'Arachide
UBT	Unité de Bétail Tropical
ULC	Union Local des coopératives
UNC	Union Nationale des Coopératives
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Emergency Fund
UNSO	United Nations Soudano-Sahelian Office
URC	Union Régionale des Coopératives
USAID	United States Agency for International Development
USRC	Union Sous - Régionale des Coopératives
WARDA	West Africa Rice Development Association
WFP	World Food Program
WID	Women in Development



## Abbreviations of Measurements

<u>Monetary</u>	
FCFA	France Franc CFA
US\$	U.S. dollar
¥	Japanese yen
<u>Length</u>	
mm	Millimeter
cm	Centimeter
m	Meter
km	Kilometer
<u>Weight</u>	
g	Gram
kg	Kilogram
t	ton
tia	(1 tia = 2.5 kg)
<u>Area</u>	
m <sup>2</sup>	Square meter
km <sup>2</sup>	Square kilometer
ha	Hectare
<u>Volume</u>	
m <sup>3</sup>	Cubic meter
l	Liter
stère	(1 stère = 1 m <sup>3</sup> )
cc	Cubic centimeter
<u>Fiscal Year</u>	
1/1 ~ 12/31	January 1 to December 31
<u>Others</u>	
l/s	Liter per second
m <sup>3</sup> /s	Cubic meter per second
t/ha	Ton per hectare
kcal	Kilocalorie
kcal/g	Kilocalorie per gram
kg/ha	Kilogram per hectare
FCFA/US\$	France Franc CFA per U.S. dollar
FCFA/kg	France Franc CFA per kg
m/s	Meter per second
stère/ha	Stère per hectare
UBT	Tropical Livestock Unit (Unité de Bétail Tropical)
%	Percentage
°C	Degree in Celsius



## Summary

### A Background

#### A.1 Background to the Study

The main economic sector in Niger consists of agriculture, live stock and forestry. It accounts for 38% of the country's GDP, and about 80% of the working population works in this sector. Tillabéri Department, the area covered by this Study, has relatively high rainfall compared with one in other areas in the country and so is comparatively well suited to agriculture, stock raising and sylviculture. The department supplies foodstuffs and firewood to Niamey, the capital of Niger. The area is suffering from rapid desertification, however, due to a combination of repeated droughts and human factors such as excessive cultivation of the land, excessive livestock grazing, and excessive gathering of fuel wood, all of which have become major problems resulting from the rapid increase in the population of the department. If desertification continues unchecked, it is feared that sustainable production from agriculture, stock raising and sylviculture will become impossible, with the result that the bedrock upon which the livelihoods of the inhabitants in the area depend will collapse.

In order to cope with the problem of desertification, the Government of Niger ratified the Convention to Combat Desertification (CCD) in January 1996 as a national measure for preserving the environment and hence enabling sustainable development. Based on this, the Government of Niger then began investigations to draw up a "National Environmental Plan for Sustainable Development" (PNEDD) in August in the same year.

Based on the above background, the Government of Niger requested the technical assistance from the Government of Japan to draw up a 'Plan for Combating Desertification' through sustainable agriculture, stock raising and sylviculture as well as rural development for Tillabéri Department. In response, the Government of Japan dispatched a Preliminary Study Team to Niger in July 1997 through the Japan International Cooperation Agency (JICA). Then, on the eleventh of that month, JICA and the Ministry of Hydraulic and Environment in Niger concluded an agreement on the detailed regulations for conducting the present full Study ('Study for the Plan to Combat Desertification in Tillabéri Department in the Republic of Niger').

#### A.2 Objectives of the Study

This report is the final report of the 'Study for the Plan to Combat Desertification in Tillabéri Department in the Republic of Niger' and has been drawn up in line with the agreement on the detailed regulations for conducting the Study concluded by JICA and the Niger Ministry of Hydraulic and Environment.

The Study was conducted in Tillabéri Department, located in the southwest of Niger, with the following three objectives.

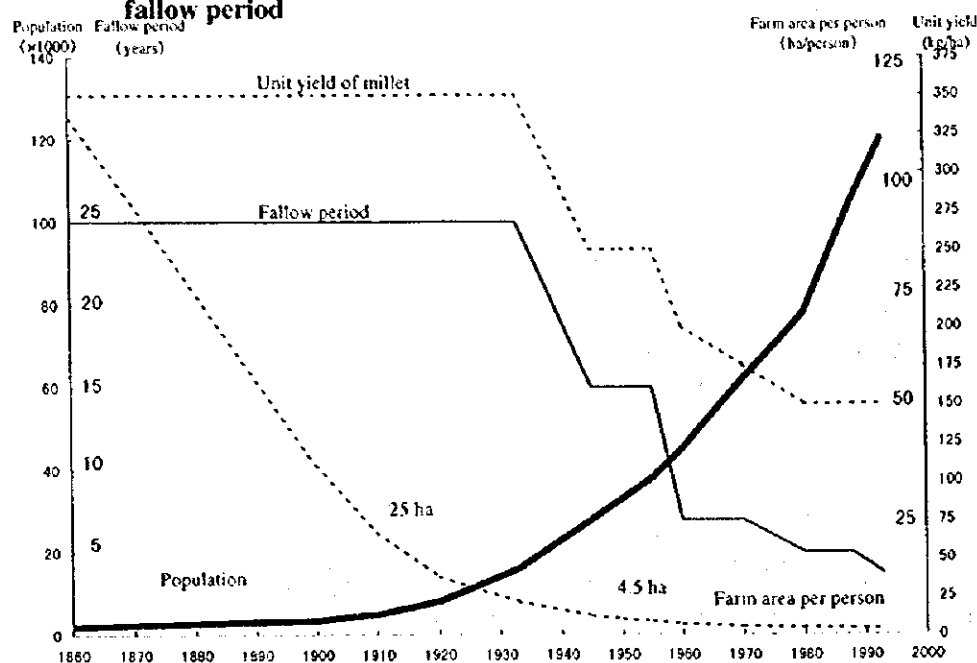
- ① To develop a Master Plan to combat desertification through the development of sustainable development in the areas of agriculture, stock raising, and silviculture, together with improvements in living conditions.
- ② To select priority projects and develop implementation plans for these projects.
- ③ To provide technical assistance to Nigerien counterparts both on site in Niger and also in Japan (through acceptance of trainees) regarding survey methods and the drawing up of plans.

## B Current conditions

### B.1 The current state of desertification

Desertification in the north of the Study Area is escalating. Deterioration of the land in Ouallam District is particularly serious. According to village elders, thirty years ago Ouallam District was still rich in vegetation, but these days there is very little vegetation and soil degradation is progressing. This can be seen clearly in Figure B. 1.1, which shows changes over the years in population, unit yield of millet, length of time that land is left fallow, and the average area of farming land per farmer for the Zarmaganda Central area of Ouallam District. Moreover, it is feared that desertification will also escalate in the central and southern parts of the Study Area as the population of these areas increases.

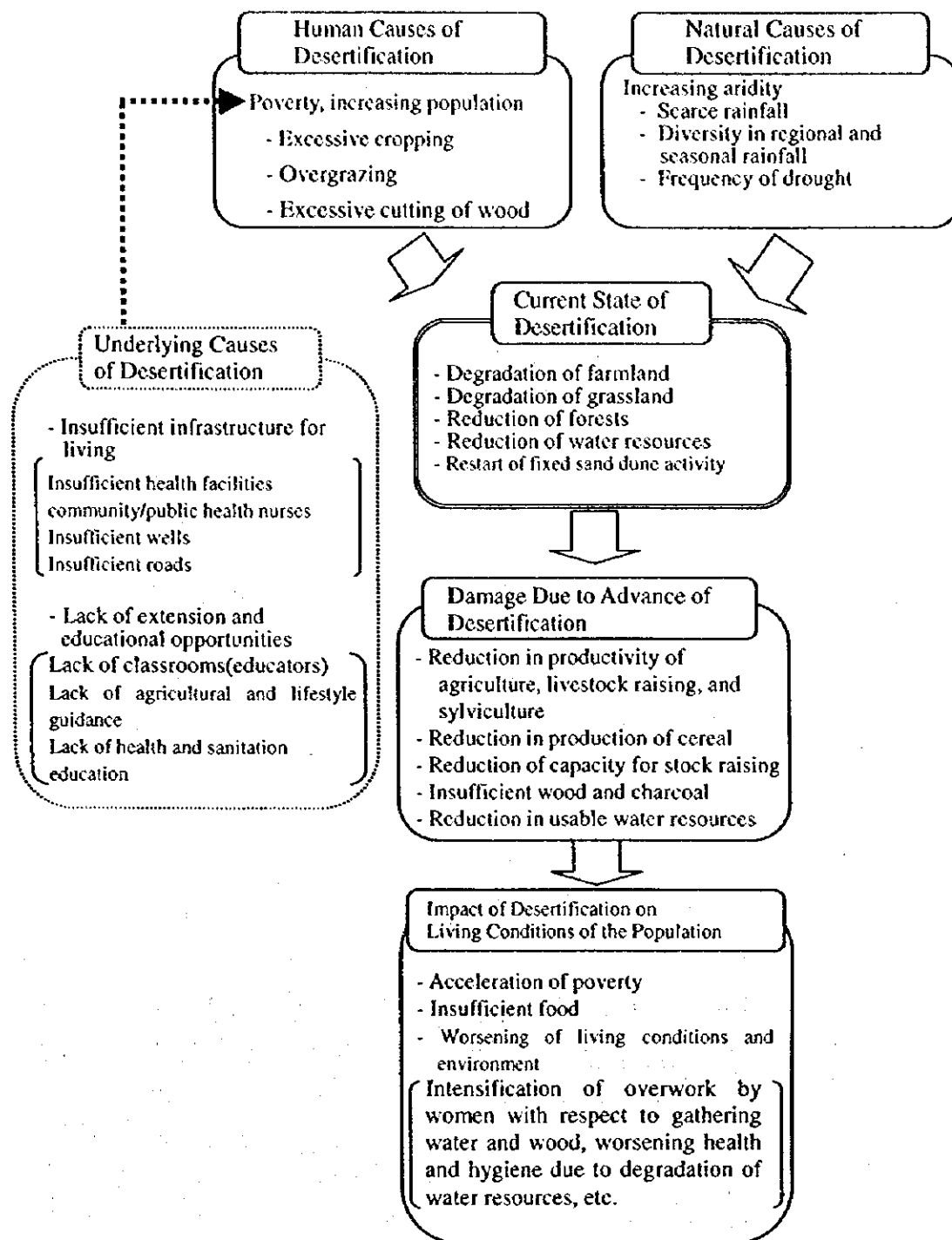
**Figure B.1.1 Evolution of Population, unit yield of millet, farm area per person, and fallow period**



Source: ÉTUDE SUR LE SYSTEME AGRAIRE DU "ZARMAGANDA CENTRAL" 1993

The causes and current state of desertification in the Republic of Niger, damage caused by the advancement of desertification, and the impact of desertification on the lives of local inhabitants, as well as the relation among these various aspects of desertification are shown in Figure B.1.2.

**Figure B.1.2 Conceptual figure of the causes and effects of desertification in Niger**



## **B.2 Natural conditions**

Niger is a landlocked country in West Africa. It has a total area of 1.27 million km<sup>2</sup>, two-thirds of which is covered by the Sahara Desert. Tillabéri Department, which is the Study Area for this Study, is located in the southwest of the country and accounts for 8.2% (104,245km<sup>2</sup>) of the total area. Looking at the topography of the department, it consists of a vast tableland with an average elevation of 250m above sea level; there are very few undulations, although the land does slope gently from north to south. The River Niger – the third largest river in Africa – flows down the western side of the Study Area. As for climate, the year is divided into a wet season from June to September and a dry season from October to May. There are large variations in rainfall across the Study Area, with the average yearly rainfall ranging from 250mm in the northern part, which is in the Sahelian-Saharan climatic zone, to over 500mm in the southern part, which is in the Sudanian-Saharan climatic zone. There are thus large variations in rainfall in terms of both region and time of the year. Nevertheless, the amount of rainfall in the Study Area as a whole has been decreasing in recent years.

## **B.3 Society**

According to the 1988 national census, the total population of Niger is 7,252,000, about 18% of which (1,328,000) lives in Tillabéri Department. 96.4% of the department's residents lives in rural areas. It is estimated that the population in 1996 was about 1,743,000. If the current yearly growth rate of 3.3% continues, the population will approximately double by the year 2014, reaching about 3,333,000.

In 1995 the mean life expectancy was 47.5 years. The adult literacy rate (French language) was 13.1% through 20.9% for men and only 6.7% for women, due to the low social status of women. In 1996, the death rate for children five years of age and younger was 320 per thousand, while the infant mortality rate was 191 per thousand. These are among the highest rates in the world. About 80% of the people in Tillabéri Department lives below the poverty line, considerably higher than the national average of 63%.

## **B.4 Economy**

Niger has a per capita GNP of US\$220 (as of 1995) and as such is classified as one of the very poor countries in the world. In recent years the rate of increase in GNP has consistently failed to match the population growth rate, meaning that the per capita GNP has been in continual decline. With respect to the international trade, the agriculture and stock raising sector accounted for 18% of the total value of exports in 1995, becomes it the second most important sector after uranium (78%). Repayment of debts accounts for 23.5% of total government expenditure and the economy of the country is pushing up with structural adjustment policies.

## **B.5 Methods of Social Development**

In recent years, a method known as Terroir Management has been employed with the introduction of projects at the village level. The term 'terroir' means that "with respect to an area of land such as farmland or grassland owned and used by a certain community, the use of together with the right to use that particular area of land by the community are recognized by other communities in the region". One of the background reasons as to why this type of method has been adopted lies in the fact that large-scale projects undertaken in the past under the leadership of the government had often failed, leading the government to reassess the situation and learn from it. Terroir Management now means that "a community (1) takes sole responsibility for managing the land resources which it owns and uses, (2) strives to improve the living conditions and environment of the community over the long term, and (3) encourages the development of local vitality". Put in concrete terms, it means that "the local population is an independent driving force which carries on a series of activities with respect to planning, implementing, managing, and evaluating small-scale projects which are closely related to local resources".

