

Japan International Cooperation Agency  
Ministry of Mine, Energy and Water  
The Republic of Mali

**THE STUDY OF PREVENTION  
FOR  
DESERTIFICATION  
IN  
THE SOUTH REGION OF SEGOU  
IN  
THE REPUBLIC OF MALI**

Final Main Report

Master Plan



July 2003

Japan Green Resources Corporation

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## PREFACE

In response to a request from the Government of the Republic of Mali, the Government of Japan decided to conduct the Study of Prevention for Desertification in the South Region of Segou in the Republic of Mali and entrusted the study to the Japan International Cooperation Agency (JICA).

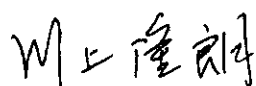
JICA dispatched a study team headed by Mr. Naoya SHIMIZU of the Japan Green Resources Corporation to the Republic of Mali, between April 2000 and June 2003.

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

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

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

July 2003



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Takao KAWAKAMI  
President  
Japan International Cooperation Agency



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## Letter of Transmittal

Mr. Takao Kawakami,  
President,  
Japan International Cooperation Agency

July 2003

Dear Mr. Kawakami,

We are pleased to submit herewith the Final Report on the Study of Prevention of Desertification in the South Region of Segou in the Republic of Mali.

This study was implemented by the Japan Green Resources Corporation(JGRC), under a contract between the Japan International Cooperation Agency(JICA) and JGRC, over a period of 40(forty) months from March 2000 to July 2003. In the Study, we have looked into and gained a full understanding of the actual state of desertification in the region and related issues. On the basis of this we have worked to formulate the most appropriate Master Plan for the prevention of desertification, by means of the development of resident-participatory sustainable agriculture, stock raising, silviculture, and the improvement of the living standards, based on support for the self-reliance of the local residents facing desertification.

While the Study area is Mali's leading agricultural production region, it is a region in which there is a marked decline in the agricultural productivity of the land and decrease of the forest area, accompanied by the rapid advance of desertification. There is a serious decline in the living standards of the residents. In formulating the Master Plan, we adopted the method of taking one part of the Master Plan projects, implementing this as a model project, and feeding back the results of the feasibility and practicality evaluations of the model project into the Master Plan. In the process of carrying out the model project we were able to learn a great deal, the results of which were reflected in the formulation of the final Master Plan.

The Master Plan is set to commence in 2004 and has a target completion year of 2025. The 22-year period will be divided into 4 phases, and the plan will be implemented phase by phase. Should this plan be implemented, it can be applied not only to the Republic of Mali but to the entire Sahel region, as a model case for the prevention of desertification, and it is hoped the Master Plan will be implemented without delay.

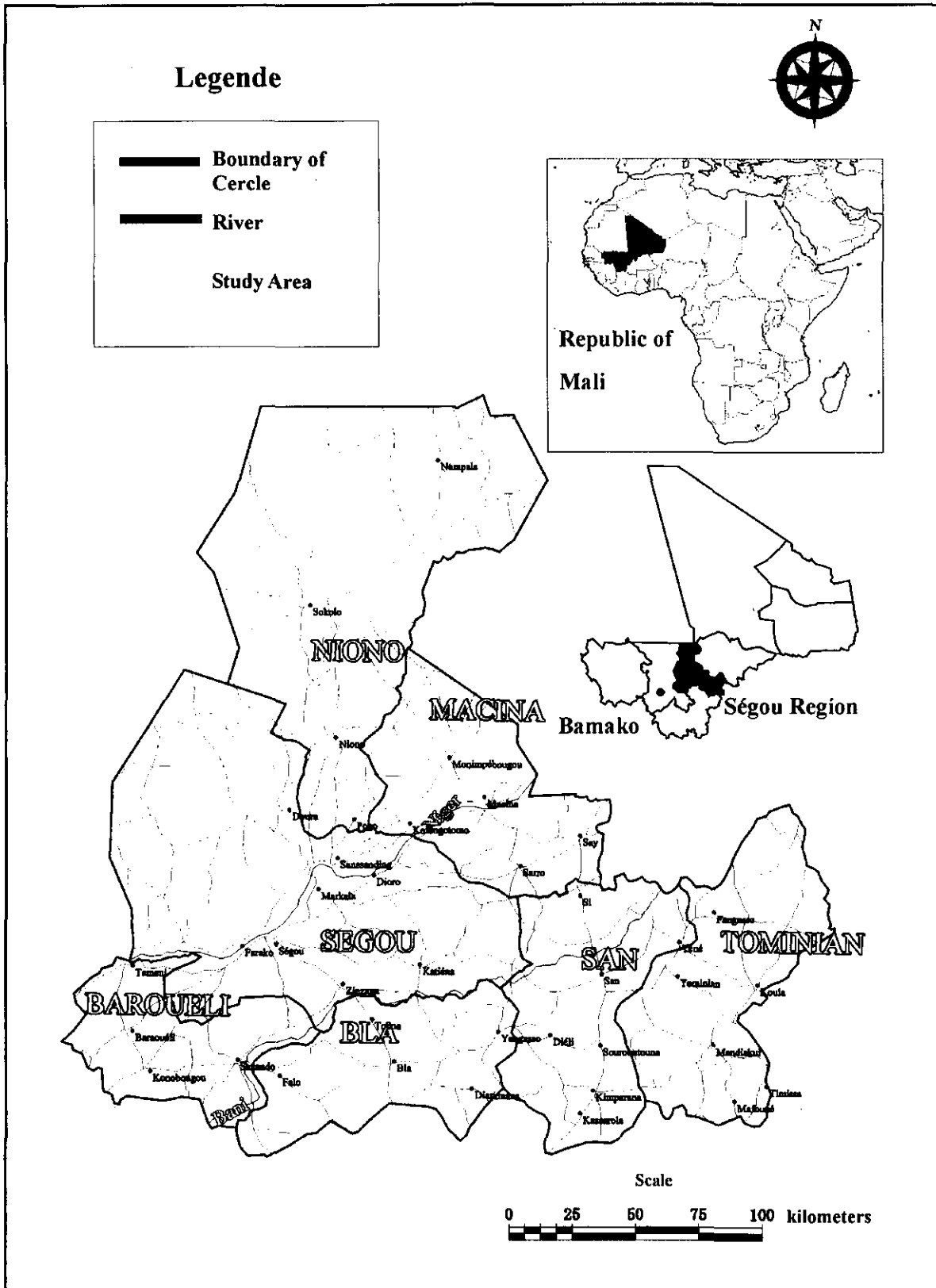
We wish to take this opportunity to express our sincere gratitude to JICA, as well as the relevant officials concerned of the Ministry of Foreign Affairs and the Ministry of Agriculture, Forestry and Fisheries of Japan for their great understanding and assistance during the Study period. We also wish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

Very truly yours,

  
Naoya Shimizu, Team Leader,

The Study Team for the Prevention of Desertification in the  
South Region of Segou, Republic of Mali,  
Japan Green Resources Corporation

# Location Map of the Study Area



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## List of Abbreviation

Abbreviation	French/English/German
AACAER	Antenne de l'Appui Conseil et Aménagement et Equipement Rural
ACN	Antenne Conservation Nature
AfDB	African Development Bank
BHN	Basic Human Needs
BNDA	Banque National de Développement Agricole
CCD	Convention des Nations Unies sur la lutte contre la Désertification
CDF	Code Dominal et Foncier
CMDT	Compagnie Malienne de Développement des Textiles
CSC	Centre de Santé Cercle
CSCOM	Centre de Santé Communautaire
DED	Deutscher Entwicklungsdienst
DNAER	Direction Nationale de l'Aménagement et de l'Equipement Rural
DNAMR	Direction Régionale de l'Appui au Monde Rural
DRAER	Direction Régionale de l'Aménagement et de l'Equipement Rural
DRAMR	Direction Régionale de l'Appui au Monde Rural
DRCN	Direction Régionale de la Conservation de la Nature
DRS	Direction Régionale de Santé
FODESA	Programme Fonds de Développement en Zone Sahélienne du Mali
GDP	Gross Domestic Product
GEF	Global Environment Fund
GIS	Geographic Information System
GPS	Grobal Positioning System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
ICRAF	International Center for Research in Agroforestry
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
IDA	International Development Association
IER	Institut d'Economie Rurale
IFAD	International Fund for Agricultural Development
JGRC	Japan Green Resources Corporation
JICA	Japan International Cooperation Agency
KFW	Kreditanstalt Für Wiederaufbau
ON	Office du Niger
OPAM	Office des Produits Agricoles
ORS	Office Riz Ségou
PAE	Projet Agro-Ecologie
PAL	Programmes d'Actions Locaux
PAR	Programmes d'Actions Régionaux
PASAOP	Programme d'Appui aux Services Agricoles et Organisations Paysannes
PDR	Programme de Diversification des Revenus en zones non Cotonniers
PEDVS	Projet Fonds de Développement Villageois de Ségou
PIRT	Projet Inventaire des Ressources Terrestres
PMB	Programme de mise en valeur des plaines du Moyen-Bani
PNAE/PANCID	Plan National d'Action Environmental et Programmes d'Actions Nationaux de la

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	<b>Convention Contre la Désertification</b>
<b>PNVA</b>	<b>Programme National de Vulgarisation Agricole</b>
<b>SAA</b>	<b>Sasakawa Africa Association</b>
<b>SCN</b>	<b>Service Conservation de la Nature</b>
<b>SLACAER</b>	<b>Service Local de l'Appui Conseil et de l'Amenagement et Equipement Rural</b>
<b>SOMIEX</b>	<b>Société Malienne d'Importation et d'Exportation</b>
<b>UBT</b>	<b>Unité du Bétail Tropical</b>
<b>UPA</b>	<b>Unité de Production Agricole</b>
<b>UNDP</b>	<b>United Nations Development Program</b>
<b>UNICEF</b>	<b>United Nations International Children's Emergency Fund</b>
<b>USAID</b>	<b>United States Agency for International Development</b>
<b>WID</b>	<b>Women in development</b>

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## List of Weights, Measures and Currency Exchange Rate

<b>Currency</b>	(As of March 31, 2003)
FCFA	Francs Communauté Financière Africaine (Franc used in African countries) (FCFA1 = ¥0.2002)
EUR	Euro (EUR1 = ¥131.33)
¥	Japanese yen
\$	US dollar (\$1 = ¥121.20)
<hr/>	
<b>Length</b>	
mm	Millimeter
cm	Centimeter
m	Meter
km	Kilometer
<hr/>	
<b>Weight</b>	
g	Gram
kg	Kilogram
t	Ton
<hr/>	
<b>Area</b>	
m <sup>2</sup>	Square meter
km <sup>2</sup>	Square kilometer
ha	Hectare
<hr/>	
<b>Volume</b>	
m <sup>3</sup>	Cubic meter
l	Liter
stere	Stere (A unit to measure charcoal and equivalent of 1 m <sup>3</sup> )
cc	Cubic centimeter
<hr/>	
<b>Other</b>	
l/s	Liter per a second
m <sup>3</sup> /s	Cubic meter per a second
t/ha	Ton per a hectare
kcal	Kilocalorie
kcal/g	Kilocalorie per a gram
kg/ha	Kilogram per a hectare
m/s	Meter per a second
stere/ha	Stere per a hectare



## **Summary**





## SUMMARY

### **I Introduction**

#### <Objectives>

1 This is the draft final report of the Study implemented with a region covering 3.3 million hectares south of Ségou as the study area, in accordance with the Scope of Work concluded between the Government of the Republic of Mali and the Japan International Cooperation Agency (JICA) in December 1999 to specify the detailed rules for implementation of the Study which has the following objectives:

- ① To formulate the Master Plan for integrated rural development for the prevention of desertification through development of sustainable agriculture, stock raising and silviculture, reflecting the results of the verification study.
- ② To carry out the transfer of technology relating to the methodology of the Study and the procedures and guidelines for drawing up the study plans to the counterparts from Mali in the course of the Study.

#### <Study Area>

2 The south of Ségou Region, target area of this Study is on the right (south) bank of the Niger River in Ségou Region that is located in the central part of Mali. The study area covers the 6 Cercles of Baraouéli, Ségou, Bla, Macina, San and Tominian, of which Ségou and Macina are separated by the Niger River. The population in the study area is about 1.1 million and there are 1,695 villages with a population of 200 or more.

### **II Present state of the study area**

#### <Progress of desertification>

3 The forest area of Mali decreased by 7.1% during 17 years from 1974 to 1992. The unit yield of millet, which constitutes the main cereal and indicates the land productivity, dropped from 800 kg/ha in 1980s to 600 kg/ha in 1990s. The decline of land productivity, which means desertification, is proceeding in the entire national. The main causes for this advancing desertification are drop of soil fertility caused by the shortened fallow period of cultivated lands, decrease of forests due to tree cutting, and overgrazing of livestock under the background of declined precipitation and population increase (annual increase rate of 3% or less). The Government of Mali established a National Desertification Control Plan (NDCP: PNLCD; Plan National de Lutte Contre la Désertification) in 1985 and started to implement the measures for prevention of desertification. However, sufficient results could not be obtained due to lack of information transmission and residents' participation in implementing the measures. In 1998, based on the provisions of the United Nations Convention to Combat Desertification, the Government of Mali established the National Environmental Action Plan and National Action Plans provided for the implementation of the United Nations Convention to Combat Desertification (NEAP/ANP-CCD: PNAE/CID; Plan National d'Action Environmental et Programms d'Actions Nationaux de la Convention Contre la Désertification).

#### <Measures for prevention of desertification>

4 In response to the above mentioned NEAP/NAP-CCD (PNAE/CID), an Action Plan "Program of Recovery and Renewal of Natural Resources" (PAR: Programms d'Action Régionaux) was established

in Ségou Region . This Plan specified the implementation of activities by the residents' participation for the following four items, in order to achieve a rational management of natural resources:

- ① increase of the residents' ability on land management,
- ② promotion of the comprehensive management of natural resources and agriculture and stock raising,
- ③ promotion of the rational management and use of forests, and
- ④ efficient implementation of the monitoring and evaluation of Action Plan.

To this end, a budget of 3 billion Fcfa for three years was deemed necessary, but it was actually difficult to secure this amount. It is hard to say that sufficient activities and effects have been demonstrated by now.

#### <Trend of Aid>

5 There are many projects being implemented by administrative agencies and aid organizations such as NGOs in the study area. Many solution technologies and schemes to counter desertification have been introduced and some have been successful. In successful cases, however, the effects have stopped at village unit or agricultural production unit level, namely at individual “points”, and have not expanded to a wider level. The main causes of this limited spread are the low interest of residents in programs to counter desertification and the poor exchange of information between villages. In addition, the relationship among the administrative agencies, international aid organizations and NGOs which are implementing similar projects is not closely cemented and this is deemed to be another cause.

#### <Economy>

6 The industrial structure of Mali in 2000 consisted of the primary industry (43.4%), the secondary industry (17.8%), and the tertiary industry (38.8%). The per capita GDP was 150,000 Fcfa (approximately US\$ 220) and Mali falls into the poorest group in the world. The literary rate of adults is assumed to be 31% (World Bank Fact Book 1995), and the educational difference between urban and rural areas is wide. The Human Development Index (HDI) established by the UNDP ranked 166th in 174 countries in the world. The economic system followed the planned economy until 1985, but since then, it has been changing to the market economy.

