

## **Current conditions**



## **Chapter 3 Overview of Natural, Social and Economic Conditions**

### **3.1 Natural conditions**

#### **(1) Location**

Niger is a West African country, encompassing a large territory of 1.27 million km<sup>2</sup> (3.4 times the size of Japan), two-thirds of which is covered by the Sahara desert. The department of Tillabéri is located in the southwest corner of the country, between 11°5" and 15°45" north latitude and 0°10" and 4°20" east longitude. The Niger river, the third largest river in Africa, runs through the western portion of the Study area and is a precious source of water for the region.

#### **(2) Climate**

Mean annual rainfall in the department of Tillabéri varies widely ranging from 250 mm in the north, which is included in the Sahelian-Saharan climatic zone, and 500 mm in the south, which is included in the Sudanian-Sahelian climatic zone. The year is marked by two seasons: the rainy season, from June to September, and the dry season from October to May. Rainfall is irregular, both in terms of time and space, and over the last several years, rainfall has tended to decrease across the department. The mean monthly temperature varies between 16-43°C in the north of the Study area, and between 20-50°C in the south. Furthermore, between October and April a strong wind, called the harmattan blows around twice a month and covers the region with dust.

#### **(3) Geology and topography**

From the geological point of view, the Study area is divided into a sedimentary layer in the Iullumenden basin, which covers almost all the northern area, and a Precambrian base layer separated by volcanic rocks of the Liptako Gourma along the Niger river. These layers are covered with light sand and clay layers, originating from the alteration of the quaternary layer.

From the topographical point of view, the area is slightly inclined from north to south; it is a major highland, with a gently rolling landscape, and an average altitude of 250 meters.

### **3.2 Society**

The increase in population has had a great influence on the balance of food supply and demand and this has become a major social problem in Niger. In addition, the conditions of social development of the people, from the points of view of religious and ethnic structures, governmental organizations and HDI (Human Development Index: an index of a country's

average level of development derived from life expectancy, education and standards of living) are as follows.

### (1) Population

The 1988 national population census indicated a total population of 7,252,000 inhabitants, of which about 18% or 1,328,000 inhabitants reside in the department of Tillabéri and 96.4% reside in farming villages. In the 1977 census, the population was 929,000 inhabitants, which corresponds to a mean yearly population growth rate of 3.3% over 12 years in the department. The population in 1996 is estimated at about 1,743,000 based on the above growth rate.

If the population continues growing at such a rate, the estimated population in 2014 will reach more than 3.33 million, almost double what it is at present (see Table 3.2.1). Such an increase is mainly due to the high birth-rate that is revealed in demographic analysis. Youth aged between zero and 14 years accounts for some 50% of the entire population, those aged 15 to 64 years account for 46%, while those age 65 or over comprise less than 4% of the population.

Further, analyzed by district, the highest growth rate in one district is 5.4% while the lowest is 1.2%, a gap of as much as 4.2% (see Table 3.2.1). Rates are higher in southern districts and lower in northern districts of the Study Area. Since it is unlikely that natural growth rates vary this much by district, this difference in rates is considered to be due to the migration of people from the north to the south, which can be seen as being a reflection of the more marked advance of desertification.

Of the total work force of Niger, about 80% are workers in primary industries such as agriculture and stock farming. In the department of Tillabéri, about 90% of the work force are engaged in primary industries, while the remaining 10% work in trade and handicraft industries.

**Table 3.2.1 Population trends by District**

District	National Census (No. of persons)		Increase by District (%)	1996 (Persons)	1997 (Persons)	2014 (Persons)
	1977	1988				
Filingué	208,499	285,977	2.9	359,463	369,887	601,355
Kollo	131,145	234,588	5.4	357,298	376,592	920,792
Ouallam	143,431	190,171	2.6	233,520	239,591	370,660
Say	97,486	163,376	4.8	237,727	249,138	552,817
Téra	210,089	295,969	3.2	380,788	392,974	671,303
Tillabéri	138,199	158,202	1.2	174,043	176,131	215,727
Total	928,849	1,328,283	3.3	1,742,839	1,804,313	3,332,654

Source: RECENSEMENT GENERAL DE LA POPULATION, 1988

### (2) Religious and ethnic groups

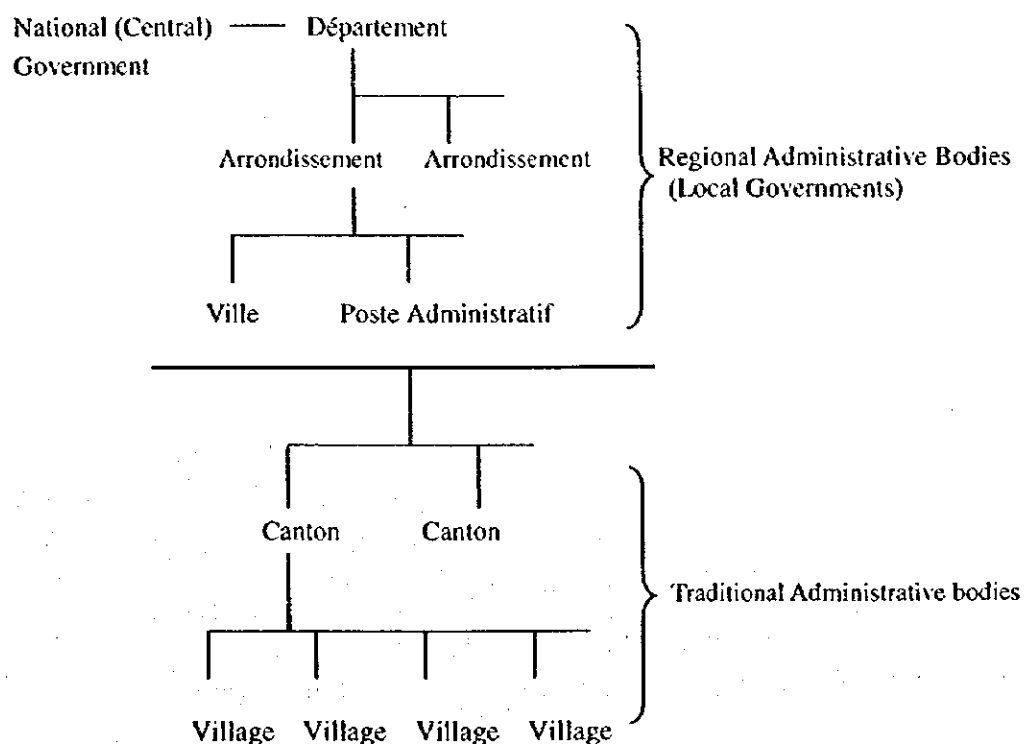
Of the religions practiced in the country, more than 90% of the population are Muslims; there are a small number of Animists and Christians. Nomadic peoples live primarily in the

north of the Study Area, while a predominantly sedentary populations live in the center and south. Some 95.6% of the population of the department are sedentary, while 4.4% still maintain a nomadic form of life style. In recent years, stock raising has been seriously damaged by the tendency towards repeated droughts and poor rainfall, with the number of nomads converting to a sedentary lifestyle of cultivating agricultural crops on the increase. The major ethnic groups are the Songhai-Zarma, the Haoussa, the Peuhls and the Touareg; these four ethnic groups represent 94% of the population of the department. The Songhai-Zarma and Haoussa are sedentary farmers, while the Peuhls and Touareg are herders.

### (3) Regional administration

The regional administrative divisions of Niger consist of department, district, Commune\* and post-district. The governors of departments, districts and post-districts are appointed by the President. In addition to these public administrative bodies, there are traditional administrative bodies such as cantons and villages. The Chiefs of each canton are chosen by election from among the hereditary chiefs of the villages comprising the canton. Usually, a post-district consists of several cantons and is responsible for general administrative matters. The chief of the canton handles tax collection, arbitration of disputes, and the organization of ceremonies.

**Figure 3.2.1 Regional administrative Bodies**



\* Commune: city with more than 15,000 of population is designated to "urban commune" by government decree. When the population reaches 25,000, the urban commune is designated to "Ville".

#### (4) Health, hygiene and education

According to 1998 Annual Report of the UNDP, the HDI of Niger ranks 173rd out of 174 countries, making Niger one of the poorest countries in the world in terms of social development.

In 1995, the mean life expectancy was 47.5 years, and the percentage of school aged children attending school was 15%. The adult literacy rate (French language) was 13.1% (20.9% for men and 6.7% for women). Women are placed at a very low social position. In 1996, the child death rate for children under five years old was 320 out of 1000, while the infant mortality rate was 191 out of 1000. These are among the highest rates in the world. Since 1960, these rates have for the most part remained unchanged, and the hard living conditions of women and children have not been improved.

### 3.3 Economy

The economy of Niger has been supported by the uranium industry which has shown tremendous growth since the mid-1970s. However, in recent years, the uranium market has dropped and the economy has shown negative growth and the country is currently working toward economic and financial recovery. Import and export, GNP, the federal budget and also the development plan and strategy of the economic recovery plan areas follows.

#### (1) Gross national product (GNP)

The GNP of Niger has significantly increased over the last two decades, increasing from US \$38 million in 1970 to US \$2.365 billion in 1990. Over the period, the GNP per capita increased from US \$90 to US \$310. However, because the growth rate of the GNP has constantly been less than the population growth rate, per capita GNP has since been continually decreasing, reaching US \$220 in 1995, making Niger qualify for classification as one the poorest countries of the world (LLDC).

#### (2) Import-export

In 1995, exports by Niger amounted to FCFA 93.1 billion, 78% of which was due to exports of uranium, while the agriculture and stock raising sector accounted for 18% (see Table 3.3.1). As the domestic resources in Niger have not been sufficiently developed, and as the establishment of social infrastructure is slow, imported products are varied consisting mainly of automobiles, fuel, machinery and equipment, raw materials, cereals, and general consumer goods. The trade balance is always negative (see Table 3.3.2).

**Table 3.3.1 Exports trends**

Item	(million FCFA)				
	1991	1992	1993	1994	1995
Uranium	56,251 (72%)	50,328 (70%)	45,865 (73%)	75,566 (72%)	72,566 (78%)
Livestock products	15,081 (19%)	12,746 (18%)	12,460 (20%)	14,355 (14%)	6,953 (7%)
Cattle	9,347	4,999	6,239	7,401	3,581
Sheep, Goats	3,731	3,647	4,624	4,730	2,011
Camels	1,589	3,918	1,490	1,835	1,033
Leather	414	180	106	378	328
Meat	0	2	1	11	
Agricultural products	2,379 (3%)	5,376 (7%)	1,743 (3%)	10,989 (11%)	9,893 (11%)
Green peas	59	0	17	224	302
Cowpeas	1,381	1,415	1,023	1,243	951
Onions	697	3,917	313	9,476	8,141
Cotton	242	44	390	46	499
Others	4,637 (6%)	3,292 (5%)	2,471 (4%)	3,406 (3%)	3,712 (4%)
Total	78,348 (100%)	71,742(100%)	62,539(100%)	104,316(100%)	93,124(100%)

Source: DSCN, 1997

**Table 3.3.2 Imports in 1995**

Item	(million FCFA)								
	Automobile, Tractor, etc.	Fuel, oil	Machine, equipment	Sugar, etc.	Cereals	Cooking oil, etc.	Pharmacy	Others	Total
Amount	14,558	14,340	13,849	10,306	9,589	8,558	7,952	70,151	149,303
%	9.8	9.6	9.3	6.9	6.4	5.7	5.3	47.0	100.0

Source: DSCN, 1997

### (3) National budget of fiscal year 1998

In 1998, the federal budget is estimated to be FCFA 203.2 billion (of which, the amount expected foreign financial sources, including loans, represents 43.3% of the total). A 4.5% increase in the budget is anticipated over last year due to expectations of an increase in foreign aid received, as well as a focus on improvements in tax collection resulting from the creation of a tax authority and a revision of the tax system in 1998.

Annual expenses will be limited by rationalization of government organization being undertaken under the guidance of the IMF, and a policy insistence on suitable reimbursement of loans (of which, reimbursement of foreign loans represents 23.5%), and the reinforcement of public investments in the production sector which is expected to be the backbone of economic recovery.

### (4) National policies and strategies of development

The Economic Recovery Program approved by Law No. 7-024 on July 8, 1997 sets forth the short- medium- and long-term policies and strategies of Niger concerning socio-economic development.

Its purposes are to:

- ① encourage the stable rehabilitation and maintenance of the macro-economic framework. Also, to create such a proper socio-economic environment that will promote the activities of private enterprises;
- ② reduce poverty and increase the income of inhabitants in a sustainable manner;
- ③ ensure the recovery of the rural sector;
- ④ increase the foodstuffs supply; and
- ⑤ conserve the environment and conserve the natural potential of the environment through the consolidation of legal rights.

The contents comprising the Economic Recovery Program include the following:

- ① Arrangements with partners for the purpose of development through reports on politics, the economy and public finance during the years 1997 to 1999; and
- ② The following National Programs and Projects:
  - National Program of measures against poverty,
  - National Program for the advancement of the private sector,
  - National Program for the strengthening of economic management and the promotion of good governance,
  - National Program of the Environment for sustainable development, and

Since the above Law was adopted, the Economic Rehabilitation Program has provided the framework for activities of the government, as well as governmental policies and strategies regarding all forms of development. The current Study is carried out as a part of the National Environmental Program for Sustainable Development.

### **3.4 Evolution of agricultural policy**

Since independence in 1960, the GON has, in order to improve the self-sufficiency of the food supply, in addition to strengthening agricultural production and taking action to improve the general living conditions of the population, given top strategic priority to measures to develop agriculture. These action plans can, roughly, be divided as falling into three major periods: 1960-72, 1973-83, and from 1984 to date. The current study recognizes and reflects the background of the change from government guided development at the beginning to inhabitant participation type development in recent years.

#### **(1) From independence (1960) to 1972**

From independence to 1972, rural development was achieved through sectoral development strategies, specified in the first three year plan (1961-64); the first four year plan (1965-68), the second four year plan (1969-72), and so on. At the same time, improvements in yield, especially the increase of millet and groundnut production, which was the major export crop, was



achieved. However, repeated droughts, which began in 1971, hit rural areas and negatively affected the implementation of the development strategy.

#### (2) 1973 to 83

1973-83, with the increase in uranium exports and the favorable financial conditions resulting from foreign loans and other types of assistance, the GON gave priority to a stable price policy and increase in yields, as well as promoted large-scale projects in rural areas. Over this period, an additional three year plan (1976-78), which included measures against drought, and a five year development plan (1979-83) were developed. A distribution system was also developed, while infrastructure to support agriculture such as large-scale irrigation facilities were constructed.

#### (3) After 1984

Since 1983, Niger has been confronted with a financial crisis, and has undergone a long lasting period of economic difficulty. An additional reinforcement plan (1984-85) and a socio-economic development plan (1987-91) were developed, and subsidies granted to agriculture and price policies were revised. The following strategies with respect to agricultural development were adopted and implemented in order to achieve food self sufficiency ① participation of the population in the form of terroir management, etc, ② restoration and protection of national resources, and ③ the adoption of measures at the regional level aimed at achieving development, etc. This commitment was incorporated in the Rural Development Policy Framework, drafted in 1992.