## **B.6 Land Use**

The most common form of land use is rain-fed agriculture (i.e. agriculture where irrigation is not used). It is estimated that at present 1.32 million ha (13,200km<sup>2</sup>) or about 13% of the land in the Study Area is used for rain-fed agriculture. Judging by isohyets (lines connecting places of equal rainfall) obtained by the analysis of the results of remote sensing and soil distribution, however, it is estimated that as much as 3.98 million ha (39,800km<sup>2</sup>) could be used for rain-fed agriculture. Nevertheless, if one considers that some land which has little potential for agricultural production should be left fallow in order to make sustainable land use possible, it turns out that there is actually not too much land that could be newly developed for agriculture. Moreover, soil degradation is proceeding, particularly in the northern part of the Study Area.

Only places where the land along the banks of the River Niger is used for irrigated agriculture – the area of land used in this way is extremely low at only about 8,000ha (80km<sup>2</sup>). At most, an estimated 5,247,300ha (52,473km<sup>2</sup>) of land is used for stock raising (this figure includes not only grassland that is used purely for stock raising, but also land that is also used for rain-fed agriculture and that is, however, currently lying fallow and grassland classified as 'woodland, etc.'). The area of land that can clearly be classified as woodland based on the results of remote sensing is no more than 391,400ha (3,914km<sup>2</sup>, 3.7% of the study area).

## **B.7 Water Use**

### **(1) Surface water**

The major sources of flowing surface water in Tillabéri Department consist of the Niger River which flows year-round, seven tributaries of the Niger River which dry up in the dry

season, and 'koris'(temporary watercourses that generally run through bare land) which flow only for about 6-24 hours after rainfall. The Niger River is used for large-scale irrigation of paddy fields, as a source of water for livestock, for fishing, and for transportation. The tributaries are used as a source of water for livestock and for irrigated agriculture where the water is taken from the river either by hand or by low-lift pumps. Water from koris is hardly used. All of the above-mentioned rivers have a flow that varies greatly with time, meaning that water storage facilities are necessary if a stable supply of water is to be maintained. Such facilities are lacking, however.

Sources of surface water other than rivers include fifty-one permanent ponds and three manmade reservoirs. These are used for small-scale irrigation, as sources of water for livestock, and for fish farming. However, the capacity of the reservoirs is decreasing due to inflow of soil and aging embankments.

## (2) Groundwater

With the exception of a very small area of land along the banks of the Niger River, all drinking water is brought up from underground. Such groundwater is also used for small-scale irrigation and is sometimes used as a source of water for livestock. There is insufficient development of facilities, however, to meet the demand for groundwater for these various uses.

## **B.8 Agriculture, stock farming, and sylviculture**

### (1) Agriculture

#### 1) Rain-fed agriculture

##### (a) Outline of rain-fed agriculture

The rain-fed agriculture in the Study Area consists of exploitative agriculture that simply uses the natural fertility of the soil. In the past, sustainable agriculture had been achieved using a method whereby the same crop is repeatedly cultivated on the same land, and when the fertility of the land drops, it is allowed to remain fallow for several growing seasons. Cultivation is only resumed once the fertility of the soil has recovered. This method is workable so long as there is sufficient land. However, in recent years, increases in population and corresponding pressure for increased food production, have made it necessary to increase the area of land under cultivation, meaning that land is left fallow for shorter and shorter periods of time. This means that the quality of the soil drops, leading to reduced productivity and thus yet further necessitates increasing the area of land under cultivation. This is a vicious circle, and has resulted in a more-or-less continuous drop in the unit yield of millet in recent years.

Achieving sufficient agricultural production depends on making the best of scant rainfall and infertile soil. It is clear that use of surface water by 'water harvesting' would be effective, and that there are also many measures for maintaining and improving soil fertility that would be effective. However, the standard of education is low, and little progress is being made in



equipping poor farmers with farming implements.

**(b) Cultivation methods**

The method generally used to cultivate the main cereal crops of millet and sorghum can be summarized as follows. Seeds which have been produced and stored by the farmer are planted at one meter intervals at the start of the wet season, and intertillage/weeding is carried out once or twice during the cultivation period. The crops are then reaped at the end of the wet season. Even in the past, however, some of the more innovative farmers have adopted measures for maintaining and improving soil fertility whereby they keep livestock in the crop fields during the dry season so that they will fertilise the soil with their excreta by means of penning it (enclosure) or intermediate planting of legume crops with millet.

**(c) Supply and demand for major cereal crops**

Looking at the production of cereal crops in the Study Area, by far the most common crop in terms of both cultivation area and amount produced is millet. Table B.8.1 shows the production status for millet, sorghum and cowpeas averaged over three years – the years from 1991 to 1995 with both the years of greatest and least production excluded. It is estimated that at this level of production, the self-sufficiency ratio of the Study Area for cereal crops is probably around 80%.

**Table B.8.1 Production status for major cereal crops**

Item	Millet	Sorghum	Cowpeas
Cultivated area (thousand ha)	794-993	90-122	204-472
Unit yield (kg/ha)	325-466	134-420	54-263
Production (thousand ha)	323-427	16-50	15-106

**2) Irrigated agriculture**

**(a) Cultivation of paddy rice**

Cultivation of paddy rice is carried out in large-scale paddy fields over a total area of approximately 8,000ha along the Niger River. The unit yield and land productivity are both high, but pumps and irrigation channels are all necessary, and the costs of maintaining and operating such things are high. Productivity has dropped in some fields due to ageing facilities. There are two cropping systems – one involves growing rice in both the wet season and the dry season, while the other involves growing rice in the wet season and then vegetables or tuber crops in the dry season.

**(b) Cultivation of vegetables**

Cultivation of vegetables is mainly for self-sustenance and is only carried out on a small scale; only a few vegetables are grown, such as okra, chillies and cowpeas. Many different types of crops are cultivated in areas along the Niger River, where water raised by pump or direct irrigation is used, and on the flood areas of koris. These include vegetables such as onions, cabbages, tomatoes, pimentos and lettuces, fruit trees such as mangoes, other fruits such as

melons (including watermelons), and tuber crops such as cassava and sweet potatoes. Most of these products are shipped to nearby markets or Niamey, although the garumi- variety of onion is exported to nearby countries such as Nigeria.

## (2) Stock raising

Livestock, particularly large animals (cattle) are raised as a form of savings in preparation for unexpected expenditures etc. And among nomadic people, a person's wealth is evaluated in terms of how many head of stock the person owns. For this reason, there is a strong tendency for stock raisers to try to increase the size of their herds through increased productivity achieved by boosting ?shipping rate/the birthrate?. A characteristic of the study area is that it has more cattle than any other part of the country thanks to the abundant feed available in the region. The livestock population declined sharply as a result of the deaths of many animals during the drought of 1971 to 1973 and the drought of 1981 to 1985, but their numbers have steadily recovered in recent years.

### 1) Forms of stock raising

Rough grazing using natural grassland is used. Partitioning using fences, etc. is not carried out. There are three forms of stock raising – a transhumant form which involves movement according to the season, a nomadic form which involves movement unrelated to the season, and a sedentary form which involves no movement.

### 2) Productivity and demand for unpasteurized milk and meat

With the supply of feed limited, the primary method used to improve the productivity of cattle that is a large form of livestock is to increase the size of the herds. Almost nothing is done to improve the productivity per animal. The productivity of both unpasteurized milk and meat are, therefore, low. Although the Azawak breed of cattle that is a good dairy and beef breed and is well adapted to local natural conditions exists in the study area, it has not contributed to improvement of livestock.

The annual per capita consumption of unpasteurized milk and meat in the study area in 1996 was almost identical to average consumption for all developing countries. But because the population is rising at an annual rate of 3.3%, a sharp increase in total demand for both unpasteurized milk and meat is forecast. It is feared that if this trend continues, it will increase pressure on farmers to increase the size of their herds, resulting in extensive overgrazing.

### 3) Animal health

The government of Niger is conducting inoculation campaigns with the aim of making livestock immune to contagious diseases. Inoculation rates are low, however, for such reasons as insufficient budget allocations for animal health being, a lack of veterinarians, vaccines and health infrastructure, etc., and poor awareness of the need for inoculation among livestock farmers.

### (3) Sylviculture

According to the Environmental Analysis Summary of Tillabéri Department, the department has 912,392ha of forest under protection in the form of national forests or national parks, and 1,650,208ha of 'other forest areas.' These figures represent only 9% and 16%, respectively, of the total study area of the department, meaning that the amount of forest resources that can be used by local inhabitants is extremely limited. Lumber is not only used as firewood, but also for things such as construction of houses, furniture-making, logs and stakes used in agriculture, and fences for livestock. Demand for lumber is increasing year upon year and in recent years there has been a considerable decrease in the amount of woodland.

#### 1) Supply and demand for lumber

The demand for lumber in the Study Area in 1996 was 2.13 million steres (1 stere=1m<sup>3</sup>), whereas it is estimated that the sustainable production is about 3.27 million steres. It is predicted that, due to increases in demand, even if the sustainable production remains constant, the demand will surpass the sustainable production by the year 2010.

#### 2) Usage of forests and lumber in rural areas

In the rural areas in the Study Area, households depend mainly on firewood for their day-to-day energy, and consumption of firewood is thus high. There has been a remarkable decline in the amount of forests within cultivated areas and around villages in recent years due to increased cultivation of crops like millet and excessive cutting of firewood. The women and children, whose job is to collect firewood, are thus being forced to go further and further in their search for firewood.

Forests around villages act not only to reduce soil erosion and improve the fertility and water-holding capacity of the soil, but also to make the environment more pleasant by acting as a windbreak and shielding the sun's rays. As forests are depleted, these benefits are lost.

These village-owned forests are the main forests that can be regarded as 'community forests.' Village-owned forests can be used by all inhabitants of the area and are used mainly as sources of firewood. Systems for managing and maintaining these resources, however, are insufficient, meaning that such forest resources are being destroyed because of reckless use by local inhabitants.

### (4) Farming types

According to a questionnaire survey of six villages, 80% of the agricultural land in the Study Area is owned and farmed by the local inhabitants, with the average holding being 12.5ha. The main crop is millet, which accounts for 85.7% of the total cultivation area.

Three major types of farming patterns can be distinguished: ① independent rain-fed agriculture, ② rain-fed agriculture with stock raising, and ③ rain-fed agriculture with irrigated agriculture. The most commonly used types are ① and ②. In all three types of three farming patterns, the most common type of farming consists of producing foodstuffs for self-sustenance and carrying out by hand using traditional farming tools.

## **B.9 Market distribution**

### **(1) Agricultural products**

Most agricultural products are for self-consumption, and only small quantities are distributed and sold commercially. Those products that are sold commercially are shipped to areas of high consumption such as the capital, Niamey. Agricultural products for export, such as onions, are bought by middlemen who deal directly with the farmers in the production areas. At present there is a lack not only of market facilities and means of transportation, but also of laws and systems relating to markets and distribution.

### **(2) Livestock products**

With the exception of local consumption, livestock products are shipped to the capital Niamey, or are exported to countries like Burkina Faso, Benin, Nigeria, and Mali. Livestock are sold at market by negotiated transaction, not by auction. Sellers often have a lack of market information and so end up accepting prices by middlemen which are very low.

### **(3) Forest products**

Firewood accounts for 90% of the distribution of forest products, and most of this comes from trees felled in national forests.

## **B.10 Agriculture, stock raising, and silviculture support, and farmer's associations**

### **(1) Agricultural support**

#### **1) Experimental research**

Research into agriculture, stock raising, and silviculture in Niger is carried out mainly by the Niger National Agronomic Research Institute (INRAN: Institut National de Recherches Agronomiques du Niger), which is in charge of a wide variety of research fields such as agriculture, stock raising, silviculture, and freshwater fishing. Due to a lack of personnel and funding, however, INRAN is not able to carry out enough test research to meet the needs of rural areas.

#### **2) Spreading of good agricultural practices**

As of 1998, there were (a total of) fifty-eight agricultural instructors in the six districts of Tillabéri Department. Due to the low number of instructors, as well as a lack of transport and funding, it is not possible to carry out sufficient work on the spreading of good agricultural practices. This means that there is very little opportunity for farmers to learn basic agricultural techniques to prevent soil degradation and raise productivity.

#### **3) Small-scale financing**

A number of systems for providing small-scale loans to farmers have been established up to the present time, most of which involve aid from overseas. However, there are many cases of

such projects not lasting due to such factors as farmers being unaware of or unaccustomed to loan systems and having a lack of administrative ability.

#### (2) Farmer's associations

There are various types of farmer's association at the village level such as village aid organisations (GM) and co-operatives (co-ops). A new method called terroir management has gradually been spreading in recent years. It involves the local inhabitants themselves in taking the lead in planning, implementing, managing and assessing projects.

### **B.11 Living conditions**

#### (1) Health and hygiene

The average life expectancy in Niger is 47.5 years. The infant mortality rate is 191 per thousand and the death rate for children five years of age and younger is 320 per thousand. The death rate for women during childbirth is 7 deaths per thousand births. These figures are high compared with the figures for low-income countries as a whole – an average life expectancy of 62 years and a death rate for children under five years of age of 73 per thousand. Judging by the fact that the poverty rate is higher for the Study Area (80%) than for Niger as a whole (63%), it is thought that the level of health and hygiene in the Study Area is probably lower than the average for the country.

#### (2) Potable drinking water

According to the National Environmental Plan for Sustainable Development (PNEDD), the coverage rate for potable drinking water supply facilities in Tillabéri Department is 44% overall, with some variations from district to district.

#### (3) Education

The primary school attendance rate for the Study Area is 23.1%. The main reason for the low rate is the low number of school classes due to very insufficient government funding. There is a significant difference in the attendance rate for boys and girls, with the rate being extremely low for girls at all school levels.

### **B.12 The environment**

Against a background of overgrazing and excessive felling of trees, land in areas outside of cultivated areas is rapidly going to waste. Not only are these areas suffering damage such as soil erosion, there are also adverse effects on agricultural production and people's lives in areas downstream due to such phenomena as floods resulting from a reduction in the water-holding capacity of the soil.

### B.13 Obstacles and concrete measures to combat desertification

The causes of desertification can be attributed to many factors. In addition to natural factors, there are also numerous human factors which have a notable impact such as the population problem, poverty, political factors, and international economic influences. These human factors interact with one another in a complicated fashion resulting in a vicious circle. It is necessary to implement suitable measures for each of these factors in order to break out of the vicious circle and combat desertification effectively.