#### <Nature>

7 The southern part of the Ségou region is located in a basin and forms a broad plain with little undulation. The main stream of the Niger River which extends 292 km and its branch stream, the Bani River, which extends 250km, flow through this basin. The Ségou region which the study area is located represents the main agricultural zone producing approximately one third of the general domestic production of millet, which is the principle food of the nation. On the other hand, progress of desertification is conspicuous in this area recently. The basin is an area relatively suited for agriculture, stock raising and forestry. The geologic strata consist of fluvial sedimentary strata of the Quaternary period of the Cenozonic era, and weathered silt, sand and gravel are distributed widely in the study area. The main soil type is Alfisols under the USDA classification. This soil is low in organic contents, lack nitrogen and phosphoric acid, but the soil shows almost no problem for agriculture in terms of depth of soil stratum, drainage, and pH. With the average temperature in the study area being 29°C and the precipitation, 600 to 700 mm a year, there is a great potential for agricultural development of the study area. Therefore, this area has the sufficient potential to prevent desertification through the agricultural development by taking the conservation of natural resources in

account.

#### <Water resources>

8 As the water source in the study area, surface water is observed throughout a year in Niger River and Bani River as well as in large lakes and marshes. In many "wadis" (seasonal rivers) and small marshes, surface water is found only in certain periods of the year from the rainy season until the beginning of the dry season. Groundwater is a precious water source for the areas located far from rivers or marshes and in the areas in which surface water is dried up during the dry season. Wells as the water source facilities can be divided into traditional wells, modern large-diameter wells, and boreholes. Modern wells providing good water quality and stable amount of water are being constructed by overseas support organizations, but they are not sufficient in number. Many villages are still using only traditional wells.

#### <Tribe and Custom>

9 Native animism culture originally developed in Mali, but Islamism began to spread from around the 10th century and European culture was introduced by colonization. The intermingling of these three cultures forms the current cultural and religious base of Mali, which dominates the entire scope of social and economic activities of the Malian people. There are nine ethnic groups in the study area. The majority of people, belong to the Bambara (52%) tribe as agricultural tribe, followed by the Bobo tribe (17.%) as mainly stock-raising tribe, the Minianka tribe (10%), the Sarakole tribe (10%), the Peul tribe (9%) as mainly stock-raising tribe, the Bozo tribe (2%) as mainly fishery tribe, the Dogon tribe (1%), the Mossi tribe (1%), the Sonrai tribe (0.1%) and the Mandingo. The racial structure of Mali is versatile. However, mixture of races is not common recently, the language of Bambara tribe is used as a common language, and there is more equality in the rural society.

#### <Rural Society>

10 In the village, there is a traditional organization called "Ton". The number of Ton differs for each village, but usually there is an average of five to six Ton in a village. A Ton is a group with an objective, such as an agricultural organization, an organization of family chiefs, a young peoples' organization, a women's organization, or a hunters' organization. If a villager does not participate in the "Tonbaara (joint work)" of the village, he/she will be punished with a fine. If he/she does not pay the fine, the amount of the fine is raised. If the offending villager still does not pay, he or she is exiled from the village. If the suitor is excluded from the Ton, nobody will help him. The leading class of villages maintains the community while following the above mentioned customs. The fact that a village keeps this kind of customs significantly acts positive in organizing the residents.

#### <Village Structure>

11 A village is generally formed as a hierarchical structure: (from the lowest level) family members – family (couples and their children) – agricultural production unit (UPA) – hameau (hamlet)– village. This means that several families live together and form a UPA. The UPA is the basic unit of everyday life and economic activity of farming. In addition, there are various groups by age, gender and occupation across the hierarchical structure, and some families are appointed to be in charge of functions such as festivals, hospitality and clerical work. On average, a family consists of 4.8 persons and a UPA consists of less than 20 family members. An average villages' population is approximately 600.

<Land Use>

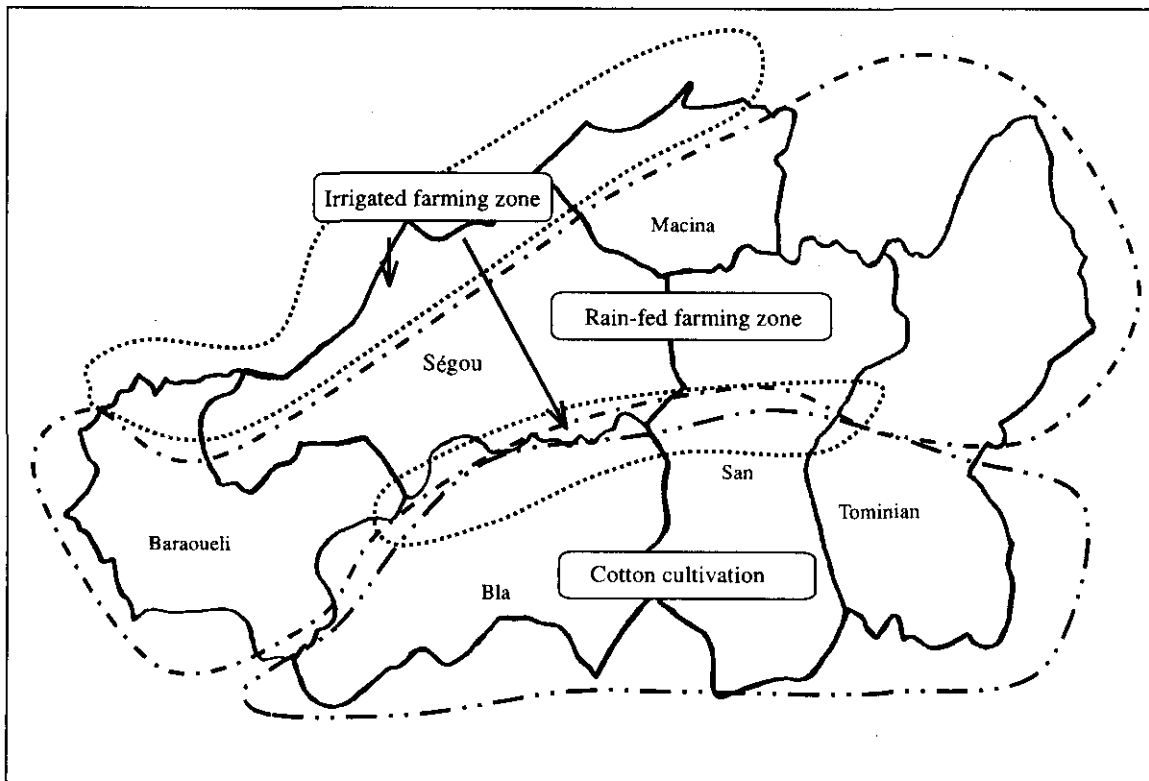
12 Under the Law in Mali, ownership of land is vested in the state. Customarily, traditional land users (farmers) are granted usufructuary rights to farmland under the responsibility of the village chief. In the actual land management in each village, a family that desires to settle on or use land is granted an area proportional to its labor by approval of the village chief and the senior council. Forests, rivers and swamps are the common property of the village. There is a system that a person who wants to use the land must register with the Commune. In such case, the right to land use for ninety-nine years is allowed. However, most land users have in fact not registered even though there is a land registration application system. Recently, some people have started to realize that some traditionally-recognized rights of land use, albeit only a very small number, can be sold and/or bought. It shows the rise of the consciousness for the individual land use and management. The present state of land use in the study area is: farming land is about 35%, woodland 21%, grassland 18% and of sand dune and bare land including fallow land 22%.

<Agricultural Zone>

13 Agricultural areas are mainly divided into the following three zones (see Figure 1) on the basis of the rainfall, topology and water conditions.

- ① Irrigated farming zone in the basin of the Niger River (including part of the basin of the Bani River);
- ② Rain-fed farming zone occupying most of the central part of the study area;
- ③ Rain-fed cotton cultivation zone in the southern part of the study area.

**Figure II - 1 Agricultural zone Classification in the Study Area**



<Characteristics of the Agricultural Zone>

14 Millet, sorghum and fonio are basically produced in the rain-fed farming zone which dominates the most of the Study Area (about 70%). These are cultivated in a single crop or in combination with beans such as niébé. The yield is greatly affected by the annual fluctuation of precipitation. Recently, small-scale irrigated vegetable cultivation and fruit production have been increasing in Ségou and neighboring Baraouéli and Macina. The main horticultural products are vegetables such as watermelons, shallots, tomatoes, melons and green peppers, and fruit such as mangos and citrus fruits, papayas and bananas. In the cotton cultivation zone which dominates more than 20% of the Study Area, cotton as an important product for earning foreign currency in Mali is mainly cultivated. In this zone, cereals are also cultivated and mostly combined with peanuts. In the small-scale irrigation or the cotton cultivation zone, organizations in charge of the supports of the farmers in zones such as Ségou Rice Office (ORS: Office Riz Ségou) or Mali Textile Development Company (CMDT: Compagnie Malienne de Développement des Textiles) give close extension guidance on cultivation technology or provision of funds or production materials.

<Agricultural Extension>

15 The administrative agencies that are engaged in technical extension activities to counter desertification in the study area include the Regional Directorate of Rural Support (DRAMR), Regional Directorate of Rural Management and Equipment (DRAER) and Regional Directorate of Natural Conservation (DRCN). The relationship of these agencies at national and regional level is as follows.

**Table II - 1 Relations between Extension Organizations**

	Ministry of Agriculture, Sylviculture and Fishery		Ministry of Environment
National Level	National Directorate of Rural Support (DNAMR: Direction Nationale de l'Appui au Monde Rural)	National Directorate of Rural Maintenance and Equipment (DNAER: Direction Nationale de l'Aménagement et de l'Équipement Rural)	National Directorate of Natural Conservation (DNCN: Direction Nationale de la Conservation de la Nature)
Regional Level	Regional Directorate of Rural Support (DRAMR: Direction Regionale de l'Appui au Monde Rural)	Regional Directorate of Rural Maintenance and Equipment (DRAER: Direction Regionale de l'Aménagement et de l'Équipement Rural)	Regional Directorate of Natural Conservation (DRCN: Direction Regionale de la Conservation de la Nature)
Cercle Level	Local Service of Repair and Rural Maintenance and Equipment (SLACAER: Service Local de l'Appui Conseil et de l'Aménagement et Equipement Rural)		Natural Conservation Service (SCN: Service de la Conservation de la Nature)
Commune Level	Repair and Rural Maintenance and Equipment Base (ACAER: Antenne de l'Appui Conseil et Aménagement et Equipement Rural; each extension worker visits about 8 villages.)		Natural Conservation Base (ACN: Antenne de la Conservation de la Nature; contact with residents)

In addition, CMDT, Ségou Rice Office (ORS) and others are conducting support activities through their own instructors. The areas that are targeted by these extension support organizations are described in the Table below and the activity area is divided clearly between the respective organizations.

**Table II - 2 Extension Activity Area of Public Organization Concerning Agriculture**

Organization	Targeted Activity Area (Cercle)
Malian Textile Development Company (CMDT -- mainly in San Cercle Office)	The entire area of Bla, San and Tominian cercles and the southern-half of Macine cercle.
Regional Directorate of Rural Support (DRAMR)	Ségou and Baraoueli
Ségou Rice Office (ORS)	Irrigated rice farming zone in the basin of the Niger River
Middle Bani River Development Program (DMB)	Ségou, Bla and San in the basin of the Bani River.
Non-cotton Zone Revenue Diversification Program (PDR)	Rain-fed farming zone in San, Tominian and Bla and the southern part of Macina

#### <Stock Raising>

16 In Ségou Région, 1,017,000 cows, 1,053,000 sheep, 1,382,000 goats, 20,000 horses, 104,000 donkeys and 2,759,000 fowls are raised. This accounts for 17.4% of the tropical livestock unit (UBT: Unite de Betail Tropical) in Mali. Ségou Région is an important production base for the livestock-raising business in Mali. Cows are raised as savings and the raising period is long because they are not renewed when the timing is economically right, resulting in low production efficiency. The productivity of poultry raising, which is the valuable method for obtaining cash for farmers, is low due to insufficient hygienic measures and raising of poultry by outdoor grazing. Livestock raising in the study area takes the form of grazing using natural grassland, fallow fields and woodland. Livestock raising is carried out in close connection with agriculture in terms of effective use of farm product residues, feedback of livestock dung and urine to the fields, and use of livestock as draft animals.

#### <Forests>

17 There remains little of the original vegetation. Grassland is combined with sparse woodland where the tree crowns are isolated from each other, and the vegetation consists of low herbaceous plants sparsely mixed with shrub. The average cumulative volume of forests is 12 to 16m<sup>3</sup>/ha and the average yearly growth of forests is extremely slow. Forest protection and exploitation conditions are stipulated in the forestry management law, but the forests under common ownership by custom are used as firewood collection sites at present. In addition, the sale of forest resources is an important source of cash income for the residents, resulting in frequent occurrences of illegal cutting and trading in wood. No renewal work is carried out at the sites where the trees have been cut down. As a result, the entire forest resources are decreasing and bare land is appearing in places in a mosaic pattern.

#### <Social infrastructure>

18 Road improvement is delayed. The national roads have improved at a specified level, except for the main and general local roads. Furthermore, there are problems of partial defect of pavement due to insufficient maintenance as well as the road surfaces having inflow of water due to unimproved drainage facilities. At some portions of roads, safe traffic is not secured. The improvement of the access roads to the market used by the residents on a daily basis has been delayed. Some of these access roads become impassable during the rainy season, which causes trouble for the distribution of agricultural products and receiving of public services such as medical service or education. Agricultural roads are not improved at all. The installation state of main public facilities in the villages of the study area is low of 8% for meeting halls, 36% for mills, and 8% for medical clinics. As for the already installed facilities, the maintenance by the residents is generally poor and many facilities are not used.

< Factors impeding the development >

19 The impeding factors of rural development in the study area are summarized in the Table below. For the settlement of sustainable agriculture, these impeding factors must be removed first.