### **3.5 Current state of social development**

The problems in the area of social development are the low social position of women and poverty. In addition, the implementation of the project securing the participation of the inhabitants and the effective use of NGO activities in Niger are also important. These issues are covered below.

#### (1) Problems in social development

##### 1) Women

According to women-related health and hygienic indices, Nigerian women have the greatest number of children in the world (7 to 8 per woman), while the death rate at delivery is the highest in the world at 7%. Life expectancy is short at 49 years of age (the average in Africa is 53 years). Women are forced to work around 16-18 hours a day to draw water, collect wood, cook and take care of the children, work in the fields, take care of animals as well as to do handicraft work, and the like.

Customarily, the minimum marriage age is 14 years at which time she can marry freely. Often, however, the father chooses the husband, with no prior consultation with the daughter. Usually, a divorced woman or a widow goes back to her father, or her relatives. In case of heritage, a son has priority over the mother.

With regard to education, the school attendance rate for women is 36% of school-aged girls in primary school, 29% for junior high school, 9% for vocational school, and only 1% for senior high school.

In the economic area, women leave their families after being married. Therefore, land ownership is usually restricted to men. It is not easy for women to obtain financial credit when they have no land to use as collateral. These differences between men and women are due to local customs, the influence of Islam, poverty, defects in the school system, and other factors. Early marriage and multiple child bearings in particular have contributed to a surging increase in the population which grows at an average annual rate of 3.3%. This growth in population places excessive human pressure on available natural resources, and has become one of the major factors contributing to the progress of desertification.

The following measures were taken to improve this situation

- ① 1981: Establishment of the Directorate for the Advancement of Women
- ② 1987: Establishment of the Agency for the Advancement of Women and Social Affairs later converted into the Ministry of Social Affairs and Women Advancement in 1989.
- ③ 1994: Decision of the Family Code (Draft) (not yet adopted).
- ④ September 9, 1996: Development of the National Policy of Women Advancement

Securing family health is very important under Islam. Thus, to improve women status, it seems reasonable for women to be relieved from their overwork of taking care of their families and dedicate their save time to activities that may improve their capabilities and economic power. However, as it is difficult to reduce women's workload without any additional external support, it is important to incorporate into each project components for achieving the advancement of women which will substantially increase the number of women who can benefit if any development project is truly to succeed.

## 2) Poverty

The DSCN has set the poverty line at an annual income of FCFA 50,000, and the extreme poverty line at FCFA 35,000. Some 80% of the inhabitants of the department of Tillabéri are under poverty line (63% of the total population of the entire country). The poverty in rural areas runs to the extremely poor with 54% of rural inhabitants are under the extreme poverty line. This represents one-third of the extreme poor in Niger. The poor have no means of subsistence other than the excessive use of natural resources. In this sense, poverty is a major factor contributing to desertification. It is therefore indispensable to take steps against poverty in order to combat desertification in the department of Tillabéri. The characteristics of poverty may be noted as follows:

- ① Competition for the use of limited resources: The scarcity of agricultural land brings about competition between farmers and herders, and among farmers for the use of natural resources. This competition is very high in the south, where population density is highest.
- ② Loans: As poor families have small agricultural landholdings, they quickly eat up their harvests, or sell their produce at low prices in order to obtain cash to cope with household needs. They are then forced to buy millet on credit. In rural areas, credit is essentially extended to buy millet in order to survive until the next cropping season. Those farmers who do not own cows, or other non-perishable products, are obliged to go into debt when they become ill or face an unpredicted event, such as funerals. As indebted farmers are required to work in the fields of their debtors to reimburse their loans, they neglect their own fields, and if the next harvest is bad, they incur an even greater loan to reimburse.
- ③ Vulnerability of rural households: In the event of a major crop failure, harvest damage or storage failure, etc, even relatively well-off farmers who can sell part of their harvest when prices are high may easily fall into the group of poor people. This change in status of rich farmers deprives the poor from job opportunities, and causes a further reduction in rural salary levels.
- ④ Migration: Migration is one of the most used means to escape poverty, but it happens that it turns out to be a way for poverty to get worse. Both the rich and poor migrate. The rich migrate so as to initiate business with the money they have. The poor migrate in order to seek food and work, but they often return to their home village for agricultural work during the rainy season. The work that the poor migrants can do consist of unskilled tasks, such as making small craft goods or selling water and tea, for example. The migration of entire families shows that poverty has reached critical levels, and migrants who live with their relatives in town only increase the masses of unemployed.
- ⑤ Saving club (Tontine): One form of credit-savings is the Tontine, typically created by a group of women who contribute a certain amount of their earnings each week and take turns in receiving the pool. A Tontine set up by well-to-do women, even in villages, can reach FCFA 1,000 a week, while a poor group might manage FCFA 200 a week. The poorest women are not able to unite in this manner. Revenue from the Tontines is used to pay for marriages, ceremonies, clothes, and animals, as well as to meet non-food expenses.
- ⑥ Number of household members: A correlation exists between the number of household members and poverty. Some 27% of households with one to three members are poor, while 75% of households with more than thirteen members are poor.
- ⑦ Education: Poverty is closely correlated with education. About 70% of households whose head is illiterate, 58% of the households whose head attended Koranic school, 56% of households whose head has attended primary school, and 29% of households whose head has attended junior high school are under the poverty line. The non-educated population and the population who has only received Koranic education combined represent 87% of

the total. These two groups in particular have difficulty in accepting education on health, nutrition, family planning and hygiene, as well as in production and employment development related matters.

## (2) Methods of Social Development

### 1) Participation of the population

After the drought of 1984, an examination was made into the causes behind the failure of large-scale projects implemented by the government. These efforts resulted in the adoption of a new method of control known as "terroir management" which is currently applied in almost all rural development projects. In this case, terroir refers to open areas of land (agricultural and grassland) or territory used for agriculture, stock raising and similar activities which belongs to a given community, the ownership and utilization right of which are recognized by the other communities of the region.

The concept of terroir management, with many ideas taken from approaches toward villages by NGOs operating in the Sahel before 1984, was adopted at the Conference on Environment and Development held in Nouakchott, Mauritania, in November 1984, as a means of realizing "Regional Strategies to Combat Desertification in the Sahel". It is also part of the basic policy of the GON to carry out measures to combat desertification, encourage rural development, and improve terroir management.

The first step in terroir management by local residents is the analysis of the current state of their own terroir. Since 1990, the United Nations Sudano-Sahelian Office (UNSO) has been promoting the Active Method of Participatory Research and Planning (MARP) as a method of analysis. This method is now commonly used in the Sahel. MARP was developed as a means of bringing out the knowledge and analytical ability of the community residents through illustrated explanations and group discussions so that the illiterate could also participate.

MARP was introduced for the first time in the Republic of Niger at a Study meeting organized under the support of UNSO in 1994. Since then, the concept of terroir management has been introduced in a practical manner. Subsequently, in the same year, the "Niger MARP Network" was established as an NGO agency whose aim has been to promote MARP nationwide. It was approved as an official agency for promoting MARP by a government decree issued in February 1997.

The process of putting the terroir management project into practice consists of the steps outlined below. Donors who put the project into actual effect provide guidance to participating residents.

- ① The process starts with efforts to sensitize and increase the awareness of the inhabitants and to restore confidence.
- ② Analyses of current circumstances is carried out at the initiative of the residents themselves (donors carry out the analysis, using the MARP network of staff members).

- ③ A Terroir Management Committee is then established by the community residents themselves. (The Terroir Management Committee serves as the main body for planning, implementing, managing and evaluating projects, and is established incorporating several villages as a unit. Committee meetings are held as an open-air meeting, and discussions proceed in a democratic fashion.)
- ④ The project plan is elaborated by the Terroir Management Committee (depending on the project components required, specific activity groups may also be formed under the Terroir Management Committee).
- ⑤ Discussions are held and agreements made between the Terroir Management Committee and the project team regarding the project plan.
- ⑥ Projects are implemented primarily through active participation of local inhabitants who belong to the Terroir Management Committee.
- ⑦ Projects are managed and evaluated by the Terroir Management Committee.

Through the process, the community itself is expected to bare responsibility for the resource management of its terroir, and to act as the core body responsible for improving living conditions as well as promoting the development potential of the region on a long-term basis.

Although this new method has been implemented for only 10 years and most projects are still in progress, thus far making it too early to make any objective evaluations, it is necessary to give consideration to the following points:

- ① If the influence of the existing rural organizations is strong, the Terroir Management Committee may become just an ostensible organization and not be able to take effective action.
- ② As knowledge or the lack thereof makes a major difference in the organizational functions of the Committee, it is desirable, to the extent possible, to train a group of leaders in the content of the project plans and its outputs who would then become the members of the Committee, and then to extend their vision.
- ③ If poverty is an urgent issue, moving to another location in search of employment or migration may become constraints on the participation of the populace in project implementation. Concerns may then arise as to whether or not the benefits generated by the project will be high enough to encourage continued project management and reinvestment.

## 2) NGOs in Niger

As of February 1996, of the various NGOs conducting work in the area of combating desertification in the Sahel in Niger, twenty (including eleven international organizations) were active in Niger and registered with the Organization for Economic Cooperation and Development (OECD). Most of the international NGOs have worked in this country for more than twenty years, and about half of the local NGOs have worked here for more than ten years. Based on a survey conducted of fourteen of these NGOs, their main activity areas cover: natural

resources (five NGOs), integrated development (four NGOs), the status of women (three NGOs), regional support (two NGOs), amongst others.

For example, "Contribution to Rural Development (Contribution au Développement Rural: CDR)" is a local NGO established in 1991. Supported by the Food and Agricultural Organization of the United Nations (FAO), the United States Agency for International Development (USAID), as well as France and Germany, its activities include ① support for women's activities, ② the reasonable management of natural resources, ③ compost processing, ④ installation of sanitary facilities, and ⑤ education. Its activity expenses for the year 1997 totaled FCFA 110 million. In another example, the International Institute for Environment and Development (IIED), an international NGO, promotes the diffusion of MARP in the Sahel with the support of UNSO (see Annexe 2.2.4).

### **3.6 Orientation of aid**

Regarding trends related to aid, comparison by field and evaluation of example projects are covered and points of reflection regarding this project are provided.

The total amount of aid obtained by the GON in 1996 was 206 million US\$ (FCFA 105 billion), which accounts for 60% of the total annual budget (FCFA 174 billion). Out of this aid amount, nearly half was for project investments. France ranks first as the largest donor country. The total aid amount was earmarked for the development of human resources (19.5%), regional development (12.7%), social development (8.8%), agriculture (8.0%), transportation (7.5%), hygiene (6.5%), administrative development (3.7%), and natural resources (3.5%), respectively, in addition to economic management, such as for loan restructuring/reimbursement, and the like. Considering the low level of the human development index of Niger, it is reasonable that emphasis is laid on the development of human resources.

Notable examples of other projects which have been implemented or put into practice to combat desertification and evaluations of past soil conservation projects to which reference should be made in the preparation of this Plan are summarized below (see Annexe 3.6.1).

Evaluation has not been finalized for projects in progress. Therefore, issues and effectiveness cannot be given in detail. However, in general they involve securing the participation of inhabitants and are achieving good results. On the other hand, regarding the FAO soil protection project which has been completed, evaluation has been done and the current survey plan reflects these findings.

#### **(1) Examples of other projects to combat desertification projects already implemented**

The following are major examples of projects implemented to combat desertification classified by type.

## 1) Terroir management

Terroir management is the most important approach to combating desertification because desertification is a problem that should be dealt with through the active participation of the populace directly affected in order for the effects of any measures taken to be sustainable. The choice of the type of terroir management will determine the nature of the series of projects adopted to combat desertification from launching to realization, management and evaluation.

### (a) Keita Integrated Development Project (PIK) by the FAO

Project plans are developed mainly by a project team, while the population is mobilized in implementing the project through Food for Work. In this case, food is provided to each participant in the form of meals. The FAO believes that the best way to change things is to show the population sites that are actually improved through the implementation of the project. Mechanization has also been introduced to obtain good results. New and effective measures were attempted which did not insist on the use of local traditional techniques. A Terroir Management Committee was established mainly to manage the improved sites. The Nord Ader Improvement Project (PANA) of SWISSAID and the Tarka Base Valley Project (PBVT) of the European Community (EC) also adopted a Food for Work approach, but they have not introduced mechanization.

### (b) Projet Agro-Sylvo-Pastoral (PASP) of the German Technical Cooperation Organization (GTZ)

The essential elements behind the project is the good understanding of the population for the need to combat desertification. Dialogues and discussions are conducted repeatedly with the population for this purpose. A Terroir Management Committee formed by the populace then develops the project plan. The project components consist of elements which the populace can take care of in a sustainable manner, while the project team assumes responsibility for those parts which the populace can not handle alone. The Food for Work approach, more food aid than an exchange of work for food, has not been adopted, for the reason that the populace comes to participate in the project only in order to receive food.

### (c) Natural Resources Management Project (PGRN) of International Bank for Reconstruction and Development (IBRD)

In this project, priority is given to what the populace decides; the project components requested by the Terroir Management Committee are basically funded, and technical assistance is provided on a need basis. The beneficiary populace is expected to cover an average of 14.5% of the project costs. This project has just started and an Terroir Management Committee is currently being formed.

## 2) Soil erosion control

### (a) PIK

Based on the understanding that dramatically effective measures must be started from the upper end of the stream where soil erosion originates, measures are taken on small river basin

basis rather than on village basis, after which the project proceeds on land. On the upstream plateau, embankments<sup>1</sup> are constructed. Trenches<sup>2</sup> (tranche) are constructed on the slopes.

(b) PASP

Filtrating dikes made of gabion are placed on koris (dry riverbeds) to prevent erosion. In addition to the construction of embankments, grassland is restored on bare land through shallow tillage, and trees are planted using eyebrow ridges<sup>3</sup>.

3) Protection of agricultural land

(a) PIK

A small-scale dam 10 m in height made of earth or gabion is constructed on a kori, and irrigated cropping or fruit cultivation are practiced downstream from the dam. In addition, the interior of the storage basin may also be used for vegetable gardening as the water is used or during drought. This is an effective measure to develop water resources in desert areas where there are few such resources.

(b) PASP

Stone ridges are placed along the contour lines of a millet field in order to promote the percolation of rain water and to prevent the run-off of surface soil. In addition, millet can be cultivated through the use of eyebrow ridge and zai<sup>4</sup>. This is a widely applicable measure which is sustainable on a grassroots level.

(c) PANA

A deep kori is dammed up with gabion and an artificial flood is created. Surrounding agricultural land is then supplied with flooded water and fertile soil. This is an effective measure for rural recovery in areas where gully encroachment is found.

4) Community forests

(a) PBVT

Plants are produced in tree nurseries managed by the community and are bought at FCFA 35 per unit by the project team. Trees are planted in trenches by unit groups of 30-50 people who work under the supervision of a group leader. Each person is expected to excavate 1.5 trenches, plant 35 trees, construct three eyebrow ridges, and construct 0.5 m<sup>3</sup> of stone ridge per day, which is the equivalent of a half day's workload. Each person then receives Food for Work (0.5 kg of cereal, some oil, some milk and some meat) as their daily remuneration.