Table B.13.1 summarizes the issues, obstacles and key elements in planning with respect to combating desertification that have been put together based on the results of a number of questionnaire surveys targeting rural inhabitants, district chiefs and sub-district chiefs and the results of field studies.

**Table B.13.1 Issues, obstacles and key elements in plans for combating desertification**

Issue	Obstacles	Concrete Measures
1. Politico-administrative area · Ineffective support	· Lack of participation of residents	· Promotion of projects based on terroir management
2. Social area - Weak literacy and school rates	· Insufficient number of schools and teachers	- Increase number of classrooms built and educate teachers
3. Economic area - No achievement of food self-sufficiency rate	- Unstable production due to droughts · Increased demands as a result of population growth	- Establishment of land commissions and promotion of appropriate land use
4. Agriculture, stock raising and sylviculture area - Low agricultural productivity  - Low animal productivity - Reduction of forest resources  - Production of commercial products	- Continuous cropping of conventional varieties - Surface soil run-off - Lack of irrigation facilities  - Overgrazing and delay in the improvement of livestock - Excessive wood cutting for firewood  - Underdeveloped market distribution infrastructure	- Introduction of ameliorated seeds and restoration of land fertility by means of agricultural land conservation measures - Inexpensive and manageable water resources development suited to the ability of villagers - Restriction of overgrazing, - Improvement of productivity per head - Afforestation and forest management by villagers - Inexpensive seedling production - Change of product from for self-consumption to commercial purposes - Infrastructure development
5. Support to agriculture stock raising and sylviculture - Delayed organization of farmers and support system	- Lack of allocated budget - Lack awareness by local inhabitants	- Utilization of NGOs, Establishment of credit system - Improvement of guidance system
6. Environment - Reduction of national forest and soil degradation	- Lack of implementation of environmental protection due to poverty of population	- Education of population on forest protection and implementation of public soil conservation measures

## **C Basic Development Plan for Combating Desertification (MP)**

### **C.1 Basic Concept**

#### **(1) Purpose of the Plan**

The desertification factors in the Study Area include the natural and human ones mentioned above.

In addition, if agriculture cannot be continued due to expanding desertification, the livelihoods of the inhabitants and the very existence of the villages will be threatened. For this reason, the Plan for Combating Desertification should not simply aim at the prevention of erosion or at planting trees in areas threatened by desertification. What is necessary is an overall agricultural development plan which creates an area where the inhabitants can enjoy a sustainable lifestyle.

Thus, the purpose of this plan is to combat desertification and in the process ① bring about a change from exploitative agriculture, stock raising and silviculture to sustainable agriculture, stock raising and silviculture and ② preserve the basic living conditions of the inhabitants of the area.

#### **(2) Basic Philosophy**

The basic philosophy that will be used to enact the above mentioned plan is as follows.

1) In order to increase sustainability after the project is completed, it is necessary to increase the ownership of the project by the inhabitants themselves. To this end, a system will be introduced by which the inhabitants can participate in the entire process, including the selection, planning, implementation and maintenance/management of the project.

2) In order to raise the productivity of the land while keeping within the constraints of sustainable agriculture, stock raising and silviculture, the plan will include a system designed to make the greatest use of the natural resources of the area. Specifically, consideration will be given to the best ways to use water effectively and use land efficiently, thereby renewing the plant life and the fertility of the soil in the area. Productivity will also be increased through the introduction of ameliorated seeds.

3) In order to allow the inhabitants to carry out production activities without anxiety over basic needs, the maintenance of good basic living conditions will be promoted in terms of the provision of potable drinking water, health care, sanitation, and education.

4) In order to create a society which can weather a drought, the maintenance of transport systems and infrastructure, including road networks and storage facilities, will be promoted.

### (3) Basic planning indicators

The basic indicators of the Plan for Combating Desertification are as follows:

- ① Planning baseline year: 1997
- ② Project implementation period: 2000-2014 (15 years)

Based on existing upper level plans, and taking into account the implementation periods of other donor agencies, etc., the project implementation period will be fifteen years, with the year 2014 set as the completion year.

- ③ Anticipated population growth rate to the year 2014: 3.3% per year (based on the Environmental Analysis Summary of Tillabéri Department)

### C.2 Zoning of the Study Area

The Study Area extends over an extensive area of 104,245 km<sup>2</sup>, in which natural and socio-economic conditions vary. The Basic Development Plan will be laid out now that the Study Area has been zoned.

#### (1) Basic Concept of Zoning

Zoning was carried out based on natural indicators such as annual rainfall, water resources, productivity of millet and pasture resources, as well as socio-economic factors such as access to markets and population density. Table C.2.1 presents the criteria used for zoning by zone.

**Table C.2.1 Difference of natural, social and economic conditions in each district**

Division		Fitingué	Kollo	Ouallam	Say	Téra	Tillabéri
Annual rainfall	More than 500 mm		○		○		
	Less than 500 mm	○		○		○	○
Water resource	Surface water		○		○	○	○
	Groundwater	○		○			
Access to markets	Near		○		○		
	Far	○		○		○	○
Productivity of millet	More than 350 kg/ha		○		○		
	Less than 350 kg/ha	○		○		○	○
Pasture resource	Much	○		○	○		
	Little		○			○	○
Density of population	High		○		○		○
	Low	○		○		○	
Zone		Third	First	Third	First	Second	Second



## (2) Characteristics of each Zone

### 1) Zone 1

Zone 1 has the advantages of having the heaviest rainfall in the Study Area and being located near Niamey, a major consumption area. There are irrigated plots, mainly paddy fields, which use the water of the Niger River. This area has a high potential for fruit and vegetable production.

It has the highest population density among the three zones and the rate of population growth is high due to the influx of people from other regions. In recent years, problems have arisen in terms of food supply due to the influx of people from the north. This has resulted in a shortage of agricultural land and the destruction of woodland due to development and excessive cropping.

### 2) Zone 2

Although diversified agriculture focusing on irrigation using the water resources of the Niger River and its tributaries may be expected in Zone 2, inland cropping can only be rain-fed. Desertification is spreading northward from the center of the zone and it is therefore necessary to conserve the agricultural land and restore soil fertility. The population density is between that of zones 1 and 3 and the population is concentrated in the departmental capital, Tillabéri. The stock raising practised in this zone is a mixture of sedentary and transhumant types.

### 3) Zone 3

Most of the agriculture in this zone consists of rain-fed production of millet and other crops. Production has decreased in recent years due to soil degradation and decreased rainfall. For this reason, unit yield is the lowest here of the three zones. There is some small-scale fruit and vegetable cultivation being conducted with terroir confined ground water irrigation. Stock raising is mostly transhumant, but there is also some nomadic stock raising. The nutrient value of the grasslands is falling due to continuing desertification and the worsening condition of the grasslands. The Azawak breed of beef cattle, native to this zone will be the main target of stock improvement activities.

Population density is the lowest of the three zones and many people are migrating in search of work or working elsewhere because of the advancement of desertification.

## **C.3 The Basic Development Plan (M/P)**

### **C.3.1 Land Use Plan**

#### **(1) Land Use Plan**

It will be possible to control the development of new agricultural land in the rain-fed agricultural belt, which accounts for most of the land usage and agricultural production, by increasing the production per unit area of existing agricultural land. This is an effective way to combat desertification by breaking the vicious cycle whereby expansion of agricultural land into

land which is unsuitable for such activities leads to degradation of soil, which then leads to decreased production, which in turn leads to further expansion of agricultural land. In areas where it is possible to develop water resources, small-scale irrigated agriculture will be promoted, focusing on fruits and vegetables. An overview of the land for which these activities are planned is given in Table C.3.1.1.

**Table C.3.1.1 Land use plan**

(Unit: ha)

Current classification	Current area	Planned land use									
		Agricultural land					Non-agricultural land				
		Rotational agricultural land			Irrigated farmland		Forest	Protected area	Bare land	Aquatic zone	
		Planted land	Non-planted land		Paddy field	Field, etc					
Fallow land	Grassland, etc										
Agricultural land I	215,300	97,900				9,800		107,600			
Agricultural land II	1,320,000	1,318,400	898,400	898,400	2,187,900	1,600					
Grassland	431,300	431,300									
Bare land I	4,806,000	2,137,100					2,084,400	584,500			
Bare land II	3,077,400								3,077,400		
Paddy fields	8,000					8,000					
Woodland	391,100						391,100				
Aquatic zone	175,400								175,400		
Total	10,424,500	3,984,700	898,400	898,400	2,187,900	8,000	11,400	2,475,500	584,500	3,185,000	175,400
		100%	20~25%	20~25%	60~50%						

Source: JICA remote sensing survey commissioned in Japan, 1998.

## (2) Land Use Management System

In order to promote the effective use of land, terroir management committees will be organised at the village level in order to ensure that the land use reflects the general wishes of the inhabitants. At the same time, because reorganisation and establishment of land rights is required, Land Commissions as stipulated in the Rural Code will be established in each district, rural cadasters will be developed, and land use management will be enhanced.

Drawing up and management of rural cadasters will be the responsibility of the Land Commissions, special administrative district agencies.

## C.3.2 Development of Surface Water and Groundwater

### (1) Development of Surface Water

By establishing small-scale dams on the tributaries of the Niger River and koris, in addition to storing floodwater and controlling floods and soil erosion, the reservoirs created also become a source of water resources for agriculture. Small-scale dams are built using methods already common in the country and materials which are available in the area are used as much as possible. These dams are easy to manage and maintain.

Due to the recent drop in rainfall and increase in sedimentation, a pond area within the study area has suffered a drop in the stored water volume and a decrease in the inflow period and the water use conditions have worsened. In order to recover the functions and improve this pond area, improvements such as ① dredging of the ponds, ② heightening of the banks, and ③ reinforcement of the banks by gabions are planned.

## (2) Development of Groundwater

The development of potable drinking water (including water for miscellaneous uses) is already greatly desired by the inhabitants. The securing of safe and high quality water sources is an important factor in the daily life of the inhabitants. Because contaminated drinking water can be the cause of many diseases, its development is a very urgent matter from the point of view of health and sanitation. Therefore, the acquisition of potable drinking water is the most important part of the development of groundwater. It should be noted that this plan gives precedence to rural areas and that municipal water supply (AEP) is not covered. Table C.3.2.1 gives an overview of the plan for potable water supply facilities required by area.

**Table C.3.2.1 Plan for potable water supply facilities (by district and type)**

Category	Filingué	Kollo	Ouallam	Say	Téra	Tillabéri	Total
M-AEP	5	10	3	2	8	6	34
PEM	70	113	62	60	77	40	422
New	14	11	5	10	8	12	60
Repaired	14	12	5	10	8	11	60

Source: Le schéma directeur de mise en valeur et de gestion des ressources en eau du Niger

## C.3.3 Improvement of Agriculture, Stock Raising, and Sylviculture

### (1) Agriculture

#### 1) Improvement of rain-fed agricultural land productivity

The current food self-sufficiency rate for major staple crops (1996 basis) is 82%. Based on the annual population growth of 3.3%, if no measures are taken to improve productivity, the self-sufficiency rate will fall to 45% by 2014, the year this project is scheduled to end. (see Table C.3.3.1) It is necessary, therefore, from the point of view of sustainable production, to halt the expansion of rain-fed agricultural land at its current level. To that end, we plan to meet the increased demand for food as much as possible by increasing productivity through increased yields per ha. Specifically, the food self-sufficiency rate will be maintained at around 62% up to 2014 through a 50% increase in yields per ha compared with present values: 30% through the widespread distribution of ameliorated millet and sorghum seeds, and 20% through land conservation measures. The remaining 38% will be made up for through imports and a reduction in the population growth rate, amongst other measures.

**Table C.3.3.1 Current and target rainfed agricultural production and self-sufficiency rates for cereal crops**

District	Cultivated area (ha)		Production (t)			Necessary quantity (t)		Self-sufficiency rate (%)		
	Current status	Target year (2014)	Current status	Target year (2014)		Current status	Target year (2014)	Current status	Target year (2014)	
				No measures taken	M/P				No measures taken	M/P
Filingué	289,177	171,500	84,992	84,992	80,600	90,992	147,933	93.4	57.5	54.5
Kollo	132,281	120,875	69,578	69,578	91,582	93,395	228,356	74.5	30.5	40.1
Ouallam	173,841	220,100	37,823	37,823	76,566	59,179	91,553	63.9	41.3	83.6
Say	109,445	107,850	64,733	64,733	99,378	61,537	136,546	105.2	47.4	72.8
Téra	215,881	198,950	76,523	76,523	111,861	95,886	163,798	79.8	46.7	72.0
Tillabéri	83,493	79,000	31,338	31,338	42,471	42,976	52,637	72.9	59.5	80.7
Total	1,004,118	898,275	364,987	364,987	508,458	443,965	820,824	82.2	44.5	61.9

Note: The reason that the cultivated area in Table C.3.1.1 and the cultivated area in this table are different is because they were calculated from square km to ha.

**(a) Distribution of ameliorated seeds**

The amounts of ameliorated millet and sorghum seeds, which have already been developed and whose distribution has been slow, will increase and distribution will increase due to the establishment of a distribution system. An increase in efficiency along with stabilised production and improved quality is expected.

**(b) Restoration of land productivity**

The introduction of a combination of agricultural land conservation measures, such as (1) fertility enhancement achieved through the adoption of fallow periods, (2) provision of required organic matter achieved through the systematic introduction of penning (enclosures), (3) promotion of intermediate cropping with legumes, such as cowpeas, (4) improvement of soil fertility through agro-forestry and (5) improvement of the water-holding capacity of soil through water harvesting, will increase efficiency and stabilise production.

**2) Promotion of irrigated agriculture**

By securing low-cost water resources from groundwater, ponds and river tributaries, production areas for fruits and vegetables can be developed through small-scale irrigation. Crops which can be reproduced rapidly and stored easily will be selected.

Further, since women are the main workers in irrigated vegetable fields and they gain valuable income from them, these women will be actively used for these activities. Production will be increased by improving the existing wet rice paddies which have become superannuated or shown a drop in productivity.

**(2) Stock raising**

The main types of livestock being focused on for promotion of production from the point of view of use of natural resources and export are cattle, sheep, and goats. Management of sheep and goats is relatively simple and, due to the fact that the investment required is small, they can be used to increase the amount of cash available to rural women. Rather than attempting to

increase the herd sizes, the aim is to increase production per head and production efficiency as well as improving the quality of livestock products.