**Table II - 3 Factors Impeding Rural Development in Study Area**

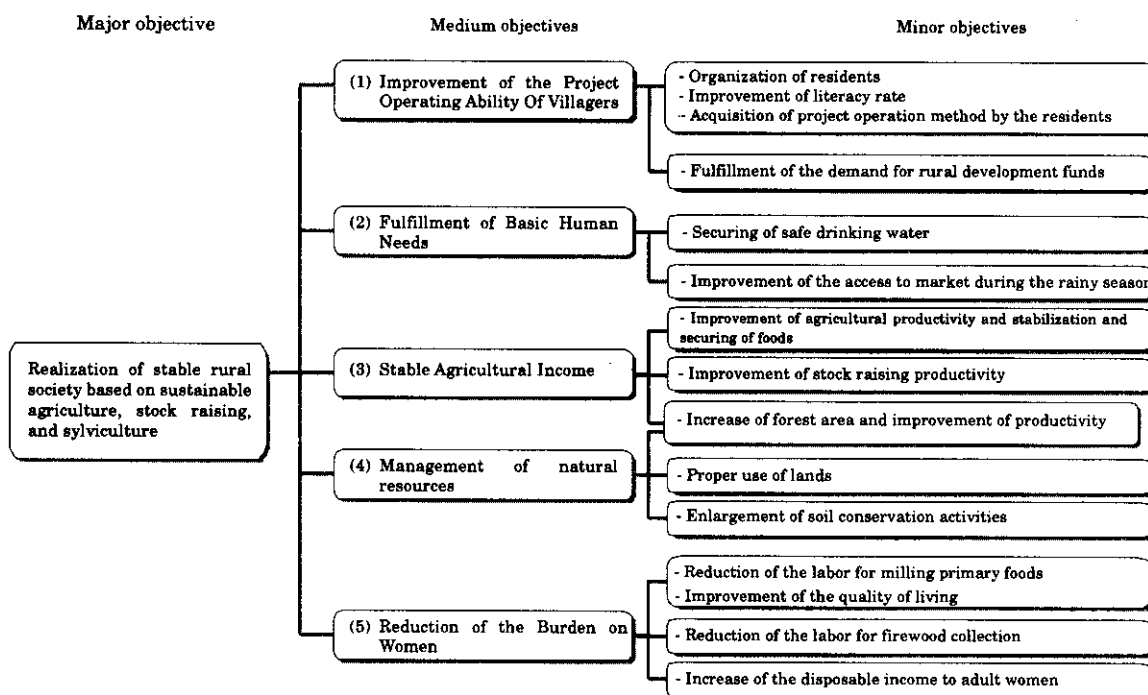
Sector	Factors impeding the development
Rural society	<ul style="list-style-type: none"> <li>① There are few educational opportunities and the basic educational level such as the literacy rate is low.</li> <li>② Metrology is not clear and the residents rarely have the concept of area and distance.</li> <li>③ These factors impede the organized agriculture and transfer of technologies.</li> <li>④ Burdens to women are excessive and the participation of women in rural development is insufficient.</li> </ul>
Rural economy	<ul style="list-style-type: none"> <li>① Lack of investment funds in all sectors</li> <li>② Lack of access measures to funds in farming villages</li> </ul>
Support of farmers	<ul style="list-style-type: none"> <li>① Unestablishment of resident participatory promotion method and system</li> <li>② Lack of extension tools (transportation measures or teaching materials for extension workers)</li> <li>③ The organization of farmers being inadequate, the effects of extension are not sufficient.</li> </ul>
Land use	<ul style="list-style-type: none"> <li>① Lands are not used under the ordered plan and regulation.</li> <li>② Traditionally residents rarely have the concept of land possession and are not motivated in improving the land use.</li> </ul>
Water resources	<ul style="list-style-type: none"> <li>① Lack of modern water source facilities and water use facilities</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>① Excessive cultivation accompanying the population growth, reduction of land productivity due to the enlargement of cultivated lands</li> <li>② Insufficient extension of technology to relieve the effects of vigorous weather change</li> <li>③ Unestablishment of the supply system of materials such as improved variety or fertilizer</li> <li>④ Increase of soil erosion caused by the factors outside the fields (upstream)</li> </ul>
Stock raising	<ul style="list-style-type: none"> <li>① As the nation's consciousness is low, there is no improvement of stock raising.</li> <li>② Stock raising for the purpose of saving is the main stream, which induces overgrazing due to the increased number of animals.</li> <li>③ Stock raising for the purpose of saving rather than for selling reduces the shipment rate, hindering thus the productivity.</li> <li>④ Due to the lack of stored feed and nutritious supplement feed, the productivity of stock raising is low.</li> <li>⑤ Due to lack of vaccination, wearing of livestock caused by diseases is severe.</li> </ul>
Sylviculture	<ul style="list-style-type: none"> <li>① As the residents are rarely conscious of forest conservation or possession of trees, tree planting does not proceed.</li> <li>② Damage of vegetation eaten by livestock or caused by burning is serious.</li> <li>③ Disorderly tree cutting with the purpose to obtain cash through selling firewood increased.</li> </ul>
Market distribution	<ul style="list-style-type: none"> <li>① Market price of cereals fluctuates greatly being linked with the annual fluctuation of production.</li> <li>② Access roads to the market are not improved at village level.</li> <li>③ Lack of cereal storage facilities</li> </ul>

### III Master Plan

#### <Objectives of Development>

20 This Master Plan positions the PNAE of Mali as the upper level plan and aims at the prevention of desertification through the removal of impeding factors of rural development and the establishment of sustainable agriculture based on the development targets shown in the figure below. Under the basic recognition that "population increase and poverty promote the non-reproductive exploitation, which brings in desertification", the Master Plan has the basic strategy to stabilize the living conditions of local residents, then to prevent the exploitation of resources.

**Figure III - 1 Objective Structure of MP Project**



#### <Formulation concept of Master Plan>

21 The basic concept in constructing the measures for achieving the development objectives consists of the following three points.

- ① To promote the residents' participation and the autonomous project operation by the residents at all stages of project activities to be planned
- ② To construct the support system of the residents' activities at both the administrative and the residents' levels and continue the autonomous project operation by the residents through the said system
- ③ The technologies and method to be adopted in the planned project shall be the existing ones in West Africa or their adaptations.

#### <Project Area>

22 The study area for this project covers an area of 3.3 million hectares in the south of the Ségou Cercle, but the area covered by the Master Plan project (the "project area") is the "rain-fed farming zone" (2.26 million hectares). As described in 2.1 of "Compilation of the Present Situation", agricultural development projects by existing aid-related agencies with objectives similar to the

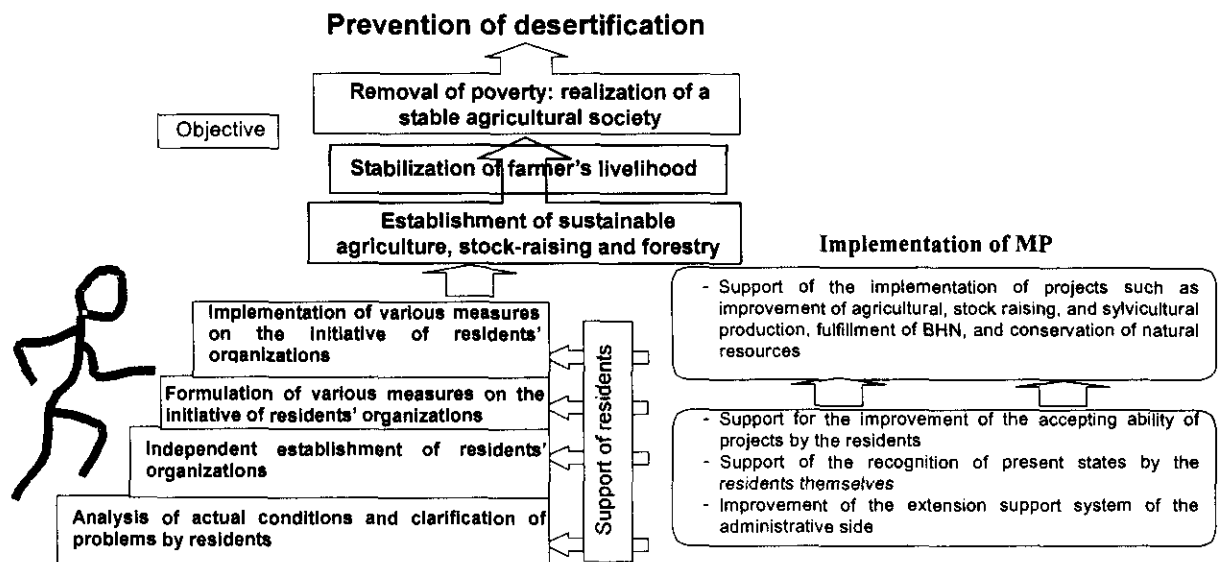


objectives of this project have been implemented in the “irrigated farming ”and the “cotton cultivation” zones, and are beginning to obtain good results. In these areas unique project systems, including an extension support framework, have already been established or are in the process of being established; and the agencies responsible for these areas have a clearly-defined concept for the project in the future. In order to avoid duplication and confusion, those zones are not included in the target area this project. From the survey for the production of village cadastres, it is estimated that the rain-fed farming zone of 2.26 million hectares contains 1,159 villages.

<Method of promoting residents’ participation>

23 In order for the local residents to recognize the necessity for desertification prevention activities and to tackle the activities under their own initiative, it is necessary to introduce an arrangement through which the villagers can participate on their own initiative in all processes, including analysis of the present situation at village level, selection of measures, and the formulation, implementation, and maintenance of plans. Through the process of this participation, the ownership and the empowerment of villagers will mature. For this reason, under the Project the method of promoting residents’ participation employed will be “the maturing of villager ownership in desertification prevention measures → voluntary establishment by the villagers of an organization to implement measures → operation and management of the measures spearheaded by the villager organization” (hereafter referred to as “Terroir<sup>1</sup> Management”). The conceptual drawing for achieving the objectives through the realization of Master Plan is shown below.

**Figure III - 2 Conceptual Chart of Objectives to be Achieved through Implementation of Master Plan**



<sup>1</sup> Terroir means “a spatial area such an agricultural land or grassland possessed and used by a social group in which the group’s ownership and right to use it is recognized by other groups in the neighborhood”, but which is not absolutely coincident with any administrative or geographical division such as a village or colony.

The Terroir Management approach represents a general term of actions of the Terroir staff members including ① establishment of an organization, ② improvement of living conditions, ③ regional resource management and ④ introduction of technologies. The Terroir Management approach was introduced as a means for realizing the “Strategy against Desertification in the Sahel Region” at the Conference on the Combat against Desertification held in Nouakchott, Mauritania, in November 1984, on the occasion of the large-scale drought in the same year, because most of the large projects directed from the upper to the lower level under the governmental initiative had failed.

<Total project arrangement>

24 In order to achieve the project objectives, the projects shown in the Table below shall be planned for each project objective. The rural development must be promoted comprehensively by solving the complicatedly intertwined problems such as degradation of resources (desertification), poverty, or gender. In order to remove a given impeding factor, a standpoint to solve uniformly the impeding factors in the causal relationship is required. For this reason, diversely related projects (mutually complementary projects) were comprehensively planned and arranged.

**Table III - 1 Programs Corresponding to the Project Objectives**

Medium goals	Minor goals	Project programs
(1) Improvement of the project operating ability of residents	<ul style="list-style-type: none"> <li>① Establishment of support system for Terroir Management Committee</li> <li>② Support for organizing residents</li> <li>③ Improvement of literacy rate</li> <li>④ Acquisition of project operating method by the residents</li> <li>⑤ Fulfillment of the demands for funds for the rural development</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of support system for Terroir Management Committee</li> <li>• Support for organizing residents</li> <li>• Improvement of literacy rate</li> <li>• Improvement of the residents' project implementation ability</li> <li>• Establishment of small-scale financial system</li> </ul>
(2) Fulfillment of BHN	<ul style="list-style-type: none"> <li>① Securing of the water source for safe drinking water</li> <li>② Improvement of the access to the market during the rainy season</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement of modern well</li> <li>• Road improvement</li> </ul>
(3) Stabilization of farmers' income (Improvement of production in agriculture, stock raising and sylviculture)	<ul style="list-style-type: none"> <li>① Improvement of agricultural productivity</li> <li>② Stabilization and securing of foods</li> <li>③ Improvement of stock raising productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of fertilizer for rainfed crop</li> <li>• Small-scale vegetable cultivation</li> <li>• Construction of cereal bank</li> <li>• Construction of vaccination facility</li> <li>• Stock raising</li> <li>• Construction of improved poultry houses</li> <li>• Introduction of improved fodder plants</li> </ul>
	④ Increase of forest area and improvement of productivity	<ul style="list-style-type: none"> <li>• Improvement of mini-nursery</li> <li>• Tree planting</li> </ul>
(4) Conservation and management of natural resources	<ul style="list-style-type: none"> <li>① Proper use of lands</li> <li>② Enlargement of soil conservation activities</li> </ul>	<ul style="list-style-type: none"> <li>• Land use regulations establishment</li> <li>• Soil conservation</li> </ul>
(5) Reduction of burdens to women	<ul style="list-style-type: none"> <li>① Reduction of the labor for milling primary foods</li> <li>② Reduction of the labor for firewood collection</li> <li>③ Increase of disposable income</li> <li>④ Improvement of living</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of mill</li> <li>• Extension of the manufacturing of improved oven</li> <li>• Extension of the manufacturing of handicrafts</li> <li>• Training of nutrition, preservation of mother and child health</li> </ul>

The project programs in the intermediate objective (1) of "Improvement of residents' project operating ability" have the characteristic to be implemented with priority in the first stage of this Master Plan as measures for the medium goals mentioned in below Item (2).

<Villager's burden>

25 The projects planned under this Master Plan are divided into those to be carried out at the village level with residents' participation, and those to be carried out at the administrative level, to support activities at village-level. As a general rule all the projects at village level require the villagers to shoulder a burden (in terms of the provision of materials, labor, money) as far as is acceptable: this will also help enhance their sense of Ownership. When the villagers' burden is to be monetary, funds will be reserved as a fund of the Terroir Management Committee, and the Terroir Management Committee will promote the use of this fund as maintenance costs for the project facilities and as

micro-credit capital. The following table shows the principles of villager's burden.

**Table III - 2 Principles of Villager's Burden**

Project item	Type	Villager's burden
Training	Literacy education	Cost of teachers and stationary only
	Other	No burden except stationary
Works of a highly public nature	Building, road, well	Provision of simple labor and materials on site plus 300,000FCFA per site
	Building (such as vaccination stations)	Provision of simple labor and materials on site plus 150,000FCFA per large-scale site and 100,000FCFA per small-scale site
Projects directly contributing to an increase in farming income	Technologies already established in the community.	80% of equipment cost
	Technologies not fully established.	30% of equipment cost
Equipment for common use	Mill, road improvement equipment etc.	30% of cost

<Concept of land use>

26 The basic concept on land use in this Master Plan is shown below.

- ① The cross-sectional expansion of cultivated lands and pastures hinders woodlands. The areas of cultivated lands and pastures being used shall not be changed greatly. The productivity of cultivated lands and pastures shall be improved.
- ② The area and the productivity of woodlands shall be increased and improved.
- ③ Multiple villages in concerned relationship on land use shall establish a land use regulation using the prevention of degradation and preservation of common lands among the said villages as the basic concept and observe that regulation.

The Table below shows the present state of land use and the comparison of planned areas.

**Table III - 3 Areas of Land Being Used**

Present classification of land		Total area (in 1000 hectare)		Planned land use (in 1,000 hectare)									
		Study area	Planned area	Woodland			Grassland	Fallow land	Planted land			City area	Aquatic zone
				Total	Permanent woodland	Rotational forest			Total	Permanent woodland	Rotational forest		
	Woodland	695	475	515	80	435							
	Grassland	602	412				412						
	Bare land	827	565					525					
	Farmland	1,139	779						779	436	343		
	City area	13	9									9	
	Aquatic zone	22	15										15
	Total	3,298	2,255	515	80	435	412	525	779	436	343	9	15
		%	100.0	22.8	3.5	19.3	18.3	23.3	34.5	19.3	15.2	0.4	0.7

<Target Year of the Project>

27 The base year of the Project will be 2002. The year the Project commences will be 2004, the year

following the drawing up of the Project. The Master Plan will start with education and literacy training in areas with a low literacy rate to promote residents' participation, and includes plans to establish wide-ranging improved techniques in agriculture, stock-raising and sylviculture. Some time will be needed to carry out the project in its entirety and for the effects to show themselves. Thus, the project period will be set at 22 years and the project target year will be 2025.