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<sup>1</sup> (subsoil is broken in each rectangular unit area upon which millet or fodder plants are grown. Three downstream sides of the unit area are reinforced by ridges of earth or piled stones. Grazing is prohibited for three years after construction in order to allow grass to develop its roots. The management of the area is then entrusted to the community).

<sup>2</sup> (Trenches are a method of tree plantation developed by the FAO in which pits are excavated in order to store water and collect organic matter. Grazing is prohibited for three years, and on the tenth year, wood cutting for fire is authorized).

<sup>3</sup> (eyebrow ridges are constructed to harvest rain water and surface soil).

<sup>4</sup> (holes of about 30 cm in depth dug in the field and then filled with a mixture of millet seeds, organic matter and soil).



Grazing is prohibited for three years after trees have been planted. Then the grazing of animals by persons who are outsiders of the community may be authorized at fees of FCFA 25 per goat or sheep, FCFA 100 per cow, and FCFA 150 per camel. After two months of grazing, the area is then closed for fifteen days to allow for necessary repair and rehabilitation, after which time grazing will be allowed to continue again. The income collected is earmarked for repair and rehabilitation of the land and for the payment of guards. One issue is how to go about the privatization of seedling production.

**(b) Project for promoting forestation at Karegoro by the Japan Overseas Cooperation Volunteer (JOCV)**

In the beginning of the project, fruit tree seedlings were distributed freely, but after three years, four persons became independent in the production of seedlings. The seedlings so produced were then sold to the population of a total of twenty-two villages. In the event of millet crop failure, the money initially earmarked for the purchase of seedlings is actually arranged for the purchase of millet, which causes unstable accountancy among the seedling producers. Unlike fruit tree plantation, nothing can be harvested and sold from tree plantation, and no option is left but to distribute seedlings for trees. However, even though they are freely distributed, 20% of the seedlings are abandoned and wither. Two issues are the education of the inhabitants and how to go about the privatization of seedling production.

**5) Granting of carts**

**(a) Project of the International Cooperation Study Center (CECI) by Canada**

This project was undertaken in response to the request of a community for the provision of carts to transport manure to the fields as a means of increasing field fertility. The project provided twenty-seven carts to the community on three different occasions under the condition that a cart funding committee would be established as a specific activity group of the village Terroir Management Committee. The carts were provided to groups of farmers under the condition that the cost would be reimbursed in five years, and that the reimbursement funds would be used to fund the purchase of new carts, farming tools, the raising of animals, the construction of wells, and the like. Funding requests are made by farmers' groups to the special cart funding committee, after which funding is approved by a general meeting of the Terroir Management Committee. If repayment for small-scale financing can be depended upon, the incoming repayment money could be used effectively for rural development by funneling it into new projects.

**6) Cereal bank**

The cereal bank is one of the food security measures adopted to provide millet to those residents who do not have enough cash to purchase grain during times of food shortages due to droughts.

(a) JALDA's verification Study

In 1994, forty-eight sacks of millet (100 kg/sack) were harvested in the trial field and provided to an agricultural cooperative as an investment (in other projects, there are cases where the communities themselves provided millet as investments). The agricultural cooperative was then requested by JALDA to establish a cereal bank with the investments. A sack of millet can be borrowed with FCFA 1,500 with the stipulation that a sack must be reimbursed after the next harvest. This allows the bank to profit FCFA 1,500 per each sack.

Under the cash borrowing program, one can borrow FCFA 5,000 for which one must reimburse the bank one sack of millet (the market price of which is FCFA 8,500) after the next harvest, thereby allowing the bank, in principle, to profit FCFA 3,500 per sack. In 1996, ninety sacks were anticipated as the balance, but due to payments being in arrears, only seventy-three sacks were collected. The recovery of overdue payments is actually a problem.

(b) Project of the cereal bank network sponsored by the FAO/Netherlands

The sixty to eighty cereal banks that have been established work well. The FAO has assessed that the operation is successful, because of the satisfactory staff training provided in the field for literacy and management techniques which specialize in bank management. In addition, it is desirable to adopt a system of secret balloting when electing committee members in order to avoid existing community leaders from being elected and making the committee unfunctional.

7) Village-level mutual funding

(a) PBVT

The Saving and Credit Members' Group (GAEC) is a mutual funding association, consisting of about twenty-five persons living in the same region, or who do the same type of work. Currently, 311 GAECs are trained on project sites, which have 7,299 members. In an attempt to manage larger funding activities, the GAECs have joined together to form nine independent mutual federations. Membership requirements in a GAEC include having a deposit book prepared with the federation, making a deposit of FCFA 2,000, obtaining a guarantee from among the members, and to be presently managing an economic activity or entity of some sort.

The monthly interest rate for short-term funding of less than one year is 2%. Loans are granted for cropping, handicrafts, agricultural product processing, stock raising, the sale of agricultural products, etc. The monthly interest rate for medium-term funding of 1-5 years is 1%. Loans are granted for investment activities such as irrigation facilities, purchase of animal-drawn agricultural tools, livestock, mills, and the like. When the federation grants a loan, it retains 10% of the investment amount from the member association, as a form of guarantee collateral, which is confiscated if the reimbursement is not made by due date. In the event of delayed payment, the association concerned can not be granted any new loans. In the case of mid-term funding, an amount of 1% of the amount fund is also deducted to serve as life insurance.

Between 1996 and 1997, a total of FCFA 227,305,500 in funds were granted, out of which FCFA 49,387,500 were for short-term and FCFA 177,918,000 for medium-term loans. Total investment since the beginning of funding activities has been FCFA 1,233,215,970, and the current balance is FCFA 619,349,120. Formerly, the loan recovery rate was at 80%; now it ranks between 98% to 100%. It is thought that the high rate of return is due to the fact that the loans are guaranteed not by individuals, but by the GAEC.

#### 8) Mills

##### (a) CECI project

Single process type milling machines are easier to manage and have lower maintenance costs than machines capable of two processes - threshing and flouring. When a single process milling machine was purchased, the Terroir Management Committee paid FCFA 100,000, and the project shouldered the remaining FCFA 350,000. The committee decided that it was better to entrust the mill to a private corporation and sold it to a corporation, under the condition that it should be kept in the village. The corporation reimbursed the cost of the milling machine to the committee over a period of five years, subsequently becoming the owner and continues to manage the mill in the village. Women are relieved from their millet grinding work, and can conduct other production activities in the spare time thus created. If the work in the village is collateralized, entrustment of the operation of the mill to a specialized private operator is a good management method.

##### (b) JALDA's verification Study

JALDA installed a mill in April 1997 at a cost of FCFA 900,000 (equipment cost: FCFA 600,000, installation cost: FCFA 300,000). The committee hired an operator to operate the mill. Grinding costs are FCFA 25 per tia (2.5 kg). If the mill can be operated for ten years, the monthly profit should be FCFA 7,500, but current monthly profit averages FCFA 7,000. Income is generally small during the initial stages of operation, because the operator is not yet familiar with how to handle or operate the machine, and only few people are aware of the existence of mill. However, neighboring villages are gradually becoming aware about it, and the number of users is increasing. Thus, a monthly income of FCFA 7,500 can be expected in the future.

#### 9) Improved cooking stove

##### (a) Project for promoting forestation at Karegoro by JOCV

Three women's groups (five to six persons) have been trained and are distributing the improved cooking stove. The improved cooking stoves are even described in textbooks of the group primary school. Although everyone knows how to operate the stove and is aware that it can save firewood, many feel that it is tiresome to use and thus continue to use the traditional three-stone stove. One of the reasons this stove has not become more popular is that gathering firewood has not yet become very difficult.

## (2) Evaluation of past soil conservation projects

### 1) Faulty plan

The FAO has assessed various soil conservation projects in Africa and has analyzed the causes of their success and failure. In this sense, it could generally be said that project planning is the most important factor in the success of the project. According to an assessment of 1,000 projects conducted by IBRD, 86% were evaluated having failed because of faulty planning.

Based on this analysis, the following points are required for a better project planning in the future:

- ① Clear, measurable and achievable objectives need to be set.
- ② Project should be designed with the participation of the population, and the design should be flexible and allow for modifications and developments.
- ③ A sufficient time period should be allowed for the project to be implemented in order that changes in the agricultural system can be made gradually with due consideration of local conditions and circumstances.
- ④ Many projects have failed because techniques which proved to be effective in other areas were simply replicated without any adaptation to local circumstances. It is necessary that techniques to be introduced to the project meet the following conditions:
  - They should be appropriate to the area and able to be carried out on farmer's land.
  - They should generate profits or increase production within a short period of time.
  - Resources available in the area should be used.
  - Techniques that may cause damage or ruin fields should not be used.
  - Risky activities are not to be included.
  - The project should be consistent with local social conditions (role of men and women, land ownership, land use, customs, etc.).

### 2) Continuing project evaluation

A continuing evaluation made on projects of five to twenty-five years after completion showed that about 50% of them had failed. The main causes behind these failures include the following.

- The capability of the agencies implementing the projects was insufficiently developed to continue the project.
- Long-term viability after completion of the project was not taken into account.
- No local development agency was trained or developed.
- The technical capability for regular examination or maintenance of the project was inadequate.
- Project objectives were not in line with the local social system activities or conditions.
- Difficulties existed in raising funds to continue projects.

### 3) Points of reflection regarding this Study

The following measures should be reflected in the study in response to the evaluation above.

- ① Agriculture should use mainly sustainable techniques.
- ② Organizations should be established along with the work to be done and a sustainable system should be developed.
- ③ Work that the farmers are able to carry out should be managed by an organization run by the inhabitants (such as a terrior management committee) in order to create a sustainable system.

Projects should mainly support the efforts of farmers in a supplemental way.

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

### 4.1 Temperature and rainfall

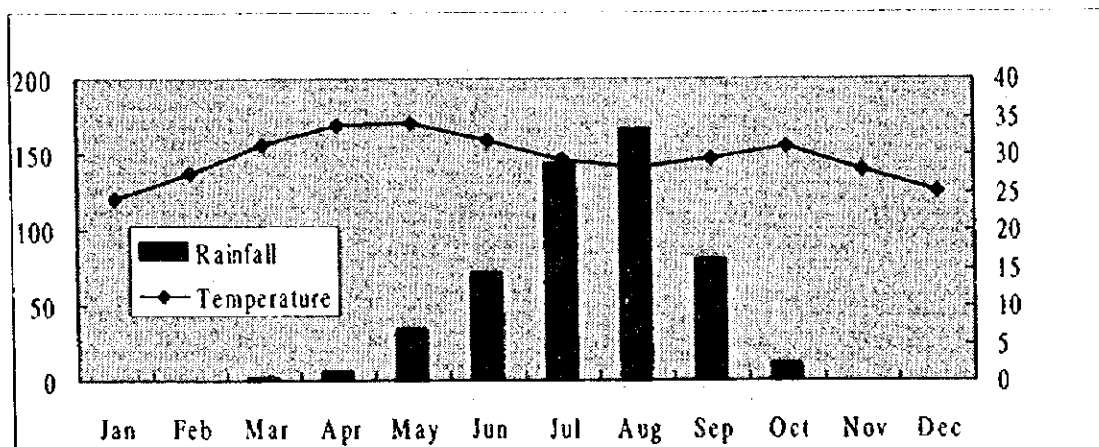
Temperature and rainfall, which are closely related to the agricultural productivity of the region are as follows.

#### (1) Temperature

Mean temperature is lowest during December and January; it rises in February, and falls again with the beginning of the rainy season, reaching a minimum in August. It then rises again to reach a second peak in October before falling once again. The annual mean temperature of the capital city of Niamey is 29°C, with important variations that can range between 16.3°C in January and 41°C in April (these figures are based on maximal and minimal monthly mean temperatures for the last thirty years). (see figure 4.1.1.)

Figure 4.1.1 Average monthly temperature and rainfall of Niamey

(Unit: mm, °C)



Source: Annuaire Climatologique de Niger (average of 1967 – 96) (See original data in Tableau A4.1.1.1-4)

#### (2) Rainfall

Based on the agricultural and ecological classifications, the Study area can be divided into three zones by rainfall pattern. The northern part has rainfalls of less than 350 mm per year and is a stock-farming zone. The central part has an average rainfall of between 350 to 450 mm and is an agriculture/stock-farming zone, while the southern part of the Study area averages rainfall levels of between 450 to 800 mm making it suitable as an agriculture zone. Rainfall in the Study area increases generally from north to south and from east to west. The rainy season runs from June to September, while the dry season is marked practically by a total absence of rain.

Rainfall is important during the rainy season and may peak in August with the climate becoming humid. The evolution of the rainfall pattern over the last thirty years points to a gradual reduction in rainfall.

## 4.2 Land use

The conditions of land use and the results of an analysis of land productivity in the 6 regions of Tillabéri Department (the study area) are as follows.

### (1) Current land use

Table 4.2.1 and Figure 4.2.1 show current land use patterns based on the remote sensing data analysis, commissioned in Japan and a field Study. In Niger, it is difficult to tell agricultural land from fallow land and grassland clearly, even with the field Study.

In this analysis, land use patterns were classified based on the vegetation coverage which could be assessed through the use of remote sensing. Agricultural land and grassland cover 1.97 million ha, or about 19% of the total area. Rainfed agricultural land are estimated to be 1.32 million ha in this Study, while data of the Directorate of Agriculture of Niger indicates a total of 1.10 million ha for rainfed cropping; it can be said that 220,000 ha of fallow land is included in the 1.32 million ha estimated above. Furthermore, a part of fallow land is included in the grassland and the bare land I. Almost no management system or organization exists for the effective land use.

**Table 4.2.1 Areas of vegetation and land use**

							(Unit: ha)
Classification	Filingué	Kollo	Ouallam	Say	Téra	Tillabéri	Total
Agricultural land I	0	70,600	0	30,700	47,400	66,600	215,300
Agricultural land II	491,200	215,500	162,600	132,100	228,800	89,800	1,320,000
Grassland	272,000	0	117,100	0	29,100	13,100	431,300
Bare land I	1,184,100	436,600	1,451,300	727,800	495,400	510,800	4,806,000
Bare land II	684,400	121,600	574,200	265,800	1,134,400	297,000	3,077,400
Paddy field	0	2,400	0	2,500	0	3,100	8,000
Woodland	49,600	32,000	12,100	211,600	55,300	30,500	391,100
Aquatic zone	0	62,100	0	29,500	31,600	52,200	175,400
Total	2,681,300	940,800	2,317,300	1,400,000	2,022,000	1,063,100	10,424,500

Source: JICA remote sensing survey commissioned in 1998

#### Explanation of Classification

- ① Agricultural land I: Flooded area (hydromorphic land on which irrigated cropping is possible and wilderness are mingled)
- ② Agricultural land II: Land for rainfed cropping
- ③ Grassland land: Meadows including fallow land
- ④ Bare land I: Land with 20-60% vegetation coverage, including fallow land, partial grassland, and poor land
- ⑤ Bare land II: Land with hardly any vegetation with exposed laterite
- ⑥ Paddy field: Farmland mainly used as rice paddy where water can be supplied throughout the year
- ⑦ Woodland: Land with over 60% vegetation (tree) coverage
- ⑧ Aquatic zone: Rivers, lakes and ponds, etc.