In the area of stock improvement of cattle, the Azawak breed of beef cattle has been selected for introduction. Improvement of deteriorating grasslands, creation of grasslands, maintenance of water supply facilities and maintenance of breeding management facilities will be the main activities carried out to improve the production base.

### (3) Community Forests

The concept of Community Forests will be adopted, whereby forests in the area will be managed by the local communities and the benefits derived from them will be distributed among the local communities either directly or indirectly. In order to promote forestry activities, plans are to be made to ① educate inhabitants on forest conservation, ② develop mini-nurseries, ③ train seedling producers to manage and maintain nurseries and ④ improve central nurseries.

### (4) Farming

The farming plan will take the following points into consideration.

- ① Under the plan, rain-fed agriculture and livestock will play an important role in the future.
- ② In order to halt the deterioration of soil quality caused by currently practised excessive cropping, fallow periods will be introduced and the area of land used will be reduced.
- ③ This development plan will encourage effective water use and efficient land use and introduce ameliorated seeds, thereby increasing unit yield and developing the food production base and improving livestock, etc. This will improve both beef and dairy productivity and increase incomes.

Table C.3.3.2 presents estimates of the future economic conditions of current average farm households by type of farming.

**Table C.3.3.2 Amount of income by type of farming (standard model)**

(Unit: FCPA)

District	Zone 1		Zone 2		Zone 3		
	Rainfed agriculture only	Rainfed agriculture + stock raising (sedentary)	Rainfed agriculture only	Rainfed agriculture + stock raising (sedentary)	Rainfed agriculture only	Rainfed agriculture + stock raising (sedentary)	Rainfed agriculture + stock raising (transhumance)
Farm area	8.4 ha	8.4 ha	6.4 ha	6.4 ha	2.1 ha	2.1 ha	2.1 ha
Cultivated area	Millet: 6.9 ha Sorghum: 1.5 ha Cowpeas: 2.9 ha	Millet: 6.9 ha Sorghum: 1.5 ha Cattle: 2 head Goats: 3 head Sheep: 3 head	Millet: 4.7 ha Sorghum: 1.7 ha Cowpeas: 2.6 ha	Millet: 4.7 ha Sorghum: 2.7 ha Cattle: 5 head Goats: 15 head Sheep: 10 head	Millet: 1.8 ha Sorghum: 0.3 ha Cowpeas: 0.6 ha	Millet: 1.8 ha Sorghum: 0.3 ha Cattle: 2 head Goats: 4 head Sheep: 5 head	Millet: 1.8 ha Sorghum: 0.3 ha Cattle: 10 head Goats: 11 head Sheep: 14 head
Number of head raised							
farming income	922,720	1,013,430	674,500	1,071,690	221,520	386,560	925,010
Portion from agriculture	922,720	862,980	674,500	620,940	221,520	209,160	209,160
Portion from stock raising	-	150,450	-	450,750	-	177,400	715,850

Source: Prepared based on the results of local commissioned studies (survey of 100 households per district) and the current area under cultivation.

The cultivated area of cowpeas is interspersed throughout the cropping area of both millet and sorghum and thus is included in the total of the farm area.

### C.3.4 Market distribution

Currently, because most agricultural production is for home consumption and there are very few commercial products produced, no market access allowing farmers to sell agricultural products on the market has been established. In relation to this, the plan includes the following points.

- ① Transporters and shippers will be organised in production areas, and cottage industry production facilities will be developed.
- ② In the area of transportation, agricultural roads leading to the highways will be developed and carts for transport will be introduced which use donkeys and cattle.
- ③ Market information management systems will be developed in consumption areas.

### C.3.5 Agricultural, stock raising, and sylvicultural support

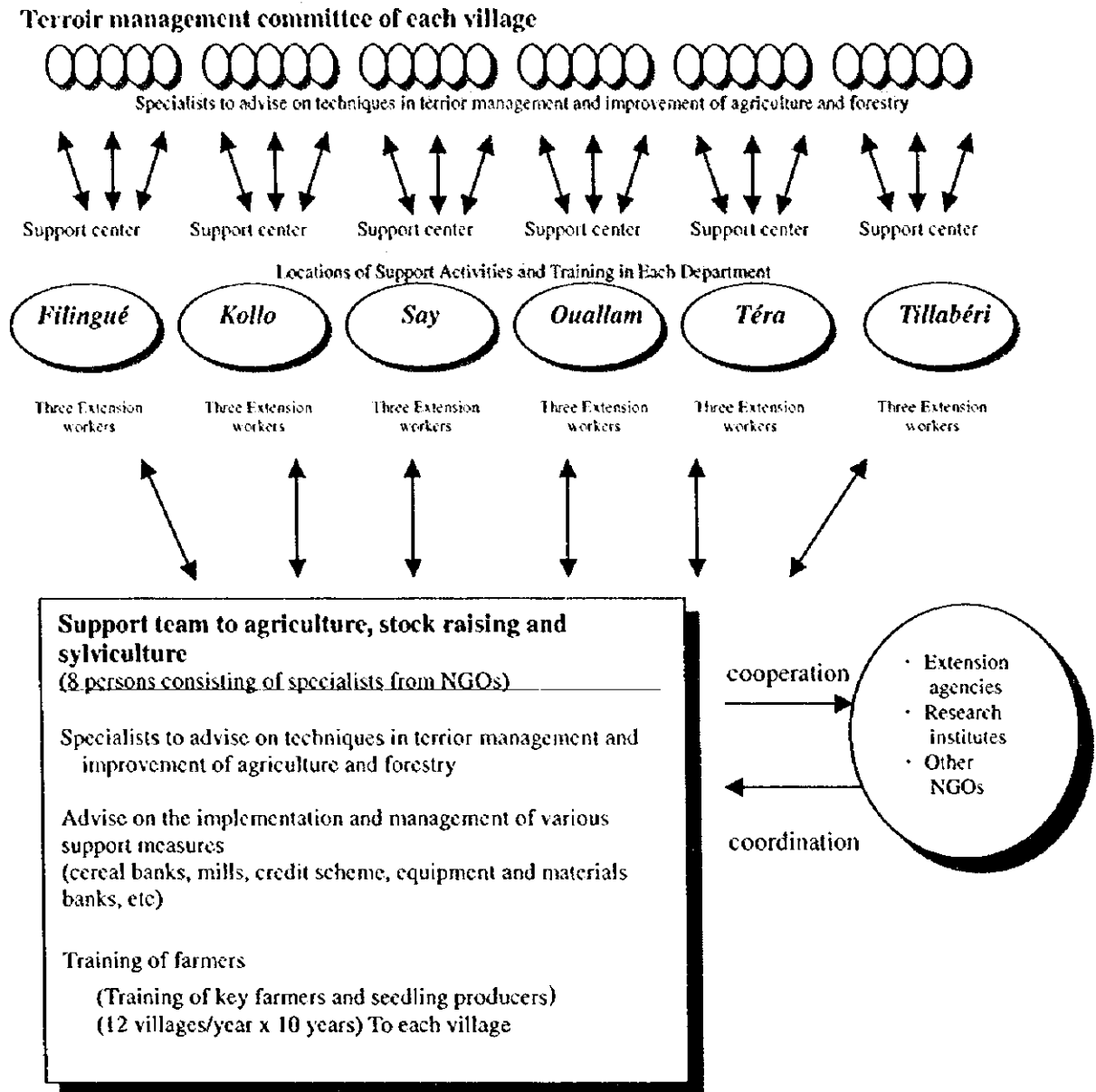
In order to insure the sustainability of development, support teams of specialists will be established in the areas of agriculture, stock raising, and sylvicultural support in order to assist farmers and production groups in conjunction with the development activities being carried out. These Support Centers for agriculture, livestock raising, and sylviculture support are to be established at the district level. These centers will be used as training centers for core farmers

and seedling producers. Three professional 'diffusion' personnel will be on duty to assist in spreading necessary skills and techniques who will always be engaged in ① extending support to villagers organize Terroir Management Committees and acquire skills in how to manage the Committees, ② receiving requests for assistance in various types of projects, and ③ providing guidance to farmers on agriculture, livestock raising, and silviculture techniques.

At the departmental level, a support team of specialists in agriculture, livestock raising, and silviculture will be formed in a desertification combat project office (hereafter referred to as the "Project Office" which will train the above mentioned 'diffusion' personnel stationed at each support center in respective districts in Terroir Management methods and provide guidance regarding agriculture, livestock raising, and silviculture techniques. The support teams will engage in guidance tours around to each support center in respective districts and, if need be, even provide guidance to farmers directly together with the above 'diffusion' personnel. (see Figure C.3.5.1)

The number of villages targeted by these measures, after considering their ripple effect was determined to be 120 villages, approximately 15% of the 804 villages in cooperation with PRSAA (Programme de renforcement des Service d'Appui a l'Agriculture).

**Figure C.3.5.1 Pattern of the agriculture, stock raising, and sylviculture support system (proposal)**



### C.3.6 Improvement of living conditions

In order to increase agricultural production activities and ensure the sustainability of these activities, it is first necessary to insure a minimum basic quality of living environment. The main focus will be on basic human needs such as health, sanitation, potable drinking water, and education.

### C.3.7 Protection of the environment

In upstream areas of river branches, grassland and woodland restoration measures will be implemented. The creation of vegetation zones will allow the improvement of the water-holding capacity of soil and the prevention of soil degradation. It will also reduce damage from flooding



and sedimentation, etc. in downstream river basins. At the same time, these measures will allow the increase of grass and forest resources.

With regard to the restoration of grasslands, through measures such as simple, low-cost water harvesting practices such as leveling the soil on the faces of steep, narrow sloping areas, the water-holding capacity of soil will be improved. The total area for which such restoration of grasslands will be carried out over the fifteen years of the project will be about 190,000 ha, which is 50% of the 'non-agricultural conservation land' minus about 102,000 ha of land which is targeted for woodland restoration.

#### Restoration of woodlands

The area to be planted with trees in the Study area is about 6,800 ha per year, as prescribed in the Maradi Engagement. This area will be included 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 (fifteen years) will cover about 102,000 ha.

### C.3.8 Initial Environmental Impact Assessment

As the government of Niger has not yet established environmental guidelines applicable to the project, the assessment was made based on JICA guidelines.

As a result of an evaluation based on six areas, [① field development, ② development and rehabilitation of grasslands, ③ construction of small dams (including bridge dams) and improvements to ponds and koris crossing works, ④ agricultural road development, ⑤ construction and rehabilitation of wells, and ⑥ farmland and soil conservation measures] it was judged that there will be no major adverse impact on the natural or social environment as a result of the project.

## D. Priority Projects

### D.1 Selection of Priority Projects

In order to combat desertification in the Study Area, it would be preferable to implement all of the various projects formulated in the Master Plan (M/P) simultaneously. However, implementing all the projects at the same time is likely to be difficult in view of budgetary and manpower constraints. Therefore, in order to achieve a conversion from exploitative agriculture, stock raising, and silviculture to sustainable agriculture, stock raising, and silviculture, one of the objectives of the Master Plan, '① Study Area Support Projects' will be selected which will promote the participation of local inhabitants in development and encourage improved productivity in agriculture, stock raising, and silviculture by reforming the awareness of the farmers. These projects will be implemented broadly over the Study Area.

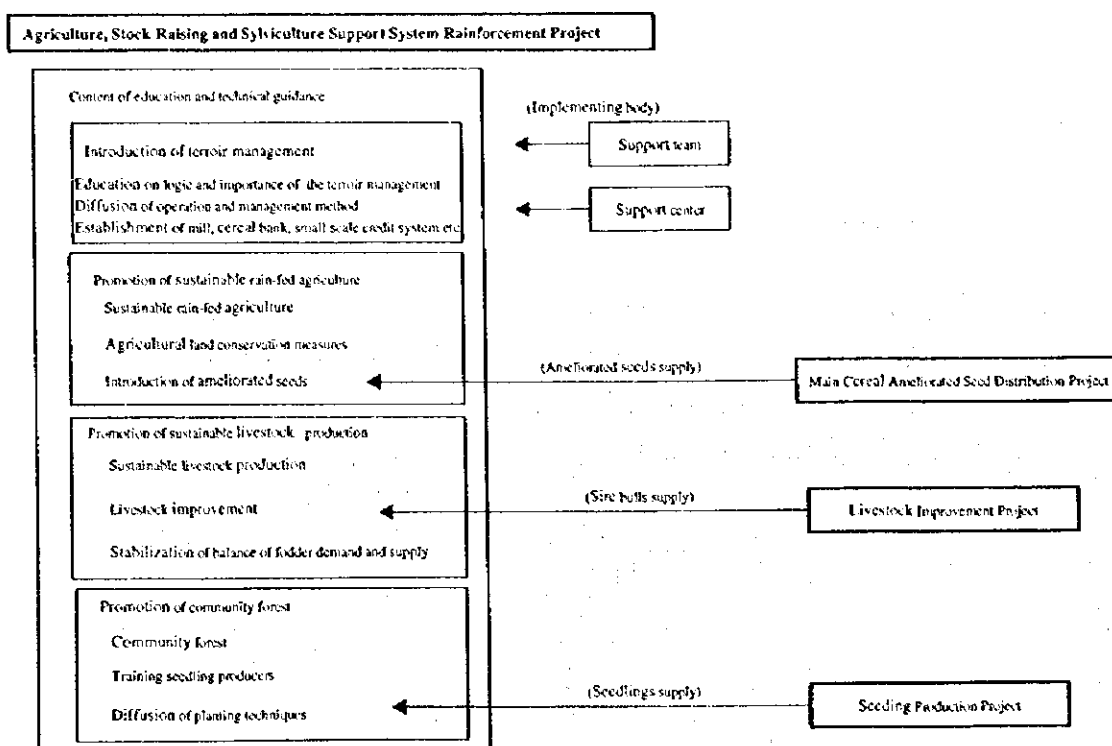
In addition, ② Model Pilot Projects will be selected to clarify the ideal type of villages for

successfully combating desertification and having them serve as models for neighboring areas by simultaneously achieving the “conversion from exploitative agriculture, stock raising, and silviculture to sustainable agriculture, stock raising, and silviculture,” and an additional objective, “securing a fundamental living environment for the local inhabitants.” This entire project will be implemented in accordance with the three-village project plan at three model villages selected in each zone. This will be done by having the terroir management committees formed at the village level implement, manage, and evaluate the project from the detailed planning stage.