<Population Growth Rate>

28 The population growth rate in the project area up until the target year was estimated at 2.2 %, based on "Mali 2025", the long-term forecast by the Government of Mali (National Forecasts until 2025, issued by the Presidential Office in June 1999). The latest population growth rates for the project area as a whole could not be obtained, but the population growth rate for the last 5 years in 12 villages covered by the verification study (estimated from data in the SLACAER study) was a yearly average of 2.23 %. From this it was judged reasonable to estimate the population growth rate in the project area at 2.2 %.

<Project Schedule>

29 The planned projects will be a package by a village unit and will each be implemented as a project package over a period of five years. First two years of 22 years of project period are used for establishment of project office system and trainings for extension workers. The details are shown in the following figure.

**Figure III - 3 Progress of Project Package**

Program	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year	6 <sup>th</sup> Year	7 <sup>th</sup> Year
Development and establishment of promotional tools for Terroir management	■						
Promotion of Terroir management		■					
Construction of support facilities for extension workers' and Commune staffs' activities		■	■	■	■	■	■
Training of extension workers (PRA, bookkeeping)		■					
PRA survey			■				
Establishment of Terroir Management Committees			■				
Organizational reinforcement of Terroir Management Committees			■	■	■	■	■
Formulation of Terroir management programs			■				
Implementation of Terroir management programs				■	■	■	■
Support for establishment of small-scale finance system				■	■	■	■

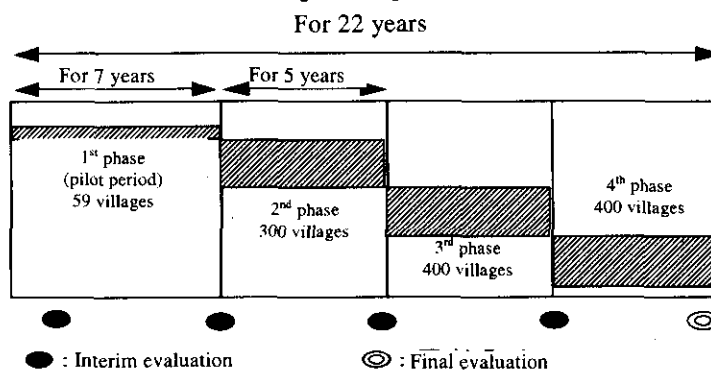
<Phases in Project Period>

30 Project period is divided into 4 phases. In 1<sup>st</sup> phase, a pilot project will be implemented in 59 villages out of the total of 1,159 villages covered by the project. The first evaluation of the system of implementation will be conducted in the second year after the start of the project. An interim evaluation of 1<sup>st</sup> phase of Terroir Management will be conducted in the seventh year, and where necessary modifications will be made to the method of implementation and content of the Project from 2<sup>nd</sup> phase onwards. From the second phase to the fourth phase, programs will be implemented in 300,

400 and 400 villages respectively, to spread the costs.

The following figure shows the schedule for implementation of the project and the work allocation.

**Figure III - 4 Schedule for Project Implementation and Work Allocation**



Required project costs (million Fcfa) 4,842      20,452      27,163      26,859      Total: 79,316

<Project costs>

31 The total project costs for realizing the Master Plan shall be approximately 131 million dollars as shown in the following table.

**Table III - 4 Total Cost of Project**

Field and Program Name	Project Cost (million FCFA)	Project Cost			
		1 <sup>st</sup> phase	2 <sup>nd</sup> phase	3 <sup>rd</sup> phase	4 <sup>th</sup> phase
1. Program to Improve Residents' Ability to Run Projects	<b>9,617</b>	1,036	2,436	3,175	2,970
1) Project to Establish Terroir Management Support System	2,544	676	605	734	529
2) Project to Support Organizing of Residents	835	43	216	288	288
3) Literacy Rate Improvement Project	4,141	211	1,072	1,429	1,429
4) Project to Improve Residents' Ability to Implement Projects	1,235	63	320	426	426
5) Project to Support Establishment of Micro Credit System	862	43	223	298	298
2. BHN Fulfillment Program	<b>24,433</b>	1,245	6,324	8,432	8,432
1) Modern Well Construction Project	6,378	325	1,651	2,201	2,201
2) Road Construction Project	18,055	920	4,673	6,231	6,231
3. Farmers' Income Stabilization Program	<b>13,682</b>	696	3,542	4,722	4,722
1) Project to Supply Improved Rain-fed Product Seeds and Fertilizer	1,827	92	473	631	631
2) Small-scale Vegetable Cultivation Project	4,364	222	1,130	1,506	1,506
3) Cereal Bank Construction Project	4,780	243	1,237	1,650	1,650
4) Vaccination Facility Construction Project	1,615	83	418	557	557
5) Livestock Fattening Project	127	6	33	44	44
6) Improved Poultry House Construction Project	707	36	183	244	244
7) Project to Introduce Improved Fodder Plants	262	14	68	90	90
4. Natural Resource Conservation and Management Program	<b>1,413</b>	71	366	488	488
1) Mini-nursery Construction Project	855	44	221	295	295
2) Afforestation Promotion Project	225	11	58	78	78
3) Project to Establish Land Use Rules	41	2	11	14	14
4) Soil Conservation Project	292	14	76	101	101
5. Program to Relieve Burden on Women	<b>4,637</b>	235	1,200	1,601	1,601
1) Mill Construction Project	3,088	157	799	1,066	1,066
2) Project to Promote Manufacture of Improved Ovens	854	43	221	295	295
3) Project to Promote Manufacture of Handicrafts	695	35	180	240	240
Total Direct Project Costs	53,782	3,283	13,868	18,418	18,213
Office Expenses	5,378	328	1,387	1,842	1,821
Engineering Service Cost	9,412	575	2,427	3,223	3,187
Material Reserve Fund	5,378	328	1,387	1,842	1,821
Sub-total	73,950	4,514	19,069	25,325	25,042
Price Reserve Fund	5,366	328	1,383	1,838	1,817
<b>Total</b>	<b>79,316</b>	4,842	20,452	27,163	26,859
Foreign Currency Equivalent	( \$ 131million )	( EU 121 million )			

<Economic evaluation>

32 As the result of the economic evaluation of measurable projects based on the project costs, the project implementation effect of tree planting was deemed extremely low from the economic standpoint. However, from the viewpoint of the prevention of desertification, there is a great significance for implementing this project. The economic internal revenue rates (EIRRs) of main projects are shown in the Table below.

**Table III - 5 Results of the Calculation of Economic Internal Revenue Rates (EIRR)**

Project name	EIRR	Remark
(1) Small-scale	9.57%	Substantial long-term interest is approximately 10% a year.
(2) Vaccination facility	24.32%	
(3) Tree planting project	2.48%	
(4) Road project	11.17%	
(5) Mill project	17.73%	

<Social evaluation>

33 In addition to the quantitative evaluation from the economic standpoint, a qualitative evaluation was undertaken for each planned project from the social standpoint in accordance with the project objectives. The importance of planned projects for the local society was compared using the qualitative scoring of indices on the following nine items:

- ① contribution to the prevention of desertification,
- ② conformity with the needs of rural society,
- ③ contribution to the reduction of poverty,
- ④ conformity with the administrative technical level,
- ⑤ conformity with the residents' technical level,
- ⑥ conformity with the scale of funds,
- ⑦ difficulty of project implementation,
- ⑧ consideration to gender, and
- ⑨ urgency of project.

As a result, the following projects were highly evaluated in terms of social impact for implementing the project; extension of improved oven, support for the establishment of small-scale financial system, improvement of well, improvement of small-scale irrigation, and promotion of tree planting.

<Evaluation of initial environmental effects>

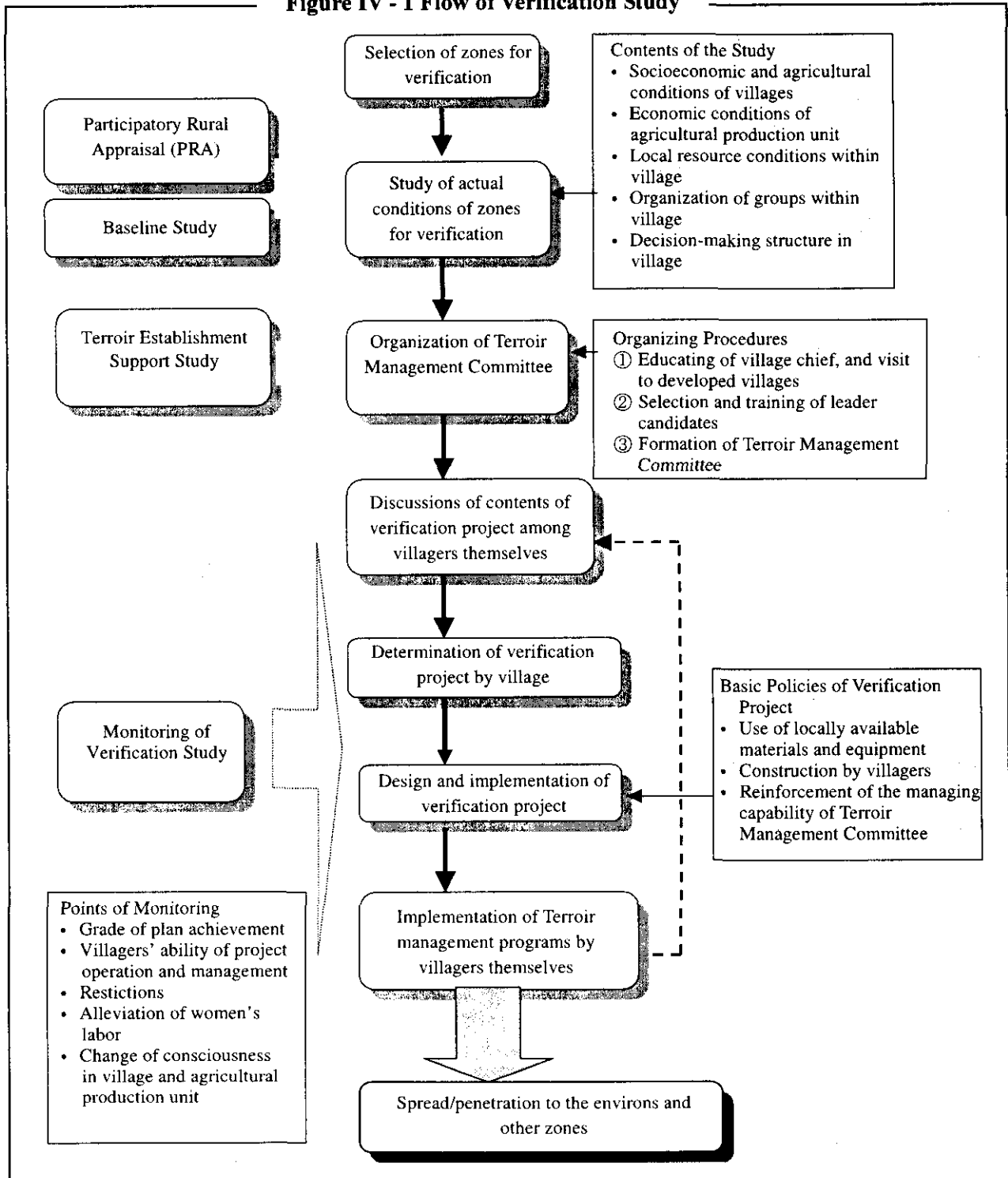
34 The development activities of planned projects are small-scale as they are implemented being divided for each village and determined without affecting the environments in the project area. As the evaluation of the initial environmental effects, the effects of the increase of pumping amount accompanying the construction of wells in the improvement of modern wells and the small-scale irrigated vegetable cultivation were analyzed quantitatively only for the amount of groundwater. As the amount of the annual demand for groundwater after project implementation was extremely small of only 4% against the annual irrigation amount, the possibility of the drying up of groundwater caused by the increase of pumping amount by the project is determined none. As this Master Plan is well conforming to the National Environmental Action Plan and National Action Plans for the Combat of Desertification (PNAE/CID), it rather has the effects to conserve environment.

#### IV Verification Study

< Processes of the verification study >

35 In the verification project, some projects constructing the Master Plan are implemented ahead of others as a model to feed back the evaluation results of validity and feasibility as the projects to the Master Plan. The verification study was conducted in twelve villages in three districts representing the study area according to the following procedure.

**Figure IV - 1 Flow of Verification Study**



<Contents of verification>

36 The contents of the projects implemented in the verification study as the models (to be referred hereinafter as the "verification project") were almost same as those of the projects planned in the Master Plan. However, in the verification projects, after providing the technical ability on the support of Terroir Management to the administrative extension agents through training, etc. within a limited period of time of approximately two years, it was deemed difficult to implement as well as monitor and evaluate the organization of residents and the model projects under the leadership of the residents based on the said residents' organization. For this reason, the Terroir Management support system establishment project planned in the Master Plan was not implemented as the verification project. Instead, the study team employed directly the persons provided with the Terroir Management support technologies, such as potential administrative extension agents in the Master Plan (to be referred hereinafter as the "local coordinators") and assigned them in the three verification districts, one each of male and female coordinator, for a total of six coordinators. The local coordinators played most of the Terroir Management support projects in the verification projects.

<Implementation process>

37 In the verification projects, the organization of residents (establishment of CGTV and determination of project plan by the residents) in the twelve verification villages were completed by end of 2000. During the period of more than two years since then, the verification projects were implemented on the basic concept of residents' participation and autonomous project implementation by the residents. As of February 2003, most projects were smoothly operated and managed under the leadership of CGTV. In some projects, independent measures were taken by villages and new development or extension of effects to nearby area could be observed. The study team continuously monitored and evaluated the verification projects throughout the implementation process of verification study and reflected the results on the formulation of Master Plan.

<Evaluation by project>

38 As the evaluation of the verification project, the evaluations made by the indices related to the "process" of projects and the ones by the indices related to the "results and effects" of projects were deemed equal. The main evaluation indices on the "process" include ① establishment degree of the project management and operation system, ② provision state of labor, ③ payment state of the costs to be borne, and ④ participation state in the training. The indices on the "results and effects" vary depending on the type of the project. The projects evaluated fairly high (evaluation score of 4 or more in all villages) are ① well, ② small-scale financial system, ③ provision of seeds and fertilizers, and ④ roads, small-scale irrigation (vegetable field), and cereal bank, followed by the introduction of handicrafts (soap manufacturing was evaluated the highest). Among these projects, those related to the BHN infrastructure were strongly requested from the first and the residents ardently desired the improvement of the infrastructure, in order to attain a good performance of the projects. Also, the projects may ensure profits within a short period of time such as seeds and fertilizers, vegetable cultivation, and soap manufacturing are highly evaluated. On the other hand, poorly evaluated projects concern ① improvement of pastures, ② soil conservation (by joint work), ③ mini-nursery, and ④ tree planting. Many of these projects are related to public lands or joint work. However, the difficulties of the projects are not decisive.