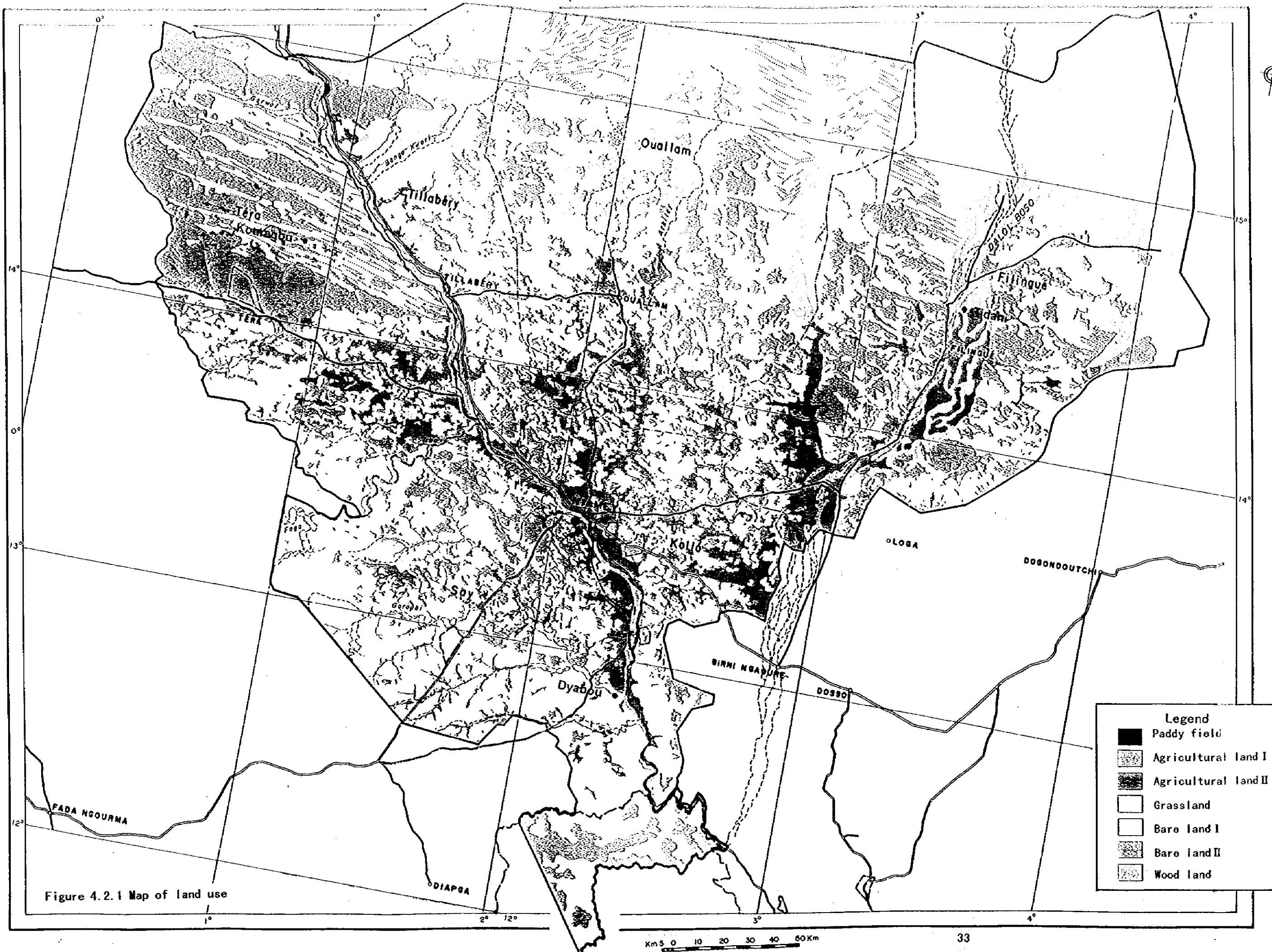


Figure 4.2.1 Map of land use







## (2) Classification of land dedicated to rainfed agriculture by degree of fertility

Rainfed agriculture using periods of cultivation and fallowing is the principal type of agriculture in the Study Area, as it always has been. Table 4.2.2 shows a classification of land dedicated to rainfed agriculture by degree of fertility, based on remote sensing data analysis and existing data.

Areas of rainfed agricultural land deemed to be "Suitable" and "Not very suitable" totals 3.98 million ha (about 38% of the area of the department). A portion of the land designated as "Not very suitable", mainly in the northern part of the Study area, is bared at present meaning that the land degradation is advanced although, it still has potential for agricultural use.

Most of the rainfed agricultural land, including fallow land, are estimated to be located in "Suitable" or "Not very suitable" land. There is little possibility to develop any new rainfed agricultural land in addition to that already being used for rainfed agriculture.

**Table 4.2.2 Classification of land dedicated to rainfed agriculture by degree of fertility**  
(Unit: ha)

Grade	Filingué	Kollo	Ouallam	Say	Téra	Tillabéri	Total
Suitable	0	3,300	0	2,000	600	9,600	15,500
Not very suitable	857,500	480,200	1,100,500	429,400	795,200	306,400	3,969,200
Not suitable	1,823,800	457,300	1,216,800	968,600	1,226,200	747,100	6,439,800
Total	2,681,300	940,800	2,317,300	1,400,000	2,022,000	1,063,100	10,424,500

Source: JICA remote sensing survey commissioned in 1998

Background documents of the evaluation (See Annexe 4.2.1 for details)

Soil status: Pedological map by Overseas and Technology Research Office (ORSTOM)

Hydrological conditions: ① Rainfall: Annual isohyetal map by the International Committee to Combat Drought in the Sahel (CILSS)

② Surface water: Map of vegetation and soil use prepared in this Study

③ Groundwater: isolevel map by the Inter-African Committee of Hydraulic Studies (CIAH)

General evaluation based on a 10 point scale: 10-6 points are "Suitable," 5-3 points "Not very suitable," while 2-0 points "Not suitable".

## (3) General classification of agricultural land based on yield level

Table 4.2.3 and Figure 4.2.2 show the classification of agricultural land (irrigated, rainfed, grassland, woodland, etc), depending on yield level in the department of Tillabéri, based on current vegetation, land use, land status and hydrological conditions (rainfall, surface water, groundwater). The total area of land designated as being either "Very suitable", "Suitable", or "Not very suitable" amounts to 5.21 million ha (about 50% of the area of the department). In the northern part of the Filingué District, a lot of land, most of which is not currently used for agriculture, is designated as being "Not very suitable" from the viewpoint of its adaptability to forest use, because of the positive evaluation of groundwater potential in the Dallols Bosso.

Given the fact that if 2.56 million ha of forest land in the department of Tillabéri were added to the 1.97 million ha of agricultural land currently under use for a total of 4.53 million ha, there exists very little remaining land which is capable of being developed for agricultural use in the Study area. This is the reason why effective use of current agricultural land should be emphasized in the development of a land use plan which makes full use of crop rotation using

traditional agricultural practices of establishing set fallow periods and the current unsuitable land use should be changed, taking into account the adaptability of the land to agriculture.

**Table 4.2.3 Area for agricultural land graded by productivity**

(Unit: ha)

Grade	Fitingué	Kollo	Ouallam	Say	Téra	Tillabéri	Total
Very suitable	0	5,500	0	3,400	2,000	10,500	21,400
Suitable	294,200	274,100	203,000	229,400	281,100	84,200	1,366,000
Not very suitable	1,248,600	353,300	976,400	439,300	504,900	304,500	3,827,000
Not suitable	1,138,500	307,900	1,137,900	727,900	1,234,000	663,900	5,210,100
Total	2,681,300	940,800	2,317,300	1,400,000	2,022,000	1,063,100	10,424,500

Source: JICA remote sensing survey commissioned in 1998

The background documents of the evaluation are the same as for Table 4.2.2. The designation of "Very suitable" was given when it was evaluated as "Suitable" in more than three out of four classifications of agricultural land (rainfed, irrigated, grassland and woodland).

#### (4) Important issues to be addressed

- ① Excessive cropping, including overgrazing, are progressing mainly in the northern portion of the Study area, due to the trend towards reduced rainfall and rapid population growth.
- ② At the same time, woodlands and grasslands are being transformed into agricultural land for agricultural production and the expansion of tree cutting for firewood is causing an imbalance in the resource base.
- ③ Management systems and organizations for the effective use of these important land resources have not been established nor exist.





Figure 4.2.2 Map of land suitability classification

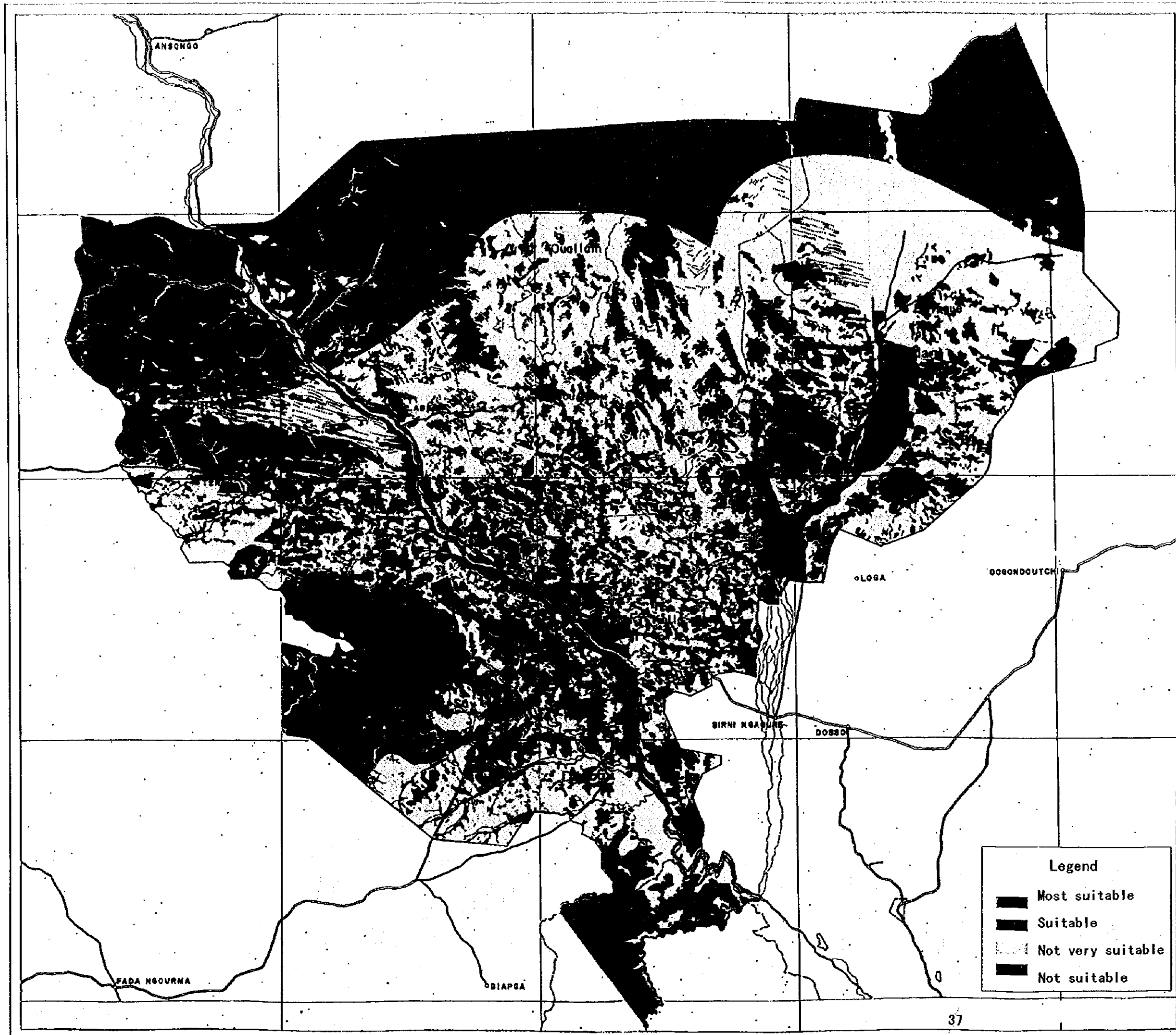
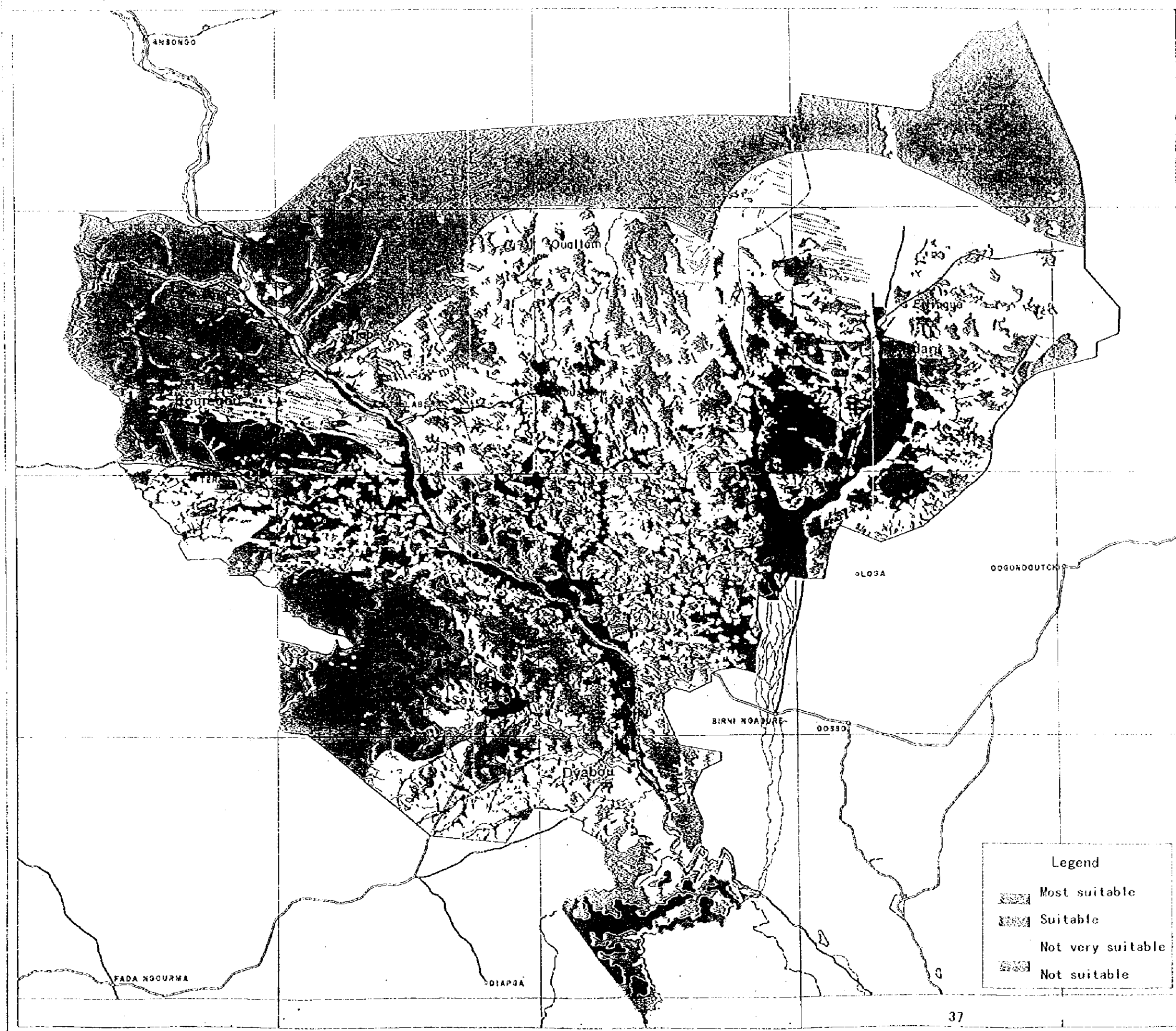


Figure 4.2.2 Map of land suitability classification









### 4.3 Use of surface water and groundwater

Water resources are an important limiting factor affecting productivity of agricultural land. The conditions of use of groundwater and surface water in the Study Area are as follows.