## D.2 Study Area Support Projects

In order to promote a conversion from exploitative agriculture, stock raising, and silviculture to sustainable agriculture, stock raising, and silviculture, it is important that the local inhabitants themselves actually practise sustainable agriculture, stock raising, and silviculture in awareness of the actual problems of exploitative agriculture, stock raising, and silviculture. To this end, we will plan an Agriculture, Stock Raising and Forestry Support System Reinforcement Project aimed at strengthening education and technical guidance for local inhabitants, and a Main Cereal Ameliorated Seed Distribution Project, a Livestock Improvement Project, and a Seed Production Project aimed at supplying materials indispensable to the practice of sustainable agriculture, stock raising, and silviculture (namely, ameliorated seeds, sire bulls and seedlings) to local inhabitants. The relationship between the various projects that comprise the Study Area Support Projects is shown in Fig. D.2.1.

Figure D.2.1 Overview of the Study Area Support Project



### **D.2.1 Agriculture, Stock Raising and Sylviculture Support System Reinforcement Project**

The content of education and technical guidance for local inhabitants and the organisation for the implementation thereof will be as follows.

#### **(1) Content of education and technical guidance**

##### **1) Introduction of terroir management**

In order to implement activities led by the local inhabitants, the management capability of local resources (terroir) will be improved and education and technical guidance provided on farming systems, including mills, cereal banks, small-scale credit systems, agricultural management credit systems, equipment and materials banks, and the like.

##### **2) Promotion of sustainable rain-fed agriculture**

Education and technical guidance will be provided on agricultural land conservation, the introduction of improved millet and sorghum seeds, and the like. By so doing, the aim is to achieve sustainable rain-fed agriculture through a reduction in soil degradation and an improvement in unit yields.

##### **3) Promotion of sustainable stock raising**

Education and technical guidance will be provided on how to improve productivity through livestock improvement, stabilised fodder supply and demand, efficient livestock production, and similar measures. By so doing, the aim is to reduce excessive grazing through the enhancement of productivity per individual animal.

##### **4) Promotion of Community Forests**

Education and technical guidance will be provided on agroforestry, the creation of firewood forests, training of seedling producers, and similar measures. By so doing, we will aim to increase trees and forests in the form of Community Forests and improve the environment in settlements and surrounding areas.

#### **(2) Organisation for implementation**

##### **1) Establishment of Agriculture, Stock Raising, and Sylviculture Support Teams**

Agriculture, Stock Raising, and Sylviculture Support Centres will be established as focal points for agriculture, stock raising, and sylviculture support in the six districts of Tillabéri Department. The Department will assign promotion personnel to the Agriculture, Stock Raising, and Sylviculture Support Centers to handle continuous liaison and coordination with the terroir management committees in order to clarify problems at the local level. The promotion personnel will, in accordance with guidance and advice by the Support Teams, select the villages where the project is to be implemented, train the members of the terroir management committees, and provide study and training on the front lines.

##### **2) Establishment of Agriculture, Stock Raising, and Sylviculture Support Centres**

To support local farmers, Agriculture, Stock Raising, and Sylviculture Support Teams formed by NGOs will be established from specialists in agriculture, stock raising, and

sylviculture, while forming links with GTZ and other international bodies as well as research and diffusion agencies. The support team of specialists in agriculture, livestock raising, and sylviculture will regularly consult with NGOs, other support organizations, as well as the testing and research organizations of agricultural bureaus and such agencies as INRAN regarding technical levels of training and diffusion which should be provided at the village level with respect to improving agriculture, livestock raising, and sylviculture productivity. Moreover, the support team will take care to coordinate each project in which the team is engaged with any other projects being carried out, so as to avoid any overlap but rather supplement projects already in progress.

The support teams will also administer mill activities, grain banks, and operate small-scale loans programs at the village level through the agriculture, livestock raising, and sylviculture support centers.

#### **D.2.2 Main Cereal Ameliorated Seed Diffusion Project**

When cultivating millet and sorghum (the main cereals) in the Study Area, in most cases reliance is placed on native seeds collected by the farms themselves, and this causes low crop productivity. Therefore, in this Project, ameliorated seeds will be broadly distributed with the aim of achieving stability in production and yield increases of 30%.

The seeds to be diffused will be selected from ameliorated seeds possessed by INRAN and ICRISAT, taking account of their productivity, resistance to disease, and so on. In order to diffuse these quickly throughout the Study Area, we will develop a system for gathering and distributing seeds in an organised and planned fashion, using the LOSSA Seed Centre of the Ministry of Agriculture and Livestock as a Promotion Centre.

#### **D.2.3 Livestock Improvement Project**

Excessive grazing can be cited as a cause of desertification. Accordingly, the productivity per individual animal needs to be improved through livestock improvement rather than through increased herds. Therefore, in this Project, we will aim to improve the productivity of ameliorated cattle breeds which currently have low productivity.

Specifically, using the state-operated Toukounous Ranch as a centre, we will breed and distribute superior Azawak sire bulls, a breed which highly rated for both its beef and milk, as well as promoting diffusion through model dairy farm practice demonstrations using improved cattle.

#### **D.2.4 Seedling Production Project**

Owing to excessive felling of firewood on or near crop cultivation land, topsoil erosion on farmland and manpower reinforcement needed for firewood gathering by the villagers are now serious problems. Therefore, in this Project we will aim to enable the villagers to provide their own firewood forests.

As for the content of activities, mini-nurseries will be established in forty villages, with a plan to produce 5,000 seedlings per year in each. In addition, training will be provided to seedling production specialists in how to manage and operate these nurseries, who will then be put in charge of the core of the sustained Community Forest activities in each village. The public central nurseries in each district will also be renovated, with a view to using them as training sites for seedling production specialists.

### D.2.5 Project Costs for Study Area Support Projects

The quantities, direct costs, and duration of the projects that comprise the Study Area Support Projects are shown in Table D.2.5.1.

**Table D.2.5.1 Content of the Study Area Support Projects**

Name of Project	Unit Cost ('000 FCFA)	Quantity		Project Cost (million FCFA)	Duration (Years)
<b>(1) Agriculture, Stock Raising, and Sylviculture Support System Reinforcement Project</b>				<b>2,648.0</b>	<b>15</b>
Establishment of support team facilities	15,000.0	1.0	Site	15.0	1
Management of support teams	51,600.0	15.0	Year	774.0	15
Establishment of support center facilities	70,500.0	6.0	Site	423.0	1
Management of support center	57,600.0	6.0	Site	345.6	15
Support system				1,090.4	10
Cereal banks, Mills	9,160.0	40.0	Site	366.4	10
Small-scale credit	600.0	40.0	Site	24.0	10
Agricultural management credit	3,000.0	40.0	Site	120.0	10
Equipment and materials bank	14,500.0	40.0	Site	580.0	10
<b>(2) Major Cereal Ameliorated Seeds Distribution Project</b>				<b>182.6</b>	<b>7</b>
Establishment of seed centers	82,700.0	1.0	Site	82.7	1
Contracted seed collecting plots (millet)	27.7	2,708.0	ha	75.1	5
Contracted seed collecting plots (sorghum)	21.8	1,137.0	ha	24.8	5
<b>(3) Improvement of Livestock Project</b>				<b>521.0</b>	<b>15</b>
Livestock improvement centers	325,150.0	1.0	Site	325.2	1
Introduction of sire bulls	180.0	525.0	Head	94.5	15
Introduction of improved cattle	112.5	900.0	Head	101.3	15
<b>(4) Seedling Production Project</b>				<b>727.1</b>	<b>12</b>
Improvement of central nursery	49,985.0	6.0	Site	299.9	5
Mini-nurseries	10,600.0	40.0	Site	424.0	10
Community forests	66.0	200.0	ha	13.2	12
<b>Total (direct business expenses)</b>				<b>4,088.8</b>	

### D.3 Model Pilot Projects

Model Pilot Projects are projects that laterally incorporate one of the priority projects of the Agriculture, Stock Raising and Sylviculture Sector (including agriculture, stock raising and sylviculture support), the Living Environment Sector, and the Environmental Protection Sector, as

formulated in the Master Plan (M/P). Since the Study Area is divided into three zones due to its natural and social conditions, three villages (one village representing each zone) have been selected as target villages. The three villages were selected from six villages that were originally selected as subjects for the Rural Society Study, representing each of the six districts in Tillabéri Department.

Selection was based on the following six criteria.

- ① There is greater potential for development.
- ② The selected villages are located close to trunk roads and so are highly effective for demonstration purposes.
- 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 Wells, schools, markets, medical facilities, roads, etc. are underdeveloped.

### **D.3.1 Characteristics of the 3 villages**

#### **(1) Dyabou Village (Metropolitan Suburb Agriculture Promotion Zone)**

Dyabou is on a plateau sandwiched between two tributaries of the River Niger (the Goroubi to the north and the Dyamangou to the south), and has a total land area of 139 square kilometres. Annual rainfall is relatively abundant, fluctuating between 500 and 800mm. There is advanced gully erosion on the sloping land going down to both rivers from the village, and the southern half of the village is now glaciais land. There are signs of small-scale vegetable farming near both rivers. The bridge on the access road to Say, the District capital, was washed away by floods in 1998, leaving the village stranded in the rainy season.

#### **(2) Kourégou Village (Western Agriculture, Stock Raising and Sylviculture Promotion Zone)**

Two belt-like sand dunes extend from east to west in the south of this village. In the rainy season, large ponds appear to the east and west of the village. The village has a total land area of 85 square kilometres. The villagers have dug numerous unlined wells on the sites of old koris and use them for drinking water and water for livestock. However, the supply is not constant, and when the wells start to lose their function the villagers immediately dig new wells next to the old ones. The millet fields near the wells retain their fertility due to manure from livestock that gather to drink the water, but the majority of the fields are in an advanced state of deterioration. Standing trees are scarce in village-owned firewood forests, and villagers walk more than five kilometres each way to collect firewood.

### **(3) Tidani Village (Northern Stock Raising Promotion Zone)**

Tidani consists of the village proper and two enclaves, Dabaga and Banguir. The total land area, including the enclaves, is 75.6 square kilometres. The Dabaga enclave, with its highly fertile sandy soil, is the village's base for agriculture and stock raising, but suffers progressive sand sedimentation of farmland and water resources, owing to shifting sand dunes. The Banguir enclave includes two ponds, but also has the same advanced sedimentation.

The village proper has an annual rainfall of around 330 mm, the minimum needed for millet cultivation. Therefore, this occasionally invites food shortages due to droughts. The village's water resources consist of five wells and ponds, but in the dry season it is difficult to secure the water needed for human and livestock consumption.

#### **D.3.2 Content of the projects in the three villages**

The project quantities and direct project costs for each village subject to Model Pilot Projects are shown in Table D.3.2.1. The project duration is 5 years for each village. Comparing the project costs for each village, Dyabou shows a cost of 862 million FCFA, three to four times the amount for the other two villages. The reason for this is that the costs of constructing a bridge dam on the access road and creating irrigation fields associated with this are larger than those in the other two villages.

**Table D.3.2.1 Content of Model Pilot Projects**

Item	Unit	Dyabou		Kourégou		Tidani		Total	
		Quantity	Cost million FCFA	Quantity	Cost million FCFA	Quantity	Cost million FCFA	Quantity	Cost million FCFA
<b>(1) Conservation of Agricultural Land</b>									
Stone ridges	ha	465.0	9.5	380.0	7.8	180.0	3.7	1,025.0	21.0
Contour planting of Andropogon	ha	0.0	0.0	285.0	0.0	0.0	0.0	285.0	0.0
Zai	ha	580.0	0.0	480.0	0.0	225.0	0.0	1,285.0	0.0
Simple eyebrow ridges	ha	350.0	0.0	0.0	0.0	270.0	0.0	620.0	0.0
<b>(2) Improvement of Agricultural Roads</b>									
Agricultural roads	km	2.0	14.0	0.0	0.0	0.0	0.0	2.0	14.0
Koris crossing work	Site	3.0	21.0	3.0	21.0	1.0	7.0	7.0	49.0
<b>(3) Improvement of Small Irrigation Facilities</b>									
Field development	ha	11.0	187.0	1.0	17.0	0.2	3.4	12.2	207.4
Construction of small scale dams	Site	1.0	550.0	0.0	0.0	0.0	0.0	1.0	550.0
Pond restoration	Site	0.0	0.0	1.0	18.0	0.0	0.0	1.0	18.0
<b>(4) Improvement of Distribution of Agricultural Products</b>									
Collecting and shipping facilities	Site	1.0	20.3	0.0	0.0	0.0	0.0	1.0	20.3
<b>(5) Improvement of Land Commissions</b>									
Cadaster elaboration	Site	0.1	5.0	1.0	50.0	1.0	50.0	2.1	105.0
<b>(6) Improvement of Fodder Production Infrastructure</b>									
Grassland development	ha	0.0	0.0	0.0	0.0	100.0	30.0	100.0	30.0
Livestock nutritional brick production facilities	Site	19.0	0.4	17.0	0.3	15.0	0.3	51.0	1.0
<b>(7) Improvement of Water Supply Facilities for Livestock</b>									
Rehabilitation of deep wells	Site	0.0	0.0	0.0	0.0	1.0	4.0	1.0	4.0
Construction of new wells	Site	0.0	0.0	1.0	9.0	0.0	0.0	1.0	9.0
<b>(8) Improvement of Livestock Product Distribution</b>									
Fresh milk collecting and shipping facilities	Site	1.0	16.0	0.0	0.0	0.0	0.0	1.0	16.0
Dry cheese production facilities	Site	3.0	1.4	4.0	1.9	4.0	1.9	11.0	5.2
Yogurt production facilities	Site	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>(9) Improvement of Potable Water Supply Facilities</b>									
Modern wells	Site	1.0	10.0	8.0	106.4	5.0	66.5	14.0	182.9
Construction of new wells	Site	1.0	1.0	1.0	1.0	0.0	0.0	2.0	2.0
Restoration of wells	Site	0.0	0.0	0.0	0.0	1.0	4.0	1.0	4.0
<b>(10) Diffusion of Information and Education Facilities</b>									
Solar powered TV	Site	1.0	0.7	1.0	0.7	1.0	0.7	3.0	2.1
<b>(11) Improvement of Health and Hygiene</b>									
Simple health huts	Site	1.0	5.6	1.0	5.6	1.0	5.6	3.0	16.8
<b>(12) Improvement of Education</b>									
Classrooms	Site	1.0	8.5	2.0	17.0	1.0	8.5	4.0	34.0
School farms	Site	1.0	7.2	1.0	7.2	1.0	7.2	3.0	21.6
<b>(13) Soil Conservation</b>									
Plowing	ha	300.0	3.9	0.0	0.0	320.0	4.1	620.0	8.0
Afforestation	ha	25.0	0.5	25.0	0.5	25.0	0.5	75.0	1.5
<b>Total (direct business expenses)</b>				862.0		263.4		197.4	1,322.8

\* 1) In principle, conservation of agricultural land is practiced as a part of farming practice. Thus, the cost of stone ridges is limited to the transport of the stones.