<Evaluation by village>

39 When the evaluation scores of verification projects were collected and compared for each village,



significant differences were found among the twelve verification villages. By judging from the correlation between various conditions related to the inputs to projects and the project evaluation, the conditions having high correlation with the evaluation of each village are "the ability of village leaders", "basic educational level of residents", and "the ability of local coordinator". From this result, the effective measure to make "the villages with high project performance" can be said "to assign the facilitators having high quality after raising the educational level of the residents to a certain degree and put efforts in the improvement of the ability of village leaders while constructing a reliable relationship between the village and the project". No significant correlation is observed between "the natural locational conditions of village", "lots of experiences in project" in the past, and the "degree of problem recognition on the progress of desertification before starting the project" with the "project performance".

<Items reflected on the Master Plan>

40 As a result of monitoring and evaluating the verification projects, the main items in which the contents were corrected from the stage of verification projects and reflected on the Master Plan formulation are as follows.

- ① Judging from the present technical level of the residents, the training positioned at fairly high level (for example, training of vegetable cultivation technology or plant vegetation technology) is effective if it is given repeatedly by taking the intervals of certain period of time. Training of some of the projects had to be repeated.
- ② With regard to most of the verification projects, it was confirmed that the residents had enough ability to bear the costs by judging from the ambition for handling the projects, the balance of the potential monetary support ability, or the profit expected from the projects. The ratio to be borne by the residents was thus increased.
- ③ The exchange of project experiences among the residents was effective for the maturing of the residents' ambition on project handling and the improvement of project implementation ability of residents. As one of the components of the "project implementation ability improvement project" in the Master Plan, meetings to exchange project experiences among the residents were planned.
- ④ While the improvement of marshes needs large amount of investments, it was verified that marshes were difficult to be effectively used as the water source for the irrigation of small-scale vegetable cultivation. Therefore, the improvement of marshes as the water source for the small-scale irrigation vegetable cultivation shall not be included in the Master Plan. The improvement of water source shall be limited only to wells.

<Recommendations>

41. For a smooth implementation of the M/P and a secure demonstration of the effects of the implemented M/P, the considerations to be taken by the Administration should be as follows:

- (1) To suppress the population increase through promoting and enhancing the family planning and improvement of literacy rate
- (2) To develop the early warning system for forecast of meteorological changes and alleviating the influence of meteorological changes on agriculture
- (3) Support the enactment of land use regulations by residents
- (4) To reinforce the guidance and regulations for natural resource management and search for the means of bestowing the incentive on the residents
- (5) To support the fowl sanitation and improvement
- (6) To rehabilitate highways on a plan



## **Introduction**



## **CHAPTER I INTRODUCTION**

### **1.1 Background of the Study**

The economy of Mali largely depends on agricultural production. The agricultural sector accounts for almost 50% of the gross domestic product (GDP). Approximately 80% of the employed population are related to the agricultural sector.

The natural ecosystem of Mali was weak, but had the regeneration ability to enable the exploitative agriculture for a long time. However, the balance of this natural ecosystem could not be maintained further due to the rapid increase of population after 1970 and the repeated droughts which caused a rapid degradation of natural resources.

The main farming zones in Mali are Sikasso and Ségou region the south. Most of the population are concentrated in these areas. Especially, Ségou region including the target area of this study produces more than one third of the domestic production of millet, which is the primary food of Mali people. Under the background of recent population increase, desertification has been advancing, resulting in the decrease of the unit yield of cereal in the rainfed agricultural area, reduction of firewood resources, lack of pastures, and generation of dispute between farmers and herders accompanying the above mentioned.

From the experience of the repeated droughts that hit the entire Sahel area after the 70s', the Government of Mali has been undertaking a rational management of natural resources and promoting the activities to prevent desertification. The Government of Mali ratified the Convention to Combat Desertification on October 27, 1995 and established the National Environmental Action Plan and National Action Plans for the Combat of Desertification from 1995 to 1998 according to the items that specified by the said Convention for the ratified countries to handle. The Government of Mali tries to prevent desertification by asking for the cooperation of the advanced countries that ratified the said Convention.

Under the above mentioned situation, the Government of Mali requested the Japanese Government in October 1998 for a technical cooperation with the purpose to establish a comprehensive plan to prevent desertification by selecting the southern region of Ségou, which is the center of the agricultural production of Mali, as the base point and develop continuous agriculture, stock raising, and sylviculture and improve the environment of rural living while effectively using the resources such as land and water.

In response to the above mentioned request, the Japanese Government dispatched a preliminary study team through the Japan International Cooperation Agency (JICA) in November 1999. The Government of Mali and the study team concluded the detail implementation items (Scope of Work) of this study. This study was undertaken from March 2000 to July 2003 after extending the study period by one year.

## **1.2 Objectives of the Study**

The Study is implemented with the southern part of Ségou region as the study area, in accordance with the Scope of Work concluded between the Government of the Republic of Mali and the Japan International Cooperation Agency (JICA) in December 1999, to specify the detailed rules for implementation of the Study having the following objectives:

- ① To formulate the Master Plan for integrated rural development for the prevention of desertification through sustainable development of agriculture, stock raising and forestry, reflecting the results of the verification study.
- ② To carry out the transfer of technology relating to the methodology of the Study and the procedures and guidelines for drawing up the study plans to the counterparts from Mali in the course of the Study.

## **1.3 Study Area**

The target area of this Study is an area of approximately 3.30 million hectares south (on the right bank) of the Niger River in Ségou Region that is located in the central part of Mali. The study area covers the 6 Cercles of Baraouéli, Ségou, Bla, Macina, San and Tominian, of which Ségou and Macina are separated by the Niger River. The population in the study area is about 1.1 million and there are 1,695 villages with a population of 200 or more.

## **1.4 Support System for the Study**

The support system for the Study was formed, including committees and agencies in both Japan and Mali as described below.

### **(1) Steering Committee**

In this Study, a Steering Committee was organized to promote the study works in a smooth manner. It consists of members of the Water Bureau of the Ministry of Mine, Energy and Water of Mali and other governmental agencies of Mali and the delegates of the Study Team. As a rule, the Steering Committee is convened when various reports are submitted and from time to time as needed.

### **(2) Technical Committee**

The Technical Committee, consisting of members of local Government agencies, research and survey institutes and assisting organizations in the study area as well as the delegates of the Study Team, was established to provide advice to ensure the smooth implementation of the verification study works. The Technical Committee is convened from time to time as needed.

### **(3) Support by Learned and Experienced Persons in Japan**

The Study Team is supported by members (learned and experienced persons) of various related committees formed within JGRC and advised by 4 learned and experienced persons newly committed to the Study (in the fields of pedology, cultivation, reforestation and cultural anthropology) whenever preparing reports.

#### (4) Support by the Existing Work of JGRC

Since 1995, JGRC has been subsidized by the Ministry of Agriculture, Forestry and Fishery of Japan to implement a project “Study for Environmental Preservation Measures such as Combating Desertification” in three countries (Niger, Burkina Faso and Mali) in West Africa. In implementing the Development Study, a study implementation system is established on the basis of the experience of JGRC’s existing work.

### **1.5 Structure of the final report**

This report consists of a main report and an attachment (two volumes) as shown below.

#### (1) Main report

- Introduction: Describes the background and the purpose of the study and the support system.
- Present state: Describes the present states of nature, society, economy, and agriculture, stock raising, and silviculture of Mali and the study area.
- Master Plan: Describes the basic concept of the Master Plan and the planned project contents.
- Implementation plan: Describes the project evaluation and the project implementation method of Master Plan.
- Verification study (separate volume): Describes the results and the evaluations of the verification study.

#### (2) Annex

- Annexes: Lists the back data of Master Plan formulation, monitoring data of the model (verification) project implemented in the verification study, and the texts used in the verification projects.





## **Present State**



## **CHAPTER 2     NATURE, SOCIETY AND ECONOMY**

### **2.1   Nature**

#### **(1)   Location**

The Republic of Mali is a landlocked country in West Africa with an area of 1.24 million km<sup>2</sup> (3.3 times larger than that of Japan) and the eighth largest of the 52 countries in Africa. The territory extends from lat. 10 to lat. 25 degrees north and from long. 4 degrees east to 12 degrees west. The southern border is a natural boundary formed by rivers and ridgelines and the northern border is a straight boundary. Mali borders on the 7 countries of Algeria, Niger, Burkina Faso, Côte d'Ivoire, Guinea, Senegal and Mauritania.

The country of Mali is divided into the 8 regions of Kayes, Koulikoro, Sikasso, Ségou, Mopti, Tombouctou, Gao and Kidal, and the Ségou region including the study area is located at about the center of those 8 regions. The southern part of the Ségou region in which the study area is located has a total land area of approximately 33,000 km<sup>2</sup>, and is located on the south side (right bank) of the Niger River in Ségou.

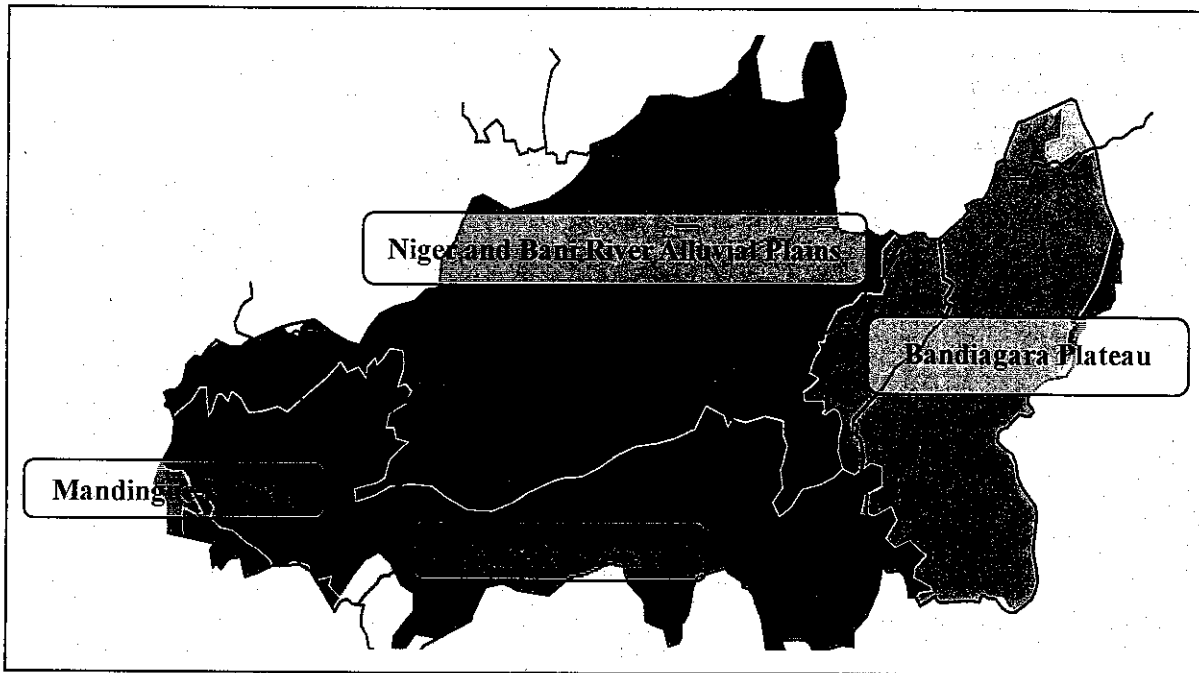
#### **(2)   Topography, Geology and Soil**

The topography of Mali consists of plateaus and basins with an elevation of about 300 to 400m. Among them, the Adrar Mountain (with a peak of 890m) in the northeast, the Futajaron Mountain on the border with Guinea, and the Dogon Plateau (with a peak of 1,155m) near the border with Burkina Faso are exceptionally high. The geological base is composed of metamorphic rocks and granite of the Precambrian era, on which sedimentary layers from the Paleozonic to the Cenozonic eras are distributed.

The study area is located in a basin and forms a broad plain with little undulation. The main stream of the Niger River which extends 292 km and its branch stream, the Bani River, which extends 250km, flow through this basin. The basin is an area relatively suited for agriculture, stock raising and forestry. In the study area, alluvial plains formed in the basins of the Niger and Bani Rivers extend from the northern region to the central region, and the southern region consists of gentle hills stretching to the Bandiagara, Koutiala and Mandingue Plateaus. (See Figure 2.1.1)

The terrain is flat in general, and regions that have 2% or more of slopes are only found in part of the hilly lands in the south, the area of which is less than 20% of the study area (approx. 650,000 hectares). The geologic strata consist of fluvial sedimentary strata of the Quaternary period of the Cenozonic era, and weathered silt, sand and gravel are distributed widely in the study area.

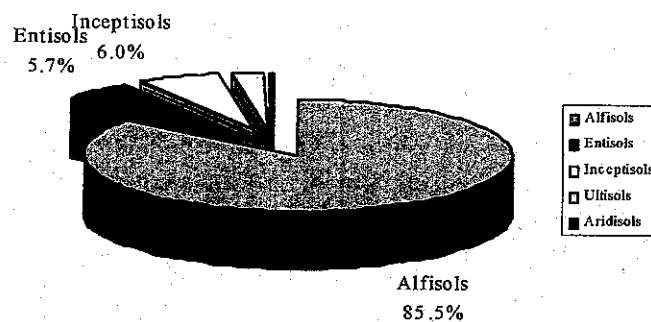
Figure 2.1.1 Topology of Study Area



Source: IER survey results

The main soil type is Alfisols under the USDA classification which accounts for more than 85% of the soil in the study area (Figure 2.1.2). This soil is low in organic contents, lacks nitrogen and phosphoric acid, but has almost no problem for agriculture in terms of the depth of soil stratum, drainage, and pH. It has sufficient potential for production through the management of soil and fertilizer and improvement of cultivation technology and varieties. However, the soil is sandy and weak that degenerates easily under insufficient soil management.

Figure 2.1.2 Structure of Soil in Study Area



Source: IER survey results

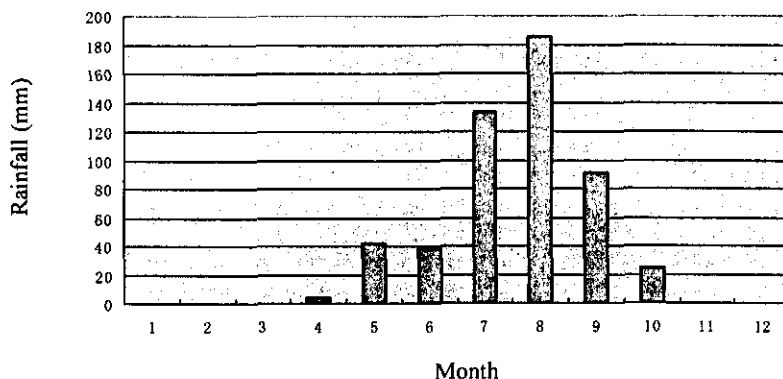
### (3) Climate

The changes in average monthly maximum and minimum temperatures were observed by the Ségou Meteorological Observatory in the study area for the period from 1967 to 1997. The average yearly temperature is about 29°C. The peak of the average monthly temperatures appears in May at the beginning of the rainy season (maximum 40°C) and in November at the beginning of the dry season

(maximum 36°C). There is a large daily fluctuation in temperature, and the difference between the maximum and minimum temperatures each month ranges from 9° to 18°C. The average yearly rainfall is 606 mm (average from 1967 to 1999), but the yearly difference fluctuates greatly from 391 to 925 mm.