#### (1) Surface water

##### 1) The Niger river

(a) The Niger river is a permanent river with a basin of 1.5 million km<sup>2</sup>, a length of 550 km in Niger and 420 km in the department of Tillabéri. It has a maximum flow of 2,365 m<sup>3</sup>/s, and crosses the four districts of Téra, Tillabéri, Kollo, and Say in the Study area. The river has an annual run-off volume of about 28 billion m<sup>3</sup>, and is utilized in the following ways:

- ① Some 89 million m<sup>3</sup> of water is used annually for large-scale irrigation of 8,000 ha of paddy fields (see 4.4.1 Agriculture).
- ② It is used for animal water supply, by the population living along the Niger river and by nomads. However, the actual volume of water used is unknown.
- ③ The number of people who fish in the river has grown from less than 1,000 during the 1960s to more than 5,000 in 1984-85. However, the numbers of fish being caught are falling (practically no water is consumed in the practice of fishing).
- ④ The river is also used for ferry transportation and trade.

(b) Run-off of the surface water, such as for the Niger river, its tributaries and koris, changes considerably according to rainfall characteristics. For the effective use of surface water, generally, a certain flow of water is temporarily reserved by way of river structures while the water level is high, and is used in a controlled manner through the resulting discharge during times of drought by adjusting the hydraulic regime.

Three dams, namely the Kandadji, Gambou and Dyodyonga, are being planned for the development of the water resources of the Niger river. Of these dams, only the Kandadji is located upstream of Niamey at about 200 km; the others are located downstream more than 100 km.

The objectives of the Kandadji dam are: ① to stabilize the hydraulic regime of the Niger river, ② to support 140,000 ha of irrigation development, ③ to support the development of hydroelectric power, ④ to provide stable water supply to the large towns (Niamey, Tillabéri) along the Niger river and ⑤ to promote environmental conservation.

In 1986, a Canadian engineering office conducted a feasibility Study on the Kandadji dam, but as the construction cost is high, the opinion of donor agencies like the IBRD, Canada, amongst others, is leaning more towards the construction of the Gambou or Dyodyonga dams rather than the Kandagi. Currently, an F/S study is being conducted with the support of BAD (African Development Bank).

## 2) Tributaries of the Niger river

The Niger river has seven tributaries, which become sources of groundwater for the surrounding region (see Table 4.3.1). Their annual run-off volume is about 2.2 billion m<sup>3</sup>. They have water from May to January, and their notable variations in hydraulic regime make their use as dependable water resources difficult. However, they are currently used for animal water supply, rainfed agriculture conducted in the flood area according to diminishing water levels, and for irrigated agriculture achieved either manually or with small pumps. Because according to a JALDA implementation study, relatively inexpensive water resource development is possible and the potential for development is great.

**Table 4.3.1 Characteristics of principal tributaries of the Niger river**

Name of tributary	Drainage area (km <sup>2</sup> )	Mean annual run-off (1,000 m <sup>3</sup> )	Maximum run-off (m <sup>3</sup> /S)
Niger river	700,000	28,000,000	2,365 (1,182)
1. Gorouol	44,850	222,000	300 ( 37)
2. Dargol	5,490	160,000	202 ( 9)
3. Sirba	38,750	680,000	456 ( 20)
4. Goroubi	7,630	160,000	121 ( 5)
5. Diamongou	1,206	100,000	175 ( 6)
6. Tapoa	1,070	40,000	— (—)
7. Mekrou	10,500	800,000	410 ( 98)
Total (seven tributaries)	109,486	2,162,000	— (—)

Source: PNEDD: Documents of the Service d'Hydrologie on maximum run-off only.

Note: ( ) indicates the flow of the year when maximum run-off is smallest.

## 3) Koris

A kori is a temporary watercourse which generally runs through bare land. It arises just after the start of rains and disappears about 6 to 24 hours after the rain has ceased. Although it is a source of charging groundwater, it is hardly used. It is one of the main causes of soil erosion, and local inhabitants are afraid of its progress. It is desirable to build small-scale dams to protect the watercourses and to serve as a reserve for water. Table 4.3.2 provides examples of major typical koris. It should be noted, however, no documents exist which record observations on such watercourses, including hydrology documents.

**Table 4.3.2 Characteristics of principal koris in the Study area**

Koris	Drainage area (ha)	Length of channel (km)	Average width of channel (m)	Average depth of channel (m)
Boubon	5,900	18	40	8
Karma	4,900	14	40	2
Sorbon haoussa	7,800	14	80	5
Farie	28,500	38	22	6
Kokomani Dia-Dia	9,514	6	10	5
Daikaina	70,650	46	40	15
Diamballa	6,360	17	35	10
Diomona	19,214	36	50	15
Famale	24,500	40	60	10
Gabou	42,025	61	40	10
Beibatan	23,890	47	25	10
Yassane Gorou	7,850	15	80	15
Total	251,103	352	—	—

Source: PNEDD

#### 4) Ponds

The department has more than 145 ponds of which 51 are permanent. These are formed in the extended part of the koris or in the basin of the stream bed. They are filled with water from the rainfall which accumulates during the rainy season and from the water table of the neighboring alluvial layers. There are more than 94 semi-permanent ponds formed in koris or in the plateaus where clayed layer is exposed. This type of pond appears under the influence of rainfall and has a lifetime of five to six months. Table 4.3.3 indicates the distribution of ponds by district. The district of Tillabéri has the greatest number of ponds, while the district of Kollo has the fewest. They are widely used for irrigation, animal water supply and pisciculture, but no statistical documentation is available, and the volume of water consumed is also not clear.

**Table 4.3.3 Major ponds in the Study area**

District	Permanent	Semi-permanent	Total
Filingué	3	21	24
Kollo	7	4	11
Ouallam	13	16	29
Say	11	13	24
Téra	8	19	27
Tillabéri	9	21	30
Total	51	94	145

Source: Department of Tillabéri, PNEDD

#### 5) Artificial reservoirs

Two artificial reservoirs exist in the district of Téra and one in the district of Say. They are used for water supply and irrigation. However, there are no water supply facilities, nor any



irrigation canals. Irrigation is done either manually or through the use of small transportable pumps.

## (2) Groundwater

The right hand bank of the Niger river is located on a layer of the Liptako Gourma, and the water table is relatively deep. However, the left hand bank lies upon the Terminal Continental layer. The water table is high along the Dallols Bosso valley crosses the eastern portion of the Study area, and the groundwater runs more deeply from east and to west. Seasonal variations in water level are less than one meter, while the annual water supply during the rainy season is estimated to be more than 200 million m<sup>3</sup>. The alluvial aquifer layer is discontinuous and is located along the flowing course of a stream where it is recharged with water. A free groundwater table, an intermediate water table, and a sub-stratum water table are all present, each having respective available depths of 10-80 m, 80-130 m, and 100-300 m.

### 1) Wells for potable water

With the exception of a very limited area along the Niger river, almost all potable water comes from wells (see "Section 4.7 Social infrastructure", for details).

### 2) Wells for small-scale irrigation

Wells have been constructed in the valley of the Dallols Bosso in Zone 3 and along the tributaries in order to utilize the abundant and high groundwater resources, manpower and small scale pumps for small-scale irrigation. A total of about 1,200 ha are of such land is under cultivation for cassava and watermelon in the district of Filingué, and for lettuce and tomatoes in the district of Ouallam.

### 3) Wells for animal water supply

Sources of water supply are insufficient and often cause conflicts among herders. The main sources of animal water supply are from the Niger river and the above-mentioned 145 ponds. In areas where it is difficult to use surface water, the existence of 78 wells for animal water supply is confirmed as shown in Table 4.3.4.

**Table 4.3.4 Wells for animal water supply per district**

District	Shallow wells	Deep wells	Others
Filingué	52	12	
Kollo	0	0	Niger river
Ouallam	6	2	
Say	0	0	Niger river +1 man-made reservoir
Téra	0	0	Niger river +2 man-made reservoirs
Tillabéri	6	0	Niger river
Total	64	14	Niger river +3 man-made reservoirs

Source: PNEDD

(3) Major issues to be addressed

1) Surface water

- (a) Storage facilities allowing stable storage of surface water are insufficient.
- (b) Ponds are widely used, but their functions are deteriorating because of the inflow of earth and soil, and dike degradation. The reduction of stored volume and storage period cause conflicts among the various users of the ponds.

2) Groundwater

- (a) Wells that are used as sources of potable water sources; ① distant from residences, ② constructed in traditional forms which become dry during the dry season, do not have sufficient quantities of water, and have the water of bad quality, and ③ there is an insufficient number of possible locations.
- (b) Wells used for agriculture are problematic in that they are ① mostly buried, ② insufficient number of possible locations, and ③ in case of deep wells, construction is expensive.
- (c) Wells used for animal water supply have the same problems as those used for agriculture. They are also firstly affected by water shortages caused by the reduction of the functions of ponds.

#### 4.4 Agriculture, stock raising, and sylviculture

##### 4.4.1 Agriculture

###### (1) Crop Cultivation Conditions

The major crop in the study area is the staple, millet. In 1995, the planted area was 993,000 ha, which was 87% of the total cultivated land. The second crop is sorghum (122,000 hectares, 10% of all cultivated land), and cowpeas which are extensively cultivated as a companion crop to both millet and sorghum also occupy about 10% of the cultivated land (129,000 hectares). These crops are cultivated using the rainfall during the rainy season (rainfed cultivation). One characteristic of this cultivation method is that the land is not fixed. It is a traditional shifting cultivation. A farmer cultivates the same field for 2 or 3 year then switches to another field, leaving the field used up till that time fallow for between 4 and 5 times as long as he cultivated it to allow it to recover. In some cases, while the fallow land is recovering, it is used to graze livestock and as a place to collect firewood. Recently there has been a tendency for the land under cultivation to expand under the effects of population growth and a decline in yields caused by low rainfall. Crops are cultivated without adequate fallow periods to permit the full recovery of the land. This results in a vicious circle as yields decline even more and the soil becomes increasingly degraded.

The cultivated area and production are susceptible to the effects of the annual total rainfall and the rainy season, with the result that both fluctuate widely from year to year. The coefficient of variation of the surface area of land growing millet from 1991 to 1995 is 10%. Naturally, the greater the water requirements of a particularly crop, the greater the variation (sorghum: 14%, cowpeas: 45%). The same applies to unit yield, which varies more widely than cultivated area. This problem destabilizes agricultural production in this region.

**Table 4.4.1.1 Changes in Cultivated Land Area for Principal Crops**

(1,000 ha)

Crop \ Year	1991	1992	1993	1994	1995
Millet	939	845	793	955	993
Sorghum	90	99	119	94	122
Subtotal	1029	944	912	1049	1115
Cowpeas	432	405	204	277	129

Source: Ministry of Agriculture and Livestock, Farm Bureau January 1997

Fixed agricultural land includes paddy (8,000 ha), vegetable gardens, industrial crop fields, and orchard, and most of these are irrigated. Paddy fields are found along the Niger River, which limits them to Kollo, Say, and Tillabéri Departments. Two methods of using paddy fields are practiced: second cropping of wet field rice and wet field rice + vegetables. In 1996, the total area of wet field rice cultivation was 13,000 ha (1.1% of all cultivated land). The total area of land used for irrigated cultivation of crops other than wet field rice was 8,000 ha (0.8% of all cultivated land), and it was used to produce vegetables such as cowpeas, onions, red peppers, tomatoes, cabbages, and lettuce. It was also used for tubers, principally cassava and sweet potatoes (See Table 4.4.1.1 and Figure 4.4.1.1).

**Table 4.4.1.2 Crop Cultivation on Irrigated Fields**

(ha)

Category	Crop	Filingué	Kollo	Ouallam	Say	Téra	Tillabéri	Total
Paddy Field	Wet Field Rice	0	3,904	0	4,066	0	5,042	13,012
Irrigated Dry Fields	Leafy and stem vegetables	117	467	27	193	573	118	1,495
	Flower vegetables	139	630	42	196	120	103	1,230
	Root vegetables	734	1,319	9	638	0	65	2,766
	Cowpeas	21	0	0	0	3,185	61	3,267
	Fruit	4	24	4	16	2	4	54
	Industrial crops etc.	57	263	23	91	54	65	553
	Subtotals		1,072	2,703	105	1,134	3,934	416
Totals		1,072	6,607	105	5,200	3,934	5,458	22,376

Source: PNEDD, 1996

## (2) Crop cultivation methods and production infrastructure

### 1) Millet and sorghum

Millet is cultivated using the following method. At the beginning of the rainy season, seeds are manually planted in holes dug at intervals of about 1 m. After manual intertillage and weeding are performed once or twice, the crop is harvested by cutting off the ears by hand. In some cases, only millet is cultivated but in others cowpeas or other legume is cultivated as a companion crop. Seeds are almost always obtained by home seed cultivation of existing varieties, with limited use made of ameliorated seeds. The seed quality has declined sharply because they have not been replaced for a long time.

The farmers use almost no chemical fertilizer. In addition to leaving fields fallow, they use the following methods to restore the fertility of the land.

- ① During the dry season after the harvest, cattle or sheep are grazed in the fields in order to restore the fertility of the soil by effectively using the manure they excrete in the fields. (enclosure).
- ② Legumes such as cowpeas are grown as a companion crop with the millet or sorghum to restore the soil's nitrogen content and return its residue to the soil as organic matter.
- ③ *Acacia Albida* or other leguminous trees are planted in the fields to provide the livestock with fodder and so their leaves can be a source of organic material (Agroforestry).

Water harvesting of rain water or surface water in order to maintain the soil's water content is done by digging holes in the fields (say), by constructing masonry levees (Banquette), by building contoured levees, or by forming grooves on the field surfaces. These methods have been adopted as part of GTZ and FAO projects, but they are not in very wide use. Sorghum is cultivated in almost the same way as millet. But land where sorghum is cultivated is limited because it grows better on fertile land with good water holding properties.

### 2) Wet field rice

Wet field rice is grown in two ways: on paddy fields supplied with water by irrigation facilities and on either on bars or on low lying land along the banks of the Niger River while they are inundated by water rising and falling during the rainy season. Paddy fields supplied by irrigation facilities are scattered at about 30 locations. Sections range in size from 20 to 30 a, oxen pulls the plows while all other work is manual. The wet field rice yield is high, but not only are pumps required to irrigate the paddy fields, increasing the maintenance costs, it is impossible to repair deteriorated channels and other facilities. These problems hold down both yields and profits. Cultivation while the water level is rising includes transplanting the seedlings (early July) so that the plants will reach between 70 cm and 80 cm by July 20<sup>th</sup> when the Niger River water level begins to rise. And the varieties grown are adjusted so that the boot stage will come after September 10 when the water level begins to fall.