## E Implementation Plans

### E.1 Project Cost Calculations

The total project costs consist of direct project costs, administrative costs, engineering service fees, physical contingency, and price contingency. The total project cost of the Master Plan as a whole is 150,262 million FCFA (US\$257 million).

### E.2 Economic Evaluation

Of the various projects in each sector, economic evaluation has been carried out for five projects which the State ought to implement and from which the benefits may be ascertained with clarity. With the exception of large-scale irrigation facility rehabilitation projects, these exceed the 10-12% of 'capital opportunity costs' generally applied in West Africa and are appropriate for the Plan. Table E.2.1 shows the result of calculation of the economic internal rate of return (EIRR).

**Table E.2.1 Calculated economic internal rates of return (EIRR)**

Project name	Case	EIRR	Remarks
1) Distribution of improved major cereal ameliorated seeds	Plan	17.4%	The costs for agriculture, stock raising, and sylviculture support (organizational support, technical support, etc.) out of the improvement plan for agriculture, stock raising, and sylviculture support system are included in the project cost. As a 20 % increase in yield is anticipated as the effect of the agricultural land conservation, the expenses required for the agricultural land conservation are included in the ordinary expenses for farming.
	Case 1	17.3%	
	Case 2	12.4%	
2) Rehabilitation of large-scale irrigation facilities	Plan	7.7%	The maintenance costs of facilities are included in the expenses for farming.
	Case 1	6.4%	
	Case 2	4.9%	
3) Improvement of small-scale irrigation facilities	Plan	24.1%	
	Case 1	21.8%	
	Case 2	19.0%	
4) Livestock improvement	Plan	146.2%	The costs of the livestock infrastructure improvement, the improvement of water supply facilities for livestock, the improvement of animal hygiene and the livestock management facilities are included in the calculation.
	Case 1	134.4%	
	Case 2	120.2%	
5) Seedling production	Plan	22.6%	The costs for improvement of the central nursery are included in calculation.
	Case 1	21.7%	
	Case 2	20.4%	

Note: Sensitivity analysis was conducted in the case of a 10% increase in direct project costs (case 1) and in the case of a 20% decrease in the benefit of handling quantity (case 2), in addition to the planned case.

### E.3 Financial Evaluation

Financial evaluation is used to judge the relative need for project facilities from the point of view of private businesses. The financial internal rate of return (FIRR) for the six individual

projects included in the Model Pilot Projects of the Priority Projects is at least 17.2% in every case, excluding the fresh milk collecting and shipping project and the small-scale irrigation facilities improvement project in Kouregou village. This exceeds the 15.0% estimated actual interest in Niger, and thus there is no problem in terms of financial evaluation. Table E.3.1 shows the result of calculation of the financial internal rate of return (FIRR).

**Table E.3.1 Calculated financial internal rates of return (FIRR)**

Project name	Case	FIRR	Remarks
1) Production of dry cheese	Plan	72.7%	
	Case 1	67.9%	
	Case 2	61.9%	
2) Production of yogurt	Plan	19.4%	
	Case 1	17.5%	
	Case 2	15.3%	
3) Fresh milk collecting and shipping facilities	Plan	11.9%	
	Case 1	9.8%	
	Case 2	7.1%	
4) Improvement of small scale irrigation facilities (the Dyabou village)	Plan	18.1%	When the construction cost of a bridge dam is included in the calculation, each FIRR is 2.3%, 1.6%, 0.7% respectively.
	Case 1	16.5%	
	Case 2	14.6%	
5) Improvement of small scale irrigation facilities (the Kouregou village)	Plan	12.4%	
	Case 1	11.1%	
	Case 2	9.5%	
6) Improvement of collecting and shipping facilities (the Dyabou village)	Plan	17.2%	
	Case 1	14.9%	
	Case 2	11.0%	

(See Tableau A10.2.1.7 - 12)

#### **E.4 Social Evaluation**

The various projects formulated in the Master Plan (M/P) are all in line with national or departmental development plans. In addition, most of the projects planned at village level will incorporate the rationale of terroir management to reflect initiatives, implementation, and management by the villagers themselves, and the sense of ownership and empowerment of the villagers will be improved through the implementation of the projects.

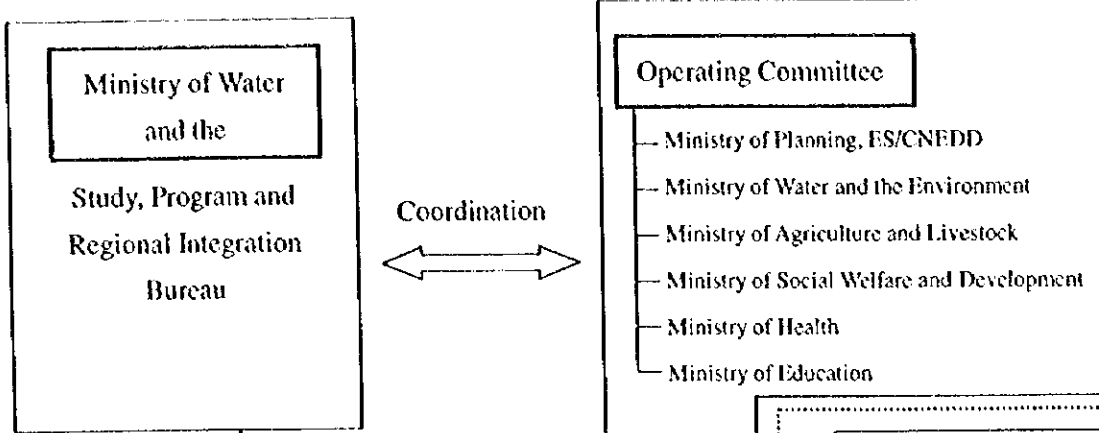
#### **E.5 Project Implementation System**

As the organisation for implementing this Plan, we will establish a Tillabéri Department Desertification Control Project Office (hereinafter referred to as the "Project Office"). For implementation, we will coordinate project execution with relevant bodies at Department level and will receive technical support from them. As organisations at District level, we will establish Land Commissions in line with the Rural Code, and will supervise land management at village level.

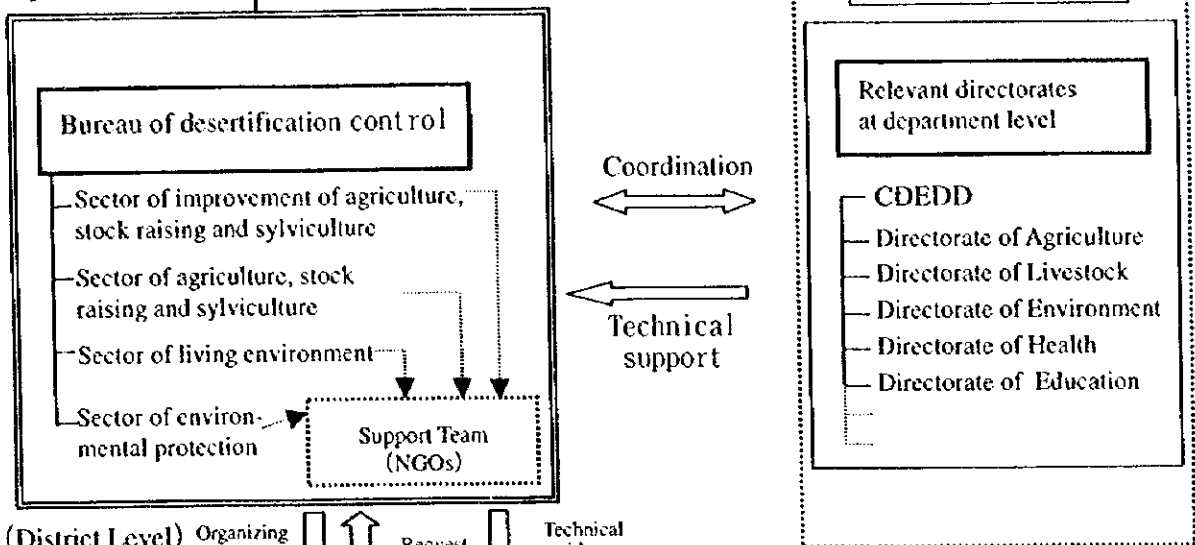
The contents of this Plan span the areas of jurisdiction of many government ministries and agencies. Implementing these contents comprehensively will be vital for the efforts of Tillabéri Department to combat desertification. Therefore, with the Study, Program, and Regional Integration Bureau of the Ministry of Water and the Environment as an organ for coordination with the relevant government bodies, we will establish an Operating Committee at national level between the various ministries connected with the project content. This Operating Committee will coordinate the direction and timing of project implementation in each sector with national objectives. Figure B.5.1 shows the overall system for project implementation.

Figure E.5.1 Overview of Project Implementation System

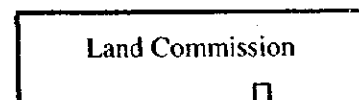
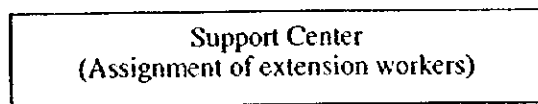
(National Level)



(Departmental Level)

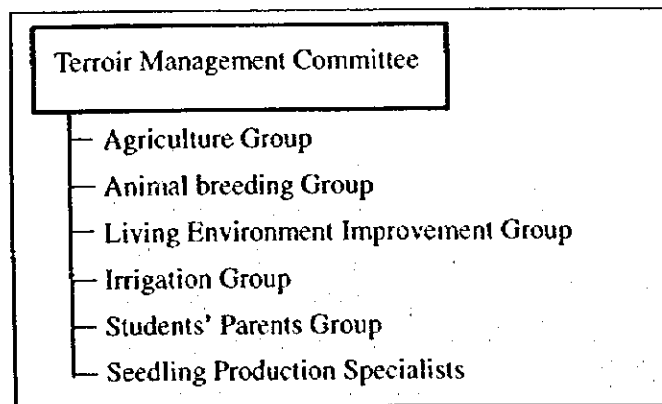


(District Level)



Control of land management

(Village Level)



## **E.6 Establishment of Land Commissions**

According to the provisions of the Rural Code, the establishment of Land Commissions at the district level is mandatory. This Commission is to determine the rights to land related to the implementation of projects, register the rights to land in rural cadasters, as well as regulate and control human activities which cause degradation of the soil. Since the Land Commissions are essential to the implementation of projects for combating desertification in the Republic of Niger, their establishment is a precondition for the implementation of the Master Plan.

## **E.7 Project Implementation by Terroir Management Committees**

In villages where projects will be carried out, Terroir Management Committees will be established to allow the villagers themselves to take charge of project implementation and management. When establishing these Committees, the project side will train key persons who will be responsible for running the Committees, and will encourage them to organise themselves. Groups formed around these key persons will, while receiving advice from the project side, draw up the Committee's Articles of Foundation (draft) and bylaws (internal rules) (draft). Each Committee will be inaugurated following its adoption at a Residents' Meeting. Each Terroir Management Committee will consist of a General Assembly, Executive Board, auditor, and specific activity groups in charge of individual project implementation and management. The project side will train the principal staff of each Committee in accordance with the contents of the work entrusted to them.

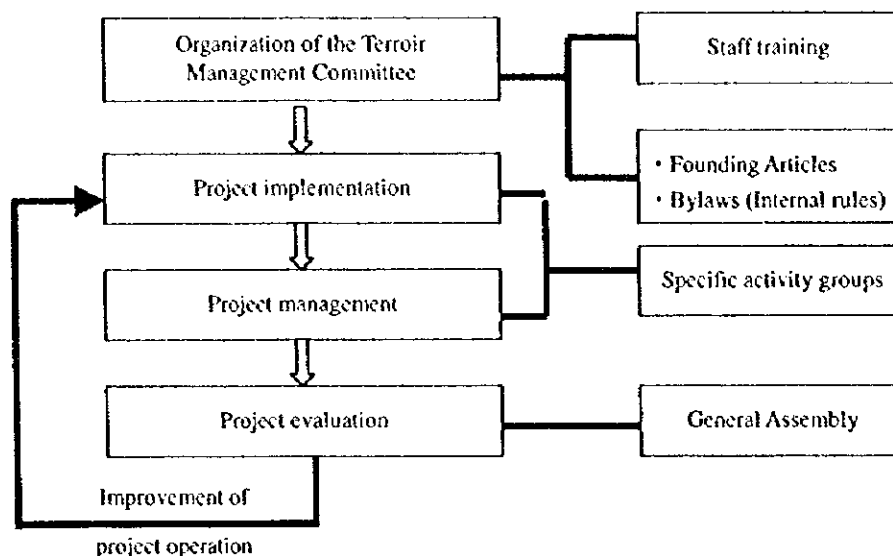
When implementing individual projects, the specific activity groups will cooperate with the Executive Board in drawing up plans for implementation and allocation of work to the villages, and will present these to the General Assembly for approval. Following a decision by the General Assembly, the specific activity groups will discuss project implementation and proportional allocation with the project side. When installing project facilities, the villagers will provide funds, materials, and/or manpower pending agreement with the project side.

When managing individual projects, the specific activity groups will cooperate with the Executive Board in drawing up proposals concerning utilisation fees needed for the management and maintenance of the projects, as well as methods of collecting them, and present them to the General Assembly for approval. Following a decision by the General Assembly, the specific activity groups will provide services to the villagers and will manage and maintain the project facilities.

Support from the project side will only be available during the initial stages. Thereafter, the Committees will, in principle, manage and operate the projects independently. To support the financial independence of the Committees, a 'collection of autonomous development funds' will be established as one of the individual projects. This will involve collecting regular levies from the villagers, quite separate from any tax, which will then be used as funds for maintaining and managing the public projects implemented by the Committees.