Figure 2.1.3 shows the monthly rainfall. The rainy season in Ségou Region is the period from May to November. Taking 1997 as an example, the rainfall is highest in August. The rainfall is irregular in area and time. The rainfall-time intensity is high, being apt to cause water erosion.

**Figure 2.1.3 Rainfall (Ségou, 1997)**



As annual average wind velocity is less than 1m, a dry, strong wind called “harmattan” rages twice a month or so from November to April in the dry season, causing wind erosion.

## 2.2 Society

### 2.2.1 Rural Society

#### (1) Overview

The total population of Mali stood at 10,267,000 in 2001, an increase of 2.0% or more from the previous year. The nation consists of many tribes, of which the Bambara tribe is the largest (20%).

Native animism culture originally developed in Mali, but Islamism began to spread from around the 10th century and European culture was introduced by colonization. From the intermingling of these three cultures were derived Animist Muslims and Western Muslims culture, both of which form the current cultural and religious base of Mali, dominating the entire scope of social and economic activities of the Malian people. It is not unusual at the start of the Rainy Season for both Muslims and Christians in the villages to perform together ritual offerings so that the land will be blessed with abundant rains.

#### (2) Characteristics of the Rural Society

##### 1) Features of Malian Agriculture

Mali is a Sahel country located on the southern edge of the Sahara, the largest desert in the world. Farming and stock raising in this area are critically dependent on the period and quantity of rainfall. Malian agriculture has the “risk diversification-oriented” characteristics that are the features of West

## African agriculture.

In West Africa, including Mali, agricultural production in the rain-fed farming areas that occupy the greater part of the farmland is strongly risk diversification-oriented because of the irregular and unstable rainfall. The climatic cycle is not the same every year. The farmers have to decide or change the seeding time and the kinds of farm produce in response to the rainfall conditions, making full use of their past experience.

If they misjudge or even if they do not misjudge those items, a climatic change may result in a sharp decrease in the crop. In actual risk-diversification practice, they carry out mixed farming of two or three kinds of crops in a considerably large area of the farm. The percentage of mixed farming is not constant every year, but it tends to be larger in years with irregular rainfall. Farmers strongly desire agricultural sustainability. In risk diversification-oriented agriculture, the yearly stability of the crop production is desired more than the increase of the production per unit.

### 2) Features of rural community

Reflecting the unstable agricultural production, the rural communities are characterized by a mutual aid system that protects their livelihood. A UPA (collective unit of living groups consisting of families and facilities of production and consuming) as described later, hamlets consisting of several UPAs, and villages consisting of one or more hamlets are organized in a relationship of production and consumption under the mutual aid system. Not only the labor-sharing relation within a UPA which will be described later, but labor exchanges are also made between neighboring UPAs.

Generally, the village chief is the ruler of the land. The chief of the family (householder) obeys the village chief. The chief makes various decisions related to the village through mutual discussions with the seniors. He manages the village. If any tax imposed on a UPA is not paid, the village chief pays it on behalf of the village.

### (3) Agricultural Traditional Society mainly consisted by the Bambara

#### 1) The origin of villages

The study area is the homeland of the Bambara tribe. The Bambara tribe once built a kingdom in olden times. They now make a living through settled agriculture in the arid land of the Sahel. There are many farming families that raise cattle in this area, where pastures extend into the savanna.

There are nine ethnic groups in the study area. The majority of people, 52%, belong to the Bambara tribe, followed by the Mandingo linguistic group which includes the Bobo tribe (17%), the Minianka tribe (10%), the Sarakole tribe (10%), the Peul tribe (9%), the Bozo tribe (2%), the Dogon tribe (1%), the Mossi tribe (1%) and the Sonrai tribe (0.1%). The Bozo tribe lives along the Niger and Bani Rivers and their main activity is fishery. The Peul and the Bozo tribes are stock-raising tribes.

The Bozo tribe lives along the Niger and Bani Rivers and their main activity is fishery. The Peul and the Bozo tribes are stock-raising tribes. The villages of the Bambara are located in the hilly area of the savanna. In Bambara society, land can be occupied by the family that first settled on it (the pioneer). The holy spirit possesses the land, but the village chief can exercise the right to the land as proxy for the spirit. The Bambara tribe have paternal family names such as Samake and *Coulibaly*,

and the families of the pioneers live in the respective villages, so these village are called as “Samake village”, or “*Coulibaly* village”. Most of the chiefs of those villages are the descendants of these oldest families.

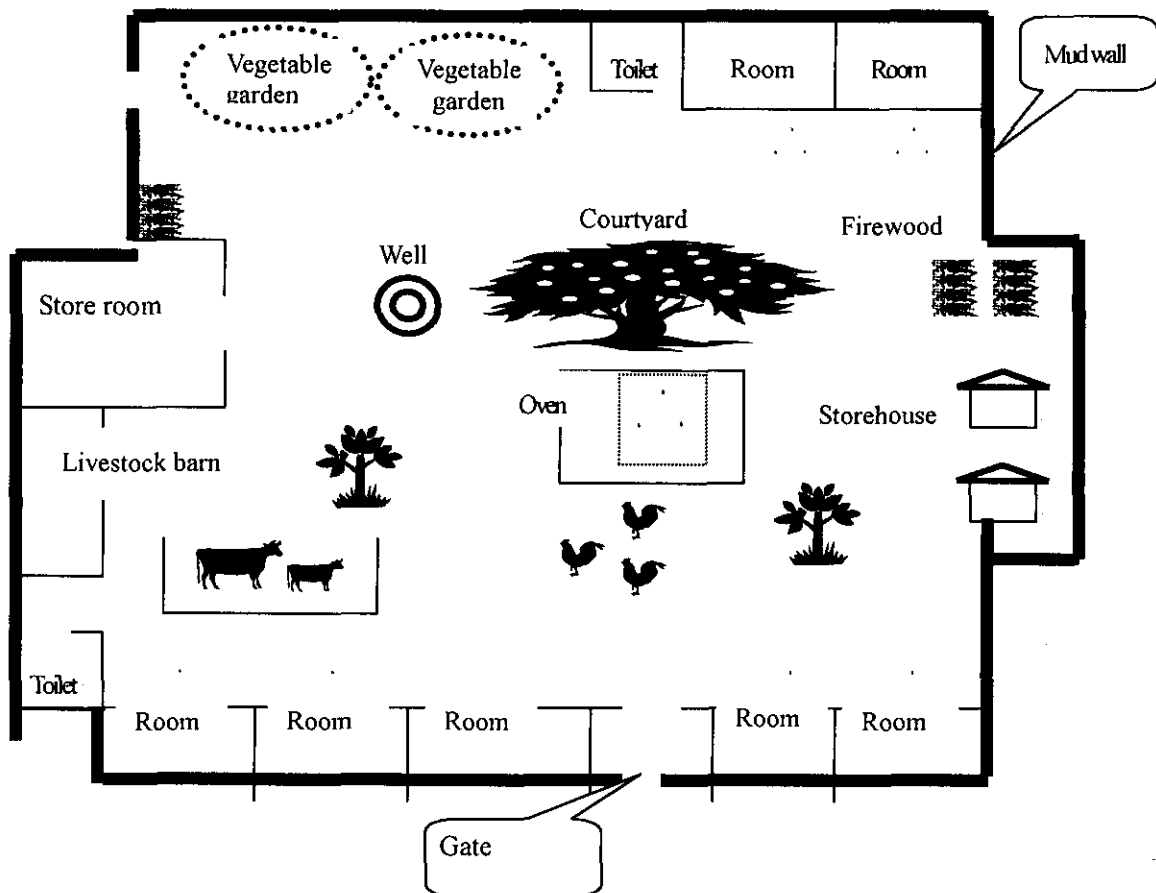
Today, settlement on new land is still carried out in this area. If the settler succeeds in making a living on the land, his friends join and the land expands as a hamlet. The state owns the land, but settlements can be made freely. This means that there is unused cultivable land in this area.

2) Village (hamlet) organization

A village (*dugu*) is composed of hamlets consisting of tens of collective houses (called *du* in Bambara, and called UPA in French) to over hundred collective houses. UPA means a mud wall around a house in the Bambaran language and a tenement house (called *so* in Bambaran language) like ‘concession’ in French (See Figure 2.2.1.). UPA will be used in the meaning of collective houses.

The Bambara tribe used to have a polygamous marriage system, which was institutionalized with the arrival of Islam. Approximately half of the families are extended polygamous families. About half of the UPA are nuclear families. An example of the enlarged family is shown below.

Figure 2.2.1 Example of UPA (sketch)



Agricultural production is conducted in two types of fields: one is a common UPA field (*foroba*). In the *foroba*, the second generation of men as mentioned later are engaged in food production for their UPA. In the common UPA field, cereals such as millet and sorghum are produced for self-sustenance, but raw cotton is cultivated as a commercial product in some areas.

The other type of field is a private field (*jonforo*), which is granted by the chief of the family to the second generation (wives of the second generation). The products such as cereals and vegetables cultivated in the *jonforo* are freely used by the wives of second generation. The origin of *jonforo* comes from a field lent by a master to one of his slaves in the time of slavery.

The extended family consists of three 'generations in one household'. The first generation is the householder (the chief of the UPA) and his wives, the second generation the married son and his wives, and the third generation the unmarried children.

Labor sharing by the generations is described at UPA level as follows:

1st generation: Married men and women who have retired from various types of labor within the UPA

Man (chief): Responsible for managing the food and money, allocating the farm produce for consumption or sale, and giving work instructions to the second generation.

Women (his wives): In charge of handing out the day's supply of millet to the second generation of women on behalf of the chief of the family every morning, purchasing seasonings with money received from the chief and delivering them to the women of the second generation. This role is played by the first wife or by all the wives in turn.

2nd generation: Married men and women who mainly undertake the labor of the UPA

3rd generation: Unmarried children helping the second generation with the labor of the UPA

2nd and 3rd generations of men (the chief's sons and grandsons): Engaged in productive labor under the chief's direction. The grandsons help the 2nd generation of men. The site of productive labor is the *foroba* of the UPA.

2nd and 3rd generations of women (wives of the chief's sons and granddaughters): In charge of mortar pounding millet, drawing and carrying water, and cooking meals for the UPA. The granddaughters help the 2nd generation of women. The 2nd generation of women is in charge of cooking by turns every two days.

There are two kinds of oven (*gwa*). One is a joint oven *forobagwa* where only the meals for the UPA are made. The other is a private oven *jonforogwa* that a married woman can use to make snacks for herself, her husband and children.<sup>1)</sup>

On average, a family consists of 4.8 persons and a UPA consists of less than 20 family members in the study area. However, the scale of the UPA differs from cercle to cercle; for instance, from 6 persons in Tominian to 80 persons in Baraouéli. Table 2.2.1 shows hierarchical village structure by each cercle in the study area.

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<sup>1)</sup> "Family space in polygamous extended families" by Michiyo Hosaka, "African Research" 38



**Table 2.2.1 Indices by Hierarchical Village Structure**

Index	SEGOU	BARAOUÉLI	BLA	MACINA	SAN	TOMINIAN	Total	
Actual Figures	Total area	1,614,504	446,508	556,114	633,565	639,642	681,960	4,572,293
	Number of villages	538	239	223	247	420	313	1,980
	Number of UPA	14,970	1,595	4,635	8,115	12,617	21,621	63,553
	Number of concessions	49,607	14,265	18,329	21,549	35,446	25,665	164,861
	Number of families	79,492	27,488	33,333	29,666	44,652	32,933	247,564
	Population	421,374	128,861	151,976	143,291	203,142	129,246	1,177,890
Indices by Village	Total area	3,001	1,868	2,494	2,565	1,523	2,179	2,309
	Number of UPA	28	7	21	33	30	69	32
	Number of concessions	92	60	82	87	84	82	83
	Number of families	148	115	149	120	106	105	125
	Population	783	539	682	580	484	413	595
	Population	Population density (persons/km <sup>2</sup> )	26.1	28.9	27.3	22.6	31.8	19.0
Population per UPA		28.1	80.8	32.8	17.7	16.1	6.0	18.5
Population per concession		8.5	9.0	8.3	6.6	5.7	5.0	7.1
Population per family		5.3	4.7	4.6	4.8	4.5	3.9	4.8

Total area: GIS measurement

Number of villages: National Statistics and Information Bureau, 1998

Numbers of UPA, concessions and families: Agricultural Annual Report, 1999

Population: National Statistics and Information Bureau, 1998

Note: The figures for UPA, villages and concessions in the study area cannot be separated, but are analyzed for the entire cercle concerned.

### 3) The nature of UPA

The word UPA has two meanings. The first refers to a cooking stove like the *forobagwa* or *jonforugwa* as mentioned above, and the other refers to the houses (UPA). The minimum unit making up the UPA is a couple.

The UPA serves as a place that caters to the farmers' physical, spiritual and religious needs. It is the arena for the production, distribution and consumption of agricultural goods; a place where information is exchanged, where physical appetites are satisfied, where children are raised and educated; and also a social arena for the observation of ceremonial occasions such as weddings and funerals.

Strong forces in the UPA, led by the family chief (*gwatigi*, also known as *dutigi*, which will be used here) are at work to prevent members leaving the UPA. All authority and control over the disposal of agricultural produce and the management of grains and the household finances are in the hands of the *dutigi*, and work in the communal fields (*foroba*) is carried out by the men of the UPA under the instruction of the *dutigi*. Since the amount of agricultural produce for the region is in direct proportion to the male labor that can be secured, male labor is highly valued. Individual fields (*jonforo*) are readily granted to females, but as a rule they are not granted to males. The reason for this is that

increased income from the *jonforo* will give a man economic power, with the danger that he will become independent of the UPA. This situation is reflected in the fact that almost all the work in the *jonforo* is done by women and children, and also in the tendency for the population of the UPA to grow.

As a general rule members of the UPA live within the mud walls of the UPA where the *dutigi* lives, but if space is cramped a single couple or multiple couples may live in separate houses (*so*) nearby. However, meals are taken within the UPA where the *dutigi* lives. The only food store is within the UPA of the *dutigi*. There is one main 'cooking stove' (the big *gwa*) used to make the meals of all the members. In the UPA of a large family, many wives will have their own private cooking stove (little *gwa*).

The UPA has a system of instructions that originates from the *dutigi* and covers different activities, including instructions for agricultural work. The word of the *dutigi* is absolute. Agricultural work in the *foroba* for the sake of the UPA is carried out on the instructions of the *dutigi*. Normally this work is done by the men, but in some areas women also join in the sowing and harvesting.

The *dutigi* sometimes dispatches a representative when he himself is asked to take part in functions. As was stated earlier, the *dutigi* attains his position through seniority, which means that many *dutigi* are of advanced years. Thus when he is asked to take part in training such as agricultural technical training, the *dutigi* will often order someone else to take his place.

Within the UPA there is a fixed order with regard to who carries out the duties of the *dutigi* ('family chief'). When a *dutigi* dies, the order of succession to the position of *dutigi* follows this order. In many cases, the order of succession is determined according to ages of the men of the UPA. If the *dutigi* has a younger brother, that brother becomes the *dutigi*.

#### (4) Organization and customs of the villagers

In the village, there is a traditional organization called "Ton". The number of Ton differs for each village, but usually there is an average of five to six Ton in a village. A Ton is a group with an objective, such as an agricultural organization, an organization of family chiefs, a young peoples' organization, a women's organization, or a hunters' organization. The Ton plays an important role in the management and operation of the village, but does not take on itself the task of develop activities, like the village office.