The total area of cultivated land during the dry season of 1998 was 6,500 ha and the average yield was 4.2 t/ha. There are now approximately 3,000 ha of paddy fields whose productivity

has declined sharply (to less than 4 t/ha) because of leakage from the water canals, malfunctioning of pumps, or leakage from water tanks, most constructed 20 years ago. The National Office for Hydro-Agricultural Improvement (ONAHIA) maintains the facilities, but for the above reasons, there are some rice farmers' cooperatives that are unable to collect their members fees and cannot pay their share of the costs of repairs.

### 3) Vegetables, etc.

Vegetables are cultivated during the dry season at locations with relatively good moisture holding ability and fertility on low ground, flood plains, or on gently sloping land. Vegetable cultivation is usually small scale production on a field with a shallow well and surrounded by a fence made of branches to protect the crops from wind and intruding livestock. Because vegetable cultivation during the rainy season would be highly susceptible to plant diseases and pests because of the high temperature, high humidity, and strong wind conditions common during that period, only okra is grown during that time of year. The following are other characteristics of this category of cultivation.

- ① Plots are about 500 m<sup>2</sup> in size.
- ② Water is obtained from the Niger River and its tributaries, marshes, and shallow wells.
- ③ Water is manually obtained from shallow wells. (The fields are irrigated with watering cans, etc.)
- ④ Transportable pumps are used in many places (when one is used, its water is usually stored in 50 m<sup>3</sup> capacity tanks at 2 or 3 locations).
- ⑤ Cropping is almost entire manual, with many women and children taking part.

The people have high expectations of small-scale irrigation of vegetables. The Nigerian Agency for the Promotion of Private Irrigation (ANPIP) was established in March 1997 with the support of the Ministry of Agriculture and Livestock and the IBRD to achieve the following objectives.

- ① To promote the creation of privatized irrigation in order to activate rural areas which is a key element of national economic development.
- ② To provide support for the organization of private irrigation projects and for the formation of managing groups; and
- ③ To improve the social status of women through the provision of support to privatized irrigation in which women participate as organized groups.

Although farmers are very interested in small-scale irrigation, it is not widely practiced because of a lack of water sources, facilities, and distributing organizations etc.

### (3) Soil on cultivated land

#### 1) Distribution of farmland soil

A survey by the Agro-hydro-meteorological Study and Application Center (AGRHYMET) has revealed that as shown in Table 4.4.1.3, the soil on 78% of the cultivated land is tropical

ferruginous soil (laterite soil). This is followed by lithosol soil (17%) and hydromorphic soil (4%). Laterite soil is sandy and easily cultivated, but because it is thin with poor nutrient and water holding capacity, its crop production capability is low. Almost all millet is grown on this soil.

Hydromorphic soil distributed along the banks of the Niger River and its tributaries provides relatively high contents of clay and organic material and good water holding capability. It is highly productive soil suited for paddy fields and dry season irrigated agriculture. But it is temporarily submerged by rising ground water and river water levels. The crop productivity of lithosol soil is poor because it is created slowly and its fertility is low.

**Table 4.4.1.3 Distribution of soil by type**

District	(Unit: km <sup>2</sup> )				
	Lithosol	Tropical ferrous soil	Hydromorphic soil	Vertisol	Total
Filingué	276	1,985	228	0	2,489
Kollo	206	609	5	17	837
Ouallam	303	1,749	41	0	2,093
Say	415	987	61	20	1,483
Téra	110	1,345	37	8	1,500
Tillabéri	217	530	21	60	828
Total	1,527	7,205	393	105	9,230
Composition rate (%)	16.5	78.1	4.3	1.1	100

Source: Commissioned analysis by Agro-hydro-meteorological Study and Application Center (AGRHYMET) (Carte des types de sol Département de Tillabéri, 1998)

## 2) Degradation of agricultural soil

Soil degradation is rapidly progressing in the Study area, because of the aggravation of water and wind erosion, as well as a drop in fertility and water holding capacity. In addition to the reduction of rainfall in recent years, this situation may be attributed to the following natural and human factors. The respective degrees of influence vary across the Study area, but they can be identified everywhere, and are one of the major reasons for desertification.

### (a) Natural reasons

- ① Vegetation is originally poor in the semi-arid climatic zone.
- ② While the rainfall is small, its intensity is strong.
- ③ Soils are sandy and thus are easily eroded.

### (b) Human factors

- ① Vegetation is becoming increasingly destroyed by overgrazing, excessive wood cutting for firewood, and the spread of agricultural land
- ② Soil degradation is progressing due to continuous cropping and a reduction of fallow periods in an attempt to make up for food shortages.

### 3) Forms of soil degradation

In the Study area, soil degradation is mainly caused by water and wind erosion in the following ways:

- ① Water erosion: Erosion occurs on rainfed agricultural fields which lie on gentle slopes in the form of surface erosion covering a wide area rather than the formation of deep koris, leading to exposure of the hard lateritic layers which makes cultivation impossible. In addition, cliffs and successive plateaus are rapidly being eroded. Earth and sand which are eroded away accumulate in the streams, ponds and swamps as well as the valleys, and reduce the area which is suitable to vegetable cultivation.
- ② Wind erosion: During the dry season, the harmattan blows away the fine particles of soil, such as alluvium. Strong winds which blow at more than 30 m/s just before a rainfall blow away, not only dry sand, but also the millet seeds, and thus causes serious damage.

### 4) Agricultural land and soil conservation measures

#### (a) Conservation of agricultural land and soil

In this plan, land conservation measures have been divided into those regarding the "agricultural land conservation" in areas where farmers conduct production activities, including rotational agricultural land, and "soil conservation" for public activities on grasslands and slopes other than agricultural land. However, since the conservation measures being executed in Niger are not divided, they are summarized together in "Section 4.4 Agriculture".

#### (b) Management and implementation systems

The Land Commissions will be responsible for the control of agricultural land and soil conservation in compliance with Article 118 of the Rural Code. However, of the six districts in the Study area, the district of Say has already entered the implementation phase based on IBRD support (PGRN) from March 1997. At present, local inhabitants are being given instruction and guidance on the Rural Code, and the cadaster form is being prepared.

Moreover, their implementation seems to depend entirely upon aid agencies. Government agencies, etc. do not play an important role in the establishment of the Land Commissions.

#### (c) Status of implementation

Agricultural land and soil conservation measures have been implemented on a scale of 1,000 - 20,000 ha a year in recent years as shown in Table 4.4.1.4 with the annual area tending to increase. The scale is still small, however, comparing with the progress of soil degradation and the area of agricultural and other lands requiring conservation measures. An examination by district and implementing agency as shown in Table 4.4.1.5 shows that the PASP (GTZ) covers 97% of all the area in which measures have been implemented and that the implementation is focused on the four districts of the north of the department. "Section 3.6 Orientation of Aid, provides examples of concrete conservation measures being undertaken with regard to the PASP.

**Table 4.4.1.4 Progress of conservation measures of agricultural land and soil in the Study area (1990 -- 96)**

Item	1990	1991	1992	1993	1994	1995	1996
CES/DRS (ha)	6,691	1,153	1,486	7,975	19,203	9,486	22,173

Source: Rapport Annuel d'Activités 1996, Département de Tillabéri, Direction Départementale de l'Environnement

Note: CES/DRS: Water and Soil Conservation/Soil Protection and Restoration

**Table 4.4.1.5 Breakdown of area covered by agricultural land and soil conservation measures by district and agency (1996)**

Executor	(Unit: ha)					
	Filingué	Kollo	Ouallam	Téra	Tillabéri	Total
Collectives		48	4			52
PASP	4,746		6,875	3,084	6,845	21,550
SAP				25	205	230
PGTF	207					207
PRSAA	5					5
Total	4,958	48	6,879	3,109	7,050	22,044

Source: Rapport Annuel d'Activités 1996, Département de Tillabéri, Direction Départementale de l'Environnement

Note: SAP: Early Alert System Project

PRSAA: Agricultural Support Service Reinforcement Project

PGTF: Filingué Terroir Management Project

#### (4) Agricultural roads

The network of major roads in the Study area totals 782 km of paved asphalt roads and 1,492 km of lateritic roads. Routes between Niamey and the seat of each district are paved, with the exception of Ouallam. In addition, when traveling from Niamey to Téra, one needs to cross the river by ferry; this causes an important loss of time on this route, and is an obstacle to distribution and circulation of products. The plan to develop major regional roads in the Study area anticipates the improvement of 124 km of road in the district of Téra, 155 km of road stretching across the two districts of Téra and Tillabéri, 16 km of road in the district of Filingué, and 140 km of road in the district of Say, or a total of 435 km of planned improvements (see Figure A4.4.1.2 for information on roads). The Government of Niger is negotiating the road improvements with the European Development Fund (FED), West African Development Bank (BOAD), amongst other organizations. The government has also requested funding for the construction of 69 km (five roads) between rural villages from the Islamic Development Bank (BID) and BOAD, etc. Well conditioned agricultural roads practically do not exist with the exception national and departmental roads. The lack of such roads acts as a serious obstacle to the collection and distribution of agricultural products, and to the transportation of agricultural materials, etc.



(5) Major issues to be addressed

1) Rainfed agriculture

At present, cereal supply is woefully insufficient (about 18%), primarily because of a decrease in the production of millet and sorghum, principal food crops, and because of the instability of climatic conditions. Even with an increase of the area under cultivation, production does not meet demand in any district except for Say. Therefore, rational land use should be promoted, soil fertility should be maintained by making the best use of enclosures, agro-forestry and water harvesting as well as ameliorated seeds should be introduced in order to increase cereal production and improve self-sufficiency in the area of cereals.

2) Irrigated agriculture

The production of rice, vegetable and fruits is still relatively small, but they are all important commercial products which generate income; vegetables and fruits are also important sources of vitamins. This is one reason why production areas should be actively developed to allow high and stable production of these crops. This can be done through the development of small-scale irrigation combined with the rehabilitation of degraded rice fields, and the use of korus and groundwater. It is necessary to facilitate stable living of population through income generation as a result.

3) Agricultural land and soil conservation

(a) Insufficient implementation area of agricultural land and soil conservation measures

Although a major portion of the agricultural land (about 4 million ha) in the Study area requires soil erosion control measures because of climatic conditions, the nature of the soil and diverse human activities, measures are implemented for only 1,000 - 20,000 ha of land each year. Most of the measures are implemented by the PASP. Consequently, the swift implementation of effective implementation of soil erosion control measures which are viable and make the best use of local material and human resources should be promoted.

(b) Inadequate control and management system

With regard to the implementation of agricultural land and soil conservation measures, Land Commissions responsible for the control have yet to be formed. In terms of management, independent bodies (Collectives in Table 4.4.1.6) are rarely operational due to major restrictions on organization and funds.

However, the good operation of the two systems of control and management is essential to securing the effectiveness of agricultural land and soil conservation measures. To this end, radical enhancement of laws and organizations related to the two systems are required in order to establish an effective system to promote the measures.

(c) Poor technical support system

Administrative technical support for agricultural land and soil conservation measures does not work very well, and support activities are practically restricted to those of the PASP. A

system should thus be established to allow farmers to receive extended technical support for their agricultural land and soil conservation activities.

#### 4) Agricultural roads

Hardly any roads are properly maintained, and people walk through millet fields. This hinders the collection and delivery of farming products as well as the transport of farming materials. It is necessary to improve agricultural roads in the future.

### 4.4.2 Stock raising

#### (1) Current status of livestock and stock raising

Stock raising represents 35% of total agricultural production in 1995. As such, it makes an important financial contribution to the economy through tax payments to central and regional authorities. This being said, however, the budget allocated to livestock development is less than 1% of the national budget, and less than 4% of the regional budget. The agencies responsible for setting livestock development policies and promotion are weakening, and no national development plan is in place. Staff training in this sector is also poorly conducted and human resources management is inadequate.

In the Study area, large livestock are kept as a provision against unplanned expenses. The larger the number of livestock owned, the greater the wealth of stock farmers. Therefore, stock farmers seek to expand their livestock herds by increasing the number of animals, rather than seeking to achieve better productivity by improving turnover.

The main system of production consists of grazing on natural grasslands. Statistics related to agriculture and stock raising in 1995 indicate that 25% of the national herd of cows, 13% of sheep, 10% of goats, and 11% of camels were located in the Study area (see Tableau A4.4.2.1).

With its relatively abundant fodder resources, the Study area is the top ranked region in the country in terms of the number of cattle raised. Many animals died during the last two droughts of 1971-73 and 1981-85, however, which caused important damage and greatly reduced the size of the herds under care due to a lack of feed and drinking water caused by drought. Table 4.4.2.1 shows the year-on-year change in number of animals raised in the Study area. In recent years, the number has been increasing steadily.

**Table 4.4.2.1 Trends in the number of livestock raised in the Study area**

(Unit: head)

Items	1991	1992	1993	1994	1995
Cattle	474,818	496,700	506,600	732,596	747,248
Sheep	425,895	447,200	460,600	515,766	531,239
Goats	1,027,602	1,078,000	1,104,900	722,018	740,068
Camels	37,686	38,400	39,000	112,620	114,309

Source: Annuaire des Statistiques de l'Agriculture et de l'Elevage 1996

Typical breeds of cows include the Azawak in the district of Filingué; the Djelli along the Niger river, and the Bororo along with crossed breeds throughout the Study area. Major breeds of sheep include the Oulah, the Ara Ara and the Koundoum, and the Sahel for goats.

The Azawak breed are raised for both their meat and milk. Since they can endure the hot and dry climate well and produce over 1,000 kg of milk per head per year, they are highly prized in the Sahel region. The Djelli, which are bred in the agricultural zone, are well suited as beasts of burden having good tracting and plowing abilities. The Bororo breed is larger than the two breeds mentioned earlier and are better suited to beef production.

With regard to sheep, the Ara Ara breed is large in size and provides a good source of meat production, followed by the Koundoum and the Oudah. With respect to climate, the Ara Ara is well adapted to the Sahelian climate, while the Oudah breed is well adapted to the Sudanian-Sahelian climatic zone. The Koundoum breed is better suited to the Sudanian-Sahelian climate south of the Niger river with its heavy rainfall. The Sahel breed of goats show good resistance to dry and hot climate, and are well adapted to drought.

The common patterns of livestock raising and management can be classified into the following three types.

#### ① Transhumance

During the rainy season, the animals are directed to pasture areas, away from their own fields. Transhumance is carried out from June through October. The animals then are returned to the agricultural zones in November after the crops have been harvested, and they eat agricultural by-products or graze on fallow fields during the dry season. The grazing areas during the rainy season are the region of Azar, the canton of Ekrufans; Tamou, in the district of Filingué; Bossey Bangou, Bolsi, Dogona and the border with Burkina Faso, in the district of Say; the canton of Kokourou; Sakoira in the district of Téra; and from North Anzourou to Inates in the district of Tillabéri.

#### ② Nomadism

Nomadism mainly consists of herding in which herders herd their animals around from place to place in search of suitable forage. It is practiced by herders (notably the Tuareg and Pheuls) regardless of season in the three districts of Filingué, Ouallam, and Tillabéri.