After implementation of the projects, the General Assembly will regularly evaluate the methods of implementing and maintaining individual projects, and will make proposals for improvement measures, thus enhancing project operation. Figure E.7.1 shows the process of project implementation by terroir management.

**Figure E.7.1 Implementation of projects by the Terroir Management Committee**



### **E.8 Maintenance and Management Plans**

Maintenance and management of projects upon completion will be as follows.

At the village level, public projects will continue to be maintained and managed by the various special activity groups within the Terroir Management Committees, starting with those parts in which effects can be manifested. Projects belonging to individual farmers will be maintained and managed by the individual farmers.

Projects in which the central government or existing facilities are renovated or newly installed and which are implemented with the technical support of employees of the central government or local authorities will be transferred to the respective government bodies upon completion and, wherever necessary, the project will be continued by the governmental body or agency concerned.

### **E.9 Duration of Project Implementation**

Taking 1999 as a preparatory period, the project duration will be fifteen years from 2000 to 2014. This period will be divided into initial (first), intermediate (middle), and final (last) phases of five years each. Although each project will be implemented in accordance with individual project plans, Priority Projects will be implemented from the first phase.

### **E.10 Capital Procurement Scheme**

If the whole of this Master Plan is implemented, the calculated costs would be 11,780 million FCFA in the initial project year (2000) and approximately 9,302 – 10,338 million FCFA per year

over the remaining fourteen years. These figures fall short of the government's estimated public investment in Tillabéri Department. However, since many other projects are already thought to be underway, further requests for funds will have to be made to external organisations.

A precondition for requests for funds to external organisations is that the Government of Niger will need to make efforts to promote structural adjustment measures and regional devolution, reinforce the functions of taxation, select priority sectors for implementation, and so on.

### **E.11 Proposals**

The Plan for Combating Desertification in Tillabéri Department in the Republic of Niger will contribute greatly to preventing desertification by developing sustainable agriculture, stock raising, and sylviculture as well as improving living conditions in the Study Area. Particular attention needs to be given to the following points in the course of implementing the Plan.

#### **(1) Project preparation and capital procurement**

The Government of Niger should formulate a National Investment Plan incorporating the Master Plan, and should make project preparations and procure capital as soon as possible. With particular regard to the Study Area Support Projects and Model Pilot Projects that have been selected as Priority Projects, implementation should be started urgently with funds and technical co-operation from the supporting countries.

#### **(2) Need for additional studies and detailed designs**

While the Master Plan shows the basic directions for desertification control in the Study Area, more detailed studies and designs will be needed when implementing specific projects.

#### **(3) Decrease in the population growth rate**

Even if the Ameliorated Seed Diffusion Project and Agricultural Land Conservation Project formulated in the Master Plan are realised as scheduled, the food self-sufficiency rate, which was 88.2% as of 1996, will fall to 61.2% by the final year of the Plan (2014) if the present rate of population growth (3.3% per year) continues unabated. This means that worries over the food supply will not be eased as long as population growth continues at the present level. The same could be said in the fields of primary education and health & hygiene. Therefore, the government should vigorously try to reduce the rate of population growth by implementing family planning and related measures. Such efforts will also help to increase the efficacy of this Plan.

#### **(4) Priority budget allocation to Land Commissions and offering incentives for land registration**

Owing to the advance of desertification and the increase in the population, the people's demand for land grows ever stronger. When promoting more appropriate land use, a precondition is that the ownership rights must be made clear. Therefore, as well as setting up Land Commissions as set forth in the Rural Code and making priority budgetary allocations for the appropriate running thereof, measures ought to be adopted for offering incentives to the villagers

in terms of land registration, such as implementing projects in order of villages with higher rates of registration.

**(5) Diffusion of and educating people about terroir management methods**

Introducing terroir management methods is extremely important for improving the empowerment of local inhabitants and securing the continuity of projects. The government will need to play an active role in informing the villagers about the cultivation of a terroir management organisation and provide guidance to relevant bodies in this regard.

**(6) Improving the status of women and introducing specific indicators**

Women play a major role across the whole spectrum of daily life, including farm work, housework, and child-rearing. The government needs to take care to provide women the same rights and opportunities as men at each stage of the projects (planning, implementation, and management), in order to raise the effects and efficiency thereof. When doing so, certain factors (for example, the land area owned by women in proportion to that owned by men) should be adopted as indicators to show the status of women, and target values to be attained after project implementation should be set and evaluated.



## **Background**



## Chapter 1 Foreword

### 1.1 Background of the Study

The main economic sector in Niger consists of agriculture, stock raising and sylviculture. It accounts for 38% of the country's GDP, and about 80% of the working population work in this sector. Tillabéri Department, the area covered by this Study, has relatively high rainfall compared with other areas in the country and so is comparatively well suited to agriculture, stock raising and sylviculture. The department supplies foodstuffs and firewood to Niamey, the capital of Niger. The area is suffering from rapid desertification, however, due to a combination of repeated droughts and human factors such as excessive cultivation of the land, excessive livestock grazing, and excessive gathering of fuel wood, all of which have become major problems resulting from the rapid increase in the population of the department. If desertification continues unchecked, it is feared that sustainable production from agriculture, stock raising and sylviculture will become impossible, with the result that the bedrock upon which the livelihoods of the inhabitants in the area depend will collapse.

In order to cope with the problem of desertification, the Government of Niger ratified the Convention to Combat Desertification (CCD) in January 1996 as a state measure for preserving the environment and hence enabling sustainable development. Based on this, The Government of Niger then began investigations into drawing up a 'National Environmental Plan for Sustainable Development' (PNEDD) in August of the same year.

Based on the above background, the Government of Niger requested technical assistance from the Government of Japan in drawing up a 'Plan to Combat Desertification' through sustainable agriculture, stock raising and sylviculture as well as rural development for Tillabéri Department. In response, the Government of Japan dispatched a Preliminary Study Team to Niger in July 1997 through the Japan International Cooperation Agency (JICA). Then, on the eleventh of that month, JICA and the Ministry of Hydraulic and Environment in Niger concluded an agreement on the detailed regulations for conducting the present full Study ('Study for the Plan to Combat Desertification in Tillabéri Department in the Republic of Niger').

In October 1997, JICA entrusted the Japan Agricultural Land Development Agency (JALDA) with the implementation of the Study, at which time a full-scale Study was then undertaken. Subsequently, the Study work was implemented and a final report was prepared over a period of about eighteen months starting from October 28, 1997.

## **1.2 Objectives of the Study**

This Study has been undertaken at the request of the Government of Niger, with the aim of pursuing the following objectives in the department of Tillabéri:

- ① to develop a Master Plan to combat desertification through the development of sustainable agriculture, stock raising, and sylviculture, while seeking to improve the living conditions of the general population;
- ② to select priority projects, and develop the project implementation plans; and
- ③ to secure technical transfer and provide advice to Nigerian counterparts regarding suitable means of implementing the Study and developing plans.

It should be noted that the planting of trees is not a main objective of this Study.

## **1.3 The Study Area**

The department of Tillabéri, which is the focus of the Study area, is located in the southwestern corner of Niger. It is bordered by Mali and Burkina Faso and is comprised of the six districts of Filingué, Kollo, Ouallam, Say, Téra and Tillabéri (see locations on the attached map) which surround the national capital of Niamey (the capital city itself is excluded from the Study area).

The total area of the Study Area is 104,245 km<sup>2</sup>, which comprises about 8.2% of the surface area of the country (1.27 million km<sup>2</sup>). Remote sensing data analysis indicates that 5.21 million hectares of land is deemed as arable land, classified as being "land not very suitable to agriculture" or better in quality, representing about 50% of the Study area. This arable land, however, also includes some 900,000 hectares of national parks and forests.

## **1.4 Structure of the Final Report**

The Final Report is composed of a main text and an annex in French. However, Japanese and English versions have been prepared of only the main text of the Report. An outline of the contents of the Final Report is presented below. In the main text of the report, when quoting from other portions of the report, the main text is referred to as "Annexe" and tables are expressed as "Figure A, Tableau A" with the appropriate number indicated. This notation is the same in the Japanese, French and English versions.

### **(1) Main report**

#### **1) Background**

##### **Chapter 1 Foreword**

##### **Chapter 2 Current State of Desertification and National Efforts to Combat It**

2) Current conditions

Chapter 3 Overview of Natural, Societal and Economic Conditions

Chapter 4 Current State of Agriculture, Stock Raising, and Sylviculture in the Study Area

Chapter 5 Obstacles and Concrete Countermeasures

3) Master Plan to combat desertification

Chapter 6 Basic Concept

Chapter 7 Zoning of the Study Area

Chapter 8 Basic Development Plan

4) Priority projects

Chapter 9 Priority Projects

5) Implementation

Chapter 10 Project Evaluation

Chapter 11 Implementation Method

Chapter 12 Proposals

6) Appendix

(2) Annex to the Final Report

The Annex to the Final Report (in French only) is composed of the following eleven chapters.

Chapter 1 Organizational Charts and Basic Indicators

Chapter 2 Current State of Desertification and National Efforts to Combat It

Chapter 3 Overview of Natural, Societal and Economic Conditions

Chapter 4 Current State of Agriculture, Stock Raising, and Sylviculture in the Study Area

Chapter 5 Obstacles and Concrete Countermeasures

Chapter 6 Basic Concept

Chapter 7 Zoning of the Study Area

Chapter 8 Basic Development Plan

Chapter 9 Priority Projects

Chapter 10 Project evaluation

Chapter 11 Implementation Method

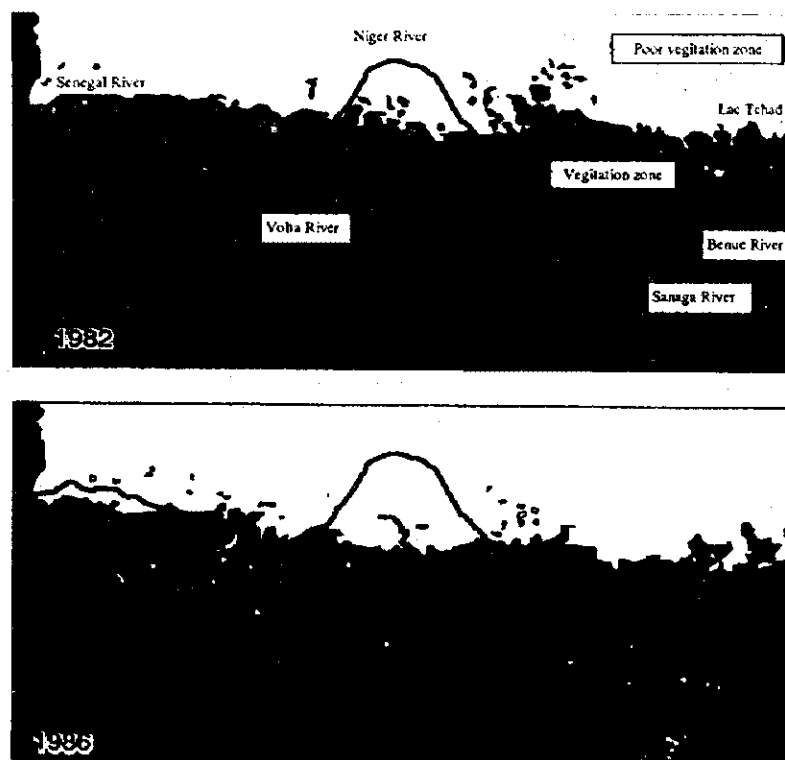
## Chapter 2 Current State of Desertification and National Efforts to Combat It

### 2.1 Current state of desertification

Desertification is defined by Article 1 of the Convention to Combat Desertification as the worsening of soil quality due to a variety of factors occurring in arid, semi-arid, and arid semi-moist areas. The factors involved in desertification can be classified into natural and artificial (human). According to a Study made by United Nations Conference on Desertification (UNCOD), human factors account for 87% of the causes of desertification. The progress of desertification results in many kinds of unfavorable consequences on human society. The worst of these is soil degradation of farmlands and grasslands that are the basis of food production. Consequently, food production decreases, and this, combined with increased population growth, results in greater pressure on the living of local population, which in turn, induces yet further desertification.

The change in plant life between 1982 and 1986 was viewed using data from the NOAA satellite in order to view the progress of desertification in West Africa. Figure 2.1.1 shows the change in plant life in the Niger River area. It can be seen that the area with no plant life is spreading southward. The Sahel desert is spreading southward at a rate of 10 to 30 km per year.

Figure 2.1.1 The variations of Living Creatures in the Niger River Basin



Source: The JALDA Empirical Survey on the Prevention of the Desertation

# 1986-1987 National Floods to the West

1986-1987 National Floods to the West

The National Floods to the West, which began in the summer of 1986 and continued through the spring of 1987, were the most extensive and destructive floods in the United States since the 1920s. The floods affected a large area of the western United States, including California, Oregon, Washington, and Idaho. The floods were caused by a combination of factors, including heavy rainfall, snowmelt, and a series of storms. The floods caused widespread damage to property and infrastructure, and resulted in the loss of many lives. The National Floods to the West were a major disaster for the western United States, and their impact is still felt today.