There is also a system similar to the "social ostracism" of Japan. If a villager does not participate in the "*Tonbaara* (joint work)" of the village, he/she will be punished with a fine. If he/she does not pay the fine, the amount of the fine is raised. If the offending villager still does not pay, he or she is exiled from the village. There also is a custom in the village whereby a suitor helps several times with the agricultural work of the prospective bride's family, together with a large number of young men. If the suitor is excluded from the Ton, nobody will help him. This system maintains the village as a community. Due to this custom, the residents have the activity standard to pay attention to how others think about them. Therefore the participants of the projects implemented by the residents' participation have to work as a group by considering how others think about them.

There also is a custom of labor exchange called '*daman*' (meaning the next day), which is the

equivalent of "Yui" in Japan, which is carried out in various forms. With the improvement of agricultural tools, this custom of exchanging labor is tending to fall off.

Women who have participated in winnowing labor receive payment in kind of a quantity of the grain in question measured in gourds of different sizes according to the woman's age and physical power. This is called the "threshing-ground gourd". Approximately 10% of the harvested crop is given as payment. This payment is equal to approximately 3 times the actual labor wage required for winnowing. This allotment of payment may be a manifestation of the alms (*zakat*) of Islam. The larger the yield, the greater the amount of payment made by the farmer. If we look at this custom from the economic aspect, farmers with a larger unit yield suffer a loss, and farmers with a smaller unit yield, gain. This system partially prevents the growth of progressive farmers.

#### (5) Situation of Village Women

##### 1) Labor and livelihood of village women

The agricultural production techniques mostly employ simple manual farming tools such as hoes, knives and hulling sticks in the processes from cultivation to harvesting and hulling, though cultivation using cattle may also be carried out. However, such farming work needs no special knowledge or experience. Of the means of agricultural production, the constant is land and the variable is labor. The number of personnel that can be mobilized regardless of their ability and experience. Under these conditions, how much manpower can be mobilized to cultivate the fields is the most important factor in determining agricultural productivity. The prolificacy of women is expected to secure as many workers as possible in order to increase production. Each woman in the rural villages bears an average of 7 children during her lifetime.

The Community Health Center (CSCOM: Centre de Santé Communautaire) that is a subordinate agency of the Ministry of Health is promoting a longer period between births for the purpose of recovery of the physical strength of the mother. This movement is aimed not only at recovery of the physical strength of the mother, but also as a hidden means of controlling the tendency toward prolificacy. Previously only 1% of married women agreed to this measure, but recently 10% of married women support it. In recent years, women have gradually come to recognize that they cannot be economically well-off if they have many children. This recognition was also verified in interviews with the chiefs of Cercle and farmers (men).

Generally speaking labor is shared in such a way that the men are generally in charge of farming and the women are in charge of work in the UPA. If they do not work away from home during the dry season men make sun-dried bricks, construct or repair the *so*, or do some work for the UPA, but are relatively free. However, women are busy all the year round. As there is no proper mill, women need to spend a long time every day polishing and milling millet and sorghum in a mortar. The drawing and carrying of water is also not an easy job. While it may be a remnant of a time when firewood could be easily secured in the nearby forests, the collection of firewood is also women's work. Over a period of about three months at the end of the dry season, the women cut down trees and spend a month carrying the firewood to the village. In the past, the area where the cutting was done was located about 1 km from the village, but recently the women must travel a distance of about 3 km. During this time some women take lunch to their husbands in the fields and make time to work in the *jonforo*. Women who have many children really have no time to rest. Men do not do any household work in the UPA. We

hardly heard of any women participating directly in the decision-making of the village.

## 2) The realities of marriage

The first wife of a young man in the village is a young woman determined by his parents. The family into which a young woman will marry is determined by an agreement between both sets of parents. This system is continued as a tradition of the Bambara tribe, in order to protect the village. We were told that, "marriage between willing parties only happens in the city". However, the elderly did not think that the present system would continue in the future.

Men perceive marriage as a way to obtain labor. Wives really do work well. Betrothal money is legally limited (10,000 Fcfa), but in fact, the amount runs fairly high, and for this reason men have to work away from home.

## (6) Social Issues for Agricultural Development

This area used to be a society in which there was no need for literacy. Even at the present time, the literacy rate remains low in the agricultural villages. The rain-fed agriculture of the area does not need written knowledge or techniques because there is little input, and this may be one of the reasons for the low literacy rate. This region is characterized by the fact that the people had almost no concept of area or distance until they encountered France (culture). The present farmers still have a poor concept of area and distance.

However, being charged a water rate according to unit area has given paddy farmers who use irrigation an understanding of the concept of land area. Even in dry-land farming, farmers who cultivate raw cotton, a commercial crop grown in the southern area where rainfall is relatively plentiful, have been instructed in fertilization management in which fertilizers and agricultural chemicals are used by area unit; since the amount paid to the farmer is determined by consignment weight, these farmers have an understanding of both land area and weights and measures, and also have a high rate of literacy. In the Bambara's society, it is said that there were boundaries marked with some natural objects such as trees, rocks or rivers, but that the concept of "territory" as an extent of land was ambiguous. A large 'country' does not mean a country controlling a large area, but numbers of 'people'. There was surely the concept of 'number'. The political and economic government has higher significance over 'people' than 'land'. The ancient kingdom had a poll tax.

It is said that prior to colonization there were no production techniques such as irrigation and ploughing in the farming regions of the area, but in fact the social and natural conditions were not conducive to the establishment of intensive farming using these techniques; the surface soil was so shallow, for example, that deep ploughing using a traction plough would produce a worse result for production than non-use. In addition, until recent years, there were broad cultivatable lands that were beyond the cultivating ability of farmers, who shifted cultivation from field to field. They were satisfactory if there was an adequate "area of farmland". These circumstances probably caused the fact that no concept of "area" and "distance" was needed. Setting aside the concept of distance, it is a great problem for the farmers to have little concept of area when undergoing technical training in the planning and operation of agricultural production based on investment and production per unit area.

The cultivation of raw cotton which is Mali's biggest export product is carried out by rain-fed farming. The technical personnel of the Mali Textile Development Corporation (CMDT) have instructed the

farmers in the concept of hectares by fixing marks on the four sides of a 100m square. The base agents have trained the farmers in the quantities per unit area of seeds, fertilizers and agricultural chemicals at each of the growth stages of cotton. This technical extension course has been repeated many times to ensure that the farmers acquire satisfactory knowledge and experience. Only farmers who can understand letters and numbers are able to achieve it. The language used in the training is the tribal language. Thus, long-term trial and error attempts have been made in order to solve a number of problems in extending agricultural technology among the farmers engaged in rain-fed farming.

## 2.2.2 Rural Sensibilization

### (1) Present Condition of School Education

The education system in Mali provides compulsory education in first elementary schools (6 years) and second elementary schools (3 years). In the elementary schools, reading and writing in French is the basic curriculum and other subjects are also taught in French. The Islamic schools focus on learning the Koran, and teach other subjects in Arabic. Both types of school come under the jurisdiction of the Ministry of Education.

The educational facilities in the study area are extremely inadequate. The present establishment of educational facilities is as shown in Table 2.2.2.1. The number of first elementary schools is 254, covering only 15% of the 1,695 villages. There are many children who cannot attend school. The school enrollment rates are 35.6% for boys, 22.6% for girls, making a total of 29.2%. The rate for girls is relatively lower than for boys.

Generally, facilities and teachers are lacking and lessons are taught in 2 or 3 shifts in some villages. In addition, the number of second elementary schools and secondary schools is extremely small, and the students from rural areas are obliged to live in lodgings from second elementary school age.

In addition to school education, there are literacy centers in which tribal languages such as Bambaran are taught to adults. In Mali, the literacy centers teach Sonarai, Foulani and Tamasheck languages in the respective areas. The literacy centers are also official schools promoted by the Ministry of Education, but they receive considerable funding support from NGOs. The fact that these literacy centers are required in Mali proves clearly that the effects of literacy education in elementary schools and Islamic schools are insufficient in terms of literacy education.

**Table 2.2.2.1 Present State of Establishment of Educational Facilities**

	Baraouéli	Bla	Macina	San	Ségou	Tominian	Study Area
First elementary school Ecole fondamentale 1	18	59	17	65	36	59	254
Second elementary school Ecole fondamentale 2	4	6	2	3	7	7	29
Secondary school Ecole secondaire	0	0	0	0	5	0	5
Islamic school (Medersa) Medersa	28	20	10	14	53	4	129
Literacy center Centre d'alphabétisation	108	135	47	141	200	103	734

Note: First elementary school: 1st to 6th year. Second elementary school: 7th to 9th year. Source: UNICEF

The situation regarding the establishment of schools in 275 villages covered by the survey on the production of village cadastres is shown in Table 2.2.2.2. One third of the villages have schools, and the average distance children must travel to school is between 5 and 8km.

**Table 2.2.2.2 Village Schools**

CERCLE	Established school				Total		Distance to school
	Yes		No		Number of villages	%	
	Number of villages	%	Number of villages	%			
Baraouéli	20	53	18	47	38	100	4
Bla	11	32	23	68	34	100	8
Macina	9	47	10	53	19	100	4
San	23	34	44	66	67	100	5
Ségou	22	33	44	67	66	100	5
Tominian	14	28	37	72	51	100	6
<b>Total</b>	<b>99</b>	<b>36</b>	<b>176</b>	<b>64</b>	<b>275</b>	<b>100</b>	<b>5</b>

Source: Surveys on production of village cadastres

In Mali, there are few workplaces (industries) where people who have received an education can get jobs in which they can demonstrate the fruits of their education. Therefore, there exists no environment in which parents would be enthusiastic about educating their children. Local agricultural production relies on rain-fed farming based only on farmers' experience. Present rain-fed farming needs no agricultural production technology that could not be effectively used without education because of a little input.

In school education at present, there is no teaching of everyday languages (e.g. Bambara). There are not enough texts or teachers for teaching everyday languages. French and Arabic are foreign languages that the children in rural villages use only in their classrooms. In particular, Arabic is a foreign language used in mosques. Daily conversations in urban life are also mainly carried on in tribal languages. There are very few farmers who understand French. Literacy education in such foreign languages that are not used in daily conversation makes it difficult for the people in rural areas to be literate. Under these circumstances, the Government of Mali plans to implement language education in tribal languages and make French an optional subject.

Agricultural production as an economic activity of which issue is productivity at present is based on agricultural technology in terms of experience and theory. This means that technical information in the field of agriculture involves lettered information and experience based on the concepts of area, weight and measure. For the transfer and acquisition of agricultural theory, lettered information is indispensable. To obtain wealth by agricultural production as an economic activity, it is necessary to have a good command of lettered information on production technology and markets. The means of information acquisition that is available to the local farmers is extremely limited and it is also very difficult to extend agricultural technology among farmers.

As detailed above, the promotion of literacy education of tribal language is a very important issue for agricultural development within the study area.

### 2.2.3 Local Public Administration and Taxation

#### (1) Administrative Organization

The Decentralization Law was passed in 1995 in Mali. Previously, there had been no local government system. The Central Government consists of 21 Ministries. The entire country is divided into 8 Régions, 49 Cercles, 701 Communes and about 10,000 Villages. The study area covers 6 Cercles, 91 Communes and 1,695 Villages. Régions and Cercles provide administrative services as subordinate organizations under the Interior Ministry. In addition, a number of branch agencies of Cercles and lower level are under the direct control of the individual Ministries of the Central Government.

The study area occupies the southern half of Ségou Région (on the right bank of the Niger River) and consists of 6 cercles. At present, the administration of Mali is categorized hierarchically into State, Région, cercle, Commune and Village. Until 1999, the cercles were divided into Arrondissements, but they were reorganized by enforcement of the Decentralization Law, and decentralization has been promoted since then. However, reorganization is not well established yet and the administration and organizations at Commune level are not functioning adequately. Therefore, the available statistical data, including data on agriculture, stock raising and forestry as well as area, are arranged in the old units of Arrondissement.

#### (2) Decentralization

After enforcement of the Decentralization Law, the Arrondissements were reorganized into Communes as new autonomous organizations. Each Commune, to which the Central Government distributes a planned budget, will start its own activities in 2000 with its own budget. The most important service of each Cercle is to provide supervision and guidance to Communes as new autonomous organizations. The chief of the Commune is publicly elected.

#### (3) Local Taxes

The Decentralization Law stipulates the securing of local financial resources by Communes as the "resolution of financial resource taxes for Communes". Each Commune has a "budget" in 2000 for the first time. The local taxes include the following:

① Commercial operation tax and export/import license tax (ad valorem taxes)

Tax revenue distribution:

Commune	50%
Cercle	25%
Région	25%

② T.D.R.L. (local development tax: so-called poll tax, specific duty) (since 1998)

T.D.R.L. is not uniform throughout the country, but differs from Cercle to Cercle.

Taxation: Uniform 1,750 Fcfa per year from age 14 to age 60 (in Ségou Cercle)

Exempted: Women with 4 or more children and university students

Tax revenue distribution:

Commune	80%
Cercle	10%
Région	10%

③ Tax on livestock and hunting guns (specific duty)

• Livestock holding tax

Taxation: Cattle	250 Fcfa/head
Sheep and goats	50 Fcfa/head
Donkeys	100 Fcfa/head
Horses	800 Fcfa/head
Camels	300 Fcfa/head
No tax on draft cattle	
• Hunting gun holding tax	
Matchlock	650 Fcfa
Loading gun	5,000 Fcfa
Tax revenue distribution	
Commune	100%
④ Income tax on officials of Communes and other government agencies	
The total amount of income tax imposed on the salary paid to each of the officials of Communes and other government agencies is paid to the Commune or agency that each official belongs to.	
⑤ Motorcycle tax (specific duty)	
Taxation: 50 cc or less	3,000 Fcfa
51 to 125 cc	6,000 Fcfa
125cc or more	12,000 Fcfa
Tax revenue distribution:	
Commune	60%
Cercle	25%
Région	15%
⑥ Automobile tax (specific duty)	
Taxation: 1 automobile	1,500 Fcfa
Tax revenue distribution:	
Commune	60%
Cercle	25%
Région	15%

The general local public taxes are as described above, but each local government can impose other local taxes such as taxes on ferry boats or donkey wagons. For instance, in Ségou, 25 Fcfa per day is collected as the rent for a concession in the market.

The national taxes include customs (export/import tax), value-added tax (18% at present) and corporate tax. A tax is also imposed on livestock as export tax.

In Mali, only the Central Government and Communes have their own budgets. The Central Government estimates the collected tax amount based on the estimated tax amount of each Commune. This tax amount is distributed to the Communes. The officials of each Cercle and the chief of each village undertake the collection of local taxes.

In tax collection, the full amount of livestock tax, which is disliked by farmers, is ingeniously distributed to the Communes. In view of the taxation system, it appears that the Government is prepared to nurture each Commune of farmers by their own charges. The number of head of livestock for taxation is not investigated by the government office, but determined by the response from the chief of each village. This taxation system is a new system enforced in 2000. Therefore, it



will take more time to grasp the actual conditions, including the issue of subsidies by the Government.