#### ③ Sedentary herding

This form of pastoralism is practiced in agricultural zones by sedentary herders or farmers with limited number of animals. Herds are fed on fallow grassland, fallow land, and non cultivated land around villages.

### (2) Supply, demand and nutritional value of fodder

Overgrazing is one of the reasons cited for the advance of desertification in the Study area. For this reason, the balance between current supply and demand for fodder has been calculated and analyzed based on fodder demand for the present number of animals and the volume of

fodder provided by available grasslands along with agricultural by-products produced in cultivated lands. In estimating fodder demand, it is assumed that a weight of 6.5 kg of dried fodder is necessary to Tropical Livestock Unit (UBT) based on the standard of 6.0 to 6.5 set by the Livestock Department of the Ministry of Agriculture. Fodder supply was estimated based on the volume of fodder that can be produced in grasslands and the volume of agricultural by-products that can be produced in cultivated lands. This approach has been taken because very few cases exist in which concentrated fodder and vitamins are used in Niger. Table 4.4.2.2 shows the results of the balance of supply and demand calculations (see Tableau A4.4.2.2 – 4 regarding calculations). It is very difficult to ascertain the exact balance by district, because of transhumance and nomadic herding.

The balance is negative in the districts of Kollo and Say because of transhumance to the North during the rainy season, but as a whole, some surplus still exists. However, since a high agricultural by-products utilization rate of 70% for millet, sorghum and maize was adopted in the calculation, the existence of surplus cannot be clearly concluded.

Natural grasslands in the Study area have a high nutritive value only during the short period of the rainy season. This means that the level of protein, vitamin and mineral salt inputs for livestock is small, which is one of the reasons for the low levels of animal productivity.

A number of attempts have been made in the Study area to introduce fodder plants such as Bourgou (*Echinochloa Stagnina*) into the irrigated grasslands along the Niger river, as well as to introduce grasses like Andropogon (*Andropogon gayanus*), Siratro (*Macroptilium atropurpureum*), and Dolique (*Lablab purpureus*), amongst others, as a means of developing koris and protecting agricultural land. However, such efforts are limited to small areas.

**Table 4.4.2.2 Test calculations regarding supply and demand for fodder**

(Unit: tons)

District	Tropical Livestock Unit (UBT)	Required dried fodder	Estimated volume to be supplied			Balance of Supply & Demand
			Grassland etc.	Crop Residues	Total	
Filingué	237,195	562,746	483,852	167,688	651,540	88,794
Kollo	180,848	429,061	202,805	104,249	307,054	-122,007
Ouallam	66,565	157,962	465,934	53,823	519,757	361,831
Say	239,200	567,503	343,622	126,464	470,086	-97,417
Téra	184,620	438,011	236,407	107,162	343,569	-94,442
Tillabéri	86,042	204,011	158,847	39,946	198,793	-5,343
Total	994,470	2,359,383	1,891,467	599,332	2,490,799	131,416

### (3) Livestock production and demand

In the Study area, cattle, are bred mainly as a means of savings. The rate of commercial slaughtering of cattle (the number of head for export and slaughter divided by total number of head raised) is very low and does not exceed 3%, while the rates for sheep and goats are high at 19% and 25%, respectively (see Tableau A4.4.2.5).

Based on agriculture and stock raising statistics, milk production was estimated to be 38,896 tons for cows, 11,050 tons for sheep, 15,357 tons for goats and 6,814 tons for camels in 1996. The proportion of female adults which produce milk is estimated to be 15% of the total for cattle, 33% for sheep and goats and 13% for camels, which is equivalent to a total milk production per head of 330 kg/year for cows, 50 kg/year for sheep and goats, and 450 kg/year for camels. Meat production (including by-products like viscera) is 3,186 tons for cattle, 1,405 tons for sheep, 2,464 tons for goats, and 91 tons for camels (see Tableau A4.4.2.6 for details by area). The weight of dressed carcasses per head is 150 kg for cattle, 14 kg for sheep, 11 kg for goats and 150 kg for camels. Because livestock are raised mainly in order to sell off during difficult times, production of both beef and milk from cattle is low, because no efforts are made to address breed improvement and there is not enough feed during the dry season.

The 1996 FAO food supply and demand table shows that the quantities of meat and raw milk supplied in developing countries are 23.9 kg/year and 42.4 kg/year. Quantities of meat and raw milk supplied in Niger in the same year are 12.3kg/year, and 31.1 kg/year respectively. These are low values equal to 51% and 73% of the quantities supplied in developing countries. In the study region, estimated quantities of meat and raw milk supplied were 20 kg/year and 39 kg/year, levels only slightly below those in developing countries.

The 1987 to 1996 yearly average of the supplied nutrition per person per day throughout Niger is 2,059 kcal, 56.2 g of protein, and 31.3g of fats. These values are extremely low, representing 78.6% of calories, and about 50% of the fat supplied in all developing countries. The small quantity of fat that is supplied is a consequence of the low level of livestock product consumption.

The study region is a part of Niger with plentiful grassland resources and livestock product production that is higher than that of the remainder of the nation. Its role is to supply livestock products to the capital city, Niamey. Because supplies throughout Niger are still at a low level and the population of the study region is growing 3.3% per year, a sharp increase in the total demand for meat and milk is forecast, which means there is plenty of room for expansion of livestock production.

The estimated quantity of animal excrement as a by-product of stock raising is 3,143,000 tons for cattle, 391,000 tons for sheep, 543,000 tons for goats, 582,000 tons for camels, 166,000 tons for donkeys, and 147,000 tons for horses (see Tableau A4.4.2.7 for the estimated base). However, these important manure resources are not efficiently used for agriculture because livestock are mainly fed on natural grasslands.

#### (4) Animal health

The government organizes animal immunization campaigns against epidemics. However, as the budget allocated to these preventive measures is not sufficient, and further, since the number of veterinarians, vaccines, the health facilities and the like are also insufficient, inoculation rates

are low. Since fees are also starting to be charged for immunizations, inoculation rates have been continuously decreasing. Principal animal health facilities consist of paddocks and capture fences for inoculation. They are available in every district. Thirty-four of these facilities are made of iron, thirty are made of concrete, and twenty-four are of earthen or wooden construction. However, most of the facilities are old (for information by area, see Tableau A4.4.2.8).

#### (5) Stock farming infrastructure

##### 1) Animal management facilities

The major facilities used in stock farming consist of water supply facilities, animal corridors, along with capture fences and grassland barriers. However, stock farming generally takes the form of grazing on natural grasslands. There are no fences in keeping with the traditional system of land use. Thorny shrubs are planted around the agricultural fields and improved grasslands as a means of restricting the entry of animals.

##### 2) Grasslands

Grasslands total an area of 431,300 ha as shown in Table 4.2.1. Most of the grassland is natural, with almost no improved grasslands in the Study area. Although irrigated grasslands have been developed on the banks of the Niger river, some of the supporting irrigation facilities are not well managed.

##### 3) Animal water supply facilities

Animal water supply facilities are inadequate in number which leads to conflicts between farmers and herders, as well as among herders regarding the supply of water to animals during the dry season. Currently, 78 wells exist exclusively for animals, including 14 tube wells (Department, PNEDD). A further 706 ponds are used, while the Niger river plays an important role in transhumance. The major problems of water supply facilities include: ① insufficient number of water supply facilities, ② ponds become buried with sand and become unusable, and ③ wells are not used because of the breaking down of pumps.

#### (6) Beekeeping (Apiculture)

According to the PNEDD, there exist many honey producing plants in the districts of Say and Kollo. In the district of Say, two groups (sixty members) produce three tons of honey per year, and generate a net income of FCFA 112,500 - 150,000 per person. It offers high profitability with little capital investment. Currently, honey collection using existing species is common, although the honey yield per swarm is small.

#### (7) Technical instruction system

The Departmental Directorate of Livestock and Animal Industries supervises the activities of six district level services, three communes, eight livestock offices and some forty CIBs established in the district and large towns.

In 1996, the Directorate had 126 regular and 42 temporary employees for technical instruction.

Although there are a reasonable number of regular employees, the number of those who are assigned to supervise livestock quarantine and illegal importing and exporting is insufficient. Supposing that a livestock supervisor monitors a total of 1,000 animals, including small- to large-sized animals, more than 200 supervisors are necessary. In fact, however, fewer than 100 employees are assigned to this task. This is mainly due to a lack of budget among the administrative organizations.

#### (8) Major issues to be addressed

- ① Although a technical instruction system is in place, the budget and the staff are insufficient at all levels, which does not help with the improvement of livestock productivity.
- ② Herders, who see large herds as assets, would rather increase herd size than improve productivity per head.
- ③ Animal breeds exist which are adapted to the local natural conditions, such as the Azoic which is raised both for meat and milk. However, these breeds do not contribute to the improvement of livestock, because technical operations such as artificial insemination are not practiced.
- ④ The number of animals is not consistent with the availability of fodder resources, which results in grassland degradation.
- ⑤ Animal water supply facilities such as wells and ponds have been becoming less functional, and their number is insufficient.
- ⑥ Large animals (cattle) are bred as a means of savings, as they are not raised for commercial purposes. Consequently, their productivity is low.
- ⑦ Effective use of animal excrement is essential to achieving an increase in food production.

### 4.4.3 Forestry

#### (1) Trends in forest resources

Forest resources are difficult to grasp, especially because the definition of area and volume of resources and harvest periods (dry or rainy season) is variable. What follows is based on the results of analysis of remote sensing data.

### 1) Forms of forest resources

According to the environmental analysis summary of the department of Tillabéri, the department has 912,000 ha of forest under protection in the form of national forests or national parks, with other forest areas totaling more than 1,650,000 ha for a grand total of 2,652,000 ha. These other forest areas include large-scale tree plantation area on projects, village-owned membership forests for cutting firewood, as well as fallow lands, lands abandoned from cultivation, and wild shrub lands which located in areas with somewhat abundant rainfall.

### 2) Forest area

Table 4.2.1 indicates that forest resources in the Study area comprise an area of 4,806,000 ha of bare land I (vegetation coverage rate of 20-60%) and 391,000 ha of woodland, etc. (vegetation coverage rate of more than 60%) for a grand total of 5,197,000 ha. A large, 49% difference from that above.

### 3) Current wood production capacity

Table 4.4.3.1 indicates wood production, calculated for each district of the Study area, using the criteria of potential output and sustained output based on vegetation coverage rate shown in Table 4.4.3.2.

**Table 4.4.3.1 Wood productivity per hectare**

(Unit: stère/ha)

Vegetation coverage rate	Potential output	Sustained output
Bare land I (20-60%)	7	0.6
Woodland (over 60%)	11	1.0

Source: Soil and forest planning and utilization project

Note: Stère is the unit for measuring the quantity of firewood, equivalent to 1m<sup>3</sup>

**Table 4.4.3.2 Wood production per district**

(Unit: 1000 stères)

Classification		Filingué	Kollo	Ouallam	Say	Téra	Tillabéri	Total
Bare land I	Potential output	8,289	3,056	10,159	5,095	3,468	3,576	33,643
	Sustained output	710	262	871	437	297	306	2,883
Woodland	Potential output	546	352	133	2,328	608	336	4,303
	Sustained output	50	32	12	212	55	31	392
Total	Potential output	8,835	3,318	10,292	7,387	4,076	3,912	37,946
	Sustained output	760	294	883	649	352	367	3,275



#### 4) Wood consumption

About 90% of wood is used as firewood in the form of wood sticks or charcoal (most such trees consist of the *Acacia Albida*. See Annexe 4.4.3.1 for details). The remaining 10% is used for handicrafts and wood tools. Wood consumption is estimated to be 1.22 stère/person/year. As is indicated in Table 4.4.3.3, wood demand has been increasing each year. In order to meet the growing demand for firewood, it is estimated that it will be necessary to establish a rational management of supply system and to restrict demand to the extent possible.

##### (a) Each district

The total quantity of wood necessary for the entire Study area is about 2.13 million stères in 1996, as shown in Table 4.4.3.3, while total sustainable output is estimated to be about 3.27 million stères as shown in Table 4.4.3.2. If no measures are taken, it is estimated that demand for wood will exceed the sustainable output level by the year 2010, at which time potential output will begin to be exhausted.

**Table 4.4.3.3 Estimated amount of wood necessary for the Study area**

District	(Unit: stères)					
	1996	1997	2000	2005	2010	2015
Filingué	438,545	451,263	491,672	567,221	654,379	754,929
Kollo	435,904	459,442	537,964	699,771	910,247	1,184,028
Ouallam	284,894	292,301	315,698	358,930	408,081	463,962
Say	290,027	303,948	349,851	442,272	559,109	706,810
Téra	464,562	479,428	526,942	616,823	722,037	845,197
Tillabéri	212,332	214,880	222,709	236,396	250,925	266,346
Total	2,126,263	2,201,262	2,444,836	2,921,414	3,504,776	4,221,272

##### (b) Niamey

Consumption of firewood has greatly increased in Niamey, the capital (population growth ranges between 6-8% per year), and desertification has been invading into the vicinity of Niamey. The firewood taken from the forests is transported to Niamey and sold to the general populace by suppliers at a price of 100 FCFA per fagot (about 0.01 stères). A Study conducted in 1984 by the IBRD indicates that it is believed that the firewood consumption in Niamey would exceed sustainable production by the year 2010 as shown in Table 4.4.3.4.

**Table 4.4.3.4 Estimates of sustainable production and wood consumption in Niamey**

Area	Sustainable production (1,000 t/year)	Wood consumption (1,000 t/year)					
		1986	1990	2000	2010	2020	2030
Niamey	266	97	126	232	420	760	1,374

Source: IBRD (1998)

Note: The total area of natural woodlands in a radius of 100 km from Niamey is 1,380,000 ha, and natural production is 193 kg/ha/year.

## (2) Protection of forest resources

### 1) Activities of the Directorate of the Environment of the Department of Tillabéri

A total of fifty-five staff members in the Directorate of the Environment of the Department of Tillabéri in the fields of water resources, soil conservation, and forest are assigned to the management of natural resources. Due to an inadequate budget, the situation is far from being considered sufficient for the effective management of forest resources, monitoring the transport of firewood, and for providing education and training to inhabitants.

The present major forest activities of the Directorate of the Environment of the Department of Tillabéri are clearly reduced, compared to the situation in the 1980s. A major reason for this is the difficulties being faced in securing sufficient funds due to inadequate national finances. This, combined with the degradation of facilities and equipment, have led to a decline in afforestation activities.

The degradation of facilities and equipment in the public tree nurseries is particularly striking: production was 1.4 million plants in 1990, but has fallen by half, to 670,000 plants today (1998), which is an obstacle to afforestation activities. Although the Engagement of Maradi in 1984 anticipated a target afforestation area of 15 ha at the department level, 10 ha at the district level and 5 ha at the community level, these target figures have not been achieved in recent years.

### 2) Dissemination of improved cooking stoves

Firewood is the essential combustible fuel in households in Niger. Dissemination of a new metal cooking stove has been promoted under the support of the GTZ and other programs in order to improve energy efficiency. (According to a JOCV survey, compared with the traditional three-point cooking stove, the improved stove consumes only about 70% as much fuel.) However, the dissemination of this type of improved stove has made little progress in rural areas because of a lack of awareness of the efficiency by the inhabitants.