## Climate Features in the Sierra River Basin

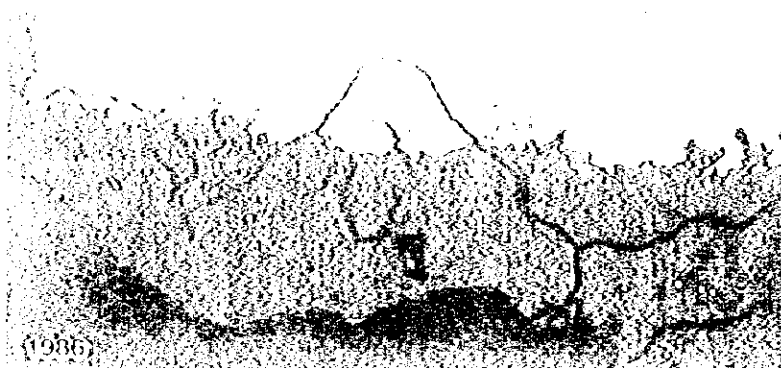
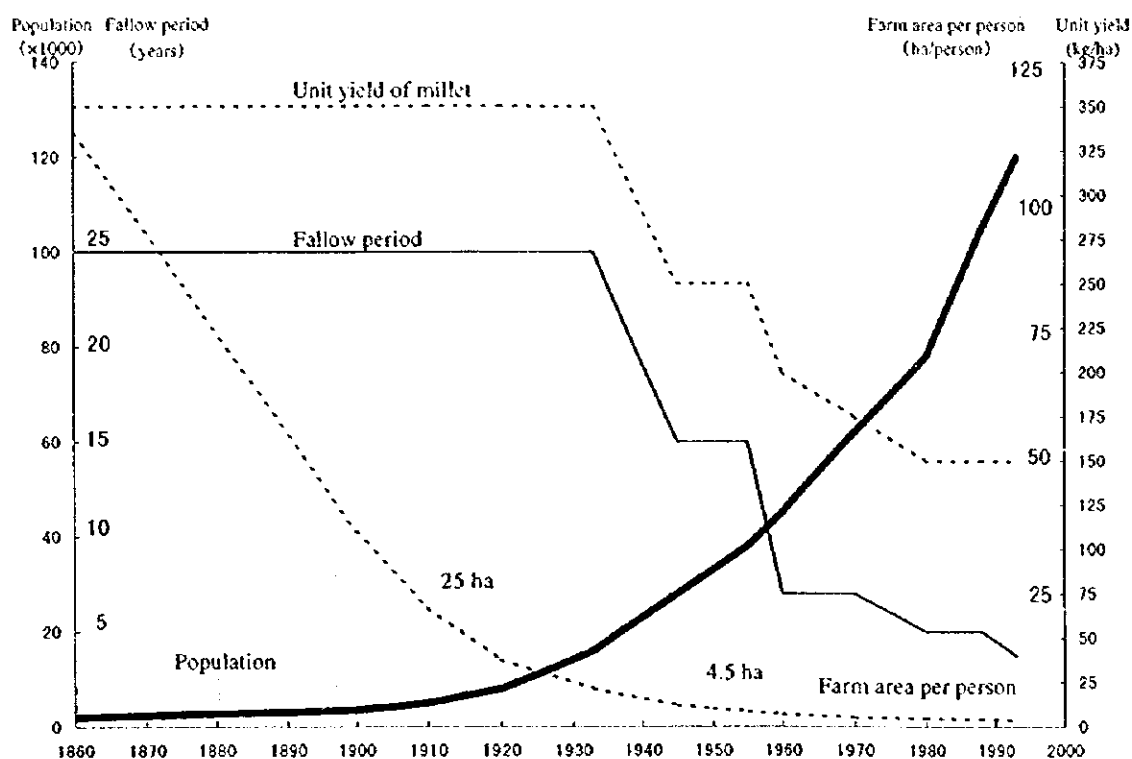


Figure 1. Climate Features in the Sierra River Basin

Looking at the FAO yearly production records, desertification in Niger has caused a fall in the production rate of millet by 86% and of sorghum by 43% from 1980 to 1996. On the other hand, the population increased rapidly by 173% during the same period of time. Within the study area, desertification is more widespread in the north. The degradation of the soil is particularly severe in Oualam Department. Elderly people living in the area report that 30 years ago vegetation was abundant in Oualam Department, but it is now extremely sparse and soil degradation has advanced. This fact is clear from Figure 2.1.2 that shows changes over the years in the population, millet harvest, fallow periods, and area of agricultural land per farmer in the Zarmaganda Central area of Oualam Department. And it is also feared that the rapid population increase in the central and southern regions will also expand the surface area of desertification.

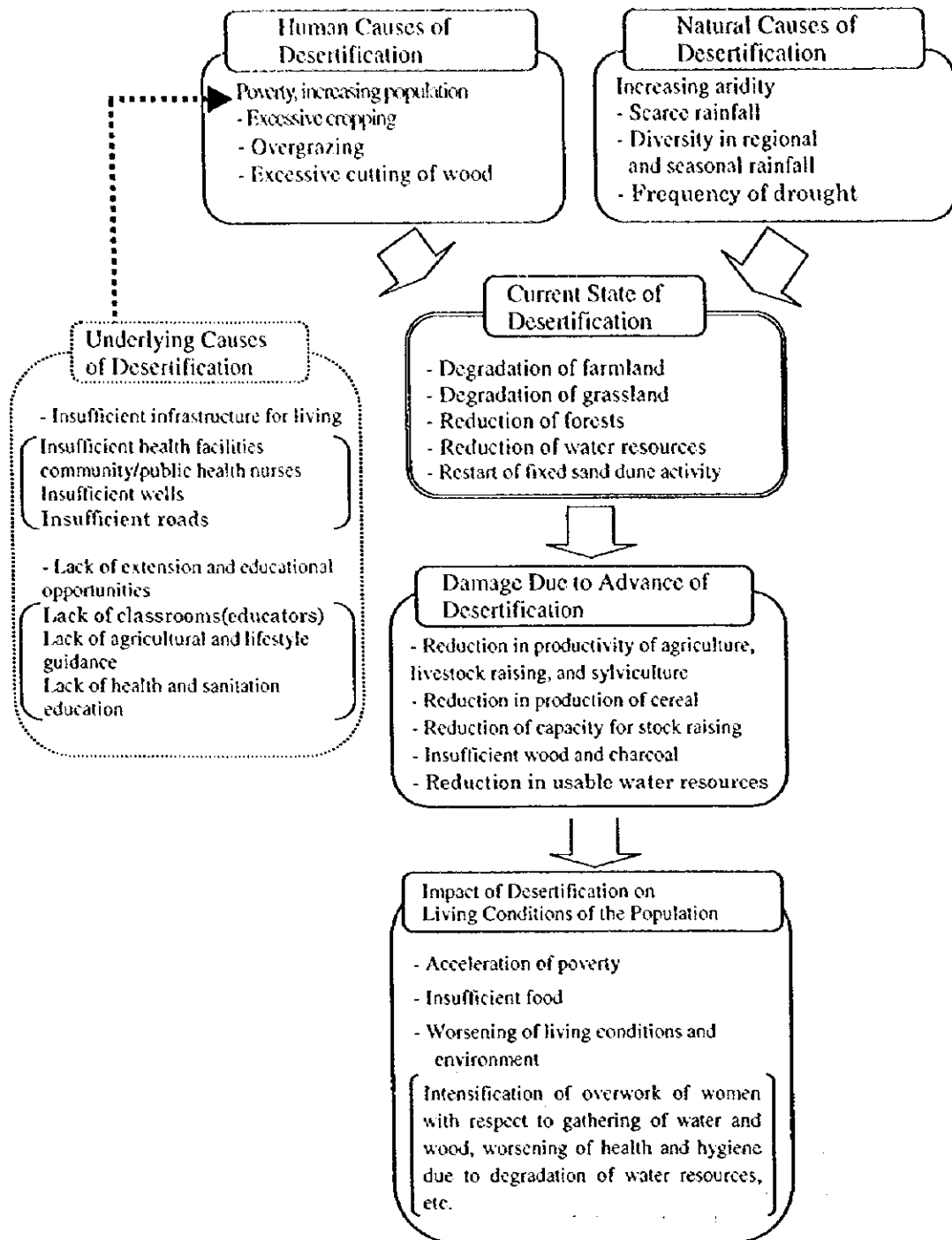
**Figure 2.1.2 Evolution of Population, unit yield of millet, farm area per person, and fallow period**



Source: ÉTUDE SUR LE SYSTEME AGRAIRE DU "ZARMAGANDA CENTRAL" 1993



Figure 2.1.3 Conceptual figure of the causes and effects of desertification in Niger



Local inhabitants realize that desertification is actually advancing, through such phenomena as ① decreases in cereal and pasture productivity, ② the drop in well water levels, and ③ the need to go ever greater distance in search of pasture and firewood. However, they themselves rarely take any measures to combat desertification. At the background of this lies the poverty of the people. Abusive farming methods and the exploitation of natural resources due to poverty inevitably results in the abandonment of habitats and migration. In fact, this is what is actually taking place in the regions suffering from desertification.

Being unable to prevent desertification and with lands being left to be desertified further, local populations become hunger-stricken refugees and migrate to Niamey, the capital, or to other cities and towns which are enjoying better conditions. Here, these people form the lowest stratum of society, or when migrating in this fashion, even come to cause disputes with local aborigines or other tribes. Thus, this situation is becoming a serious social problem.

Figure 2.1.3 presents a schematic diagram of desertification that explains the relationships between the causes of desertification in Niger, the present state of this desertification, and the damage its expansion has caused and its effects on the lives of the residents.

## **2.2 National efforts to Combat Desertification**

Niger has acted quickly on a national level to prevent desertification. The Convention to Combat Desertification has been signed and ratified and the national action program, the Rural Code and the Forestry Code established national institutions.

### **(1) Convention to Combat Desertification**

After the major drought years 1971-73 and 1981-85, the Government of Niger (GON) was first among the Sahelian countries to develop a National Plan to Combat Desertification (developed in 1985, revised in 1991). The GON also passed a law in 1992 regarding the Master Plans of Rural Development Policy, and issued an act specifying the Orientation Principles of the Rural Code (1993). These acts allow for a commitment in favor of environmental protection, with a view to realizing sustainable development. The GON participated in the drafting of the Convention to Combat Desertification (CCD) adopted by the United Nations on June 17, 1994 (this day was designated as "World Day to Combat Desertification and Drought"). The CCD was signed in October 1994 and ratified in January 1996. The cooperation that governments can offer in the Sahel region is limited by economics, etc. The expressions "West Africa" and "Non-government Organization (NGO)" appear more than twenty times in the main text of the CCD. Thus, it can be said that the convention gives attention to West Africa, which is seen worldwide to be facing marked desertification, and emphasizes the participation of local inhabitants and the community-level, bottom-up approach which is the focus of NGO activities.

## (2) National action program

The GON established a "Conseil Departemental de l'Environnement pour Developpement Durable" (Departmental Council of the Environment for Sustainable Development – CNEDD) in accordance with Ordinance No. 96-004/PM dated January 9, 1996. It is a national council organized in the Ministry of Plan for coordinating various policies related to economic and social development (See Annex 2.2.1). It has been working to establish a "National Plan of Environment for Sustainable Development" conforming to the CCD with the supports of United Nations Development Program (UNDP), International Bank for Reconstruction and Development (IBRD), Comite Inter-Etats de Lutte contre la Secheresse au Sahel (CILSS) since August 1996, which was adopted in a forum on the PNEDD held for three days from April 20, 1998. This PNEDD is one of the four programs which form the base of the economic recovery plan and consists of 6 priority projects. These are combating desertification and management of natural resources, water and sustainable development of water use, energy and the sustainable development of energy use, urban environments and the living environment, management of plant biodiversity and climate change.

In the forum, a special proposal was adopted saying "the government, associations, private enterprises and donor countries should support sedentalization and self-help effort of the population appropriately in the field of food, seeds, and stock raising to cope with the destructive food provision, extreme poverty, rainfall scarcity and population concentration in cities." The contents of aids given by international organizations and aid agencies will be examined in terms of conformity to the PNEDD by the CNEDD and will be executed efficiently avoiding duplication of aids (See Annex 2.2.2).

## (3) Legislation concerned with combating desertification

The laws which apply to the Program to Combat Desertification

### 1) The Rural code

In rural areas, land ownership and use are generally governed by customary law, and the traditional leaders, such as village chiefs, can make decision on land related matters to a certain extent. Over the last several years, the amount of remaining land that can be developed as farmland has gradually decreased because of population growth and frequent droughts. This has resulted in land tenure disputes becoming more frequent among communities, within communities, as well as between farmers and herders. It is therefore difficult to revise rights of land use with only elders' harvest rights. The GON established a Rural Code (Ordinance No 93-015, March 2, 1993, related to the Orientation Principles of the Rural Code) to clarify rural land ownership and land use based on customary law, together with the aim of conserving natural resources and enhancing the value of the land through its effective use (see Annex 2.2.3). This is the most important law concerning the combat of desertification and the land committees

which are established at the departmental level based on this law are mainly entrusted to carry out orderly land management (see 11.1.2 Establishment of Land Committees).

#### 2) Water ordinance

This ordinance (Ordinance No 93-014, March 2, 1993), which complements the Rural Code with respect to water use, was issued on the same day. It is dedicated to the protection of water resources, which is defined as a public good, and specifies rules for the protection of water resources, both quantitatively and qualitatively.

#### 3) Forest code

The Forest Code (Ordinance No 74-07, March 4, 1974) is designed to transfer natural resource management to the local population. However, since it has not worked adequately, one part of this ordinance has been integrated into the Rural Code with a view to achieving an overall approach to natural resource management.

#### 4) Ordinance on the Institutionalization of Environmental Impact Studies

This Ordinance No 97-001 was enacted on January 10, 1997. The actual enforcement tools, that is, formalities for the enforcement of this ordinance and the scope of Environmental Impact Studies (Article 5); the projects authorized without producing reports on Environmental Impact Studies (Article 6) and the organization, composition, responsibilities and operation modalities of the Environmental Impact Study and Evaluation Bureau (BEEEI) (Article 9) should be specified in separated ministerial decrees. However, as of November 1998, these decrees have not yet been drafted.

#### 5) Family code (Draft)

Since 1975, the government has been attempting to draft a family code for the purpose of ameliorating inequalities among family members based on sex and age. In 1994, the government conducted a large-scale nation-wide campaign to inform the general population of the content of the Family Code as drafted at that time. However, Islamic groups have urged the population to refuse the Family Code in its entirety, as it was considered as being a scheme by Western countries to destroy the Islamic-based social structure of Niger. Given the important social position that these Islamic groups have in Niger, there is little possibility that the Family Code to be enforced. As of November 1998, the Family Code has yet to be adopted.

#### (4) Utilization of NGOs

In order to carry out plans for measures to revive rural areas, the NGO encourages the enlistment of assistance from NGOs. As of the end of October 1998, nine groups have been formed in the Republic of Niger, and one more is in process of being organized. The CNCOD, one of the NGO groups concerned with combating desertification, stated that it would cooperate fully with the CNEDD in its efforts to combat desertification. A total of thirty-seven NGOs participate in this group. In those cases where these NGOs are utilized, it will be necessary to

give careful consideration to the strengths and weaknesses of the particular organization and provide guidance on those skills or areas which may be lacking (see Annex 2.2.4).