The fact that no poll tax is imposed on mothers of 4 or more children signifies “many thanks for their efforts and hard work” and is also based on the philosophy of “livelihood assistance”. However, it is feared that consequently it may promote an increase in the population.

## 2.3 Economy

### (1) Economic Overview

The economic system in Mali was based on a planned economy until 1985. 15 years have passed since a market economy was established. At present, there is no market regulation by the Government, and the nation’s economic activity is liberalized. Although the economy of Mali in 2000 was affected by the recession in Asia to which the country’s largest export product, cotton, is supplied, the gross domestic product (GDP) was 1,527.1 billion Fcfa (approx. 308,474.7 million yen) and the real growth rate was –8.6%. Recently the GDP growth rate is lower in 2000, but it shows favorable trend (Table 2.3.1) This is backed by a steady increase in cotton exports.

The industrial structure in 2000 was as follows: primary industry 43.4%, secondary industry 17.8% and tertiary industry 38.8%. This structure had not changed substantially for 10 years. No structural change had occurred.

GDP per capita in 2000 was 152,253 Fcfa (approx. 30,755 yen), placing it 162nd out of 174 countries in the world in 1997. Mali falls into the group of least developed countries (LDC). The human development index (HDI) reflecting these conditions placed it 166th out of 174 countries in the world.

**Table 2.3.1 Trends in GDP**

Year	Unit: billion Fcfa				
	1996	1997	1998	1999	2000
GDP	1,319	1,423	1,594	1,671	1,527
Growth rate (nominal)	+11.9	+7.9%	+12.0%	+4.8%	–8.6%

Source : Indicateurs Statistiques Surie Mali (1997)  
Comptes Economiques du Mali (1999)

### (2) National Finance

The national finances of Mali continue to incur a large revenue shortfall every year despite the efforts of the Government (Table 2.3.2). The revenue shortfall every year exceeds 30% of the expenditure. The revenue shortfall is complemented by external liabilities. As a result, external liabilities were US\$ 1,456.1 million in 1985, but tripled to US\$ 4,608.8 million in 2000. Fiscal consolidation is an urgent issue, but no effective solution has so far been found.

**Table 2.3.2 National Finance**

Year	Unit: billion Fcfa				
	1997	1998	1999	2000	2001
Revenue	236.3	254.9	272.7	269.9	320.1
Expenditure	350.4	383.5	417.5	440.1	532.6
Balance	-114.1	-128.6	-144.8	-170.2	-212.5

Source: BULLETIN TRIMESTRIEL de CONJONCTURE(Mai 2002)

### (3) National Development Plan

A five-year development plan to consolidate the national development plans was formulated in the past, but none exists at present. Today, a development plan is formulated for each sector. In agriculture, the "Agricultural Master Plan" beginning in 1992 was formulated, but it is now under revision. The previous "Agricultural Master Plan" contained project plans, and the revised plan will also include project plans. In preparing the development plan for each sector, the Planning Bureau of the Ministry of Economy and Finance participates in the drawing up of the plans.

### (4) Trend in Foreign Trade

Exports from Mali have increased at an annual rate of about 20% (nominal) in recent years. This increase is supported by the favorable growth of exports of cotton and gold which account for more than 80% of total exports. The export structure consists of three items, cotton, gold and livestock, which account for 90% of total exports. However, cotton exports in 2001 were reduced by half under the sluggish world market in addition to the drop of the unit price for the export of -8% compared with that in 1997.

On the other hand, imports are also increasing at an annual rate of approximately 20%. The main imported items are machinery, petroleum and automobiles, reflecting the fact that Mali is an agricultural country with no manufacturing industry. As a result, the balance of trade shows a high excess of imports. In actual fact, imports are 1.3 to 1.5 times as much as exports.

**Table 2.3.3 Transition in Balance of Trade**

Exports/Imports	Unit: billion Fcfa				
	1997	1998	1999	2000	2001
Exports	317.6	348.3	351.6	373.6	523.1
Cotton	148.4	159.7	134.0	116.0	73.3
Gold etc.	115.6	133.1	147.9	193.0	353.8
Livestock	28.7	28.0	32.8	37.7	46.0
Imports	398.4	478.9	506.9	573.5	725.0
Engines, machines etc.	47.1	51.9	58.9	69.4	99.7
Petroleum etc.	73.8	69.9	71.0	120.6	138.0
Automobiles etc.	46.4	45.5	58.0	59.0	64.5
Balance of trade	-80.8	-130.6	-155.9	-199.9	-201.9

Source : Statistique du Commerce Extérieur Bulletin Annual (1996)

Indicateurs Statistiques Surie Mali (1997)

### (5) Agricultural Economy

#### 1) Agricultural and stock raising production

In agricultural production in Mali, although the productivity per unit area varies by the regions, almost the same kinds of products are cultivated in the entire country. Cereals such as millet and sorghum produced by rain-fed farming are cultivated in the entire country. The production of cotton, the country's major export item, is concentrated in the Sikasso and Koulikoro regions in the southern part of Mali where rainfall is high. Rice production flourishes in Ségou Region thanks to irrigation from the Niger River. The crop depends upon the available water volume.

The Ségou region is a farming zone that is rich in water resources owing to the Niger and the Bani Rivers that flow through the region. In particular, the rice producing area is 28% of the entire country,

but production reaches 60% of the total production of the whole country. This is due to the Niono irrigated farmland of 60,000 hectares supplied with water from the left bank of the Niger River, established by the Government of France in 1943. In addition, sugar production is conducted in a joint venture with China on this irrigated farmland. Cotton production in Ségou Region is less than 10% of the total production of the country due to unstable rainfall (especially at the beginning) for cotton cultivation.

The difficulty of securing water is manifest in the making of compost. Compost is made during the dry season and requires water, animal faeces, and hard work. In particular it requires the drawing and carrying of fairly large quantities of water every week. At present compost is made by approximately 10% of farmers. In a situation where it is difficult to secure even domestic water, it may be difficult to introduce compost-making to even half of the farmers.

**Table 2.3.4 Agricultural Production in Ségou Region**

Product	Ségou				Mali	
	Area (ha)	%	Production(t)	%	Area (ha)	Production(t)
Millet	285,163	25	237,766	30	1,142,388	792,548
Sorghum	94,229	13	79,173	15	698,608	514,532
Rice	19,082	7	32,705	9	266,656	334,414
Corn	8,980	3	16,335	5	252,093	292,229
Fonio	17,655	42	6,223	29	42,241	21,398
Total of Cereals	425,109	18	372,202	19	2,401,986	1,955,121
Kidney beans	3,295	34	365	17	9,581	2,171
Green peas	10,156	38	3,994	30	26,586	13,488
Sugar	2,888	61	658	97	4,727	672
Peanuts	37,541	19	20,374	15	195,989	138,328
Cotton	27,953	7	68,999	14	398,548	480,407

Source: Annuaire Statistiques du Mali (2001)

Stock raising occupies a key position in the agriculture of Mali. The head of stock is increasing year by year. Exports of livestock account for 9% of total exports, occupying third position. In West Africa, Mali and Niger are the two biggest suppliers of livestock.

**Table 2.3.5 Stock Raising in Ségou Region**

Stock Name	Unit: head		
	Ségou		Mali
	Head	%	Head
Cattle	461,901	15	3,075,658
Sheep	451,144	20	2,310,812
Goats	561,758	17	3,227,392
Donkeys	78,901	20	406,405
Horses	8,438	23	36,864
Camels	229	0	65,445
Swine	32,349	61	53,509

Source: Annuaire Statistiques du Mali (1996)

## 2) Distribution and price formation

15 years have passed since a market economy was established in Mali, and no market controls by the Government exist in terms of quantity and price. The price formation for agricultural products depends upon demand and supply. Transactions in the markets are purchases and sales made by merchants. As farmers in rural areas have no means of transporting their agricultural products, they

cannot transport their produce over long distances and usually submit to the purchasing activities of merchants. The scope of economic activity of farmers engaged in rain-fed farming is limited because their improvement in literacy is proceeding so slowly that the range of economic information available to them is very restricted.

The price of cotton to be purchased each year by Mali Textile Development Corporation (CMDT) is announced in June when the cotton is planted. (The price in 2000 is 160 Fcfa/kg.) The international price of cotton fluctuates from year to year, but CMDT purchases cotton at an estimated price.

Mali has a cereal storage system that dates back to the time of the planned economy. The Agricultural Products Office of Mali (OPAM: Office des Produits Agricoles du Mali) purchases millet and sorghum in November to February. 35,000 tons were purchased in 2001. The stored cereals are updated by one third of the entire quantity every year.

### 3) Farm economy and savings

According to the survey on village cadastres which was implemented in 275 villages unintentionally extracted from the target villages, sources of income are agriculture (50%), stock raising (19%), forestry (11%), migrant work (14%) and salary (6%). Almost all income is gained from agriculture, stock raising and forestry, but migrant work cannot be overlooked. Monthly expenditure for a farm (UPA) is in the range of 14,200FCFA to 24,800FCFA (US\$35). When there is an economic surplus the farmers save it in one of the following ways.

- Increase of livestock: the quickest way of saving, that the farmer can manage by himself. Livestock can be converted into cash immediately when necessary.
- Purchase of gold or silver: purchase is easy, but management is difficult. Gold and silver can be stolen.
- Conversion into furniture or crockery: when times are hard, items bought in a set can be sold off separately.
- Deposit in a savings bank: Very few villages have a savings facility close enough to be of use.

In the cotton cultivation zones, there are many head of livestock although there is little pasture. In areas other than the cotton cultivation zones too, farmers say that when they have an economic surplus from production they purchase livestock. There is no other way to save money in the village. Husbandry is not a produce-and-sell activity, but an act of saving. Farmers raise goats by themselves, but sometimes leave the raising of cattle to nomads. This is certainly saving. A livestock business plan aimed at this kind of farmer must be carefully thought through. The improvement of saving systems in the area is urgently needed.

### 4) Migrant work

According to the survey on village cadastres, of 275 villages surveyed 258 villages (94%) engaged in migrant work: and according to the farm survey carried out in three villages, over 70% of the families were engaged in migrant work. In one of these villages all 30 households making up the village were engaged in migrant work. The type of work commonly undertaken was manual labor, by an overwhelming majority (over 80%). The destination of the migrant workers differed from village to village depending on the intermediating organization, but over 50% of migrant workers went to the capital, Bamako. Other destinations were the Côte d'Ivoire, other foreign countries and principal cities

of Cercles and Regions in Mali.

The type of work and the destination typically differs according to the nature of the village to which the workers belong. Migrant workers from the agricultural villages of the cotton-growing Tissala area work as traders (38%), factory operatives (23%), manual laborers (15%), teachers (8%), drivers (8%) and housemaids (8%). This reflects the fact that literacy rates are high in the cotton cultivation zones; the workers are used to trading activities, and there are cotton factories to provide work. Most workers stay in Mali, Bamako accounting for 66% of them: only 4% go to the Côte d'Ivoire.

Many youngsters work away from home. In the villages, going abroad to work is said to be "ten years working away from home, ten years of study". Working away from home is recognized as an opportunity for social training. Those who have the experience of working away from home are respected by the villagers for their breadth of knowledge, and become the leaders of the village. Many youngsters say the purpose of working away from home is to "get betrothal money". The "securing of betrothal money" is considered to be the responsibility of parents, but some young people work away from home for the sake of their brothers.

#### **2.4 Transitions in agricultural reform**

In 1959, Senegal and Sudan became independent from France as the Federal Republic of Mali. However, the federation was dissolved in 1960 and Sudan became independent as the Republic of Mali (hereafter, Mali). President Modibo Keita of Mali took the path of communism and deepened relationships with the Soviet Union and China. However, the failure of economic policies threw the national economy into confusion and President Keita was deposed in the coup d'etat of 1968. Mali continued to be a planned economy, but in 1985 switched over to a market economy.

##### **(1) From independence to 1968**

President Keita left the West African Economic and Monetary Union in 1962 and adopted his own monetary policies. These policies caused the economic confusion and stagnation, and the President was deposed. Although a development plan pursuing fast industrialization had been drawn up, no clear results were obtained because of the economic confusion.

##### **(2) From 1968 to 1984**

Mali returned to the West African Economic and Monetary Union in 1968 and order was eventually restored to the economic situation. The content of several development programs has changed little by little, and in the Sixth Development Program (1981 - 1985), the basic goals were set as follows. The following five items were the basic objectives of the program.

- ① Improvement of food self-sufficiency by means of water management
- ② Restoration of livestock lost because of drought
- ③ Development of mineral and energy resources
- ④ Amelioration of traffic problems (means and costs) within the country and with other countries
- ⑤ Recovery of economic and financial equilibrium

The Government of Mali calculated that the above measures would bring the economic growth rate to 4.1% (actual showing, 2.1%). The following four items were listed as important points for agriculture.

- ① Fulfillment of the nation's needs in terms of food, firewood and domestic water (food includes cereals, sugar, cooking oil, vegetables, fruit, meat and fish.)
- ② Supply of raw agricultural materials for existing or new food industries in the country
- ③ Promotion of the export of value-added agricultural products
- ④ Improvement of the technical, economic and social level of the village population as a whole

Ninety-seven projects specifying these items were planned, of which two-thirds received international support.

*(3) From 1984 to the present*

The economic system of Mali changed to a market economy in 1985. Various regulations and protections of the planned economy were abolished and agricultural production was made subject to free competition. The price of agricultural produce is determined by supply and demand. The objectives of agricultural promotion are indicated in the following plans.

- 1) National Environmental Action Plan and National Action Plan for the Convention to Combat Desertification (1998)

Important points in agricultural promotion were established as follows.

- ① Quantitative and qualitative securing of foodstuffs and other products through the continuous management of natural resources
- ② Improvement of living conditions and the prevention of contamination and pollution of the environment, in cooperation with the villagers
- ③ Promotion of cooperative activities at the local and international level in the sphere of environmental conservation

- 2) Basic Plan for the Rural Development Sector (1992)

The important points of this plan are as follows.

- ① Securing of food through increased food production, diversification of production and increased production in agriculture, stock-raising and silviculture
- ② Securing of environmental conservation and the conservation of natural resources for sustainable development

Each development plan and national program mentions the diversification of production, especially the "promotion of the export of value-added agricultural products", as a means of acquiring foreign currency. However there has been no progress in the diversification of export with the exception of raw cotton and live livestock.

In the national finances, there is a continuing revenue deficit of 30%. At present, the development of the entire country and the "Basic Plan for the Rural Development Sector" in the agricultural field are being revised with the support of international organizations. Recently, new agricultural development methods such as Terroir Management and other resident participatory methods are being discussed by those involved in agricultural affairs, and methods to promote agriculture are being sought.

The national finances are in difficulty, but the formulation of programs and the development of feasible agricultural measures resulting from studies by the Government itself are to be desired.

## **2.5 Trend of Development Support**

### **(1) Outline of Existing Projects**

Some projects are being implemented in the study area by the following organizations:

- ① International organization: International Fund for Agricultural Development (IFAD in English, FIDA in French)
- ② Aid agencies of various countries:
  - Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)
  - Deutscher Entwicklungsdienst (DED)
- ③ NGOs (World Vision, Sasakawa Global 2000, CARE, YEREDON, ACD, etc.)

These projects are summarized in Tables 2.5.1 to 2.5.2.