## (3) Problems at the village level

### 1) Tree cutting in cultivated fields

The reduction of trees in cultivated fields due to the development of agricultural land and excessive tree cutting for firewood is striking in the Study area. This causes a degradation of cultivated fields through run-off of the soil.

### 2) Increased demand for wood

**Firewood:** Firewood is practically the only domestic energy source, and its large scale consumption is leading to an important reduction of forests. Collection of firewood is almost exclusively the task of women and children and, as forests are reduced, they are forced to walk longer distances to seek firewood.

**Material:** Wood is necessary for the building of houses, as well as the making of furniture, trunks and poles for agriculture and animal barriers. Demand for wood as a building material is also increasing every year.

### 3) Difficulties of afforestation activities at the village level

It is ideal that tree planting activities be carried out shortly before the rainy season, but at that time, farmers are very busy with agricultural tasks, therefore coordination with farmers must be arranged..

As the management of tree nurseries requires skill and experience, seedling production is only possible with a worker who has a good command of the required techniques. Therefore, seedling production in remote rural villages which are difficult for forest agents to access is not easy. Another point is that even if many trees are planted, such planting does nothing to secure the rural household economy.

### 4) Maintenance and management of village owned forests

Under the present circumstances, village owned forests can be regarded as community forests. Trees are mainly used by local inhabitants for firewood and charcoal. However, since there is no system in place to maintain and manage these resources, they are used in a disorderly fashion.

## (4) Major issues to be addressed

The afforestation activities conducted to date at the initiative of the government have been inadequate due to lack of awareness and instruction of the population regarding forest management. A system should be established through the promotion of such activities in order to develop the ability of local inhabitants and have them recognize the problem and give them an incentive such as allowing local residents to use the public land used for replanting and protected forests to act on it so that they can plan and manage afforestation activities on their own.

## 4.5 Market distribution

### (1) Agricultural products

Most agricultural products are for self-consumption and are not produced in quantities that can be sold or distributed for commercial purposes. The distribution of commercial products is directed to Niamey, the area where consumption is greatest. With the exception of products which consumed in local villages, the distribution route generally flows from the community/village → regional center (District capitals) → Niamey. The intermediaries of Niamey often come to buy at the markets of communities and districts; for export products like onion, the intermediaries deal directly with the producers. Laws and regulations related to markets and commercial transactions do not exist.

The only agricultural processing facilities are rice clearing facilities installed at Kirkissoye, Kollo and Tillabéri. An exception is seen at the agricultural cooperative located near consumption centers in the district of Tillabéri which manages distribution infrastructures such as fruit selection facilities, pre-cooling facilities and refrigerator trucks that target major consumption areas such as Niamey.

Major problems in the stages of production, transportation and storage, and consumption include the following:

- ① Production: Since farmers do not have sufficient information on markets, prices are set mainly based on direct negotiations with intermediaries. The lack of collection and distribution facilities is another problem. Farmers are not well organized, post-harvest techniques are poor, and sales of processed food products is still at a starting phase.
- ② Transportation and storage: Farmers do not have any means of transport such as trucks; storage and cooling facilities do not exist; production norms are not set; nor is any market information system set up.
- ③ Consumption: Markets are not well developed, storage warehouses are inadequate, the management of hygienic conditions is insufficient, nor is any information system set up.

## (2) Livestock products

With the exception of local consumption, livestock products are shipped to Niamey, the area of greatest consumption. Livestock are exported to nearby countries such as Burkina Faso, Benin, Nigeria and Mali. The statistics of the Ministry of Agriculture and Livestock indicates that the quantities exported are not necessarily large.

Transactions on livestock are carried out through direct price negotiation between a herder and a Dilali (broker) who is a trader or intermediary. In the Study area, there exist six equipped livestock markets: three in the district of Filingué, and one in each of the districts of Ouallam, Téra and Tillabéri.

As the herders are not organized into groups, and have no information regarding the market, so the intermediaries usually buy their animals at low prices. The route for meat distribution flows as follows: herder → livestock market → slaughterhouse → market → consumer. Livestock traders or intermediaries serve as a link between herders and the slaughterhouse. Livestock are purchased by livestock traders or intermediaries at rural markets, or through direct negotiation with herders in the area. Herders are free to choose whom to trade with. Livestock traders or intermediaries are not organized. Wholesale traders, intermediaries, and retailers form part of the route from the slaughterhouse to the consumer.

Transactions in milk and dairy products are mainly carried out directly between the producer and the consumer. Exceptions include a commercial dairy producer known as the OLANI, and the Niger Lait, which is an a household-scale producer in Niamey. The OLANI collects milk in gourds by trucks, then it processes and sells the milk in bulk to retail stores.

Milk consumption (from cattle, sheep and goats) in the Study area is discussed in 4.4.2 Stock Raising and there is room for expansion of consumption. Currently, consumption of dairy products in urban areas is growing, and both producers are doing well..

Large livestock products processing plants do not exist in the Study area. As is indicated above, the OLANI in Niamey processes 40 tons of fresh milk per day. There are eight slaughterhouses in the district of Filingué, six in Kollo, five in Ouallam, four in Say, ten in Téra, and six in Tillabéri, or a total of thirty-nine. The slaughterhouses are often equipped with skin dryers. There exist thirty-two equipped with such dryers.

Issues to be addressed with regard to livestock distribution and markets are, in principle, the same as those noted for the distribution of agricultural products. Since there exists an insufficient number of employees for market and slaughterhouse monitoring, illegal slaughtering and transactions often take place.

### (3) Forest products

Firewood represents 90% of the forest products produced, and the greatest part comes from trees cut in the national forests. An authorization issued by the government is required for firewood transportation and sales in consumption areas, like Niamey. A tax is supposed to be paid at the location where the wood is cut for transporting wood. This is the reason why control centers are set up at the entry points of the consumption areas, and illegal transportation is punished by a forest surveillance squad.

However, inhabitants surrounding the firewood producing national forests do not have any right to restrict the actions of traders who have official authorization. Therefore, the traders concerned can only draw profits from the forests, and no indemnities are paid to the inhabitants for the destruction to the forest. To resolve this problem, the government has issued a decree on the creation of firewood markets, which is now being implemented on a trial basis in the districts of Kollo and Say (see 8.7 Environmental protection). As a result, villages managing national forests have come to resolve their own problems (e.g., construction of schools and wells) independently with the proceeds from the sales of firewood. On the other hand, they have spent most of the proceeds, and are left with few funds to be used for the original purpose of carrying out sustainable forest management. Moreover, a similar approach to creating such markets has yet to be introduced in the other four districts. Prompt action is required.

### (4) Major issues to be addressed

- ① Agricultural and livestock products are mainly for self-consumption and little is sold and distributed for commercial purposes. For that reason, market-related laws have not been established, and while laws do exist regarding food hygiene and slaughtering, they are not observed.

- ② Infrastructural and institutional supports in terms of market and distribution are lacking at every stage of production, transportation and storage, as well as consumption. They should be set up together with the creation of production areas so as to keep production losses to a minimum, and increase the commercialization rate of production.
- ③ It is necessary to improve the above-mentioned infrastructural and institutional aspects, by separating the issues to be addressed into immediate to medium and long terms in a sequential fashion.
- ④ With regard to forest products, it is desirable that the decree on firewood market creation currently enforced in the district of Kollo and Say also be enforced in the other districts.

#### **4.6 Agricultural, stock raising, and silvicultural support**

##### **(1) Agricultural, stock raising and silvicultural support**

##### **1) Agricultural, stock raising and silvicultural research**

Agricultural, stock raising and silvicultural research in Niger is mainly conducted by the Niger National Agronomic Research Institute (INRAN: Institut National de Recherches Agronomiques du Niger) which covers the fields of agriculture, stock raising, silviculture, and pisciculture, with the support of other international research centers, such as the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), the West African Rice Development Association (WARDA) and the branch office of the International Livestock Research Institute (ILRI).

The INRAN was established in 1975 as a result of reorganizing the former French research agency, located in Niger, and was placed under the umbrella of the Ministry of Agriculture and Livestock in 1985. Its head office is based in Niamey, with five departments (agricultural research, forest research, livestock research, agro-economic research, and ecological research) placed under the overall supervision of its Director. In 1997, it had some 500 employees, including 100 scientists and technicians. The Survey Site selects varieties, makes their improvements, produces seeds for the major crops of the region, namely millet, sorghum, and cowpeas, but also for peanuts, rice and vegetables, and conducts cultivation tests for fruit trees. It also conducts breeding, raising, and immunization tests on various animals such as cows, sheep, and other livestock. With regard to silviculture, tests are conducted on plant growth, planting and afforestation techniques. In addition, soil analysis, fertilizer tests and chemical analysis are conducted with regard to soil.

Although the INRAN conducts such a diversified range of research activities, it is unable to secure an appropriate staff and budget because of the financial difficulties of the government. This also adversely impacts its ability to actively tackle its various tasks. Its links with governmental extension agencies are weak.

Under such conditions, the INRAN has organized workshops with scientists from other research agencies and extension services, universities and NGOs in collaboration with the ICRISAT Sahelian Center to review the findings of various studies. Based on the results of past studies, those of which technological transfer to local residents is possible are compiled in the form of technological manuals and distributed to instructors however the stage of actual technological transfer has not been reached.

## 2) Agricultural extension

Public agricultural extension activities to village population are executed by the District section of agriculture under the control of the Departmental Directorate of Agriculture according to the national policy of promoting decentralization. In addition, during the years 1993 through 1998, the government has been carrying out the education and training of local inhabitants as well as reinforcing organizations engaged in the diffusion of agriculture in the department of Tillabéri through the Program for Reinforcing Agricultural Support Services (PRSA) (see Annexe A4.6.1) [Program de renforcement des Services d'Appui à l'Agriculture (PRSA)] with financing from IBRD. As of the end of 1998, there were a total of fifty-eight agricultural instructors for six districts in the department. However, this number represents the total number of licensed agricultural instructors and only a portion of these people actually meet the farmers face-to-face and conduct extension activities. These agents use motorcycles as transport to the actual farming areas, but since the level of road maintenance is low and due to tight national finances, there is not enough budget for the distribution of agricultural technologies. It is therefore difficult to carry out effective distribution activities in the Study area. In addition, since the ending of the USAID project due to the revolution in 1996, to maintain a research system, activity has halted. For these reasons, there is little opportunity for farmers to obtain basic agricultural technology which would prevent soil degradation and increase productivity. Therefore, farmers must continue using traditional agricultural methods which are low in productivity. Note that this is the total number of qualified instructors; actual educational activities are handled by a few staff members per district, thus not sufficiently organized. Considering the poor level of road conditions in the Study area and the financial difficulties of the government, efficient education throughout the Study area cannot be expected. In addition, the farmers have no opportunity of learning basic farming techniques which will allow them to stop soil degradation and increase yields, and they are forced to produce at low yields using traditional methods.

In 1979, the Hydro-Agriculture Improvement Office (ONAHA: Office National des Amenagements Hydro-Agricoles) became independent from the government and became a public entity as the agency in charge of the implementation of irrigation projects and the provision of guidance concerning the extension of farming. However, stagnation of the price of rice did not allow ONAHA to collect fees for the management and rehabilitation of irrigation facilities, which resulted in financial difficulties for the organization. In 1984 irrigation

cooperatives composed only of beneficiaries were established with the aim of securing effective management. These cooperatives assume responsibility for the management of irrigated fields with technical and financial support provided by ONAHA.

### 3) Agricultural credit

In Niger, the National Agricultural Fund Association (CNCA: Caisse National de Credit Agricole) provides funding to agricultural materials centers (CA) and agricultural cooperatives, focusing on public enterprises such as the Food Product Office of Niger (OPVN) and the Nigerian Peanut Distribution Corporation (SONARA). However, these public enterprises and cooperatives have incurred huge debts resulting from the aggravation of their performance, amongst other causes. Then, the CNCA, which deals with these types of funding, has stopped its activities, and the government has changed its policy on market price of agricultural products. Thus, the agricultural credit system of the country is actually not working. Several systems had been set up based on agricultural development projects supported by foreign aid to provide small-scale agricultural loans. There are many cases, however, when these systems do not work well in the present rural economic system of near self-sufficiency, due to a lack of credit experience, a lack of sensitization and weak managerial skills on the part of most farmers. (Currently under the loan system in the first phase (1991-93) of the Torodi Canton Local Development Project (PDLT: Projet de Développement local du canton de Torodi) Under the support of France, agricultural loans are provided for the purchase of fertilizer, pesticides and carts, and for the cultivation of baobab leaves. The system has shown remarkable results, with the rate of repayment reaching 100%. This is due to thorough education and raising of the consciousness of the inhabitants and strict evaluation of the participant's ability to repay through participation in the project by inhabitants (see Annexe 3.6.1 and Annexe 4.6.2).

### (2) Farmers' organizations

A traditional group of young people known as the SAMARIA exists in the Study area and has played an important role in the identification and resolution of problems at the community level. However, the unity of such farmers' organizations is weakening due to changing social conditions such as the increasing outflow of the work force to urban areas or overseas, population movements within the region, and changes in the family structure following the uranium economy after independence of the nation, not to mention damage from successive droughts. In addition, foreign aid has been used to implement policies necessary for the region such as the introduction of a financing system to improve the lives of farmers, improve traditional agricultural techniques, establish mills which reduce the long working hours of women and the establishment of cereal banks which can compensate for food shortages due to drought and population increase. Unfortunately, however, these activities are not sustainable, because of the low level of education and the lack of management practice of the people concerned.



In the light of this situation, the government established a development system in 1983 which integrates the different organizations at each canton, district, departmental and national level for the purpose of securing effective development with the participation of the population. In spite of these efforts, however, the influence of traditional leaders and the economic roles of the organizations, amongst other factors, have been complicated and have not achieved the expected outputs.

The cooperatives in Niger range from individual cooperatives such as mutual aid groups and cooperatives to federations such as the Local Cooperative Union (ULC), Subregional Cooperative Union (USRC), Regional Cooperative Union (URC), and National Cooperative Union (UNC), amongst others, which have existed for long periods of time. However, in December 1997 the government ordered that organizations which rank higher than the Local Cooperative Union be dissolved, judging that they do not allow the members to act in an independent way and that they are moving away from their assigned objectives. The reorganization of cooperative organizations will therefore be a problem to be addressed in the zone in the future.

### (3) Major issues to be addressed

- ① INRAN and the extension agencies which should actively support agriculture do not have sufficient budgets, because of the financial difficulties of the government. As a result, they do not have a good understanding of regional agriculture and cannot conduct research on current issues needing to be addressed, nor conduct the necessary guidance and extension.
- ② Based on consideration of past development projects directed by donor countries, current developments are fundamentally based on the terroir management concept which entails the participation of the population. To support it, the population should be provided with suitable instruction and the leaders should be trained as necessary.
- ③ To achieve development and maintain its effects based on terroir management, a system for coordinating various efforts of donor countries as well as research and extension agencies should be established, and sufficiently detailed guidance should be given to the farmers in a continuous fashion.
- ④ It is necessary to establish policies to reduce the working hours of women by introducing measures for the improvement of household economies and income levels and establishing cereal banks to ease concerns of farmers who are still under the threat of food shortage due to the progress of desertification.